A Work Project, presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA – School of Business and Economics.

Equity Research – Bayer AG:
The Post-Merger Era

José Miguel Fernandes Moreira - 32051

A Project carried out on the Master in Finance Program, under the supervision of:

Professor Rosário André

17/12/2021

Abstract

Following the acquisition of Monsanto, Bayer's market capitalization suffered a huge hit, as it dropped to values lower then the all-cash acquisition price. By acquiring the business, Bayer also acquired the risks and faced several lawsuits that implied settlements of over €13 bn in the last years. Despite this, the prospects for Bayer's Crop Science are positive, with mega trends driving the potential growth in revenues. There are threats from competitors, such as Corteva in the soybean seeds market, but also promising new products, such as the revolutionary short stature corn that can solidify the position of Bayer as market leaders in the Agricultural Inputs market.

The Consumer Health business unit has its roots imprinted in the launch of Aspirin™ in the 19th century, a product that is still sold nowadays and even though the competition is high, with several substitutes, its still a relevant product in Bayer's portfolio. Favorable growth in the Nutritionals segments and increasing e-commerce constitute the key trends that Bayer will be focused on.

The recent dark times for Bayer may conceal a bright future in the post-merger era.

Keywords:

Bayer AG; Crop Science; Consumer Health; Equity Research

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

This report is part of the Equity Research – Bayer AG and should be read has an integral part of it.

Table of contents

Bayer's recent past

Bayer – Monsanto merger

In order to understand Bayer's near future, one must first look into the recent events of the company. After a long negotiation process and intense antitrust scrutiny, on June 7, 2018, Bayer announced the acquisition of Monsanto for a total cost of around US$ 63bn (around €53.4bn, using the USD to EUR exchange rate at the end of that day). This was the largest deal in Bayer's history and consolidated Bayer as a leader on the agricultural inputs market, becoming a company that operates as much in the pharmaceutical sector as it does in its Crop Science unit. The merger promised valuable future synergies, whilst diversifying Bayer's portfolio. It was an ambitious acquisition, among the largest carried out by a European company towards North America[1].

"The merger promised valuable future synergies, whilst diversifying Bayer's portfolio."

Glyphosate and Roundup™

Prior to the acquisition date and following research presented by the World Health Organization[2], linking glyphosate[3] to cancer in humans, lawsuits started to be issued against Monsanto. Glyphosate is the active ingredient in RoundUp™, one of Monsanto's best-selling products, an herbicide that is widely used across the world, but mainly in the United States. Despite the significant litigation risk, Bayer proceeded with the acquisition and (mostly within 2019) over 40.000 plaintiffs were filling lawsuits claiming that exposure to glyphosate-based products caused non-Hodgkin lymphoma and multiple myeloma and other types of personal injury. The claim is that Monsanto was or should have been aware that these products were defective and that it understood the risks associated with its use, failing to warn consumers. On February 3, 2021, the lawsuits were of roughly 61.800 plaintiffs. Monsanto and Bayer reached an agreement in principle with those, with no admission of liability, and in the year 2020 alone, among other litigations, paid over €13bn in legal costs.

"Bayer…paid over €13bn in legal costs"

Post-merger and glyphosate

Using available market information for comparing the position of Bayer before and after the merger, one could see how Bayer's market capitalization has evolved over the years (*Figure 1*).

[1] Indeed, it was the largest ever all-cash acquisition performed. **Source**: Reuters. https://www.reuters.com/article/us-monsanto-m-a-bayer-board-exclusive-idUSKCN11J1PD
[2] **Source:** International Agency for Research on Cancer. (2017). *Some Organophosphate Insecticides and Herbicides (IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, 112)* (1st ed., Vol. 112). World Health Organization
[3] Glyphosate is a widely used herbicide that controls broadleaf weeds and grasses. It is used to kill weeds, especially annual broadleaf weeds and grasses that compete with crops

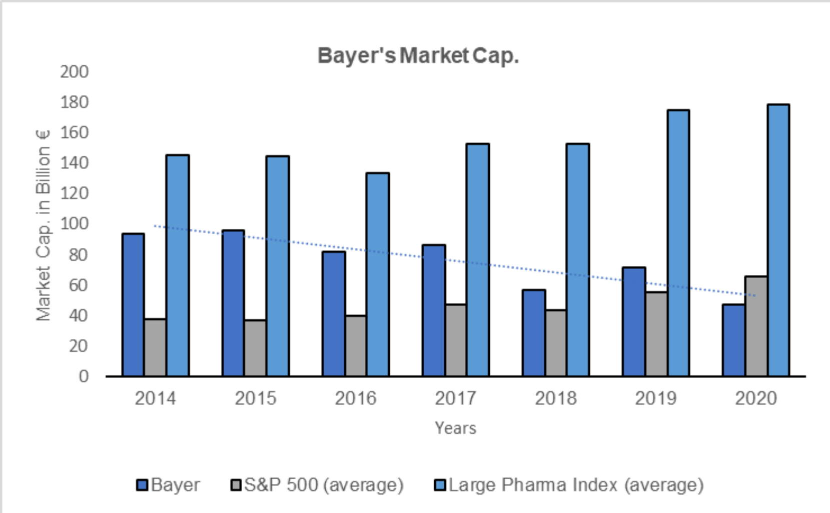


Figure 1 – Bayer's Market Capitalization compared to industry

"The current conglomerate (…) is worth less than what Bayer paid for Monsanto"

One could see that Bayer's market capitalization in 2015 was around US$ 125 bn, while at the merger date it amounted to US$ 100bn, but as of the end of 2021 its market capitalization is shy of US$ 50bn[4]. To better understand why the merger between Bayer and Monsanto is considered to be one of the worst business deals pursued in recent decades, the current conglomerate of Bayer and Monsanto is worth less than what Bayer paid for Monsanto, albeit there were some divestments meanwhile. The failure of the merger to live up to its expectation until now, combining with the litigation risks from the still on-going glyphosate legal disputes and subsequent reputational damage explain the current state and position of the company.

These events most certainly impacted Bayer's projected cash flows, but also explain, for instance, Bayer's current capital structure (*Figure 2*). Bayer had presented a conservative capital structure, with low (4 to 17%) Net Debt-to-EV, more in line with its pharmaceutical peers. As of today, the company's target ratio is set to approximately 30%, which reflects the increase in funds allocated to the merger, as well litigations settlements, and how the market is perceiving Bayer's positions.

[4] **Source**: Bloomberg

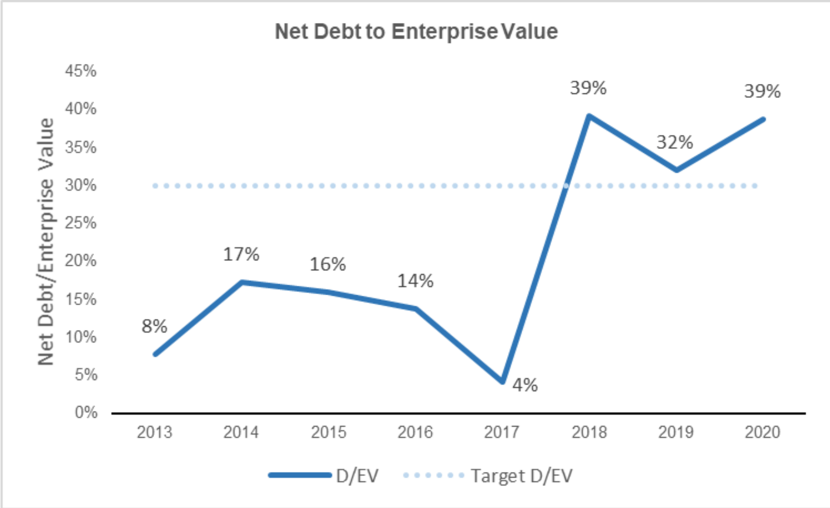


Figure 2 – Bayer's Net Debt to Enterprise Value

"Despite the consumers' and media hard take on RoundUp^{TM} herbicides, the product is still widely sold"

One shall also note that despite the consumers' and media hard take on RoundUp^{TM} herbicides, the product is still widely sold and used by the American producers and Bayer maintains its market leadership within the Crop Science segment. As such, public response to Bayer's most recent controversies is yet to be felt in its core operations.

Analysis' overview

Given the three distinct business units of Bayer AG (Crop Science, Pharmaceutical and Consumer Health), our analysis will consist in individual forecasts, discussion and respective margins and drivers for each sector. Where attainable, our valuation model will be driven by a 'sum of the parts analysis' (mainly revenues, cost of sales and R&D expenses). Some relevant financial information is not split into different business segments. In addition, there is reduced data in the pre-merger Monsanto and Bayer's Crop Science division, therefore it disallows us to measure the merger's operational synergies appropriately. This signals the market that the synergies promised by Bayer through the merger do not sum to the announced amount, as of 2021.

Having this in mind, each business unit will be hereafter explored individually, then common financial captions and other aspects of the mechanics of our valuation model will be analysed at company level and discounted at a single rate that captures each segment's operations, reaching a proposed share price for the conglomerate as of December 2022.

Crop science

Business segment description

After the merger with Monsanto, and even prior that, Bayer established itself as one of the world's leading players in the agricultural business. Its main businesses are related with Seeds, Crop Protection, such as herbicides, fungicides and insecticides, and digital and technological innovation within farming. In regard to Seeds, Bayer sells high-value seeds and special traits, catered to the needs of the farmers, whether it implies crops to be resistant to special parasites – to grow faster, to grow despite adverse climate circumstances and/or to be more sustainable overall. The Crop Protection consists of the development of products that aim to protect the plants from biological threats without harming the crop or causing undesired pollution. The business operates well with the seeds and special traits since some seeds and traits have been developed to tolerate the chemicals in the Crop Protection. The digital farming consists of developing new technologies that can support farmers managing their fields and using data to maximize the return on every acre cultivated. The global agriculture landscape is filled with major challenges, such as climate change, water scarcity and population growth. The objective is to meet the demands of the population whilst promoting more sustainable crops. To do so, Bayer needs to innovate, and it is doing so, by being the agricultural business company that spent the most in R&D in 2020 (*Figure 3*). Their near to medium-term plan is to develop in the crop science, seeds and traits and, for the long-term, a broader approach, including digital farming.

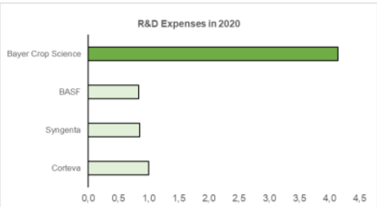


Figure 3 – R&D Expenses in 2020 for Bayer and peers (Source: Annual Reports)

"Solid growth … driven by an ever-increasing demand, both for direct human consumption and livestock"

Agricultural Inputs, Industry and Peers

Currently, Bayer is the major player in this market, with leadership in Corn, Soybean and Herbicides, with their soybean seeds being planted in more than 55% of the U.S. soybean acres, and Bayer and Monsanto amounting for close to 35% of worldwide herbicide sales in 2016[5]. The market is expected to sustain a solid growth in the years to come, strongly driven by an ever-increasing demand, both for direct human consumption and livestock. In terms of sales, Syngenta follows Bayer with Corteva coming in after. For profitability and margins comparison, Corteva, Syngenta and Nufarm were chosen. Corteva is the major competitor in the research of seeds and operates mainly in the U.S., while Syngenta is more focused in crop protection. Nufarm is considerably smaller than the other companies, operating mainly in Australia, but shares a similar portfolio as Bayer's Crop Science division. Regarding gross margins, it is possible to observe that Bayer presents slightly better margins than the average of their peers and it is assumed that its margins in the long run

[5] **Source**: Statista, *Global herbicide market share 2016, by company*

should move towards the industry, while still maintaining a higher profitability, result of their market leadership and consequent economies of scale.

How did the merger affect the industry? We already established that Bayer's market value diminished after the acquisition, but that is mainly related with litigation regarding glyphosate. The merger made the conglomerate Bayer and Monsanto the highest selling firm in the market but the benefits from being together are hard to estimate. Bayer claimed that the value of the synergies would amount to US$ 1.2bn by 2022[6], but did not explain how that value would materialize. There could certainly be cost efficiency gains, as the research performed benefits from the vertical integration and there could be revenue gains, as the products of Bayer and Monsanto coordinate reasonably well (for example, seeds sold under "*old*" Monsanto can be tolerant to insecticides produced by Bayer, thus selling them as a bundle to obtain higher market share). Monsanto was also considered to be one of the most hated companies in the U.S.[7], with the public even naming the company "Monsatan" and as such, merging with Bayer and selling under a new brand name could eliminate the poor reputation of Monsanto. The end result was negative for Bayer, with the glyphosate and dicamba litigations costing more than €13bn. Although the merger is not living up to its expectation and Crop Science sales did not grow as estimated by the conglomerate, Bayer still maintains their market position and their sales are expected to keep increasing following 2020, which decline was driven mainly by the pandemic[8].

"Monsanto was also considered to be one of the most hated companies in the U.S. (…) merging with Bayer and selling under a new brand name could eliminate the poor reputation"

Are there threats to Bayer's position? Corteva's product *Enlist E3*™ in the soybean seed market is the main threat to Bayer. Within the two years of the launch the expected market share for this product in U.S. soils is expected to be above 30% by 2021[9]. Bayer is tackling this with the launch of the second version of their most sold soybean seed, but its recent events may hamper the sales of the new product. In terms of herbicides, RoundUp™ is still the most sold product with the only relevant alternative being generic products coming from China. For the highest yielding revenue, the corn seed and traits, Bayer's dominance in the U.S. and Europe is untouched, while threats come from the growing productions in Southeast Asia[10], a market that Bayer still does not dominate. The success of their short stature corn, to be launched later in the decade, will dictate Bayer's expected revenues in corn and how they can approach all the markets.

"Corteva's product *Enlist E3*™ in the soybean seed market is the main threat to Bayer (…) market share (…) in U.S. soils is expected to be above 30% by 2021"

[6] **Source**: Bayer Investor Presentation / June 2018 / Monsanto Acquisition Update
[7] **Source**: Bloomberg News: *Inside Monsanto, America's Third-Most-Hated Company*. Monsanto is highly criticized for producing GMOs.
[8] A 5% decrease in Crop Science sales. According to the Bayer AG 2020 AR, "overall growth was limited by the decrease in cotton, fruit and vegetables demand caused by the COVID-19 pandemic, as well as dry weather conditions in Europe during the spring"
[9] **Source**: Corteva Annual Report & Polansek, T. (2021, April 9). Bayer, Corteva in "two-dog battle" over U.S. soy market
[10] Estimated CAGR 12.1% until 2023. **Source**: Mordor Intelligence (2020). Asia-Pacific Corn Maize Seed Treatment Market (2021-2026)

Revenues

“Corn seed market … grow at a CAGR of 5.5% until 2026… driven mainly by the increase in the demand for animal feed, which is a consequence of an increasing population and increasing livestock needs”

“One of the most promising innovations that Bayer will bring to the market is their short-stature corn trait … will imply an 8% growth in 2023, as it is first implemented in certain countries and 17% by 2027”

Although pharmaceuticals and crop science / agricultural inputs are totally different markets, the key drivers for these businesses, at least in the case of Bayer, are similar, in the sense that research and development, followed by the acquisition of a patent, is what drives growth in the revenues. Regarding the corn seed market, the estimation is that the market would grow at a CAGR of 5.5% until 2026[11]. This value is driven mainly by the increase in the demand for animal feed, which is a consequence of an increasing population and increasing livestock needs, but also by the fact that the producers of corn require higher quality seeds to uphold against stresses, such as pests or lack of water. In addition to this baseline growth, it is expected that certain events will increase or decrease Bayer’s revenues. One of the most promising innovations that Bayer will bring to the market is their short-stature corn trait, that is expected to be launched in 2023 and massively impact revenues by 2027. This new product tackles key threats to modern farmers and will perhaps be the main driver of growth in the Crop Science business. Such pressures arrive from climacteric conditions, whether strong winds or storms and shortage of water but also from lack of acres available. This new seed, as the name claims, generates shorter corn than usual, implying that it will require less water, it is more resilient to strong winds and storms and other external shocks to production, maximizing the output of corn per acre. This new seed will imply an 8% growth in 2023, as it is first implemented in certain countries and 17% by 2027[12], when it is launched all over the world, with the feedback for farmers from the tests in prior years. This launch should help Bayer in conquering market share in South America and Asia, where the growth opportunities are larger. Other shift to this side of the market is the loss of exclusivity over a patent around 2025 that should slightly decrease revenues.

