Lisbon School of Economics & Management
Universidade de Lisboa

MASTER OF SCIENCE IN FINANCE

MASTERS FINAL WORK
PROJECT

EQUITY RESEARCH: MERCK SHARP AND DOHME

MIGUEL MORAIS

OCTOBER 2021

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Abstract

The following research report follows the official CFA Institute recommended structure for an Equity Research.

Merck & Co., Inc ("Merck Sharp and Dohme" or "Merck") can be defined as one of the largest healthcare companies in the world, with a range of operations that include health solutions through medicines, vaccines, prescriptions, therapies, and animal health. These operations are all divided into two major segments: Pharmaceutical and Animal Health.

The company trades its shares on the New York Stock Exchange (NYSE) with the ticker symbol of "MRK". The current closing stock price as of September 15th is $72.81 and the total assets of the company accounted for $91.59Bn in FY2020, with a market capitalization of $185.246Bn.

Merck has a price target of $**83.59**, which leads to a BUY recommendation for 2022F, representing an upside potential of **15%,** or an annualized potential of **9.65%**, with a considerable **medium risk**.

Vanguard Group, BlackRock Institutional Trust Company, and State Street Global Advisors currently represent the three major shareholders, with 8.89%, 5.15% and 4.45% of Merck's shares, respectively. The turnover (or liquidity) of the stock is low for all top investors, meaning that it can be hard to buy in shares. Wellington Management Company, Geode Capital Management and Capital International Investors are also part of the top 10 investors of the company.

Merck has currently 2531 million shares outstanding and a stock's free float of 99.92%, meaning that the company has the majority of its shares available to public trade and not held by insiders.

JEL classification: F01; G10; G17; G30; G32; G34; G35; J10; J11; K41; L65; I10; J11

Keywords: Merck; R&D, Pharmaceutical; Animal Health; Oncology; M&A activity; Covid-19; Valuation; Equity Research; Pricing pressure

Resumo

Este relatório segue a estrutura oficial recomendada pelo Instituto de CFA para uma Equity Research.

Merck & Co., Inc. (“Merck Sharp and Dohme” ou “Merck”) pode ser definida como uma das maiores empresas de saúde mundiais, com um conjunto de operações que incluem soluções de saúde por via de medicamentos, vacinas, prescrições, terapias, e saúde animal. Todas as operações mencionadas estão divididas em dois grandes segmentos: Farmacêutica e Saúde Animal.

A empresa negoceia as suas ações na Bolsa de Valores de Nova Iorque (NYSE) com o símbolo “MRK”. O preço atual das ações, em 15 de setembro de 2021. é de $72,81 e os Total de ativos da empresa contabilizou $91,59 bilhões no ano fiscal de 2020, com uma capitalização de mercado de $185,246 mil milhões.

A Merck tem um preço-alvo de $83,59, o que leva a uma recomendação de “BUY” para 2022F, o que representa um ganho potencial de 15%, ou de 9,65% depois de anualizado, com um risco médio considerável.

O Vanguard Group, a BlackRock Institutional Trust Company e a State Street Global Advisors representam atualmente os três principais acionistas, com 8,89%, 5,15% e 4,45% das ações da Merck, respectivamente. O “turnover” (ou liquidez) das ações é baixo para todos os principais investidores, o que significa que pode ser difícil comprar ações. Wellington Management Company, Geode Capital Management e Capital International Investors também fazem parte dos 10 maiores investidores da empresa.

A Merck tem atualmente 2531 milhões de ações em circulação e um “free float” de 99,92%, o que significa que a empresa tem a maioria de suas ações disponíveis para negociação pública e não detidas por “insiders”.

Classificação JEL: F01; G10; G17; G30; G32; G34; G35; J10; J11; K41; L65; I10; J11

Palavras-Chave: Merck; R&D, Farmacêutica; Saúde Animal; Oncologia; Fusões e Aquisições; Covid-19; Avaliação de Empresas; Equity Research; Pressão de Preços

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To Professor Telmo Vieira, for all the attention and availability

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1. Research Snapshot

MERCK & CO: Improving Human/Animal Life with Innovation

After performing the valuation using a DCF model, it is possible to conclude that Merck's stock is undervalued. A 2022F price target of $83.59 results in a 14.81% upside potential against the closing price of $72.81 (September 15th). Hence, a final **Buy recommendation** with a **medium risk is issued,** due to the nature of the industry and the recent shifts in Merck's stock price**.**

Merck stock has been **underperforming its peers** for the past few months, which might be explained by the **slowing sales** of Januvia, Janumet and **Covid-19 speculation**.

A strong bounce back in revenues, alongside some important strategic decisions made in regards do Covid-19 programs in FY2021, can boost this recovery in the beginning of 2022. **Value to shareholders** is secured and unlocked by corporate and strategic agreements that enhance the major products to boost revenues in a long-term basis, which are then used to reinvest into new opportunities, mainly through **R&D and innovation programs.**

R&D and Innovation: Chronic diseases and Artificial Intelligence

Merck has thoughtfully decided to take a conservative approach in this new pandemic, keeping a low level of involvement in vaccines, followed by a disinvestment in Covid-19 programs in FY2021. The company's product portfolio can explain this approach, as most of the major products are related to oncology (Prevention, diagnosis, and treatment of cancer). EvaluatePharma World Preview (2020, p.12) forecasts that 34.8% of US clinical pipeline will be from Oncology, which is also a reflection of demographic conditions that are shaping Europe and the USA, geographical areas of focus for Merck. Furthermore, this therapeutic area tops the list of clinical development expenditure in 2020 and 2021. Merck's R&D expenditure accounted for $13.6Bn in FY2020, a record level for the company that will not slow down as 2025F and 2030F forecasts predict expenditures of $18.6Bn and $24.5Bn, respectively.

Shareholder Return Policy

In November 2020, Merck agreed to increase its quarterly dividends from $0.61/share to $0.65/share, which most likely result in payment of over $7.5Bn in FY2021 (Table 2). This policy will last, and it can be supported by the positive FCFCB in the 2021F-2030F period, with 2021YE of $9.7Bn, 2025F of $3.2Bn and 2030F of $8.4Bn. Capitalized operating lease obligations can explain the plunge in 2025F. A set of repurchase programs were settled in 2018, with a remaining repurchase authorization of $5.9bn with no time limit.

Conservative Strategy for the future

Despite the steady/inspiring revenues and diversified product portfolio, the fast-paced trends worldwide and business segments risks force Merck to define priorities. No concerns arise from pharmaceutical demand, as demographic conditions are constantly feeding up the industry and creating new investment opportunities for Merck and its peers. However, government interference and high product exposure will constrain the Board of Directors from making some decisions.

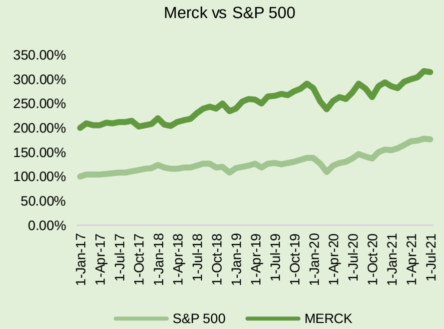
The main strategy for now is to mitigate the risk of low demand on the Animal health segment and to diversify even more the product portfolio on both segments.

BUY

Price Target	**$83.59**
Current Price (Aug.31st)	$72.81
Upside Potential	14.81%
Annualized return	**9.65%**
Medium Risk	

Market Cap ($M)	$185,246
Free Float (%)	99.92%
Shares Outstanding (#M)	2531.37
52-week Range ($)	71.72 - $86.29
YTD performance (Forbes)	-1%

Figure 1. Relative Price Performance



Source: *Author Analysis (Finance Yahoo Data)*

Table 1. Financial Highlights

$Bn	2020	2021F	2022F	2025F	2030F
Revenues	479.9	506.5	540.9	657.8	869.1
EBITDA	95.1	97.8	103.0	125.5	165.9
Mg %	19.81%	19.31%	19.05%	19.08%	19.09%
NOPLAT	**69.9**	**71.3**	**72.2**	**86.2**	**111.8**
Mg %	**14.56%**	**14.08%**	**13.34%**	**13.11%**	**12.87%**
FCFCB	**-3.5**	**97.8**	**54.4**	**32.2**	**83.8**
CAPEX	**49**	**15**	**40**	**46**	**58**
DebtRatio	56.8%	55.8%	56.9%	57.0%	60.3%
Int. Covrg	9.5	8.1	8.1	8.4	8.8
ROIC (%)	12.5%	13.5%	13.1%	13.4%	14.6%
ROE (%)	28.0%	27.4%	28.1%	30.3%	32.9%
Core IC	**560**	**530**	**549**	**617**	**732**

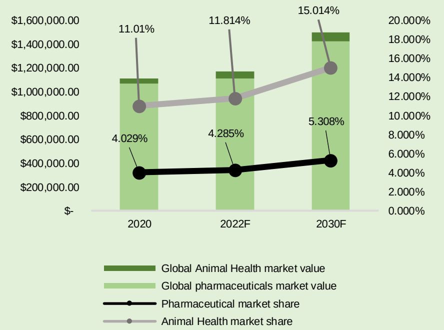
Source*: Author Analysis*

Table 2. Shareholder Return Policy

In $Bn, except %	2020	2021F	2022F	2025F	2030F
Dividend ($/sh)	2.48	2.50	2.56	2.72	2.90
Payout Ratio (%)	109%	90%	90%	90%	90%
Dividend yield (%)	2.63%	3.18%	3.06%	3.06%	3.06%
Share Repurchase	13	59			

Source*: Author Analysis*

Figure 2. Global Pharmaceutical and Animal Health Revenues/Merck's market share



Source: *MarketLine and Statista*

2. Business Description

Company Overview

Merck & Co., Inc or Merck (NYSE: MRK) is one of the major companies in the Healthcare Industry, with operations in more than 140 countries. It operates as a research biopharmaceutical company, and it has been redefining its operating model to reduce costs and prioritize the R&D investments, which can generate long-term sustainable profit.

This operating model contemplates a variety of areas, such as prescription medicines, vaccines, biologic therapies, animal health products and other health solutions related to the prevention of severe chronic diseases. Latest partnerships also show an intend to tackle areas like immunology, neuroscience, cardiometabolic diseases, oncology, cancer, diabetes, obesity, pain respiratory diseases and vaccines.

Operational Major Segments

To group these different areas, the company divides its operations into two major segments: Animal Health and Pharmaceutical.

The Animal Health segment has only been significant in recent years, as the results have been impressive, even for the boards' expectations. In this sector, the company deals with veterinarians and animal producers/distributors through the commercialization of vaccines for control, prevention, and treatment of diseases, specifically directed to livestock and companion animals.

In FY2020, revenues reached an interesting value of $4.7Bn, accounting for 10% of the company's total revenue (figure 3), excluding the category of "Other Revenues". Following the covid-19 crisis, losses reached $50 million in this specific segment according to the company's financial reports, which did not affect the market leading position.

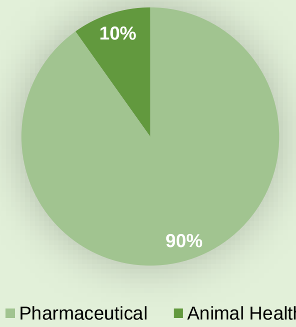
Although Animal Health's performance has been outstanding, pharmaceutical segment holds most of the company's core operating activities. According to the company's Financial Reports this segment includes every operation involving both human health pharmaceutical and vaccine products, and it accounted for approximately 90% of the company's total revenue in 2020 (excluding "Other Revenues").

Both segments are related to the commercialization of drugs, vaccines, and other pharmacy products, but the pharmaceutical's relevance goes beyond this. The involvement in disease prevention, hospital services and other medicine areas makes this core segment for Merck.

Revenues in pharmaceutical industry of $43.02Bn in FY2020 (an increase of 2.5% compared to the previous FY) proves how huge, important, and profitable this segment can be, not forgetting the subsequent risk associated with it.

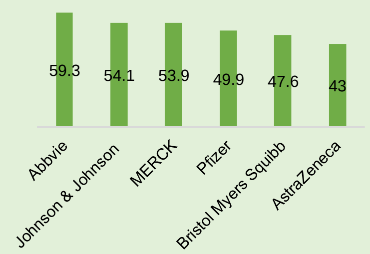
Despite this encouraging value, three risks need to be addressed. The increase of innovation costs and decrease of returns (Pricing Pressure), the implementation time for each product of 10 to 15 years, and the limited number of products available represent an undesirable risk for every competing company in this Industry.

Figure 3. Revenues By Segment



***Source**: Author Analysis*

Figure 4. Worldwide Prescription Drug Sales in 2026 (in $Bn)



Source: EvaluatePharma2021(May 2021)

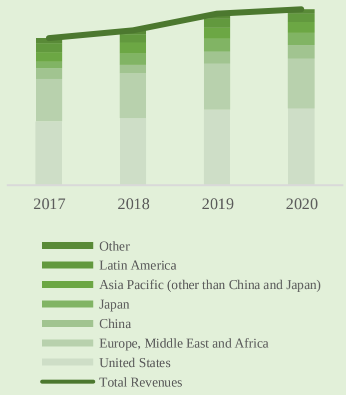
Following the covid-19 crisis, losses reached $2.5Bn in this specific segment according to the company's financial reports.

Financial reports also include the segment of "Other Revenues", recognized as a non-core operational segment, due to the third-party manufacturing sales, hedging activities, miscellaneous corporate revenues, and other small investments. Hence, the residual values from the last 5 years confirm the lack of connection to the company's core operations.

To sum up this set of information, it is relevant to mention that both pharmaceutical and animal health segments experienced a growth of 2.5% and 3% in FY2020, respectively. This growth is not close to the ones recorded in the two previous fiscal years, where rates reached approximately 6% and 10%. Covid-19 played an important role in this.