For the soybean market, the increasing adoption of veganism in the western world[13] and the constantly growing health awareness drives up the demand for soybean and derivatives. Similar to corn, soybean is also a key ingredient to feed cattle and other animals, which, as previously mentioned, is also a growing market. For these reasons, revenues from soybean seeds and traits of Bayer are expected to grow 3.5% for the next five years[14], without considering key events that will occur. Currently Bayer has in its pipeline two traits of soybeans in final phases of research, both should be available by 2024 and one of them will provide higher resistance against herbicides and other chemicals, while the other will develop an extra endurance against insects. Meanwhile two valuable patent coverages, the second-generation Roundup Ready 2 Yield™ and the Intacta RR2 PRO™, are expected to

[11] **Source**: Mordor Intelligence (2021). Maize Seed Market, Forecasts (2021-2026).
[12] Company’s estimates merged with market forecast. Later challenged in scenario analysis
[13] **Source**: Statista, *Vegan Market - Statistics and Facts*
[14] **Source**: FAO

expire in the mid-2020s and combined with increasing pressure from Corteva for the claim of leaders in this market, should decrease revenues by 9%.

"For the remaining components of the Crop Science business, it is expected that they follow a baseline trend of growing around 3% annually until the end of the decade."

For the remaining components of the Crop Science business, it is expected that they follow a baseline trend of growing around 3% annually until the end of the decade. The growth of agricultural inputs is driven both by an increase in demand for agricultural products and for the demand of producers to maximize the output of their crops. With a growing population, fuelling the demand for products of agricultural nature, thus inputs for agriculture, combined with the scarcity of water and reduced acres of land per capita for farmers, causes the need for herbicides, insecticides, and fungicides to be even more relevant, in order to protect the crops from external shocks that could severely distress the production. The annual population growth rate is expected to be 1% in 2022, slightly decreasing to 0.83% in end of the decade[15], the annual growth rate of total livestock production is expected to be 1.60%[16] throughout the years, all this while the expected acres available for the eight major crops in the U.S. is expected to be constant until 2030.[17] As revenues are expected to grow at this rate, it is implied that Bayer is maintaining its market share and is simply growing at the pace of the industry. Given that Bayer is the largest player of the market and that its return on research capital, a figure that quantifies how much of the gross profit is for every unit of R&D expenses, is on average with the peers (4.3 of industry and 5 of Bayer, decreasing to 4 in the long run), it is a solid assumption that Bayer should be able to at least sustain its market share.

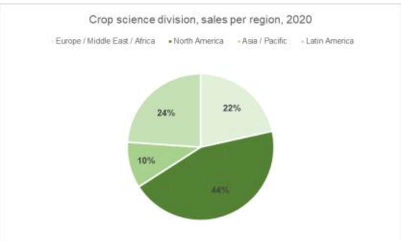


Figure 4 – Crop Science division, sales per region in 2020 (Source: Annual Report)

For herbicides, three major events are going to negatively impact revenues. The loss of patent coverage on the herbicide trait that confers dicamba tolerance, the loss of the XtendiMax™ in the U.S. (Bayer's Crop Science largest market – see *Figure 4*) and the fact that the sales of glyphosate-based herbicides for residential use in the U.S. will end, in an attempt to reduce litigation risk, especially after the RoundUp™ case. Two new products are expected to be launched in 2023 and 2024, with Bayer also trying to develop a future RoundUp™ product without glyphosate.

In fungicides and insecticides markets, new patents are expected to be acquired in 2023 and 2024, claiming additional growths of around 2 to 4%. For environmental science, vegetable and other products, in addition to the around 3% growth, the launch THRYVON™ in 2023 should boost growth by 3%, while the Dicamba-Tolerant Canola Trait should be achieved in 2028 implying the same level of growth.

[15] **Source**: World Bank
[16] **Source**: FAO
[17] **Source**: United States' Department of Agriculture (USDA)

With these forecasts, the revenue in Crop Science is expected to grow as follows (*Figure 5*):

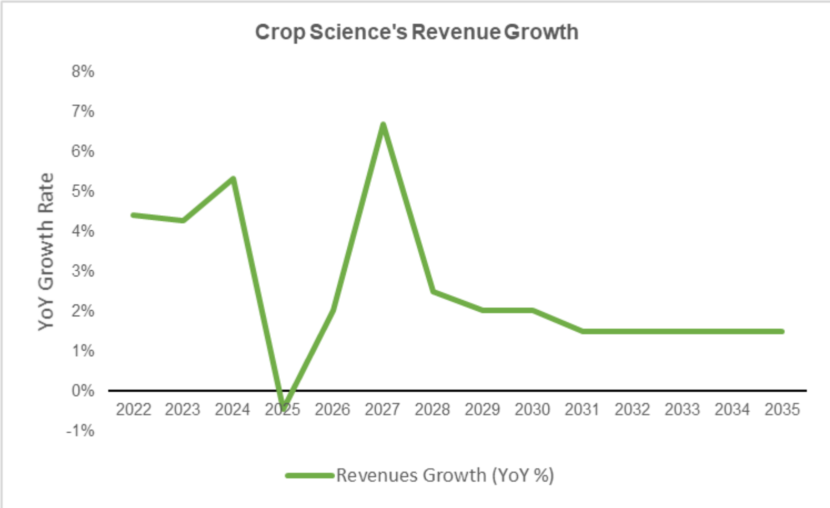


Figure 5 – Crop Science's Revenue Growth (Source: own projections)

It is possible to observe the decrease in 2025 due to loss of several patents' exclusivity and Corteva gaining market share in the soybean and seeds traits segment. In 2027, the impact of the short stature corn is clear, and revenues rebound, expecting to grow onwards.

Cost of sales and R&D

"Gross margins, they are expected to converge slightly to the industry average … maintaining some profitability advantage… R&D expenses expected to stabilise"

Regarding Bayer's Crop Science gross margins, they are expected to converge slightly to the industry average, although never reaching it by maintaining some profitability advantage due to its market position. Following a period of relatively high R&D expenses, the firm is expected to stabilise this figure over the next decade, while claiming increased sales also driven by these years of higher expenditure. Despite increasing costs in R&D and materials[18], synergies from the merger should cancel off this effect, justifying the fixed margins for Bayer.

[18] **Source**: Congressional Budget Office (CBO). (April 2021). Research and Development in the Pharmaceutical Industry

Consumer Health

Business segment description

The Consumer Health business segment consists of non-prescription products (known as over the counter, OTC), such as medicines, medicated skincare, nutritional supplements and other self-care solutions. Consumer health products are divided according to their purpose, in the following groups: Nutritionals, Allergy & Cold, Dermatology, Pain & Cardio, Digestive Health and *Others*. Not unlike the Pharmaceutical segment (discussed in later chapters), this part of the business is very reliant on R&D, although it also relies on products that have been around for several years and that gained the trust of consumers, like Bepanthen^{TM}, launched in 1943, and the Aspirin^{TM}, a product developed by Bayer back in 1899, but that is still in the market and a key product, despite a considerable number of cheaper generic alternatives.

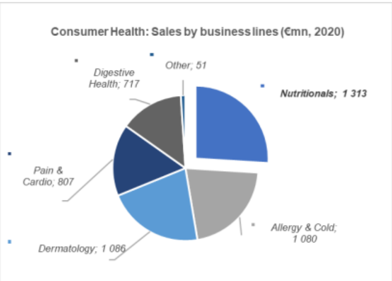


Figure 6 – Consumer Health: Sales by business lines (Source: Bayer AG Annual Report)

Following the acquisition of a majority stake in Care/of, the nutritionals is clearly the division's biggest bet (*Figure 6*), as it has now gained access to new alternatives to consumers in the main and largest-growing part of Consumer Health. New approaches of Bayer in this segment are focus on the transitioning of current prescription products to OTC ones and digitalization of all areas of their operations.

Industry analysis

The main trends affecting the industry are the increased percentage of people aged over 65 years, rising healthcare costs and a constant development of health awareness of consumers to make self-care more relevant. The market is highly competitive, with mid-size companies constantly introducing new products, that compete with existing ones at lower prices, although a few companies still hold a considerable share in this market, Bayer included. The U.S. market is the biggest market and is expected to maintain that position in the perceivable future, but it is in Latin America and Southeast Asia that the market will grow in the subsequent years, due to rapidly growing population in conjunction with increased disposable income with a fast-growing middle class.

Dietary, nutritional, weight-loss are expected to be the fastest growing products, mainly fuelled by rising awareness of the consumers on lifestyle-related health conditions, while vitamins and other supplements will maintain the market share dominance. Allergy & Cold products took a major hit during the pandemic as higher health precautions during this period reduced the need for these products.

The growth opportunities on this segment will be determined by innovation in R&D, as it historically has been, the perfecting of e-commerce experience and outreach and digitalization of products and processes, and which firms will grab significant market share in Southeast Asia and Latin America regions.

Revenues

"Bayer states that they are focused in expanding to the Southeast Asia market… competitors like Johnson & Johnson and Sanofi are already established players there and as such Bayer might miss its shot"

Bayer's Consumer Health, following divestments throughout the years, represents close to 12% of total sales of the business. For Bayer to outperform its peers and grow ahead of the market, they must focus on key areas. As of 2021, Bayer states that they are focused in expanding to the Southeast Asia market, but they do not show how they plan to tackle that market and, in the meantime, competitors like Johnson & Johnson and Sanofi are already established players there and as such Bayer might miss its shot. A promising break for Bayer is the accelerating e-commerce, that represented 7% of net sales in consumer health in 2020 and that Bayer is keen on further developing. One can see that through inorganic growth, Bayer is boosting the digitalization of its business, having now a majority stake in Noho Health, Inc., that provides personalized information in nutrition. It is also worth mentioning that Bayer is investing in data-driven precision marketing (doubling in 2 years, to 50% of digital media)[19] that could booster its e-commerce transition.

For Nutritionals, the megatrends of increasing health awareness and healthier diets should further push the sales of these products. The revenues are expected to grow on average 6.48% per year until 2027, a value that is estimated for the mature markets of Europe and North America as we see that these will still be Bayer's main markets. Following that, it is estimated to grow at the overall Consumer Health level.

Allergy & Cold sales slightly decreased during 2020 and they are expected to grow slightly in 2021 and after that. This segment should not grow as much as the remaining consumer health sectors in the next years, as we do believe that following the pandemic, the level of hygiene and health precautions will be much higher, with fewer people suffering from allergies or colds[20]. After a few years, people's awareness should fade, and this segment will increase slowly by 2% and in 2024 it should follow the sector trend.

For Dermatology, with the same rational as Nutritionals, but focused on skincare products instead, the prospects for this market are positive. It is possible to observe an increase in awareness by the male population that was not there before.

[19] **Source**: Bayer Investors Presentation (November 2021)
[20] **Source**: Centers for Disease Controls and Prevention. Also, a published article on the New York Times (2021): https://www.nytimes.com/interactive/2021/04/22/science/flu-season-coronavirus-pandemic.html

According to research[21], the global value of dermatology medicines should reach a value of €62.83bn and assuming that Bayer has no significant advantages that will increase its market share (or disadvantages that will decrease it), revenues should increase by 6.38% per year until 2028, growing with the overall market thereafter.

For Pain & Cardio, Digestive, and *other* products, with the increase population growth and old-dependency ratio[22], Bayer is expected to maintain a growth of 3.9% until 2025, smoothing to 3% in the remaining forecast period.

Bayer cleverly reduced its Consumer Health segment, by divesting in the animal health sector, solidifying its business, and by creating the most consistent segment of the company, that is expected to maintain its position in the future in terms of revenues.

To conclude, both cost of sales and R&D expenses should be relatively stable in relation to the segment's revenues as this is an already mature market, so 36% in cost of sales, as it has been for a few years now and around 4% in R&D, a value that has also been stable in the recent past.

Valuation mechanics

Multiples valuation

For the multiples valuation, the companies chosen were Roche, Novartis and GlaxoSmithKline, representing the Pharmaceuticals and Consumer Health sector and for Crop Science, Corteva and BASF. This last company was chosen instead of NuFarm since the latter operates in a different part of the world and their operations are considerably smaller than Bayer's which could affect this valuation. BASF in addition to being a relevant competitor of Bayer in Crop Science, it also acquired a part of Monsanto in order for Bayer to pass antitrust scrutiny and as so is a relevant comparable. Given that Bayer's recent profits were negative, the multiple analysis was performed adjusting for one-off events and other extraordinary items (Assets Write-down or Unusual Litigation Expenses, for example) for all companies. The multiples used were, excluding outliers (for instance, Roche, which had significantly higher multiples, explained by the large market share captured in the pharmaceutical, the most profitable of the sectors analysed), P/S, with an industry value of 2.3x, P/B

[21] **Source**: Research and Markets
[22] The old-age dependency ratio is defined as the number of individuals aged 65 and over per 100 people of working age defined as those aged between 20 and 64. In OECD countries this is set to grow from 27.9% in 2015, to 35.2% by 2025

with value of 2.5, an EV/EBITA of 13.5 and a P/E of 22.9. The average implied share price is 93€. This value does not consider the one-off events that occurred to Bayer and when the expected Litigations and Other non-current shocks such as Impairments on Goodwill or Reputational damage are considered, with an approximate cost of €20bn, the expected implied share price from the multiple valuation is 72.34€. It is important to understand the vulnerabilities of this type of valuation and although we tried to add relevant information and adjust to company level events, this analysis does not fully consider firm specific circumstances; for example, Bayer maintained an overall growth on its sales from 2018 to 2021 while its market capitalization seriously decreased, due to events that multiple valuation do not consider. In spite of these fragilities, the share price is in line with the DCF valuation, solidifying the reliability of the results.

Scenario analysis and main risks

For the scenario analysis, we first designed an overall view on how the share price would evolve from changes in the growth rate (*Figure 9*). One can see that with WACC value of 3.87% when the growth rate increases towards that number the share price increases significantly. Given the current risk-free rate and implied stagnant economy, assuming a high growth rate (> 2.5%) would be extremely inconsistent with the inputs of the discount rate and thus this scenario would not likely happen. In order to assume higher nominal growths in the future, 2.5% for example, one would need to recalculate the WACC, at least in the long run, for the sake of consistency.

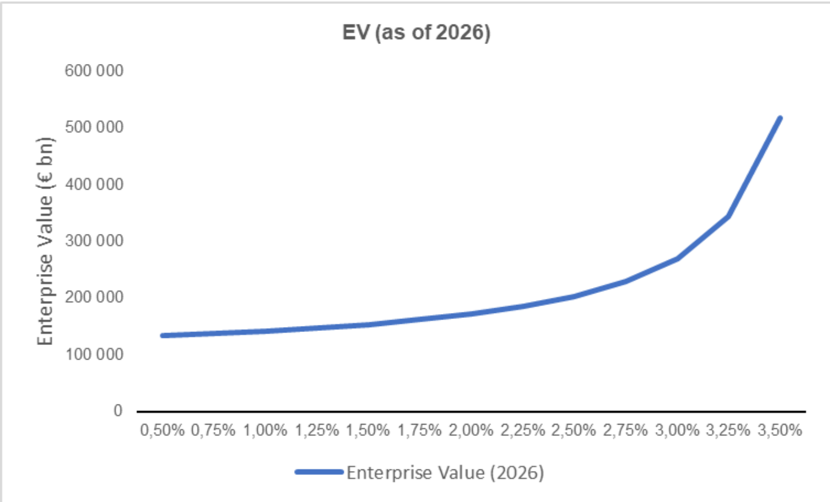


Figure 9 – EV in 2026 as a function of long-term growth rate

Analysing the impact on different values of WACC and the growth of revenues between 2031 and 2035, one can also see how that can change the share price (*Figure 10*). In so, one sees that for high WACC values, the increase in growth does not alter the share price significantly.

WACC	Growth Revenues (2031-35)							
	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%
2,50%	183 €	189 €	194 €	199 €	205 €	210 €	215 €	221 €
2,75%	144 €	148 €	152 €	156 €	160 €	164 €	168 €	172 €
3,00%	117 €	121 €	124 €	127 €	130 €	133 €	136 €	139 €
3,25%	99 €	101 €	104 €	106 €	108 €	111 €	113 €	116 €
3,50%	85 €	87 €	89 €	91 €	92 €	94 €	96 €	98 €
3,87%	69 €	71 €	**72 €**	74 €	75 €	77 €	78 €	79 €
4,00%	65 €	67 €	68 €	69 €	70 €	71 €	73 €	74 €
4,25%	58 €	59 €	60 €	61 €	62 €	63 €	64 €	65 €
4,50%	52 €	53 €	54 €	55 €	55 €	56 €	57 €	58 €

Figure 10 – Sensitivity Analysis on Share Price with changing WACC and G in 2031-35

Scenario (growth in Corn 2027)		
Worst	**Base**	**Best**
0,50%	16%	25%
67,2 €	**72,4 €**	**77,9 €**

One main risk that can impact the value of Bayer is the risk that the most promising launch of the decade, the short stature corn, fails to live up to the expectations and does not conquer market share on the Southeast Asian and Latin American markets. There are a few reasons that could explain a not so positive launch of the product. From a supplier side, the seed could fail to successfully tackle the areas it was meant to be most prolific at, specifically consuming less water and being more resistant to climate related threats. From a demand side, the farmers can be distrustful of the new product since it completely changes the usual structure of the corn plant. This worst scenario is not extremely likely to occur, given that Bayer has been testing the product for a few years now in their research facilities and fields. Another possible scenario is the one where Bayer's new product successfully penetrates the market and significantly increases the market share of the company in the maize sector. In the worst scenario the growth in 2027 would not happen, or it would be close to 0%, while in the best-case scenario Bayer could increase their revenues in Corn by 25%, explained by increasing market share and taking advantage from the growth in the most promising regions. The share price would range from €67.2 to €77.9.

Loss	Base
-20%	**Current**
67,42 €	**72,38 €**

Another threat is that Corteva successfully overthrows Bayer as the market leaders in the soybean seed markets and fulfil their objectives of target market share, hampering Bayer's soybean revenues by 20% in 2024, mostly from U.S. and Brazil, a country where Bayer's Intacta seed was the clear market leader with 80% of Brazilian soil in 2020/2021[23]. The effect on price would be around €5 per share.

[23] **Source**: Reuters

Risk of Split

Recent news announce that Bayer might face a split of its BUs, a recommendation made by several analysts[24]. This speculation follows a trend that started in November of 2021, with the giants Johnson & Johnson and General Electric announcing splits[25], in order to simplify their structure and increase focus on each business. Bayer's management claims that the company is not splitting up, but regardless, it is still a possibility. To quantify this event, one must understand what the added value of the company is by having the three segments under one roof. The synergies are mainly related to costs. By having the units combined, the company can spend less on R&D without affecting the Revenues (implying a higher RORC). In the case of Consumer Health and Pharmaceuticals, given the similar nature of the science involved behind the products, the company can use a single state of the art equipment for both segments, when compared to having to acquire one for each. When looking at Crop Science, the current DNA manipulation that is behind the seeds and traits can also benefit from having combined research centres. Other cost synergy can be related with Selling, General & Administrative Expenses (SG&A), since having a combined headquarters can reduce costs, but this is not reflected in the *ex*-"Monsanto" since the U.S. facilities are still in use. SG&A expenses can also be reduced, in combined sales deals to hospitals and drug stores, but mainly between Consumer Health and Pharmaceuticals sector. To quantify this, we will assume a scenario where R&D expenses increase by 0.3% of the sector's revenues in Crop Science and 1% in each of the other sectors, while maintaining the total sales fixed. In addition, SG&A expenses would also rise by 0.5% of total revenues. The value of having the businesses combined would be, in this scenario, of €10 331bn (*Figure 11*).

Synergy Analysis			
Assuming:			
(% of sector's Revenues)		***(in million €, except Share Price)***	
R&D Crop Science:	0,30%	Implied Share Price:	61,93 €
R&D Pharma:	1%	Market Cap.	60 817 €
R&D Consumer Health:	1%	Current Market Cap.	71 148 €
SG&A	0,50%	**Synergy Value**	**10 331 €**

Figure 11 – Analysis on Synergy

Other synergies are related with portfolio diversification, since they could reduce risks for shareholders, but these are hard to quantify and has not been the case for Bayer, as the company was severely exposed to Crop Science's litigations. It is

[24] **Source**: Bloomberg Intelligence (Christopher Perrella and Michael Shah)
[25] **Source**: Bloomberg News, https://www.bloomberg.com/news/articles/2021-11-12/johnson-johnson-to-split-into-two-companies-shares-rise

relevant to reflect on how the future of Monsanto would have been after the litigations if it was not acquired by Bayer. Their ability to raise cash for the settlements would be reduced and they would face higher costs for borrowing such sums of money. J&J's decision of splitting apart was justified by the need of specialised management and increased focus on each business activity, something that Bayer would benefit from as well.

To better understand the outcome of an eventual split, an analysis of the potential share price of each segment was estimated. For a proxy on how the share price would be distributed among companies, a multiples valuation using P/S was used, comparing each segment with their significant peers. Similar to the global multiple valuation, the values of the one-off events, such as litigation expenses, were deducted from the market capitalization, accordingly. Following these deductions, it was necessary to subtract the synergy value of having the companies' combined. Then, considering that the firm-level P/S multiple provided a higher share price than the average of the multiples, this value was adjusted among the companies through the previous calculation of the share price without synergies. This analysis provided the following share prices: Crop Science: €13.38, Pharmaceuticals: €37.55 and Consumer Health: €11.01, adding up to approximately €61.93 (share price with no synergies) (*Figure 12*). These values are in line with revenues, profitability margins and capital needs for each sector.

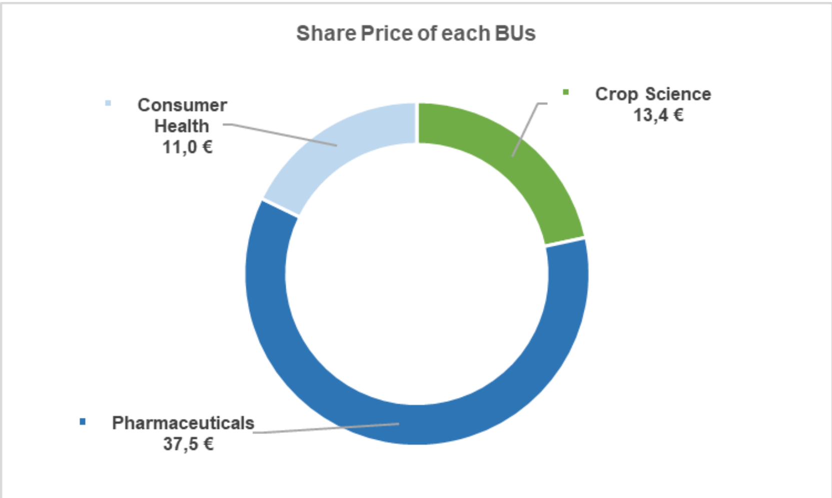


Figure 12 – Split B.U. Share Price (based on multiples)

Concluding remarks

The omnipresence of Bayer AG in distinct operational segments and geographies, as highlighted in prior chapters, drives managerial decisions to be harder to make – in particular in such fast-changing times.

Overall, Bayer AG has developed an ambitious growth strategy for the upcoming years in all its business units. As highlighted, this is mainly dependent of great investment in R&D and of capitalizing on each operational segment's foreseeable trends and dynamics.

Despite the recent negative events, our analysis concludes that the markets might have overestimated the impact of these in the value of the company. In so, our final recommendation is to **buy** Bayer AG shares, with annualized expected gains (capital gains and expected transactions with shareholders) of 52.4%.

BAYER AG

COMPANY REPORT

PHARMACEUTICAL

17 DECEMBER 2021

JOSÉ MOREIRA AND RUI SANTOS

Summary:

- The Crop Science unit has been harmful in the recent years to Bayer's market capitalization. Despite facing reputational damage and litigation risks, the promising launch of new products, such as the short stature corn, can assist the company to further increase market share in a growing market.
- Despite being the smallest in terms of revenues, the Consumer Health sector is a reliable one. Increasing demand for Nutritionals and growing e-commerce transactions are key trends that Bayer will be focused on. Some products, like Allergy, were affected by the pandemic but promises of better days should boost sales soon.
- Bayer's pharmaceutical division will face tremendous challenges in the upcoming years, with the loss of exclusivity over two of its most successful products, Xarelto™ and Eylea™. Additionally, new market trends have emerged in this business segment, such as cell and gene therapy, which is expected to capture a significant share of Bayer and competitors' investments in R&D in the following decades.
- Recent news predicts Bayer AG to split its business units, following the trend set by a few relevant conglomerates, such as J&J and General Electric. In so, we evaluated the cost synergies of operating as one firm and a hypothetical share price for each B.U..

Company description

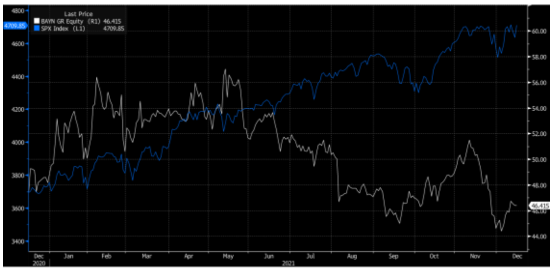
Bayer AG, a German multinational company, was founded back in 1863 and operates in three main business segments: crop science, consumer health and pharmaceutical. Its pharmaceutical division has long been its driving force; however, the acquisition of Monsanto in 2018 allowed for much more expressive crop science operations.

Recommendation:	**BUY**
Price Target FY22:	**72.38 €**
Price (as of 17-Dec-21)	**46.46 €**

Source: Bloomberg

52-week range (€)	44.40-57.01
Market Cap (€ mn)	45.599
Outstanding Shares (millions)	982.42

Source: Bloomberg



Bayer AG vs S&P (12-months, end 15.12.21). **Source**: Bloomberg

(Values in € millions)	**2020**	**2021E**	**2022F**
Revenues	41 400	43 127	44 919
EBITDA	3 772	11 094	11 981
Gross Profit	22 262	26 367	28 822
Basic EPS	4.41	0.66	(10.68)
Free Cash Flow	1 343	(1 388)	5 060
P/E	n/a	7.49	6.81

Source: Bloomberg

Table of contents

Bayer's recent past

Bayer – Monsanto merger

In order to understand Bayer's near future, one must first look into the recent events of the company. After a long negotiation process and intense antitrust scrutiny, on June 7, 2018, Bayer announced the acquisition of Monsanto for a total cost of around US$ 63bn (around €53.4bn, using the USD to EUR exchange rate at the end of that day). This was the largest deal in Bayer's history and consolidated Bayer as a leader on the agricultural inputs market, becoming a company that operates as much in the pharmaceutical sector as it does in its Crop Science unit. The merger promised valuable future synergies, whilst diversifying Bayer's portfolio. It was an ambitious acquisition, among the largest carried out by a European company towards North America[1].

"The merger promised valuable future synergies, whilst diversifying Bayer's portfolio."

Glyphosate and Roundup™

Prior to the acquisition date and following research presented by the World Health Organization[2], linking glyphosate[3] to cancer in humans, lawsuits started to be issued against Monsanto. Glyphosate is the active ingredient in RoundUp™, one of Monsanto's best-selling products, an herbicide that is widely used across the world, but mainly in the United States. Despite the significant litigation risk, Bayer proceeded with the acquisition and (mostly within 2019) over 40.000 plaintiffs were filling lawsuits claiming that exposure to glyphosate-based products caused non-Hodgkin lymphoma and multiple myeloma and other types of personal injury. The claim is that Monsanto was or should have been aware that these products were defective and that it understood the risks associated with its use, failing to warn consumers. On February 3, 2021, the lawsuits were of roughly 61.800 plaintiffs. Monsanto and Bayer reached an agreement in principle with those, with no admission of liability, and in the year 2020 alone, among other litigations, paid over €13bn in legal costs.

"Bayer…paid over €13bn in legal costs"

Post-merger and glyphosate

Using available market information for comparing the position of Bayer before and after the merger, one could see how Bayer's market capitalization has evolved over the years (*Figure 1*).

[1] Indeed, it was the largest ever all-cash acquisition performed. **Source**: Reuters. https://www.reuters.com/article/us-monsanto-m-a-bayer-board-exclusive-idUSKCN11J1PD

[2] International Agency for Research on Cancer. (2017). *Some Organophosphate Insecticides and Herbicides (IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans, 112)* (1st ed., Vol. 112). World Health Organization

[3] Glyphosate is a widely used herbicide that controls broadleaf weeds and grasses. It is used to kill weeds, especially annual broadleaf weeds and grasses that compete with crops

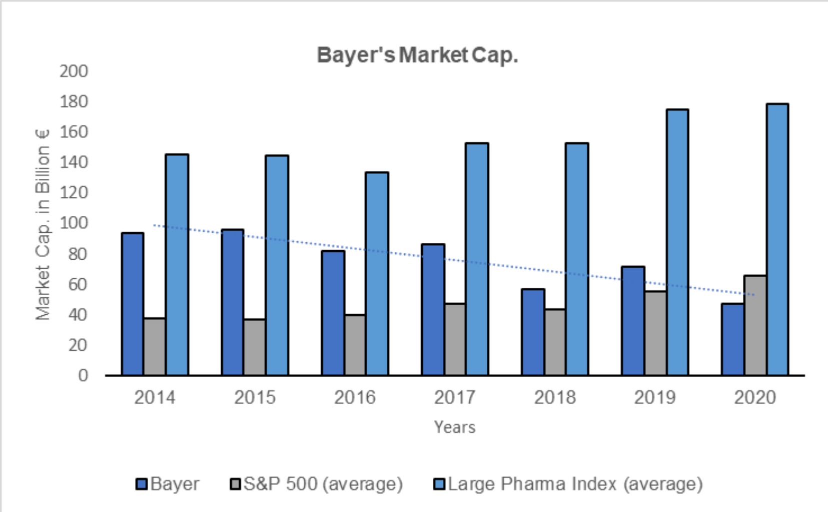


Figure 1 – Bayer's Market Capitalization compared to industry

"The current conglomerate (…) is worth less than what Bayer paid for Monsanto"

One could see that Bayer's market capitalization in 2015 was around US$ 125 bn, while at the merger date it amounted to US$ 100bn, but as of the end of 2021 its market capitalization is shy of US$ 50bn[4]. To better understand why the merger between Bayer and Monsanto is considered to be one of the worst business deals pursued in recent decades, the current conglomerate of Bayer and Monsanto is worth less than what Bayer paid for Monsanto, albeit there were some divestments meanwhile. The failure of the merger to live up to its expectation until now, combining with the litigation risks from the still on-going glyphosate legal disputes and subsequent reputational damage explain the current state and position of the company.