In FY2020 Merck had 44% of its operations in the US, 28% in Europe, Middle East and Africa (EMEA), 7% in China, 7% in Japan, 6% in Asia Pacific, 5% in Latin America, and 3% in Other Locations. From this set of information (Figure 5), it is relevant to mention the increase in the volume of operation in China, compared to the previous fiscal year (increase of 2%) justifying the strategic movement of entering in new emerging markets.

Figure 5. Revenue by Geography



Source: *Author Analysis*

History

Merck's history goes back to January 1,1891 when George Merck founded the company in the U.S, with the purpose of distributing fine chemicals mainly in New York City.

The turning point occurred in 1925 when the son of George Merck (George W. Merck) became president, leading the business to a route of innovation, bringing the attention to the research capacity. This ambition was boosted by the merger with Powers-Weightman-Rosengarten in 1927. The following years solidified this position with the creation of the first research laboratory which led to discovers in medicine.

1948 and 1953 are two of the most important years for the company, marked by the entry in the animal health market with sulfaquinoxaline and by the merger with Sharp & Dohme respectively.

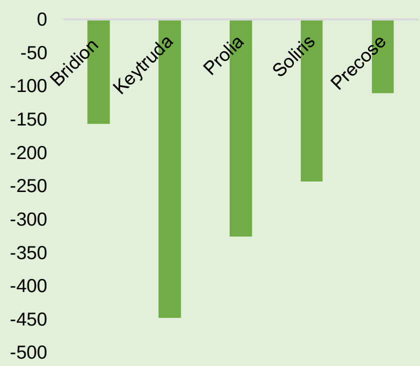
Large companies like Merck are highly intense when it comes to mergers, acquisitions, expansions, and R&D. Although they are all important to the course of operations, there a few developments that have been more crucial than others. The formation of subsidiaries in Cyprus, Germany, Holland, Peru, South Korea, and China by a joint venture represent examples of important expansions that allowed Merck to boost their revenues, innovation, and research in new and emerging markets.

Spin-offs and regulatory approvals have also been an important role to solidify the company's position in the industry.

In 2009 Merck became the second largest pharmaceutical company in the United States based on revenue, due to a merger with Schering-Plough. In 2014 the FDA approved BRAVECTO for the Animal Health division and KEYTRUDA for the Pharmaceutical division.

In this current year of 2021, the company closed an agreement with Gilead Sciences for treatments in HIV, and another one with IMV to clinical trials in some of their products. It is relevant to also mention the spin-off of Organon & Co, the acquisition of Pandion Therapeutics Inc, and the two regulatory approvals related to Lynparza and Keytruda.

Figure 6. Top Losses due to Covid-19 ($M)



Source: EvaluatePharma (2020, p.10)

Merck's Key Products

Merck possesses a large product portfolio (Appendix 4), but it is worth mentioning what is likely to become the top selling drug worldwide by 2026, Keytruda. It aims to treat patients with skin cancer by detecting and fighting tumor cells. EvaluatePharma World Preview (2021, p. 16) forecasts sales of $27bn in 2026, which represents the double amount compared to its closest rival Humira.

It is undeniable that Merck does not rely on KEYTRUDA (Figure 6), as revenues have also been bolstered by products like Lynparza, Lenvim and other animal health products, but it is also undeniable that this product has an exponential potential compared to others. FY2021 has been proving this point, as the company entered in countless agreements to improve and distribute this product more efficiently.

Financial Highlights

Merck has been a stable company for the past five years, with **revenues of $47.99Bn**, an operating **EBITDA $9.5Bn**, and a **net income of $7.08Bn** in FY2020. Although it represents an increase when compared to the previous years, it was slowed down by the **Covid-19 pandemic**, when compared to FY2019.

Moreover, **ROE** accounted for 28% in FY2020, 37.7% in FY2019, 23.2% in FY2018 and only 7% in FY2017. The main drivers of this return are the **ROA**, financial leverage **(Equity Multiplier)** and **Net profit margin**.

Net profit margin is identified as the main responsible for the low value of **ROE** in FY2017, as it only accounted for 6%. The following three years show how low this value was. Thus, the operating **EBITDA Margin** has also been the lowest in FY2017, with 18.4%. FY2018, FY2019 and FY2020 accounted for 22.8%,28.2% and 19.8% respectively. Consequently, the **NOPLAT** is also reflecting this evolution, as margins accounted for 13.3% in FY2017, 17.9% in FY2018, 20.40% in FY2019 and 14.56% in FY2020.

Shareholder Structure

On the 21st of January 2021, the company reported having 104900 shareholders, 75.20% of whom are Institutions, such as Investment Managers, Brokerage Firms, and strategic entities. Having a 99.92% free float means that most of its shares are available to public trade and not held by insiders, which is an important piece of information to current and possible future shareholders. Despite being a global company, 61.69% of Merck's investors are located in North America, 12.12% in Europe and only 1.42% and 0.04% in Asia and Middle East, respectively.

As of December 31, 2020, Merck had a total of 2.538Bn shares outstanding trading in the New York Stock Exchange (NYSE). Figure 7 shows the stabilization of the payout policy and the increase of annual dividends per share, which will keep increasing due to the companies intends, 2019-2023 programs and recent agreements.

According to the Notice of Annual Meeting and Proxy Statement (2021, p. 8), the majority of shareholders (92%) agreed to keep applying the "say-on-pay" model, which follows the shareholder engagement policy. Despite the recent decrease in approvals, when compared to the three previous years, the executive compensation and corporate governance programs suffered minor changes and will keep prioritizing long-term shareholder value.

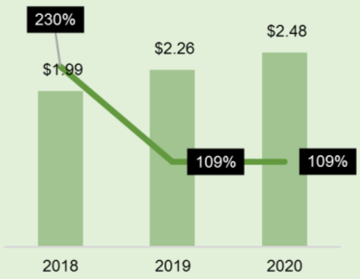
Overall, $7.5Bn of capital has returned to shareholders in FY2020, followed by an increase of 7% in quarterly dividends in January 2021.

At last, shareholders will see their total cumulative EPS reach levels of up to 67% in 2023 due to the spinoff of Organon & Co in June 2021. The agreement was closed to acquire Alydia Health and it costed $240M.

Dividend Policy

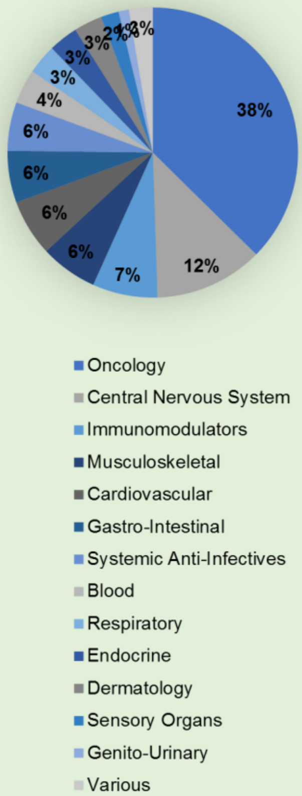
Dividends are included in the $7.5Bn capital returned to shareholders, with $2.668m paid in dividends only to former Merck's CEO. Annual dividend per share accounted for $2.48 in FY2020 and will mostly reach $2.72 in 2025F and $2.90 in 2030F. This projection takes the +9.48% CAGR and the +3.06% YoY of 2017-2020 period as an input to forecast those annual payments to shareholders.