These events most certainly impacted Bayer's projected cash flows, but also explain, for instance, Bayer's current capital structure (*Figure 2*). Bayer had presented a conservative capital structure, with low (4 to 17%) Net Debt-to-EV, more in line with its pharmaceutical peers. As of today, the company's target ratio is set to approximately 30%, which reflects the increase in funds allocated to the merger, as well litigations settlements, and how the market is perceiving Bayer's positions.

[4] **Source**: Bloomberg

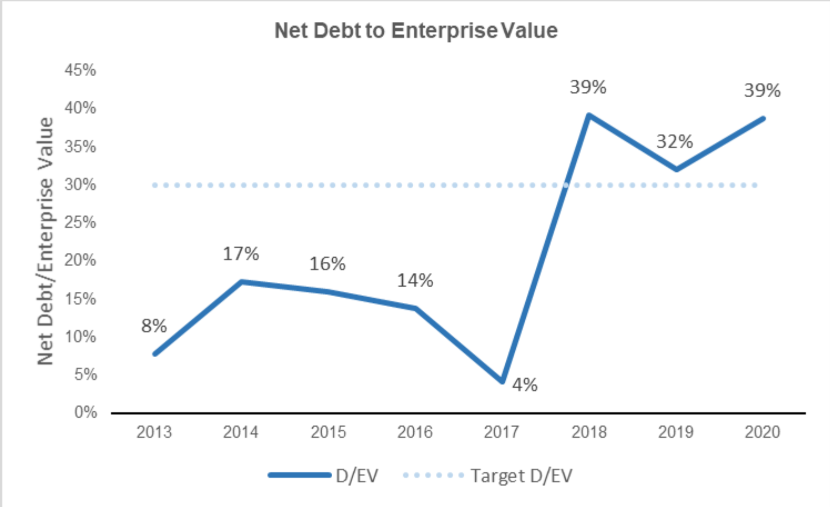


Figure 2 – Bayer's Net Debt to Enterprise Value

"Despite the consumers' and media hard take on RoundUp™ herbicides, the product is still widely sold"

One shall also note that despite the consumers' and media hard take on RoundUp™ herbicides, the product is still widely sold and used by the American producers and Bayer maintains its market leadership within the Crop Science segment. As such, public response to Bayer's most recent controversies is yet to be felt in its core operations.

Analysis' overview

Given the three distinct business units of Bayer AG (Crop Science, Pharmaceutical and Consumer Health), our analysis will consist in individual forecasts, discussion and respective margins and drivers for each sector. Where attainable, our valuation model will be driven by a 'sum of the parts analysis' (mainly revenues, cost of sales and R&D expenses). Some relevant financial information is not split into different business segments. In addition, there is reduced data in the pre-merger Monsanto and Bayer's Crop Science division, therefore it disallows us to measure the merger's operational synergies appropriately. This signals the market that the synergies promised by Bayer through the merger do not sum to the announced amount, as of 2021.

Having this in mind, each business unit will be hereafter explored individually, then common financial captions and other aspects of the mechanics of our valuation model will be analysed at company level and discounted at a single rate that captures each segment's operations, reaching a proposed share price for the conglomerate as of December 2022.

Crop science

Business segment description

After the merger with Monsanto, and even prior that, Bayer established itself as one of the world's leading players in the agricultural business. Its main businesses are related with Seeds, Crop Protection, such as herbicides, fungicides and insecticides, and digital and technological innovation within farming. In regard to Seeds, Bayer sells high-value seeds and special traits, catered to the needs of the farmers, whether it implies crops to be resistant to special parasites – to grow faster, to grow despite adverse climate circumstances and/or to be more sustainable overall. The Crop Protection consists of the development of products that aim to protect the plants from biological threats without harming the crop or causing undesired pollution. The business operates well with the seeds and special traits since some seeds and traits have been developed to tolerate the chemicals in the Crop Protection. The digital farming consists of developing new technologies that can support farmers managing their fields and using data to maximize the return on every acre cultivated. The global agriculture landscape is filled with major challenges, such as climate change, water scarcity and population growth. The objective is to meet the demands of the population whilst promoting more sustainable crops. To do so, Bayer needs to innovate, and it is doing so, by being the agricultural business company that spent the most in R&D in 2020 (*Figure 3*). Their near to medium-term plan is to develop in the crop science, seeds and traits and, for the long-term, a broader approach, including digital farming.

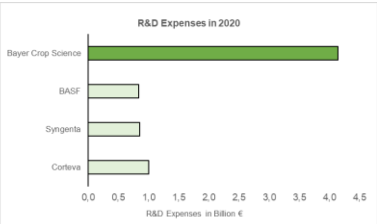


Figure 3 – R&D Expenses in 2020 for Bayer and peers (Source: Annual Reports)

"Solid growth … driven by an ever-increasing demand, both for direct human consumption and livestock"

Agricultural Inputs, Industry and Peers

Currently, Bayer is the major player in this market, with leadership in Corn, Soybean and Herbicides, with their soybean seeds being planted in more than 55% of the U.S. soybean acres, and Bayer and Monsanto amounting for close to 35% of worldwide herbicide sales in 2016[5]. The market is expected to sustain a solid growth in the years to come, strongly driven by an ever-increasing demand, both for direct human consumption and livestock. In terms of sales, Syngenta follows Bayer with Corteva coming in after. For profitability and margins comparison, Corteva, Syngenta and Nufarm were chosen. Corteva is the major competitor in the research of seeds and operates mainly in the U.S., while Syngenta is more focused in crop protection. Nufarm is considerably smaller than the other companies, operating mainly in Australia, but shares a similar portfolio as Bayer's Crop Science division. Regarding gross margins, it is possible to observe that Bayer presents slightly better margins

[5] **Source**: Statista, *Global herbicide market share 2016, by company*

than the average of their peers and it is assumed that its margins in the long run should move towards the industry, while still maintaining a higher profitability, result of their market leadership and consequent economies of scale.

"Monsanto was also considered to be one of the most hated companies in the U.S. (…) merging with Bayer and selling under a new brand name could eliminate the poor reputation"

How did the merger affect the industry? We already established that Bayer's market value diminished after the acquisition, but that is mainly related with litigation regarding glyphosate. The merger made the conglomerate Bayer and Monsanto the highest selling firm in the market but the benefits from being together are hard to estimate. Bayer claimed that the value of the synergies would amount to US$ 1.2bn by 2022[6], but did not explain how that value would materialize. There could certainly be cost efficiency gains, as the research performed benefits from the vertical integration and there could be revenue gains, as the products of Bayer and Monsanto coordinate reasonably well (for example, seeds sold under "*old*" Monsanto can be tolerant to insecticides produced by Bayer, thus selling them as a bundle to obtain higher market share). Monsanto was also considered to be one of the most hated companies in the U.S.[7], with the public even naming the company "Monsatan" and as such, merging with Bayer and selling under a new brand name could eliminate the poor reputation of Monsanto. The end result was negative for Bayer, with the glyphosate and dicamba litigations costing more than €13bn. Although the merger is not living up to its expectation and Crop Science sales did not grow as estimated by the conglomerate, Bayer still maintains their market position and their sales are expected to keep increasing following 2020, which decline was driven mainly by the pandemic[8].

"Corteva's product *Enlist E3*™ in the soybean seed market is the main threat to Bayer (…) market share (…) in U.S. soils is expected to be above 30% by 2021"

Are there threats to Bayer's position? Corteva's product *Enlist E3*™ in the soybean seed market is the main threat to Bayer. Within the two years of the launch the expected market share for this product in U.S. soils is expected to be above 30% by 2021[9]. Bayer is tackling this with the launch of the second version of their most sold soybean seed, but its recent events may hamper the sales of the new product. In terms of herbicides, RoundUp™ is still the most sold product with the only relevant alternative being generic products coming from China. For the highest yielding revenue, the corn seed and traits, Bayer's dominance in the U.S. and Europe is untouched, while threats come from the growing productions in Southeast Asia[10], a market that Bayer still does not dominate. The success of their short stature corn, to

[6] **Source**: Bayer Investor Presentation / June 2018 / Monsanto Acquisition Update
[7] **Source**: Bloomberg News: *Inside Monsanto, America's Third-Most-Hated Company*. Monsanto is highly criticized for producing GMOs.
[8] A 5% decrease in Crop Science sales. According to the Bayer AG 2020 AR, "overall growth was limited by the decrease in cotton, fruit and vegetables demand caused by the COVID-19 pandemic, as well as dry weather conditions in Europe during the spring"
[9] **Source**: Corteva Annual Report & Polansek, T. (2021, April 9). Bayer, Corteva in "two-dog battle" over U.S. soy market
[10] Estimated CAGR 12.1% until 2023. **Source**: Mordor Intelligence (2020). Asia-Pacific Corn Maize Seed Treatment Market (2021-2026)

be launched later in the decade, will dictate Bayer's expected revenues in corn and how they can approach all the markets.

Revenues

"Corn seed market … grow at a CAGR of 5.5% until 2026… driven mainly by the increase in the demand for animal feed, which is a consequence of an increasing population and increasing livestock needs"

Although pharmaceuticals and crop science / agricultural inputs are totally different markets, the key drivers for these businesses, at least in the case of Bayer, are similar, in the sense that research and development, followed by the acquisition of a patent, is what drives growth in the revenues. Regarding the corn seed market, the estimation is that the market would grow at a CAGR of 5.5% until 2026[11]. This value is driven mainly by the increase in the demand for animal feed, which is a consequence of an increasing population and increasing livestock needs, but also by the fact that the producers of corn require higher quality seeds to uphold against stresses, such as pests or lack of water. In addition to this baseline growth, it is expected that certain events will increase or decrease Bayer's revenues. One of the most promising innovations that Bayer will bring to the market is their short-stature corn trait, that is expected to be launched in 2023 and massively impact revenues by 2027. This new product tackles key threats to modern farmers and will perhaps be the main driver of growth in the Crop Science business. Such pressures arrive from climacteric conditions, whether strong winds or storms and shortage of water but also from lack of acres available. This new seed, as the name claims, generates shorter corn than usual, implying that it will require less water, it is more resilient to strong winds and storms and other external shocks to production, maximizing the output of corn per acre. This new seed will imply an 8% growth in 2023, as it is first implemented in certain countries and 17% by 2027[12], when it is launched all over the world, with the feedback for farmers from the tests in prior years. This launch should help Bayer in conquering market share in South America and Asia, where the growth opportunities are larger. Other shift to this side of the market is the loss of exclusivity over a patent around 2025 that should slightly decrease revenues.

"One of the most promising innovations that Bayer will bring to the market is their short-stature corn trait … will imply an 8% growth in 2023, as it is first implemented in certain countries and 17% by 2027"

For the soybean market, the increasing adoption of veganism in the western world[13] and the constantly growing health awareness drives up the demand for soybean and derivatives. Similar to corn, soybean is also a key ingredient to feed cattle and other animals, which, as previously mentioned, is also a growing market. For these reasons, revenues from soybean seeds and traits of Bayer are expected to grow 3.5% for the next five years[14], without considering key events that will occur. Currently Bayer has in its pipeline two traits of soybeans in final phases of research, both should be available by 2024 and one of them will provide higher resistance

[11] **Source**: Mordor Intelligence (2021). Maize Seed Market, Forecasts (2021-2026).
[12] Company's estimates merged with market forecast. Later challenged in scenario analysis
[13] **Source**: Statista, *Vegan Market - Statistics and Facts*
[14] **Source**: FAO

against herbicides and other chemicals, while the other will develop an extra endurance against insects. Meanwhile two valuable patent coverages, the second-generation Roundup Ready 2 Yield™ and the Intacta RR2 PRO™, are expected to expire in the mid-2020s and combined with increasing pressure from Corteva for the claim of leaders in this market, should decrease revenues by 9%.

"For the remaining components of the Crop Science business, it is expected that they follow a baseline trend of growing around 3% annually until the end of the decade."

For the remaining components of the Crop Science business, it is expected that they follow a baseline trend of growing around 3% annually until the end of the decade. The growth of agricultural inputs is driven both by an increase in demand for agricultural products and for the demand of producers to maximize the output of their crops. With a growing population, fuelling the demand for products of agricultural nature, thus inputs for agriculture, combined with the scarcity of water and reduced acres of land per capita for farmers, causes the need for herbicides, insecticides, and fungicides to be even more relevant, in order to protect the crops from external shocks that could severely distress the production. The annual population growth rate is expected to be 1% in 2022, slightly decreasing to 0.83% in end of the decade[15], the annual growth rate of total livestock production is expected to be 1.60%[16] throughout the years, all this while the expected acres available for the eight major crops in the U.S. is expected to be constant until 2030.[17] As revenues are expected to grow at this rate, it is implied that Bayer is maintaining its market share and is simply growing at the pace of the industry. Given that Bayer is the largest player of the market and that its return on research capital, a figure that quantifies how much of the gross profit is for every unit of R&D expenses, is on average with the peers (4.3 of industry and 5 of Bayer, decreasing to 4 in the long run), it is a solid assumption that Bayer should be able to at least sustain its market share.

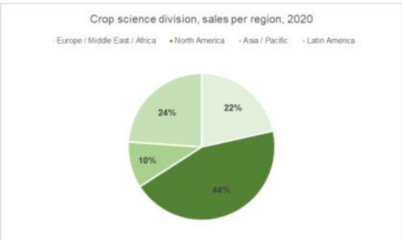


Figure 4 – Crop Science division, sales per region in 2020 (Source: Annual Report)

For herbicides, three major events are going to negatively impact revenues. The loss of patent coverage on the herbicide trait that confers dicamba tolerance, the loss of the XtendiMax™ in the U.S. (Bayer's Crop Science largest market – see *Figure 4*) and the fact that the sales of glyphosate-based herbicides for residential use in the U.S. will end, in an attempt to reduce litigation risk, especially after the RoundUp™ case. Two new products are expected to be launched in 2023 and 2024, with Bayer also trying to develop a future RoundUp™ product without glyphosate.

In fungicides and insecticides markets, new patents are expected to be acquired in 2023 and 2024, claiming additional growths of around 2 to 4%. For environmental science, vegetable and other products, in addition to the around 3% growth, the

[15] **Source**: World Bank
[16] **Source**: FAO
[17] **Source**: United States' Department of Agriculture (USDA)

launch THRYVON™ in 2023 should boost growth by 3%, while the Dicamba-Tolerant Canola Trait should be achieved in 2028 implying the same level of growth.

With these forecasts, the revenue in Crop Science is expected to grow as follows (*Figure 5*):

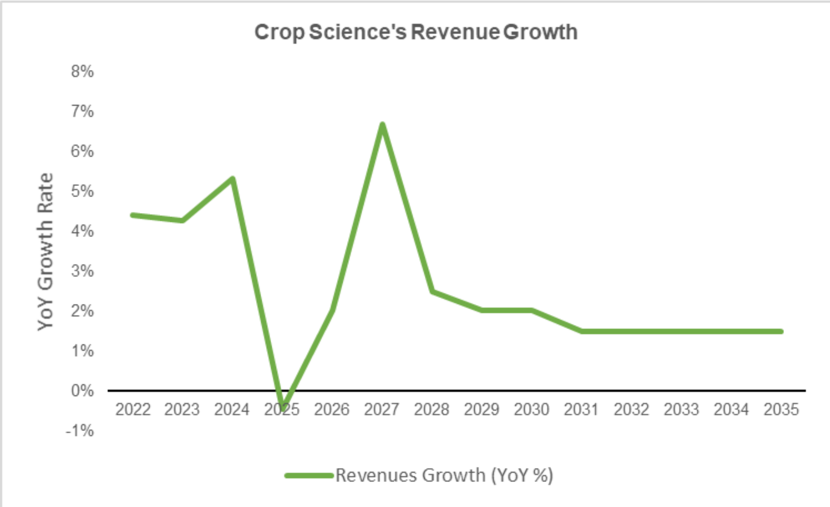


Figure 5 – Crop Science's Revenue Growth (Source: own projections)

It is possible to observe the decrease in 2025 due to loss of several patents' exclusivity and Corteva gaining market share in the soybean and seeds traits segment. In 2027, the impact of the short stature corn is clear, and revenues rebound, expecting to grow onwards.