Figure 7. Annual Dividend per share/ Payout ratio



Source: Author Analysis

Figure 8. Clinical Expenditure



Source: EvaluatePharma (2020, p.13)

Moreover, capital allocation in FY2020 included dividends, proving how the creation of value to shareholders value constitutes a core investment for the company.

Although the recent spinoff program may increase the EPS until 2023, the instability of the market and the voting intentions of shareholders indicate a conservative and stable payout policy of 90% for the next years.

Strategy

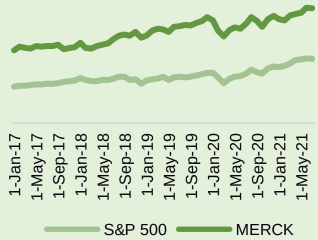
According to the Notice of Annual Meeting and Proxy Statement (2021, p. 45) Merck's strategy has 4 areas of focus to approach both short-term and long-term horizons in order to increase revenues, performance unlocking then value to its shareholders:

- **Scientific Breakthroughs:** Development of Oncology, vaccines, and investments in Hospital presence (including Health investments) are the core areas where the company wants to use its research resources to improve both products and probability of approvals. Advances in Phase 3 data from KN-581, as well as Keytruda and Lynparza approvals, reinforce the importance and focus on scientific research to strengthen the quality and dimension of products. A range of vaccine approvals, advancements in Hospital support products/ treatments, and the new 17 approvals aligned with 4 key business transactions in the Animal Health segment prove how active Merck is, in terms of advancing the pipeline for these areas of focus.
- **Product Portfolio:** Strong product portfolio drives revenues and keeps the long-term sustainable growth secured. Revenue's growth of 30% in Keytruda, 62% in Lynparza, 43% in Lenvima, 6% in Gardasil franchise, 7% in Birdion and 10% in Animal Health indicate future investments may be focused on these products and areas. Positive returns in this range of products also guarantee a strong product portfolio, due to the lack of dependence.
- **Capital Allocation:** Merck's strategy to reinvest its funds to create value for shareholders is clear given the market conditions and the company's strengths. Priorities include reinvesting its earnings into R&D, Capital investments, dividends, business developments and share repurchase. Capital investments should reach $20Bn between 2020-2024 period.
- **Innovation:** Nowadays, Merck is forced to enter in acquisitions agreements and strategic collaborations to keep a differentiated science approach. Acquisitions of ArQule and VelosBio followed by a strategic alliance with Seagen in 2020 helped the $10.6Bn expenditure in business development investment. Altogether, Merck entered in more than 100 transactions just in 2020 to reach competitive levels of innovation and differentiation.

Stock Price

Merck's stock price has been constantly increasing throughout the years, with a value of $51.64 on the 1st of January 2017 and $77.66 on the 1st of January, 2020 (Figures 1 and 9). This increase of more than $20/share can be justified by the increase in revenues and operating margins since 2017, which reflects immediately in the stock price. Recently, the stock price has been fluctuating between $70 and $80, sometimes surpassing the value of $80.

Figure 9. Merck vs S&P 500 (Jan 17 – Jun 21) Finance Yahoo



Source: *Finance Yahoo (Author Graphic)*

3. Management and Corporate Governance

Governance Model and Recent Events

Merck is ruled by a board of directors and an executive board that have the mission to foresee the risks that can damage the company and guarantee an effective and sustainable strategic direction. Mr. Kenneth C. Fraizer has step down as Chief Executive Officer (CEO) on July 1, 2021, after spending 10 years in this role. Mr. Fraizer joined the company in 1992 and served as the Senior Vice President from 1999 to 2006. His transition to CEO, chairman and President of Merck occurred in 2011 and since then he has also been a director of Exxon Mobil and PhRMA, and a member of Board of Overseers of Weill Comell Medicine and Trustee of Cornerstone Christian Academy. As for now, Mr. Fraizer is still actively involved as the executive chairman of the company's board of directors.
A new era has arrived with the new president and CEO Mr. Robert (Figure 10).

Board of Directors

Merck currently possesses a diverse, skillful, and experienced board of directors, with 13 members in total. Large companies tend to have near 90% of independent members in the board of directors, and Merck is no exception, with only 2 non independent members, making a total of 92% of independent members (Figure 11). This usually happens, because there's a need for companies with this size to have different professionals, who are not impacting the company's operations and executive decisions.
The Board holds an important responsibility of overseeing the risks and protecting the company's and shareholders' interests, while developing and planning clear strategies to keep the operations running efficiently. It can operate as a whole or through its committees and members to assure compliance with regulations, to select the Chief Executive Officer, to structure the main responsibilities and be aware of shareholder views and intends.
At the moment, the Board possesses 4 main committees:

- **Audit Committee:** Directly responsible for the appointment, oversight and control of the independent public accountants. All subjects related to the approval of audit engagement fees and terms.
- **Governance Committee:** Responsible for the advisory of policies, practices and procedures to the Board. It is a key entity to oversee the corporate compliance processes in every operating and non-operating areas.
- **Compensation and Benefits Committee:** As the name suggests, this committee is involved in the election of officers and has the authority to change the compensations of consultants advising the compensation of both directors and executives.
- **Research Committee:** With a focus on pharmaceutical products and vaccines, the research committee is in charge of making recommendations about the operational strategies regarding research and development in those areas .

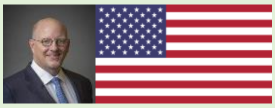
All committees must be evaluated at least once a year in terms of performance and effectiveness.

The Executive Board

Responsible for the daily operations of Merck, the Executive team has currently 12 members, all specialized in different business areas:

- **Robert M. Davis:** Chief Executive officer and president.
- **Sanat Chattopadhyay:** Executive vice president and president of the Manufacturing Division.

Figure 10. – Robert M. Davis career



Education:
- **Bachelor's Degree** in Finance (Miami University)
- **M.B.A** from Northwestern University's Kellogg Graduate School of Management
- **J.D** from Northwestern University of Law

2014-2016:
- Merck & Co's Chief Financial Officer and Executive Vice President

2010-2014:
- Corporate Vice President and President of Baxter's Medical Products Business

2006-2010:
- Corporate Vice President and President of Baxter Healthcare

2004-2006:
- Treasurer of Baxter Healthcare

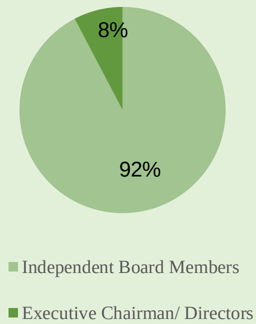
2002-2004:
- Eli Lilly's Director of Corporate Financial Planning

1990-2002:
- Eli Lilly's assistant treasurer and other financial positions

Mr. Davis is now responsible for the position of President and Chief Executive Officer.

Source: MarketLine and Merck & Co's board of directors' biography

Figure 11. Independence level – Board of Directors



Source: Author Analysis – aligned with the Merck's reports

- **Frank Clyburn:** Executive vice president and president of the Human Health Division.
- **Richard R. DeLuca, Jr.:** Executive vice president and president of Animal Health Division.
- **Cristal N. Downing:** Executive vice president and chief of communications and public affairs officer.
- **Julie Louise Gerberding:** Chief patient officer and executive vice president, responsible for the Population Health and Sustainability Division.
- **Michael A. Klobuchar:** Executive vice president and chief strategy officer.
- **Dean Y. Li:** Executive vice president and president of research facilities.
- **Caroline Litchfield:** Executive vice president and chief financial officer.
- **Steven C. Mizell:** Executive vice president and chief of human resources.
- **Dave Williams:** Chief information and digital officer.
- **Jennifer Zachary**: Executive vice president, general counsel, and corporate secretary.

Long-term incentives aim to increase +$500000 for Sanat Chattopadhyay and +$150000 for Jennifer Zachary, with an annual base salary increase between 1.8% and 13.8% in the Named Executive Officers of 2020.

ESG Metrics

ESG metrics is a framework that companies use to assess how environmental, social and governance issues are being managed. The commitment to identify and reduce greenhouse gas emissions and water use by 2025 is a priority for Merck, but there are also other commitments that need to be addressed. The company recognizes the access to health, environmental sustainability, employees, ethics, and core values as the 4 main areas of focus.

Access to health aims to provide access to medicine, to ensure product quality and safety, and also to tackle public health risks. According to the company's ESG progress report (2020/2021) there is an intend to provide health to 30 million people of low- and middle-income countries (social investments in underprivileged U.S population is included) by 2025, which will allow the company to reach at least 75% of the global population and will also unlock value through partnerships and innovative opportunities.

For employees, the goal appears to be focused on diversity, especially in higher positions where Merck defines the clear objective of maintaining or increasing the current inclusion index by 2025.

Moving on to environmental sustainability, greenhouse gas emission reduction sets itself apart from other intentions due to the commitment established in 2019 to achieve in 2030. This goal aims to reduce 30% in Scope 3 greenhouse gas emission and 46% the operational greenhouse gas emission. Carbon neutrality and 100% of renewable electricity by 2025 is also an expansion to take into account.

At last, ethics and values are aligned with the compliance to regulatory requirements and the freedom of speech within employees.

Although the projects and future prospects regarding ESG are clear and positive, it is crucial to evaluate how Merck & Co is actually performing for the past years in terms of score. According to table 3 the ESG combined score for 2019 was B-, which represented a downgrade comparing to 2018 (Score: B). The standard ESG score was A- in 2019 and has not been changed since 2016. This can be explained by a low score in environmental innovation (D-) and an extremely positive score in emissions score (A+). The company reported environmental fines in 2019 of $17690 and a freshwater withdrawal of $20320000.

Figure 12. Business and Shareholder Value Creation

Source: 2021 Notice of Annual Meeting and Proxy Statement

Table 3. ESG Scoring

ESG	2016	2017	2018	2019
Environmental Innovation Score	D-	D-	D-	D-
Emissions Score	A	A	A+	A+
ESG Combined Score	**B**	**B-**	**B**	**B-**
ESG Score	**A-**	**A-**	**A-**	**A-**
Environmental Pillar Score	B+	B+	B+	A-
Social Pillar Score	A+	A+	A+	A+
Governance Pillar Score	B+	B+	B-	B
ESG Controversies Score	C+	C-	C+	C
Resource Use Score	A-	A-	A-	A+

Source: *Bloomberg (Author Table)*

4. Industry Overview and Competitive Positioning

Industry Overview

The pharmaceutical industry represents one of the largest industries within the healthcare sector, with a range of subcategories that can go from development, marketing and production of prescription medicines, vaccines, biologic therapies to prevention of rare and chronic diseases. Innovation driven mainly by R&D has been pushing the industry further and increasing the volume of investments. Hence, revenues are also following this pattern and competition is getting higher by the second. To support this characterization of the industry, EvaluatePharma reports from 2020 and 2021 that predict a CAGR of 3.2% until 2026.
Despite the decrease in revenues due to Covid-19, the long-term growth is reassured by the way the industry operates via innovation. Additionally, this pandemic has also opened up new investment opportunities for companies, not only by the development of vaccines, but also in prevention and treatment, which is crucial for human health.

Major Trends

All data available suggests the industry will not only maintain, but also increase the focus on specialized treatments affecting smaller groups of population. Generic drugs commercialized to large groups of people are not adding the value they used to add to large pharma companies, due to the increasing number of substitutes and the pursuit of more effective treatments to severe diseases. In addition to this, prices dropped in result of the pricing pressure applied by governments, reducing returns and forcing companies to find solutions. Those solutions include heavy investments in R&D to improve effectiveness, returns and faster results. Artificial intelligence, collaborations and long-term projects will dominate the agenda of every big pharmaceutical company for the foreseeable future.

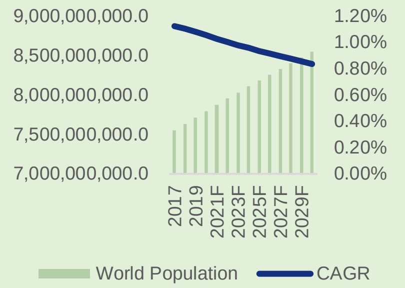
Economic (Global) Outlook

According to OECD statistics, the percentage of GDP spent on healthcare will easily surpass the average of 9%, Markets and economies like Germany, Italy, the UK, Italy, and Australia already saw this indicator grow at least 1%.
Negative impact in growth and unemployment rates are still in present in 2021, but it is fair to state that almost every country is finding a way to bounce back this numbers.

Europe Economic Outlook

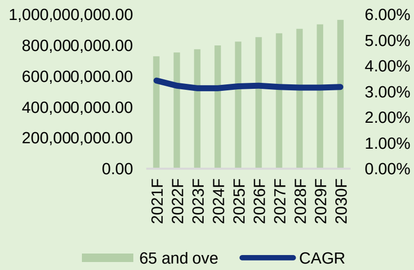
According to the International Monetary Fund (IMF), the global economy is climbing out from the depths to which it had plummeted during the Lockdown that sticked the world. Europe area was severely hit by this in March/April marking one the harshest quarters in the last years, with a GDP growth rate decrease of 11.6% in the correspondent quarter (Quarter 2, 2020). Shutting down economies, Brexit and other government restrictions were the main cause for this abrupt reduction, which was even worse in the UK, where the GDP growth rate fell 19.5%. It is also worth mentioning the fall of 3.1% in employment rates and the negative inflation rates recorded in the third and fourth quarter, with -0.03% and -0.28% respectively. After Brexit, Europe shows to be highly dependent on markets like Germany, France, Spain, and Italy, which can help the recovery in 2022.