Cost of sales and R&D

"Gross margins, they are expected to converge slightly to the industry average … maintaining some profitability advantage… R&D expenses expected to stabilise"

Regarding Bayer's Crop Science gross margins, they are expected to converge slightly to the industry average, although never reaching it by maintaining some profitability advantage due to its market position. Following a period of relatively high R&D expenses, the firm is expected to stabilise this figure over the next decade, while claiming increased sales also driven by these years of higher expenditure. Despite increasing costs in R&D and materials[18], synergies from the merger should cancel off this effect, justifying the fixed margins for Bayer.

[18] **Source**: Congressional Budget Office (CBO). (April 2021). Research and Development in the Pharmaceutical Industry

Consumer Health

Business segment description

The Consumer Health business segment consists of non-prescription products (known as over the counter, OTC), such as medicines, medicated skincare, nutritional supplements and other self-care solutions. Consumer health products are divided according to their purpose, in the following groups: Nutritionals, Allergy & Cold, Dermatology, Pain & Cardio, Digestive Health and *Others*. Not unlike the Pharmaceutical segment (discussed in later chapters), this part of the business is very reliant on R&D, although it also relies on products that have been around for several years and that gained the trust of consumers, like Bepanthen^{TM}, launched in 1943, and the Aspirin^{TM}, a product developed by Bayer back in 1899, but that is still in the market and a key product, despite a considerable number of cheaper generic alternatives.

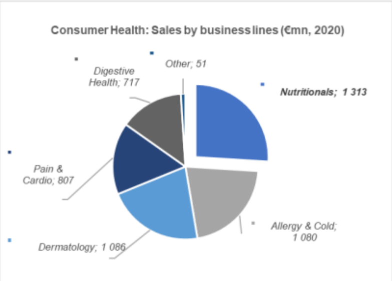


Figure 6 – Consumer Health: Sales by business lines (Source: Bayer AG Annual Report)

Following the acquisition of a majority stake in Care/of, the nutritionals is clearly the division's biggest bet (*Figure 6*), as it has now gained access to new alternatives to consumers in the main and largest-growing part of Consumer Health. New approaches of Bayer in this segment are focus on the transitioning of current prescription products to OTC ones and digitalization of all areas of their operations.

Industry analysis

The main trends affecting the industry are the increased percentage of people aged over 65 years, rising healthcare costs and a constant development of health awareness of consumers to make self-care more relevant. The market is highly competitive, with mid-size companies constantly introducing new products, that compete with existing ones at lower prices, although a few companies still hold a considerable share in this market, Bayer included. The U.S. market is the biggest market and is expected to maintain that position in the perceivable future, but it is in Latin America and Southeast Asia that the market will grow in the subsequent years, due to rapidly growing population in conjunction with increased disposable income with a fast-growing middle class.

Dietary, nutritional, weight-loss are expected to be the fastest growing products, mainly fuelled by rising awareness of the consumers on lifestyle-related health conditions, while vitamins and other supplements will maintain the market share dominance. Allergy & Cold products took a major hit during the pandemic as higher health precautions during this period reduced the need for these products.

The growth opportunities on this segment will be determined by innovation in R&D, as it historically has been, the perfecting of e-commerce experience and outreach and digitalization of products and processes, and which firms will grab significant market share in Southeast Asia and Latin America regions.

Revenues

"Bayer states that they are focused in expanding to the Southeast Asia market… competitors like Johnson & Johnson and Sanofi are already established players there and as such Bayer might miss its shot"

Bayer's Consumer Health, following divestments throughout the years, represents close to 12% of total sales of the business. For Bayer to outperform its peers and grow ahead of the market, they must focus on key areas. As of 2021, Bayer states that they are focused in expanding to the Southeast Asia market, but they do not show how they plan to tackle that market and, in the meantime, competitors like Johnson & Johnson and Sanofi are already established players there and as such Bayer might miss its shot. A promising break for Bayer is the accelerating e-commerce, that represented 7% of net sales in consumer health in 2020 and that Bayer is keen on further developing. One can see that through inorganic growth, Bayer is boosting the digitalization of its business, having now a majority stake in Noho Health, Inc., that provides personalized information in nutrition. It is also worth mentioning that Bayer is investing in data-driven precision marketing (doubling in 2 years, to 50% of digital media)[19] that could booster its e-commerce transition.

For Nutritionals, the megatrends of increasing health awareness and healthier diets should further push the sales of these products. The revenues are expected to grow on average 6.48% per year until 2027, a value that is estimated for the mature markets of Europe and North America as we see that these will still be Bayer's main markets. Following that, it is estimated to grow at the overall Consumer Health level.

Allergy & Cold sales slightly decreased during 2020 and they are expected to grow slightly in 2021 and after that. This segment should not grow as much as the remaining consumer health sectors in the next years, as we do believe that following the pandemic, the level of hygiene and health precautions will be much higher, with fewer people suffering from allergies or colds[20]. After a few years, people's awareness should fade, and this segment will increase slowly by 2% and in 2024 it should follow the sector trend.

For Dermatology, with the same rational as Nutritionals, but focused on skincare products instead, the prospects for this market are positive. It is possible to observe

[19] **Source**: Bayer Investors Presentation (November 2021)
[20] **Source**: Centers for Disease Controls and Prevention. Also, a published article on the New York Times (2021): https://www.nytimes.com/interactive/2021/04/22/science/flu-season-coronavirus-pandemic.html

an increase in awareness by the male population that was not there before. According to research[21], the global value of dermatology medicines should reach a value of €62.83bn and assuming that Bayer has no significant advantages that will increase its market share (or disadvantages that will decrease it), revenues should increase by 6.38% per year until 2028, growing with the overall market thereafter.

For Pain & Cardio, Digestive, and *other* products, with the increase population growth and old-dependency ratio[22], Bayer is expected to maintain a growth of 3.9% until 2025, smoothing to 3% in the remaining forecast period.

Bayer cleverly reduced its Consumer Health segment, by divesting in the animal health sector, solidifying its business, and by creating the most consistent segment of the company, that is expected to maintain its position in the future in terms of revenues.

To conclude, both cost of sales and R&D expenses should be relatively stable in relation to the segment's revenues as this is an already mature market, so 36% in cost of sales, as it has been for a few years now and around 4% in R&D, a value that has also been stable in the recent past.

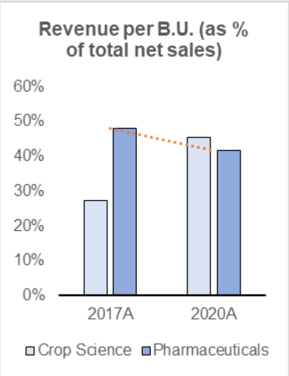


Figure 7 - Revenue per B.U. (Crop Science & Pharmaceuticals). (Source: Bayer AG Annual Reports).

Pharmaceutical division

Overview

The flagship operational segment of Bayer has long been its medicines division[23] – however, its relative importance of the overall sales of the group has diminished in recent years (*Figure 7*), following the controversial Monsanto acquisition proposal back in 2016, despite all, it still amounts to approximately 41% of total sales as of the first three quarters of 2021.

Regarding the composition of the revenue flow, as a share of total sales, the most significant therapeutic segment in which Bayer pharmaceutical division operates is by far Cardiovascular Treatments, at roughly 37% as of 2020, followed by Women's Health, Ophthalmology, Oncology and Radiology.

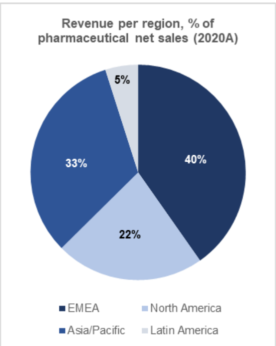


Figure 8 – Revenue per region as % of pharmaceutical's sales (Source: Bayer AG Annual Report)

Bayer' pharmaceutical division develops business worldwide (*Figure 8*). Currently, the major regions in terms of revenue origination are Europe/Middle East/Africa (EMEA) and Asia/Pacific, amounting to €1.842mn and €1.959mn, respectively, as of

[21] **Source**: Research and Markets
[22] The old-age dependency ratio is defined as the number of individuals aged 65 and over per 100 people of working age defined as those aged between 20 and 64. In OECD countries this is set to grow from 27.9% in 2015, to 35.2% by 2025
[23] Founded back in 1863, globally known for having introduced heroin as a cough suppressant alternative in late 1890s

the third quarter results of 2021. Historically, this geographic partition has held steady, albeit the major structural demographic shifts in recent decades, particularly those with respect to developing nations – Latin America comprises only about 20% of total divisional sales, which might indicate room for deeper market penetration.

Moreover, it is relevant to reflect on some considerations on the pharmaceutical industry. In particular, it is a business segment dependent upon very specific societal issues which often get overlooked in other fields, such as the impacts from ageing population, a stricter and slower regulatory framework[24], development stage of each market (national health care systems distinct abilities to sustain appropriate medical care) and a prolonged lifecycle of the products developed and commercialized[25].

Balanced baseline portfolio of drugs

Bayer's portfolio of pharmaceutical products responds to a wide range of therapeutic realities, which represents a balanced plan for longevity in the industry. Moreover, it is important to note that each segment of the division faces its challenges – for instance, Cardiovascular Treatments present a much tougher and competitive market than that of the treatment of rare diseases, such as some types of cancer and autoimmune diseases.

"The Group's management team argues Xarelto™ still holds the potential to reach peak sales of €5bn by 2023"

In so, let us now briefly describe the major drugs Bayer commercializes, and how we have projected their respective revenues. First, we have Xarelto™, an oral anticoagulant drug, which has long been the Bayer's top-selling pharmaceutical product, having reached roughly €4.5bn in sales in 2020, and a total of €3.5bn over the first 9 months of 2021, which represents a 5.6% YoY increase in this revenue source. The Group's management team argues Xarelto™ still holds the potential to reach peak sales of €5bn by 2023, mainly driven by the increased demand in certain geographies, such as in Russia or in Germany. In that sense, we argue that it is reasonable to assume a yearly growth of 3% for Xarelto™ sales for that period, slightly below management expectations, as to compensate for any optimism bias in their judgement.

Eylea™, a prescription only medicine widely used to treat several eye health conditions, Bayer's second most successful pharmaceutical product, with approximately €2.5bn in sales over 2020, presents a staggering growth according to the latest released data as of the first 9 months of 2021, having increased 19.2% YoY. The rise observed in sales of the product is linked to the expansion of Bayer's

[24] There is still no cohesive, global regulatory body of norms for the approval and commercialization of pharmaceutical products, which often affects their respective timing for market launch
[25] For instance, clinical stage of drug development generally takes about 8 years and hundreds of millions of funds employed on R&D, while the approval rate ranges from only 10 to 30% (Teramae, Fumio et al, 2020)

ophthalmology markets, as well as to the introduction and regulatory approval of prefilled syringes to administrate the product, which facilitates its commercialization. Following the same reasoning as for Xarelo™ performance, we projected a growth for this product's sales more or less in line with the recent figures, of 15% per year.

As to other existing pharmaceutical products, including some historically best-selling ones, such as Mirena/Kyleena/Jaydess™ (within Women's Health segment, that include intrauterine devices and drugs administrated to correct hormonal imbalances) and Kogenate/Kovaltry/Jivi™ (linked to the treatments of blood/coagulation conditions, in particular hemophilia A), we considered fair to assume a yearly growth rate for the forecasted horizon for each in line with the past three years, as there are no major events impacting sales, with the exception of geographic and competitive dynamics which ultimately cancel each other off over the medium to long-term, and given that their proprietary rights are still valid throughout the majority of the explicit horizon.

Patent-cliff scenario

"Bayer is facing a major identity threat to its pharmaceutical division, as it will lose the exclusivity rights over its two best-selling products discussed in the prior section, Xarelto™ and Eylea™, in the upcoming years"

At the moment, Bayer is facing a major identity threat to its pharmaceutical division, as it will lose the exclusivity rights over its two best-selling products discussed in the prior section, Xarelto™ and Eylea™, in the upcoming years (it is predicted to be phased down over a few years through the Group's extension efforts, but effects will be observed 2023 onwards). With that, it is expected that the downward pricing pressure in result of potential generic entrants in the markets will impact severely the revenue prospects of said medicines.

The so-called 'patent-cliff' phase describes the period in which pharmaceutical companies suffer revenue losses from the loss of patent exclusivity. This effect is particularly severe to drugs treating mainstream diseases. As such, there are economic incentives to conduct research on more complex medical treatments.

Interestingly enough, according to Higgins et al (2020), the expiration of patented medicines, in addition to it negatively reflecting on revenue and profitability of the business segment, it may also indicate the path for the firm's financing decisions. In particular, they observed a 25% fall in R&D expenses in the prior two years of the loss of exclusivity (LoE) of a best-selling pharmaceutical product – albeit this fact does not fully apply to Bayer, as it is a large, less financially restricted conglomerate, it is counterintuitive given that the patent horizon should be more than sufficient for appropriate and phased-down capital budgeting decisions.

Other research paper, authored by Reiffen and Ward (2005), also highlighted the issue of laying down business foundation for the LoE aftermath. The paper discusses widely known tactics of patent holder for prolonging the exclusive commercialization rights. In particular, by launching close to expiration date an improved formula for the medicine, which is granted then an additional period of patent rights, by extending patents downstream the productive cycle of the drug and, the focus of the paper analysis, the introduction of generic drugs of their product, that is, a 'branded generic', as to limit incentives to potential entrant competitors and to generate a higher equilibrium price for the generic product in the longer term. These strategies surely will help Bayer's management team to surpass the matter.

Additionally, one should stress the fact that the loss of exclusivity (LoE hereafter) over the so-called 'blockbuster' products is far from a novelty within the pharmaceutical industry – Bayer itself, and most, if not all, of Bayer's direct competitors have dealt successfully with LoE over the years – for instance, Diovan™, a drug widely administrated to treat hypertension, accounted for about a fifth of Novartis' pharmaceutical division back in 2007 – however, in the fall of 2011 and 2012, its European and U.S. patents, respectively, expired and resulted in a sharp decline in revenue. That did not undermine Novartis route to a leading position as of today within the industry.

"We considered that Bayer's management team did not properly account for the major set-back the LoE will generate"

With that said, we opted for a rather conservative approach regarding the estimate figures for revenue of these near patent-cliff drugs for 2023 onwards (a sharp decrease beginning in 2024 and 2025, followed by a slow recovery over the projected horizon), as we considered that Bayer's management team did not properly account for the major set-back the LoE will generate, and that it is perhaps too reliant on the recent developments of potential 'blockbuster' drugs still in clinical trial and of the cell and gene therapy division which will scrutinize in following sections.

Pipeline robustness

As of the end of 2021, Bayer pharmaceutical division currently presents three products in late-clinical stage with the so-called 'blockbuster' potential. These are: Nubeqa™, to be administrated in the treatment of prostate cancer (already approved and launched in some markets, such as in China and Japan, with protected trademark over the active substance, darolutamide, in Japan), Finerenone™, which promisingly tackles the morbidity in clinical stage of heart failure related conditions, and Elinzanetant™, a medicine to be administrated once a day, which prevent the colloquially denominated 'hot flashes' predominantly observed in women in menopausal transition, all with self-reported peak sales potential of over €1bn.

The revenue potential estimated by the management team of these in-development drugs do seem to be in line with historical performance of other best-selling products like Xarelto™ and Eylea™, and their clinical applications do challenge medical conditions with potential to become 'blockbusters' as such. However, the regulatory burden in the pharmaceutical industry is heavy and the overall population became increasingly difficult to satisfy. Thus, we did incorporate the sales potential of these three major products in other valuation model, within our revenues' sub-caption 'other products', which we projected 5% yearly growth rate up until 2025, and 10% onwards, for our explicit horizon, but we underline our reluctancy in considering them as of today the driving force of the division over the following decade.

Cell and gene therapy

"C&GT global market estimated to surpass US$ 47bn by 2028, and a projected CAGR of 28% from 2018 to 2026"

As to sustain revenue growth over the medium to longer term, Bayer and its competitors are currently allocating significant capital towards research and development of cell and gene therapy (C&GT hereafter). This business strategy has been gaining momentum in recent years and comes with the potential to revolutionize the pharmaceutical industry in the medium term – C&GT global market estimated to surpass US$ 47bn by 2028, and a projected CAGR of 28% from 2018 to 2026[26]. The most attractive feature of this segment for consumers is that it switches off the focus on the treatment of the disease to the prevention and early detection of the health conditions which did not have a cure prior.

More specifically, Bayer is trying to operate in the segment through both in-house investments, inorganic growth via acquisitions and business partnerships with biopharma firms such as Atara Biotherapeutics, as to brighten pipeline prospects and to ease the scale-up on the aftermath of research and approval of clinical techniques, as well as with firms focused on the research on artificial intelligence and digital innovation. In addition, Bayer established a specific subdivision dedicated to C&GT in 2020, which reports directly to the pharmaceutical division.

In 2020, Bayer acquired AskBio for US$ 2bn (with additional up to US$ 2bn if certain operational goals are achieved), which holds an extensive and promising portfolio of treatments of cardiovascular and neuromuscular conditions in varied clinical-stage phases. Back in mid-2019, it also acquired a majority stake of Bluerock Therapeutics, a US-based biotech firm engaged in C&GT treatments applicable to neurology, cardiology, and immunology fields, for a US$ 240mn upfront payment.

Likewise, Bayer's main competitors fight for a frontrunner advantage in this research niche focused on more than 3.000 monogenic diseases[27]. For instance, Johnson & Johnson is currently boosting its know-how within oncology treatments, more specifically in those of blood cancer, with an innovative C&GT approach known as

[26] **Source:** Coherent Market Insights, findings reported by Bloomberg (as of November 18, 2021).
[27] As of 2021, R&D targeting C&GT is still focus on monogenic disorders, such as ALS, Huntington's disease, among other rare medical conditions

CAR-T, much less invasive and which tackles a medical condition with poor treatment prospects otherwise.

One slight step-back for C&GT business segment, more precisely the cell-therapy process cycle, is that it requires a more complex and prolonged supply chain, thus biopharma companies have suffered back in 2020 with the disruption caused by the Covid-19 pandemic. However, we do consider it to me more of a conjectural hurdle rather than a restrictive factor *per se*.

In that sense, we consider C&GT a fertile, albeit uncertain and costly, playing field for Bayer post-patent-cliff era, in the sense it capitalizes on unmet and severe medical conditions. However, in order for a successful venture longer-term, it is required biopharma companies to scale-up the treatments and lower their respective costs, as individuals and national and private health care systems struggle to balance their economic cost with the benefits C&GT provides. To contextualize, in November 2019, Pfizer executive Angela Hwang reported to Bloomberg that these one-time treatments must price in their inherent levels of technology and precision, and that they essentially offer a cure, rather than a common simple medical treatment. That is, it must result in an (expensive) 'outcome-based' payment[28].

With that said, we are yet to be fully able to incorporate the potential of C&GT in a material sense in our valuation model over the explicit horizon, and in no precise manner its relative importance over Bayer's terminal growth.

Asian booming biopharma ecosystem

One significant growth-vector for Bayer's pharmaceutical business is venturing deeper towards the Chinese market. The Asia/Pacific region, despite its lower relative weight of total pharmaceutical sales (dropped from near 30% to 22%, in 2017 and 2020), it is still the second most relevant geography for the division. In addition, China is the second global pharmaceutical market, and roughly 80% of the Group sales in the country are attributed to this business segment.

"China displays significant demographic characteristics that fuel the pharmaceutical industry, such as an ageing population, worrying incidence rates of cancer and social and economic disparities to correct across regions"

China is the nation in East Asia and Pacific region with the strongest short-term macroeconomic prospects, revealing a prompt recovery over the Covid-19 pandemic. The World Bank forecasts a real GDP growth rate for the country above 5% for 2022 and 2023 and it is the only out of the three largest economies of the region (that is, Indonesia and Thailand) to see its output grow above the 2019 level.

Today, China displays significant demographic characteristics that fuel the pharmaceutical industry, such as an ageing population, worrying incidence rates of

[28] **Source**: Bloomberg (2019). Please refer to the following interview: https://www.bloomberg.com/news/videos/2019-11-07/pfizer-exec-on-biopharmaceuticals-breakthroughs-pipeline-video.

cancer[29] and social and economic disparities to correct across regions – in all, health care costs are projected to increase to approximately US$2.5 trillion[30] by 2035.

The Chinese Communist Party and the World Health Organization recently launched the Healthy China 2030 Blueprint, which constitutes the national public policy framework, design to promote a better quality of living and to improve the access to and the treatments provided by the Chinese health care system. In that, it defines measures which promote generic drugs. Bayer management argues that, on the bright side, it liberates funds towards more capital-intensive research & development and more expensive but justified medical treatments. Moreover, it is expected faster regulatory approvals of medicines considered essentials, which benefit some of Bayer lines of products.

Back in 2020, Bayer had already started expanding its packaging capacities in Beijing, China. That may arise from the fact that, despite roughly €4.5bn of total sales, approximately 10%, being originated in China, out of the Group's intangible assets and property, plant and equipment, only 0.8% were attributed to the country operations. Even though these figures comprise Crop Science and Consumer Health divisions, one may see that there might be a margin for operational improvements, given that Bayer's business segments are at large very complex logistically, more so the pharmaceutical one.

The influence of the Chinese market on net sales over the forecasted horizon is difficult to estimate – however, we argue that it is the booster required to compensate the markets of slower growing developed economies such those in EMEA and North America regions in the medium term. In so, it allows us to project revenues in line with historical values.

To conclude the prospects on Bayer's further expansion towards the East, we shall nevertheless argue that, even though China is opening up to foreign investment in health care and facilitating business operations, Chinese economy still lacks transparency, reliability and proper diplomatic ties with neighbouring nations which are fundamental to support sound investment plans and the much-required complex supply chains.

[29] The World Health Organization (WHO) estimates that the economic impact of cancer in 2010 surpassed US$ 1trillion
[30] **Source**: Healthy China: Deepening Health Reform in China (copublication of World Bank and WHO)

Valuation mechanics

Forecasted balance sheet items

In order to forecast balance sheet items, we have considered the historical figures of each caption, in light of any potential operational shift one should expect as a result of the business strategy we described for each business unit in prior chapters. In that, our analysis is built on the assumption that, as Bayer AG is a large, stablished conglomerate under great scrutiny of varied shareholders, stability and efficacy in operations are key features.

Some of the most significant items were projected according to revenue dynamics, as an average of the prior three years weight on total sales (as to discard potential distorting factors arising from the acquisition of Monsanto). As such, major asset classes like ‘other receivables’, ‘other intangible assets’ and PP&E were explicitly forecasted as a percentage of those. In our understanding, it is fair to assume so, as they all ultimately reflect Bayer’s capacity to generate revenue through capital employed, and nothing indicates, whether by the management team or external sources, operational efficacy gains large enough to alter in a material aspect our valuation model – neither is the segregation of captions per segment or geography provided by the notes of the annual reports and investors presentations clear to add value.

We have used the cash conversion cycle components, that is, the average collection, holding and payable periods, to project three of the main balance sheet captions – inventories, trade accounts receivable and payable; in so, we considered the average of the prior three audited periods as our baseline drivers, of 95, 200 and 100 days, respectively, 2021 onwards. Bayer’s operations congregate different business units with widely different cash management requirements – however, all those are now in a mature stage, which suggests a low probability of substantial deviations. In our analysis, in regard to operating cash, we decided for a gross proxy of 2% of total sales.

We have made a simplifying assumption that Goodwill remains unchanged at absolute terms, as it is a balance sheet item which captures the premium to book value of an asset/company acquired. Despite the complexity of the explicit forecast of the caption, to be more precise, regarding Bayer, it could have been set growing, as Pharmaceutical and Crop Science divisions are keen on inorganic growth. In addition, under IFRS norms, acquired in-process R&D expenses may be capitalized under certain criteria.

Discount rates

Firstly, to reach the appropriate discount rate, the risk-free rate should be estimated. Given that the company is based in Germany and all the cash flows are denominated in Euros the choice for the risk-free rate was the return on a 10-year German government bond. The German bund was preferred since is the one with lower returns in the Euro area, thus implying the other government bonds possess some default risk. The risk-free rate is negative, with a value of -0,353%, as of December 15, 2021.

For the cost of debt, a few approaches were considered at first. As Bayer's long-term issued bonds are callable, this will distort their yield to maturity, hence not being a reasonable proxy for the cost of debt. Ultimately, and considering the credit rating of BBB from S&P attributed to Bayer, using the appropriate probability of default[31] and loss given default[32] of 3.24% and 46.1%, respectively, and assuming a yield to maturity of 0.83% on European 10-year corporate bonds from the Bloomberg's BS166, the value for the cost of debt is 0.68%. Using the CAPM formula and assuming a market return of 5.5%[33], the debt beta is 0.18.

The unlevered beta was estimated through a list of peers. Given that no company is similar to Bayer in the sense that they operate in both agricultural inputs and in the biopharma segment, we had to settle for comparable firms for each side of the business. For the Pharmaceutical and Consumer Health divisions, the companies chosen were Roche, Novartis, GlaxoSmithKline, and the BIEULPVP Index, an index of large EU and US Pharmaceutical companies, that is, an equal-weighted basket of peers computed by Bloomberg. The choice of these companies comes from the fact that they are all based in Europe, while their operations are scattered around the world, they sell similar products as Bayer, with Pharmaceutical and Consumer Health business segments as well (although they might not formulate that division as Bayer does) – in other words, they are ultimately Bayer's rivals. Other key feature of these companies is that they do not operate, at least at significant levels, in areas that Bayer does not operate in, for example in the direct development of vaccines. For instance, AstraZeneca is also a pharmaceutical company based in Europe, but its recent involvement in the Covid-19 vaccines roll-out affected their recent performance in a way that may not allow to draw reasonable comparisons to Bayer. The BIEULPVP Index was chosen to represent other pharmaceutical companies that also compete with Bayer, even the ones based in the U.S., since the operations of

[31] **Source**: Default, Transition, and Recovery: 2020 Annual Global Corporate Default and Rating Transition Study (S&P Global). BBB-rated average cumulative default rate (1981-2020)(%) for a period of 10 years.
[32] **Source**: Moody's Investors Service, "Annual Default Study: Corporate Default and Recovery Rates, 1920-2017".
[33] **Source**: "Forecasting Stock Market returns", 2010, Miguel Ferreira and Pedro Santa Clara

the German-based company are worldwide, with great predominance in the North American region (the impact of the Covid-19 vaccine should be diluted among all the companies in the index, thus, not contradicting the previous observation). For the Crop Science division, Corteva and S5FERT, an S&P 500 Fertilizers & Agricultural Chemicals Sub Industry index were used. Corteva is the main competitor of Bayer in the Crop Science business, especially in the Soybean Seed and Traits, selling similar products and operating in the same segments. Other comparable firms in the Agricultural Inputs business are private, like Syngenta, operate in different markets, mainly China, or their portfolio of products also include substantially different products, the case of BASF a German firm that competes with Bayer in the production of chemicals to use in agriculture but also sells battery material and catalysts, processed plastic or even oil and gas. Some of these companies, although not used for the industry Beta will prove to be useful in later comparisons. To tackle the lack of adequate peers, the S5FERT index was included in the analysis, since it incorporates companies that sell some similar products as Bayer, mainly herbicides and other chemicals and operate in the U.S., where Monsanto was based and where Bayer sells most of its products in the Crop Science segment.

Initially, we calculated the excess returns for the monthly historical prices from the last five years for each stock. The choice of monthly data was due to the fact that daily or weekly returns could lead to systematic biases. Then, these returns were regressed against the MSCI World index returns, adjusting this index for each currency that the stocks are represented in (EUR for Bayer, CHF for Roche and Novartis, GBP for GlaxoSmithKline, and USD for the others). Then the smoothing process used by Bloomberg[34] was applied to the raw betas in order to adjust for the observation made by Marshall Blume's that betas revert to the mean. Using the standard errors from the regression, one could observe that Bayer's true beta, with a 95% confidence level, lies between 0.75 and 1.64, a too wide of a range to conclude anything relevant. As such an industry beta was necessary. Using the net debt to enterprise value of each company and assuming a debt beta of zero since the companies have good investment grade ratings and have low leverage (therefore the impact of leverage should not be significant), an unlevered beta for each company was reached. The average of these unlevered Betas was considered to be the Industry Beta and it was used to compute Bayer's equity beta.

Then, following the reports by Bayer that the target net debt to enterprise value is close to 30%, the unlevered Beta was re-levered through this ratio and the debt beta and as such, it has a value of 0.96. Lastly, with all the inputs, the WACC was

[34] That is, 2/3 times the raw beta obtained from the linear regressions, plus a 1/3, and it assumes the beta converges to 1 in the long run.

calculated through the common formula, and takes a value of 3.87%. The low value of the WACC reflects the current state of the economy, with negative interest rates and low cost of debt, especially to investment-grade companies.

Valuation model

The method chosen for the valuation was through a DCF (discounted cash flow) model, using the WACC. The WACC method was chosen since it simplifies the model, given that Bayer's shareholders have a target Net Debt to Enterprise Value for the long run, expressed in their desire to obtain a better investment grade from Moody's and S&P, also trending towards a value closer to its peers. A detailed forecast was performed until the year 2030, a year where there was still relevant information on the company's pipelines products and that we were able to explore thoroughly. In that year, the company is expected to have a Return on Invested Capital (ROIC), excluding Goodwill, of 6.05%. The Return on New Invested Capital was below, at around 4.6% still higher than the WACC (recall that we are excluding Goodwill in order to compare with other companies and better understand the company returns). Although the returns are rather stable, the "implicit" growth rate derived from RONIC and Reinvestment Rate is close to 3%, that is still considerably high, especially in a negative risk-free rate environment where the outlook for the economy points for slow growth. Given this, a simplified forecast until 2036 was computed, with focus on key variables such as revenue growth and specific margins, based in the previous years and industry's average. The values of ROIC and RONIC slightly decreased, and the implied growth rate was of 1.5%, which is in line in the potential GDP growth rate in the future given the current negative risk-free rate environment in Germany, following the assumption that Bayer will be able to grow with the economy, a solid supposition based on the drivers of Pharmaceuticals and Agricultural Inputs.