Figure 13. World Population



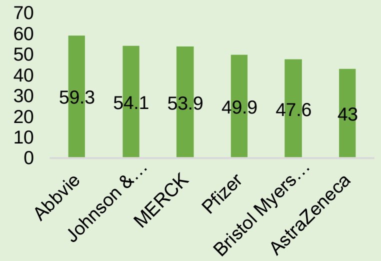
Source: *OECD Dataset*

Figure 14. World Elderly Population



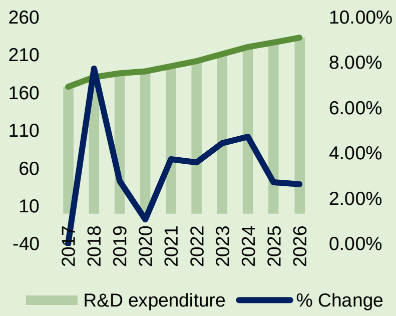
Source: *OECD Dataset*

Figure 15. Worldwide Prescription Drug Sales in 2026



Source: *EvaluatePharma (2021, p.19)*

Figure 16. Total Pharmaceutical R&D Spend ($BN)

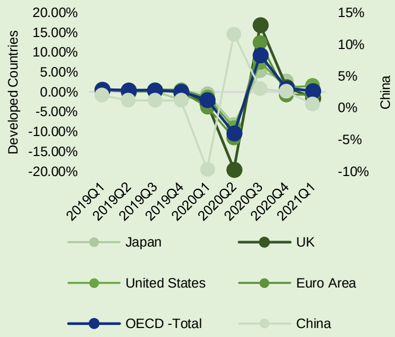


Source: *EvaluatePharma (2021, p.23)*

USA Economic Outlook

The importance of the United States, alongside China and Japan, is huge for the pharmaceutical industry, as the three nations represent the top 3 markets globally. China has been growing at the fastest pace, but the US still holds the badge for the largest market, due to not only its size, but also the attractiveness for new drugs. projects and other sources of business related to healthcare. Despite the recent pricing pressure, the United States measures to be a reasonable free market to healthcare. USA GDP felt the pandemic effect in the second quarter of 2020 registering a growth of only 0.36%, which is severe for a economy of this size. In this quarter the recession made the economy contract 31.4% resulting in a significant unemployment increase. For the foreseeable future, all economies should expect huge positive shifts in 2022, followed by a stabilized growth of GDPs. According to OECD Statistics, the USA economy should expect inflation rates to surround 2% for the next 5 to 10 years. This makes sense not only because the inflation rate for the first quarter of 2021 accounted for 4.85%, as result of the low inflation rates in 2020, but also because pre-pandemic inflation rates were close to 2%. It is interesting to mention how Japan and China can bolster the US market, due to the investment opportunities for biopharmaceutical companies, as well as the demographic conditions and governmental investments, that have been heavily increasing.

Figure 17. GDP Growth



Source: *IMF*

Covid-19 Impact

McKinsey highlights Globalization, China influence, innovation and digitalization as the speeding trends boosted by this new crisis. Separate these terms from pharmaceutical companies is impossible, as R&D and M&A activities are increasing year-over-year for the last decade.

Despite how economies are going back to normal again, Covid-19 left long-lasting marks in companies, and the temporary stagnation in R&D returns and the delay of the implementation of new technologies are still affecting Merck and its peers.

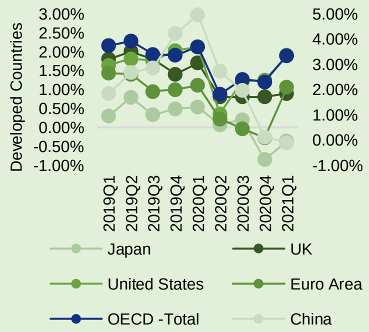
Environmental concerns and sustainable intends were also postponed due to the sudden needs in demand and supply globally. The heavy reliance on China for raw materials, intermediates and APIs is a concern that arose with the crisis, and supply chains were extremely pressured by this condition.

While the risk for pharma companies making branded products is lower, given that they have several months of safety stock in APIs, some changes should be taken into consideration such as assessing existing relationships with suppliers, establishing inventory adjustments, and looking for opportunities to diversify supply in the event of business interruption.

Another aspect that is changing is the way digital interaction is increasing, which also represents a challenge in this industry, as companies will need to review the way they deal with some products in their portfolio.

To conclude, people are now more skeptical towards hospital visits, but they are willing to take actions in order to prevent their health, which can be an opportunity for companies to invest in apps and other platforms to interact digitally with patients

Figure 18. Inflation CPI (%YoY)



Source: *IMF*

Demand and Supply

In figure 4 and following the EvaluatePharma 2020 and 2021 forecasts, the demand in prescription of medicines is, and will be growing at a positive pace. With an expected CAGR of 6.05% from 2021 to 2025 Merck and other pharmaceutical companies can expect their sales to keep growing for the next 5 to 10 years. The economic and demographic shift (ageing population) have caused an increase in chronic diseases, government expenditures on health, stressing the need for new treatments and new ways of prevention. As stated before, the world population is not only growing, but also becoming older, particularly in the European and North

American market. Merck's operations are focused in these two markets, and with the increase of new diseases and new chronic problems, the company can look forward to an increase in demand.

As these new trends grow, boosted by the Covid-19, studies indicate an increase upon 50% in some countries, which will contribute to a higher demand for pharmaceutical companies.

On the other hand, exchange rates are affecting the supply, due to the direct impact it has on revenues, costs, and final profits. Hedging activities represent an effective strategy for companies to follow in order to mitigate this risk.

Another driver of supply is the patents, that assure the company a stable a strong source of revenues, due to the exclusivity rights that they confer. An average of 3.2% of the market is estimated to be at risk for the next 5 years.

Key Drivers of Profitability

Before breaking down the main key drivers of profitability of Merck, it is important to look back in time to understand how drug pricing and R&D have been impacting the industry. It is also extremely crucial to evaluate of how Covid-19 will affect these two variables and the industry as a whole.

Life expectancy aligned with the aging of population, R&D, M&A activities, and Patents detach from other variables as the major drivers of profitability. Governments' investments and restrictions to price have been dominating the industry's agenda and causing pressure on supply chains, R&D and Patents disputes. These three drivers are also being affected by the pandemic, due to the need of immediate vaccines, treatments, and other sources of healthcare support. Companies fight for an interesting market position as soon as opportunities like Covid-19 appear, which increases competition and stresses the need to invest more in R&D and technology to get quick outcomes.