Starting with the Terminal Value, the formula suggested by Mckinsey[35] was used, with the continuing value in 2015 being calculated as:

$$\text{Continuing Value}_t = \frac{\text{NOPAT}_{t+1}\left(1 - \frac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

With a growth of 1.5%, RONIC of 5.7% and the long-term WACC of 3.87%. The claim that the RONIC is higher than the WACC implies that the company has some competitive advantage towards the market. This is simply explained by the fact that Bayer, similar to other pharmaceutical companies, possess price premium advantages, in this case through innovative products, that allow the companies to

35 **Source**: McKinsey & Company: *Measuring and Managing the Value of Companies*

receive higher earnings in the period where their products are protected by patents through several years. The terminal value and the unlevered operating FCF to the firm were discounted as to December 2022, with the WACC value of 3.87%. To the level of Operating Enterprise Value, it was added the Non-Operating Invested Capital in 2022 and subtracted the Net Financial Debt and Equity attributable to noncontrolling interest, arriving to a share price of 72.38€, with 982 million shares outstanding.

Multiples valuation

For the multiples valuation, the companies chosen were Roche, Novartis and GlaxoSmithKline, representing the Pharmaceuticals and Consumer Health sector and for Crop Science, Corteva and BASF. This last company was chosen instead of NuFarm since the latter operates in a different part of the world and their operations are considerably smaller than Bayer's which could affect this valuation. BASF in addition to being a relevant competitor of Bayer in Crop Science, it also acquired a part of Monsanto in order for Bayer to pass antitrust scrutiny and as so is a relevant comparable. Given that Bayer's recent profits were negative, the multiple analysis was performed adjusting for one-off events and other extraordinary items (Assets Write-down or Unusual Litigation Expenses, for example) for all companies. The multiples used were, excluding outliers (for instance, Roche, which had significantly higher multiples, explained by the large market share captured in the pharmaceutical, the most profitable of the sectors analysed), P/S, with an industry value of 2.3x, P/B with value of 2.5, an EV/EBITA of 13.5 and a P/E of 22.9. The average implied share price is 93€. This value does not consider the one-off events that occurred to Bayer and when the expected Litigations and Other non-current shocks such as Impairments on Goodwill or Reputational damage are considered, with an approximate cost of €20bn, the expected implied share price from the multiple valuation is 72.34€. It is important to understand the vulnerabilities of this type of valuation and although we tried to add relevant information and adjust to company level events, this analysis does not fully consider firm specific circumstances; for example, Bayer maintained an overall growth on its sales from 2018 to 2021 while its market capitalization seriously decreased, due to events that multiple valuation do not consider. In spite of these fragilities, the share price is in line with the DCF valuation, solidifying the reliability of the results.

Scenario analysis and main risks

For the scenario analysis, we first designed an overall view on how the share price would evolve from changes in the growth rate (*Figure 9*). One can see that with

WACC value of 3.87% when the growth rate increases towards that number the share price increases significantly. Given the current risk-free rate and implied stagnant economy, assuming a high growth rate (> 2.5%) would be extremely inconsistent with the inputs of the discount rate and thus this scenario would not likely happen. In order to assume higher nominal growths in the future, 2.5% for example, one would need to recalculate the WACC, at least in the long run, for the sake of consistency.

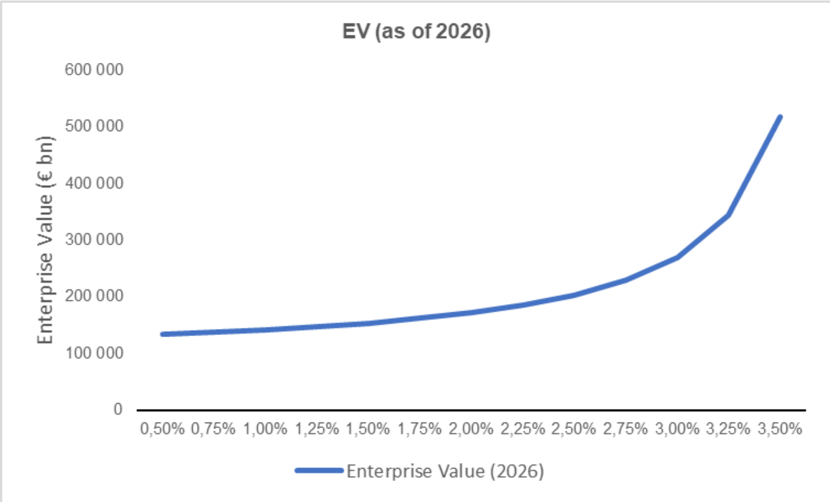


Figure 9 – EV in 2026 as a function of long-term growth rate

Analysing the impact on different values of WACC and the growth of revenues between 2031 and 2035, one can also see how that can change the share price (*Figure 10*). In so, one sees that for high WACC values, the increase in growth does not alter the share price significantly.

	Growth Revenues (2031-35)							
WACC	0,5%	1,0%	1,5%	2,0%	2,5%	3,0%	3,5%	4,0%
2,50%	183 €	189 €	194 €	199 €	205 €	210 €	215 €	221 €
2,75%	144 €	148 €	152 €	156 €	160 €	164 €	168 €	172 €
3,00%	117 €	121 €	124 €	127 €	130 €	133 €	136 €	139 €
3,25%	99 €	101 €	104 €	106 €	108 €	111 €	113 €	116 €
3,50%	85 €	87 €	89 €	91 €	92 €	94 €	96 €	98 €
3,87%	69 €	71 €	**72 €**	74 €	75 €	77 €	78 €	79 €
4,00%	65 €	67 €	68 €	69 €	70 €	71 €	73 €	74 €
4,25%	58 €	59 €	60 €	61 €	62 €	63 €	64 €	65 €
4,50%	52 €	53 €	54 €	55 €	55 €	56 €	57 €	58 €

Figure 10 – Sensitivity Analysis on Share Price with changing WACC and G in 2031-35

One main risk that can impact the value of Bayer is the risk that the most promising launch of the decade, the short stature corn, fails to live up to the expectations and does not conquer market share on the Southeast Asian and Latin American markets. There are a few reasons that could explain a not so positive launch of the product. From a supplier side, the seed could fail to successfully tackle the areas it was meant

Scenario (growth in Corn 2027)		
Worst	Base	Best
0,50%	16%	25%
67,2 €	72,4 €	77,9 €

to be most prolific at, specifically consuming less water and being more resistant to climate related threats. From a demand side, the farmers can be distrustful of the new product since it completely changes the usual structure of the corn plant. This worst scenario is not extremely likely to occur, given that Bayer has been testing the product for a few years now in their research facilities and fields. Another possible scenario is the one where Bayer's new product successfully penetrates the market and significantly increases the market share of the company in the maize sector. In the worst scenario the growth in 2027 would not happen, or it would be close to 0%, while in the best-case scenario Bayer could increase their revenues in Corn by 25%, explained by increasing market share and taking advantage from the growth in the most promising regions. The share price would range from €67.2 to €77.9.

Loss	Base
-20%	Current
67,42 €	72,38 €

Another threat is that Corteva successfully overthrows Bayer as the market leaders in the soybean seed markets and fulfil their objectives of target market share, hampering Bayer's soybean revenues by 20% in 2024, mostly from U.S. and Brazil, a country where Bayer's Intacta seed was the clear market leader with 80% of Brazilian soil in 2020/2021[36]. The effect on price would be around €5 per share.

Risk of Split

Recent news announce that Bayer might face a split of its BUs, a recommendation made by several analysts[37]. This speculation follows a trend that started in November of 2021, with the giants Johnson & Johnson and General Electric announcing splits[38], in order to simplify their structure and increase focus on each business. Bayer's management claims that the company is not splitting up, but regardless, it is still a possibility. To quantify this event, one must understand what the added value of the company is by having the three segments under one roof. The synergies are mainly related to costs. By having the units combined, the company can spend less on R&D without affecting the Revenues (implying a higher RORC). In the case of Consumer Health and Pharmaceuticals, given the similar nature of the science involved behind the products, the company can use a single state of the art equipment for both segments, when compared to having to acquire one for each. When looking at Crop Science, the current DNA manipulation that is behind the seeds and traits can also benefit from having combined research centres. Other cost synergy can be related with Selling, General & Administrative Expenses (SG&A), since having a combined headquarters can reduce costs, but this is not reflected in the *ex*-"Monsanto" since the U.S. facilities are still in use. SG&A expenses can also

[36] **Source**: Reuters
[37] **Source**: Bloomberg Intelligence (Christopher Perrella and Michael Shah)
[38] **Source**: Bloomberg News, https://www.bloomberg.com/news/articles/2021-11-12/johnson-johnson-to-split-into-two-companies-shares-rise

be reduced, in combined sales deals to hospitals and drug stores, but mainly between Consumer Health and Pharmaceuticals sector. To quantify this, we will assume a scenario where R&D expenses increase by 0.3% of the sector's revenues in Crop Science and 1% in each of the other sectors, while maintaining the total sales fixed. In addition, SG&A expenses would also rise by 0.5% of total revenues. The value of having the businesses combined would be, in this scenario, of €10 331bn (*Figure 11*).

Synergy Analysis			
Assuming:			
(% of sector's Revenues)			*(in million €, except Share Price)*
R&D Crop Science:	0,30%	Implied Share Price:	61,93 €
R&D Pharma:	1%	Market Cap.	60 817 €
R&D Consumer Health:	1%	Current Market Cap.	71 148 €
SG&A	0,50%	**Synergy Value**	**10 331 €**

Figure 11 – Analysis on Synergy

Other synergies are related with portfolio diversification, since they could reduce risks for shareholders, but these are hard to quantify and has not been the case for Bayer, as the company was severely exposed to Crop Science's litigations. It is relevant to reflect on how the future of Monsanto would have been after the litigations if it was not acquired by Bayer. Their ability to raise cash for the settlements would be reduced and they would face higher costs for borrowing such sums of money. J&J's decision of splitting apart was justified by the need of specialised management and increased focus on each business activity, something that Bayer would benefit from as well.

To better understand the outcome of an eventual split, an analysis of the potential share price of each segment was estimated. For a proxy on how the share price would be distributed among companies, a multiples valuation using P/S was used, comparing each segment with their significant peers. Similar to the global multiple valuation, the values of the one-off events, such as litigation expenses, were deducted from the market capitalization, accordingly. Following these deductions, it was necessary to subtract the synergy value of having the companies' combined. Then, considering that the firm-level P/S multiple provided a higher share price than the average of the multiples, this value was adjusted among the companies through the previous calculation of the share price without synergies. This analysis provided the following share prices: Crop Science: €13.38, Pharmaceuticals: €37.55 and Consumer Health: €11.01, adding up to approximately €61.93 (share price with no synergies) (*Figure 12*). These values are in line with revenues, profitability margins and capital needs for each sector.

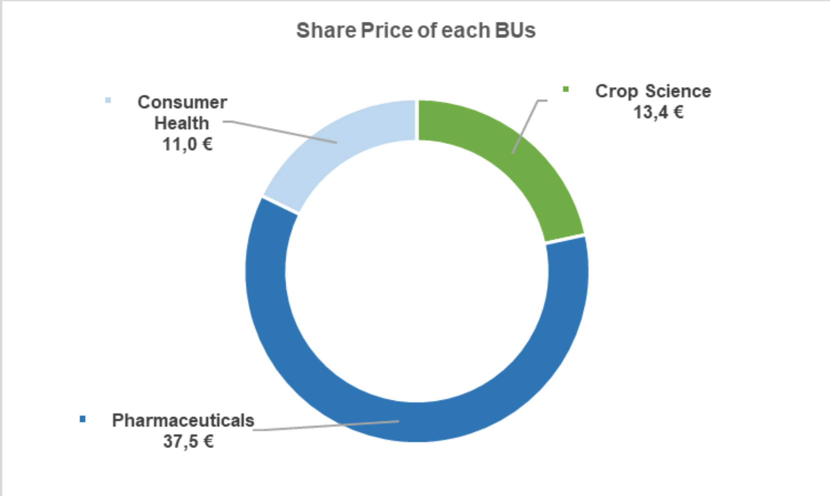


Figure 12 – Split B.U. Share Price (based on multiples)

Concluding remarks

The omnipresence of Bayer AG in distinct operational segments and geographies, as highlighted in prior chapters, drives managerial decisions to be harder to make – in particular in such fast-changing times.

Overall, Bayer AG has developed an ambitious growth strategy for the upcoming years in all its business units. As highlighted, this is mainly dependent of great investment in R&D and of capitalizing on each operational segment's foreseeable trends and dynamics.

Despite the recent negative events, our analysis concludes that the markets might have overestimated the impact of these in the value of the company. In so, our final recommendation is to **buy** Bayer AG shares, with annualized expected gains (capital gains and expected transactions with shareholders) of 52.4%.

Appendix

Financial Statements[39]

Income Statement (in €mn)

Reorganized Income Statements - Forecast
Note: A - Audited, **F** - Forecasted

(€ million)	2017A	2018A	2019A	2020A	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Revenues														
Crop Science	9 577	14 266	19 832	18 840	20 689	21 604	22 525	23 726	23 620	24 094	25 706	26 345	26 876	27 418
Pharmaceuticals	16 847	16 746	17 962	17 243	17 864	18 733	19 684	18 267	18 260	18 926	19 638	20 399	21 212	22 084
Consumer Health	5 862	5 450	5 462	5 054	5 184	5 432	5 693	5 969	6 281	6 535	6 801	7 005	7 215	7 395
Residual	2729	280	289	263	300	303	317	321	320	330	348	358	368	379
Total Revenues	35 015	36 742	43 545	41 400	44 038	46 072	48 219	48 283	48 480	49 885	52 492	54 105	55 671	57 276
Cost of Goods Sold														
Crop Science	-	-	-11 717	-11 169	-12 306	-12 855	-13 407	-14 127	-14 068	-14 356	-15 321	-15 707	-16 029	-16 363
Pharmaceuticals	-	-	-3 707	-3 615	-3 803	-4 048	-4 318	-4 066	-4 124	-4 336	-4 562	-4 805	-5 065	-5 345
Consumer Health	-	-	-1 947	-1 802	-1 848	-1 936	-2 030	-2 128	-2 239	-2 329	-2 424	-2 497	-2 572	-2 643
Residual	-	-	-242	465	-245	-256	-268	-268	-269	-277	-292	-301	-309	-318
Total Cost of Goods Sold	-10 911	-14 333	-16 672	-16 120	-18 202	-19 095	-20 022	-20 589	-20 700	-21 298	-22 599	-23 310	-23 976	-24 670
Gross Profit	24 104	22 409	26 874	25 280	25 836	26 977	28 197	27 695	27 780	28 587	29 893	30 796	31 695	32 605
SG&A Expenses	-11 403	-12 247	-12 866	-11 027	-11 811	-12 272	-12 844	-12 861	-12 913	-13 287	-13 982	-14 412	-14 828	-15 256
R&D Expenses	-4 054	-4 080	-4 374	-4 076	-5 867	-6 120	-6 718	-5 851	-5 851	-6 022	-6 331	-6 532	-6 729	-6 936
Other Operating Items	174	4 289	441	243	541	1 476	1 526	1 531	1 541	1 574	1 632	1 670	1 707	1 746
Depreciation and Amortization	-2 629	-3 391	-4 632	-4 188	-4 445	-4 617	-4 799	-4 842	-4 893	-5 031	-5 256	-5 413	-5 570	-5 732
Impairments (exc. Goodwill)	-31	-1 303	-527	-6 833	-16	-936	-957	-958	-960	-974	-999	-1 015	-1 031	-1 046
Operating EBIT	6 161	5 678	4 916	-601	4 239	4 509	4 405	4 714	4 704	4 847	4 958	5 094	5 245	5 381
Operating Taxes	-975	-899	-778	95	-671	-713	-697	-746	-744	-767	-785	-806	-830	-852
Tax adjustments	0	45	251	1	0	-13	-12	-13	-13	-14	-14	-14	-15	-15
NOPAT	5 186	4 825	4 389	-505	3 568	3 782	3 696	3 955	3 946	4 067	4 159	4 274	4 400	4 514
Significant Legal Risks	-258	-677	-546	-13 330	-4 629	-289	-302	-318	-317	-323	-344	-353	-360	-367
Financial and non-operating income	-913	-504	-28	211	-310	-229	-171	-171	-171	-170	-168	-166	-165	-164
Impairment on Goodwill	0	-1 547	-208	-2 238	0	-569	-582	-582	-583	-592	-608	-617	-627	-636
Non-operating results before taxes	-1 171	-2 728	-782	-15 357	-4 940	-1 087	-1 055	-1 071	-1 071	-1 084	-1 119	-1 136	-1 152	-1 167
Non-operating Taxes	185	432	124	2 430	782	172	167	169	169	172	177	180	182	185
Tax Adjustments	-539	-75	-40	-838	0	-47	-45	-46	-46	-47	-48	-49	-50	-50
Non-operating result	-1 525	-2 371	-698	-13 764	-4 158	-962	-933	-948	-947	-959	-990	-1 005	-1 019	-1 033
Income from discontinued operations after income taxes	4 846	321	1 700	5 074	0	0	0	0	0	0	0	0	0	0
Income after income taxes of which attributable to noncon	758	16	19	8	0	0	0	0	0	0	0	0	0	0
Income attributable to Bayer AG stockholders	7 749	2 759	5 372	-9 203	-590	2 820	2 763	3 007	2 999	3 107	3 169	3 268	3 381	3 481