- **Life expectancy/Aging of population:** Shifts in demographic have been shaping new trends and forcing countries to spend more in health. Merck operates in large countries with different conditions, but the focus on Europe, China/Japan and the USA guarantee a support for the future, as revenues and profits can be bolstered by every subcategory related to chronic diseases, cancer, and so on. The prevention of these diseases related to the long-life expectancy also guarantee growth, especially in a company like Merck that tackle a wide range of these preventions and treatments.
- **R&D:** The long development of new medicines can result in delays in study initiation, leading to increasing costs. On the other hand, these studies are necessary to ensure a competitive drug classification and to boost the likelihood of obtaining a good quality medicine. Since Merck's foundation, R&D investments, agreements, and setbacks have been taking part in every fiscal year. This is the main key driver of costs and profitability, and recent studies indicate a non-stop growth on this type of activity. This is also a driver that relies heavily on approvals and patents, which will constantly generate risks. One prime example of an area that carries both high costs and returns is Oncology. This area is one of Merck's main areas of focus, and clinical developments account for $82Bn according to EvaluatePharma, which can generate $188.2Bn. These numbers are not seen in other areas and Merck's recent agreements, collaborations and investments in Oncology and R&D research facilities indicate that the company will keep exploring this area. To sum up, this is the key driver of profitability and costs, which will keep feeding up the industry in the long-term for what it also represents to human life.
- **M&A activities:** The wide range of areas within this industry stress the urge for companies to constantly enter in mergers and acquisition deals. This guarantees

Table 4. Global Exchange Rates

Year	Exchange Rate (€/$)
2015	1.1095
2016	1.1068
2017	1.1320
2018	1.1810
2019	0.8929

Source: *MarketLine – Merck & Co., Inc. (Published: 14 Jun 2021)*

Highlights

- Worldwide prescription drug sales grow at +6.4% CAGR between 2021 and 2026.
- Abbvie to lead worldwide prescription sales in 2026, with $59.3Bn.
- Keytruda to be the top-selling product in 2026 with global sales of $27Bn and a 11% CAGR.
- Oncology prevails as the largest therapy area in 2026, accounting for 22% of prescription drug sales that year.
- Worldwide Pharma R&D spend to grow at an annualized rate of 4.2% to $254Bn in 2026, with Roche as the biggest investor at $14Bn.
- The highest valued R&D project, ranked by NPV, is Eli Lilly's tirzepatide, at close to $22Bn.
- Patent expiries will put $226Bn in worldwide prescription drug sales at risk between 2021 and 2026.

Source: *EvaluatePharma (2021, p.16)*

Figure 19. Inflation CPI (%YoY)

Source: *EvaluatePharma (2021, p.22)* a greater market share, and it also mitigates some risks, However, there is some risk associate with it, especially when acquired companies are hugely undervalued, which can impact Merck's market value. One way to also reduce the risk of these activities, is to enter into research collaborations, as Merck did with Maverick Therapeutics and Surface Oncology.

- **Patents:** Competition regarding patents approvals and expiration is complex, as different markets offer different conditions. Differences can also include governments pressure to reduce generics and patented drugs, which did not help Merck's revenues in 2019 and 2020 and will not help in the future. This is highly connected to R&D, but it does represent a key driver of profitability due to the competition and the advantages that come with patents.

PESTLE Analysis

Constant change and fast paced societies are shaping and creating new external factors that will impact all companies, which will have to spend time to evaluate those changes and how can they influence growth and returns.

Table 5. PESTLE Analysis

POLITICAL	ECONOMIC	SOCIAL
• Political changes, focus, restrictions and pressure on health industry; • Price regulation;	• Worldwide crisis; • Changes in GDP, unemployment rate, tax, and environment; • Growth in investment in healthcare *per capita*; • Reduction in consumer income; • Price pressure;	• More social awareness and social concern; • Growth in aging population; • Culture shifts; • Increasing of chronic diseases;
TECHNOLOGICAL	**LEGAL**	**ENVIRONMENTAL**
• More innovation and technological developments will affect the services provisions, customized treatments, and the marketing of products; • New digital opportunities (apps, social media); • Innovation in biotech; • Machine learning evolution;	• High regulatory and legislative restrictions; • Changes in advertising laws;	• More awareness worldwide to environmental issues, such as pollution and waste;

Legal Framework of the Industry

Patents are the most important asset in pharmaceutical industry, as they provide to each company exclusivity on their products.

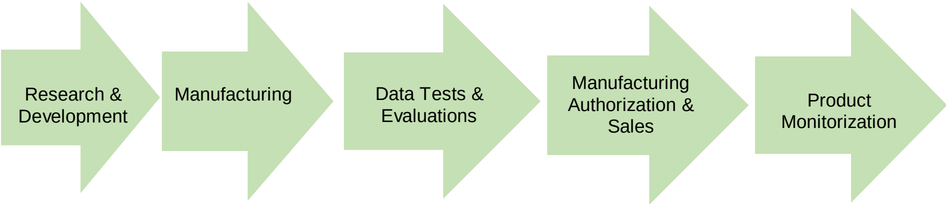
The process of launching and maintenance of a medicine in the market, as it is shown in the Figure 20, can be changed according to each country or geographical region.

In U.S., it is strictly centralized and made by FDA approvals, that has role to give the marketing authorization for the medicines. The costs of each FDA approval vary depending on the area, as stated before.

In Europe, the process can be made by EMA or by National authorities, dependent of the territory that they will be sold, EU territory or nationally.

The principal criteria that all medicines must have when applying to marketing authorization are quality, safety, efficacy, and a positive-risk balance.

Figure 20. Launching and maintenance process of medicines in the market.



Peer Group

Merck operates in one of the most competitive industries worldwide with huge number of major players. Although it can be straightforward to identify the top ten companies in this realm, based on revenues, there is a need to define the company's peer group.

The following table represents Merck's peer group:

Table 6. Peer Group (Source: Bloomberg)

Company Name	Ticker	Market Cap (Equity Value)	Revenues	Share%	Country	ROE	D/E
Merck Sharp and Dohme	MRK	185246	46840	13.93%	USA	27.59%	115.99%
Abbvie Inc	ABBV	188169	45804	13.62%	USA	188.25%	623.85%
Eli Lilly and Co	LLY	222969	24539.8	7.30%	USA	150.18%	234.89%
Pfizer Inc	PFIZ	250675	41908	12.46%	USA	11.05%	57.85%
Bristol-Myers Squibb Co	BMY	138016	42518	12.65%	USA	-20.16%	123.07%
Amgen Inc	AMGN	123065	25424	7.56%	USA	76.13%	350.17%
Johnson & Johnson	JNJ	433833	82584	24.56%	USA	23.49%	51.06%
AstraZeneca PLC	AZN	186695	26617	7.92%	UK	22.23%	139.51%

Comparative Analysis

The peer group selected represents some of the Health and Healthcare Industry leaders, which have been focusing on similar areas. Each area is approached differently from each company, but every approach seems to be aligned with this idea of innovation and sustainability, boosted by R&D. Innovation has certainly been an even more crucial topic nowadays due to this new pandemic of Covid-19, which requires a transformation in the companies' business models. To understand the dynamics in this industry, two companies of this peer group were chosen to compare with Merck: Pfizer and Johnson & Johnson.