Balance Sheet (in €mn)

Reorganized Balance Sheets - Forecast
Note: A - Audited, **F** - Forecasted

(€ million)	2017A	2018A	2019A	2020A	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Working cash	700	735	871	828	881	921	964	966	970	998	1 050	1 082	1 113	1 146
Inventories	6 550	11 012	10 650	10 961	9 973	10 463	10 971	11 282	11 343	11 670	12 383	12 772	13 137	13 518
Trade accounts receivable	8 582	11 714	11 678	9 555	11 462	11 991	12 550	12 567	12 618	12 984	13 662	14 082	14 490	14 907
Trade accounts payable	-5 129	-6 038	-6 426	-5 683	-5 485	-5 755	-6 034	-6 205	-6 238	-6 418	-6 811	-7 025	-7 226	-7 435
Property, plant and equipment	7 633	12 943	12 479	11 710	11 009	11 771	12 585	12 868	13 187	13 843	14 855	15 609	16 367	17 154
Income tax liabilities	-917	-2 483	-2 361	-2 516	-1 088	-1 158	-1 131	-1 210	-1 208	-1 245	-1 273	-1 308	-1 347	-1 382
Investments accounted for using the equity method	4 007	515	522	491	503	516	529	542	556	569	584	598	613	629
Claims for income tax refunds	474	809	1 652	1 233	1 736	751	799	780	835	833	859	878	902	929
Other provisions	-4 762	-3 441	-3 415	-2 884	-3 247	-3 182	-3 104	-3 178	-3 155	-3 145	-3 159	-3 153	-3 153	-3 155
Goodwill & Other intangible assets	26 425	75 324	74 021	62 109	75 012	76 656	78 391	78 443	78 602	79 737	81 844	83 148	84 413	85 710
Contract & Refund liabilities	0	-8 003	-8 291	-8 775	-998	-1 045	-1 093	-1 095	-1 099	-1 131	-1 190	-1 227	-1 262	-1 299
Other liabilities	-2 768	-2 487	-2 922	-3 373	-3 175	-3 321	-3 476	-3 481	-3 495	-3 596	-3 784	-3 900	-4 013	-4 129
Operating Invested Capital	40 795	90 600	88 458	73 656	96 583	98 609	101 951	102 279	102 914	105 098	109 020	111 558	114 036	116 594
Assets held for sale	2 081	234	1 137	113	0	0	0	0	0	0	0	0	0	0
Liabilities directly related to assets held for sale	-111	-12	-662	0	0	0	0	0	0	0	0	0	0	0
Other provisions	-948	-3 342	-3 602	-11 565	-12 500	-8 000	-4 864	-4 864	-4 864	-4 864	-4 864	-4 864	-4 864	-4 864
Net Deferred Taxes	3 762	-484	671	3 355	0	0	0	0	0	0	0	0	0	0
Provisions for pensions and other post-employment benefits	-8 020	-8 717	-8 213	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454	-8 454
Other receivables	1 676	2 484	2 562	2 502	1 984	2 075	2 172	2 175	2 184	2 247	2 365	2 437	2 508	2 580
Other financial assets	1 634	2 212	1 536	1 555	1 555	1 555	1 555	1 555	1 555	1 555	1 555	1 555	1 555	1 555
Non-Operating Invested Capital	74	-7 625	-6 571	-12 494	-17 415	-12 824	-9 591	-9 588	-9 579	-9 516	-9 399	-9 326	-9 255	-9 183
Total Invested Capital	40 869	82 975	81 887	61 162	79 168	85 786	92 360	92 690	93 335	95 582	99 621	102 232	104 781	107 411
	0	0	0	0										
Net Financial Debt	4 008	36 911	34 454	30 463	31 605	33 839	34 173	34 615	35 519	36 968	38 008	39 031	40 083	40 800
Total Equity (shareholders' and n.c.i.)	36 861	46 064	47 433	30 699	47 563	51 946	58 187	58 075	57 816	58 615	61 614	63 201	64 698	66 610
Total Financing (NCI to be deducted later)	40 869	82 975	81 887	61 162	79 168	85 786	92 360	92 690	93 335	95 582	99 621	102 232	104 781	107 411

[39]For more detail and years projected after 2030 please refer to the excel file attached.

Cash Flow Statement (in €mn)

Cash Flow Map - Forecast
Note: A - Audited, **F** - Forecasted

(€ million)	2018A	2019A	2020A	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	2032F	2033F	2034F	2035F	2036F
Operating Business																			
Operating EBIT	5 678	4 916	-601	4 239	4 509	4 405	4 714	4 704	4 847	4 958	5 094	5 245	5 381	5 461	5 543	5 627	5 711	5 797	5 884
Notional Taxes on Operating EBIT	-899	-778	95	-671	-713	-697	-746	-744	-767	-785	-806	-830	-852	-864	-877	-890	-904	-917	-931
Tax adjustments	45	251	1	0	-13	-12	-13	-13	-14	-14	-14	-15	-15	0	0	0	0	0	0
Operating NOPLAT	4 825	4 389	-505	3 568	3 782	3 696	3 955	3 946	4 067	4 159	4 274	4 400	4 514	4 597	4 666	4 736	4 807	4 879	4 952
D&A and Impairments	-4 694	-5 159	-11 021	-4 461	-5 553	-5 757	-5 799	-5 853	-6 004	-6 255	-6 428	-6 600	-6 778	-6 879	-6 936	-7 010	-7 086	-7 162	-7 240
Capex	6 611	1 398	854	870	2 441	2 609	2 118	2 200	2 631	3 132	2 981	3 093	3 234	2 974	2 685	2 839	2 882	2 925	2 969
Investment in NWC	5 594	-1 310	2 422	1 170	790	830	158	83	541	1 052	627	603	621	332	337	342	347	352	358
Investment in Intangible Assets	52 292	1 994	-2 514	15 793	5 517	5 696	4 016	4 131	5 164	6 243	5 505	5 530	5 628	5 060	5 106	5 153	5 200	5 249	5 297
Investment in Other Operating Assets	-11 124	275	-1 009	9 555	-1 170	-39	-164	75	-149	-250	-148	-147	-147	-61	-73	-75	-75	-76	-77
Unlevered Operating FCF	-43 854	7 191	10 763	-19 359	1 756	355	3 627	3 310	1 883	238	1 736	1 922	1 956	3 171	3 547	3 487	3 538	3 592	3 645
Non-operating EBIT	-2 728	-782	-15 357	-4 940	-1 087	-1 055	-1 071	-1 071	-1 084	-1 119	-1 136	-1 152	-1 167	-1 189	-1 211	-1 234	-1 257	-1 280	-1 304
Notional Taxes on Non-operating EBIT	432	124	2 430	782	172	167	169	169	172	177	180	182	185	188	192	195	199	203	206
Tax adjustments	-75	-40	-838	0	-47	-45	-46	-46	-47	-48	-49	-50	-50	0	0	0	0	0	0
Interest Tax Shield	-168	-203	-204	-174	-181	-193	-195	-198	-203	-211	-217	-223	-229	-233	-237	-241	-244	-248	-248
Impairment on Goodwill	-1 547	-208	-2 238	0	-569	-582	-582	-583	-592	-608	-617	-627	-636	0	0	0	0	0	0
Investment in Non-operating Assets	-5 735	2 011	-3 648	-4 921	5 161	3 814	585	592	655	725	690	697	709	40	40	41	41	42	43
Unlevered Non-operating FCF	4 743	-2 703	-8 083	589	-5 734	-4 359	-1 146	-1 154	-1 226	-1 319	-1 295	-1 312	-1 334	-1 274	-1 296	-1 320	-1 344	-1 368	-1 389
Discountinued Operations	321	1 700	5 074	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total FCF	-38 790	6 187	7 754	-18 770	-3 978	-4 004	2 481	2 157	657	-1 081	441	609	622	1 897	2 251	2 167	2 194	2 223	2 256
Financing																			
Interest Expense	-1 064	-1 281	-1 292	-1 100	-1 141	-1 222	-1 234	-1 250	-1 282	-1 335	-1 372	-1 409	-1 447	-1 473	-1 496	-1 520	-1 545	-1 570	-1 570
Tax Shield	168	203	204	174	181	193	195	198	203	211	217	223	229	233	237	241	244	248	248
Change in NFD	33 068	-2 465	-3 943	1 142	2 235	333	443	904	1 448	1 040	1 023	1 052	718	632	675	685	695	0	-46 168
Change in Equity	9 203	1 369	-16 734	16 864	4 384	6 241	-112	-260	799	2 999	1 588	1 497	1 912	834	485	605	615	1 330	47 518
Comprehensive Income	2 585	4 013	-14 010	-1 690	1 679	1 541	1 774	1 749	1 825	1 834	1 896	1 972	2 034	2 123	2 151	2 177	2 204	2 232	2 285
Financial Cash Flow	38 790	-6 187	-7 754	18 770	3 978	4 004	-2 481	-2 157	-657	1 081	-441	-609	-622	-1 897	-2 251	-2 167	-2 194	-2 223	-2 256

Disclosures and Disclaimers

Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

This report was prepared by José Moreira and Rui Santos, two Master in Finance students of Nova School of Business and Economics ("Nova SBE"), within the context of the Field Lab – Equity Research.

This report is issued and published exclusively for academic purposes, namely for academic evaluation and master graduation purposes, within the context of said Field Lab – Equity Research. It is not to be construed as an offer or a solicitation of an offer to buy or sell any security or financial instrument.

This report was supervised by a Nova SBE faculty member, acting merely in an academic capacity, who revised the valuation methodology and the financial model.

Given the exclusive academic purpose of the reports produced by Nova SBE students, it is Nova SBE understanding that Nova SBE, the author, the present report and its publishing, are excluded from the persons and activities requiring previous registration from local regulatory authorities. As such, Nova SBE, its faculty and the author of this report have not sought or obtained registration with or certification as financial analyst by any local regulator, in any jurisdiction. In Portugal, neither the author of this report nor his/her academic supervisor is registered with or qualified under COMISSÃO DO MERCADO DE VALORES MOBILIÁRIOS ("CMVM", the Portuguese Securities Market Authority) as a financial analyst. No approval for publication or distribution of this report was required and/or obtained from any local authority, given the exclusive academic nature of the report.

The additional disclaimers also apply:

USA: Pursuant to Section 202 (a) (11) of the Investment Advisers Act of 1940, neither Nova SBE nor the author of this report are to be qualified as an investment adviser and, thus, registration with the Securities and Exchange Commission ("SEC", United States of America's securities market authority) is not necessary. Neither the author nor Nova SBE receive any compensation of any kind for the preparation of the reports.

Germany: Pursuant to §34c of the WpHG (*Wertpapierhandelsgesetz*, i.e., the German Securities Trading Act), this entity is not required to register with or otherwise notify the *Bundesanstalt für Finanzdienstleistungsaufsicht* (“BaFin”, the German Federal Financial Supervisory Authority). It should be noted that Nova SBE is a fully-owned state university and there is no relation between the student’s equity reports and any fund raising programme.

UK: Pursuant to section 22 of the Financial Services and Markets Act 2000 (the “FSMA”), for an activity to be a regulated activity, it must be carried on “by way of business”. All regulated activities are subject to prior authorization by the Financial Conduct Authority (“FCA”). However, this report serves an exclusively academic purpose and, as such, was not prepared by way of business. The author - a Master’s student - is the **sole and exclusive responsible** for the information, estimates and forecasts contained herein, and for the opinions expressed, which exclusively reflect his/her own judgment at the date of the report. Nova SBE and its faculty have no single and formal position in relation to the most appropriate valuation method, estimates or projections used in the report and may not be held liable by the author’s choice of the latter.

The information contained in this report was compiled by students from public sources believed to be reliable, but Nova SBE, its faculty, or the students make no representation that it is accurate or complete, and accept no liability whatsoever for any direct or indirect loss resulting from the use of this report or of its content.

Students are free to choose the target companies of the reports. Therefore, Nova SBE may start covering and/or suspend the coverage of any listed company, at any time, without prior notice. The students or Nova SBE are not responsible for updating this report, and the opinions and recommendations expressed herein may change without further notice.

The target company or security of this report may be simultaneously covered by more than one student. Because each student is free to choose the valuation method, and make his/her own assumptions and estimates, the resulting projections, price target and recommendations may differ widely, even when referring to the same security. Moreover, changing market conditions and/or changing subjective opinions may lead to significantly different valuation results. Other students’ opinions, estimates and recommendations, as well as the advisor and other faculty members’ opinions may be inconsistent with the views expressed in this report. Any recipient of this report should understand that statements regarding future prospects and performance are, by nature, subjective, and may be fallible.

This report does not necessarily mention and/or analyze all possible risks arising from the investment in the target company and/or security, namely the possible exchange rate risk resulting from the security being denominated in a currency either than the investor’s currency, among many other risks.

The purpose of publishing this report is merely academic and it is not intended for distribution among private investors. The information and opinions expressed in this report are not intended to be available to any person other than Portuguese natural or legal persons or persons domiciled in Portugal. While preparing this report, students did not have in consideration the specific investment objectives, financial situation or particular needs of any specific person. Investors should seek financial advice regarding the appropriateness of investing in any security, namely in the security covered by this report.

The author hereby certifies that the views expressed in this report accurately reflect his/her personal opinion about the target company and its securities. He/ She has not received or been promised any direct or indirect compensation for expressing the opinions or recommendation included in this report.

The content of each report has been shown or made public to restricted parties prior to its publication in Nova SBE's website or in Bloomberg Professional, for academic purposes such as its distribution among faculty members for students' academic evaluation.

Nova SBE is a state-owned university, mainly financed by state subsidies, students tuition fees and companies, through donations, or indirectly by hiring educational programs, among other possibilities. Thus, Nova SBE may have received compensation from the target company during the last 12 months, related to its fundraising programs, or indirectly through the sale of educational, consulting or research services. Nevertheless, no compensation eventually received by Nova SBE is in any way related to or dependent on the opinions expressed in this report. The Nova School of Business and Economics does not deal for or otherwise offer any investment or intermediation services to market counterparties, private or intermediate customers.