Peers Strategies

The variety of healthcare products and services require high risky investments in R&D, and the constant need for innovation drives every company's operation model in this peer group. Knowing Merck strategy and areas of focus, it can now be compared with Pfizer and Johnson & Johnson.

For Pfizer, the main focus lies on internal medicine, rare diseases, inflammation & Immunology, vaccines and oncology. The main strategy here is to provide the best services and products in each area with transparency, sustainability and with a sense of care for the global health.

At last, Johnson & Johnson narrow their operations to consumer health products, medical services, and pharmaceutical products. Seemingly to the other companies J&J also wants to reduce the ecological footprint as they are willing to spend 800 million dollars for that purpose.

For a better understanding of the similarities and differences between the three companies, a SWOT analysis is assessed to balance and weight the main points.

Figure 21- Swot Johnson &Johnson

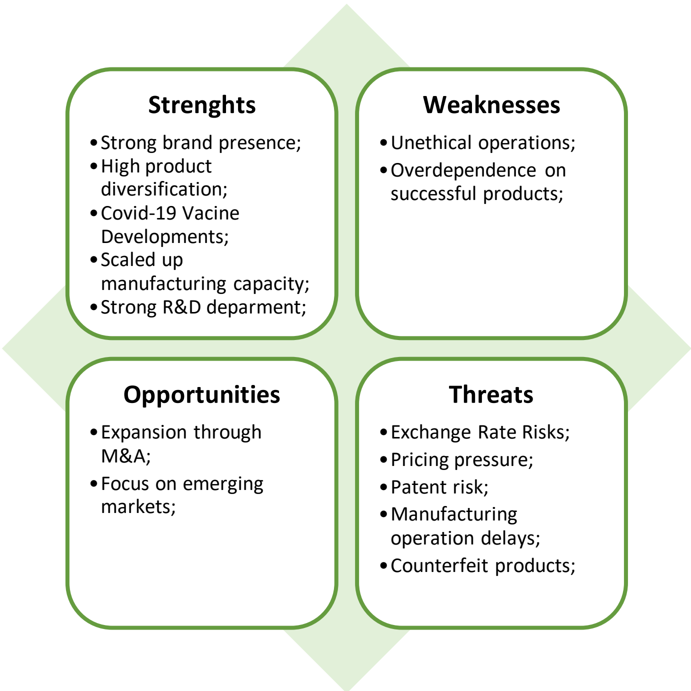
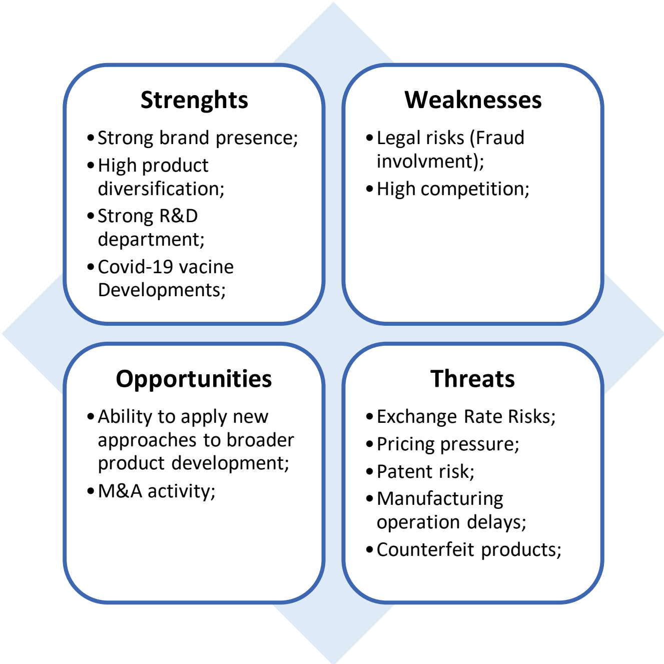


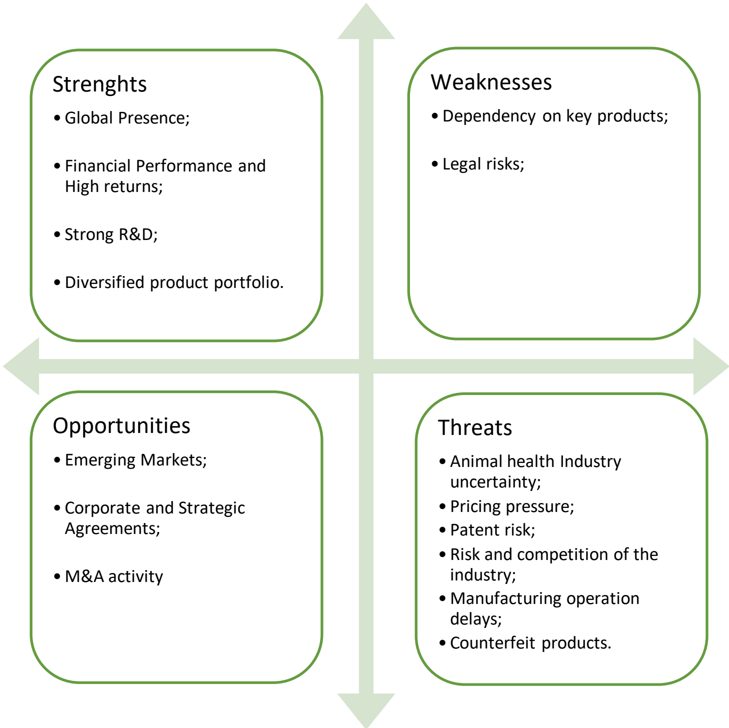
Figure 22. Swot Pfizer



SWOT Analysis of Merck

The SWOT analysis allows the investor to understand the dynamics between the major strengths and weaknesses, as well as the possible opportunities and threats. With this information, it is possible to check which risks are affecting the strengths, and which ones can damage both strengths and opportunities. Merck & Co., Inc is part of the pharmaceutical industry in different areas, with multiple locations worldwide. This global presence, the financial performance and high returns, the R&D, and product portfolio can easily be identified as the major strengths in the company. Although these strengths can differ from the other three classifications in a SWOT analysis, there is a huge connection, due to the risk of this type of industries. Weaknesses include the dependency on key products, patents, legal risks, and the high level of competition within the industry. As for the opportunities, the company is already exploiting some of them for the last years. Corporate and strategic agreements, acquisitions, and the emerging markets are the major opportunities that can unlock value and provide a sustainable growth.
Similar to the weaknesses, the threats are mainly related to the nature of the industry and the risks that come with it. The difference has to do with the animal health industry, which can represent a future threat.

Figure 23. Swot Merck



- **Strengths**

Worldwide presence represents an important operational advantage, as the dependence level on a specific region decreases and the customer base increases. As stated before, Merck had 44% of its operations in the US, 28% in Europe, Middle East and Africa (EMEA), 7% in China, 7% in Japan, 6% in Asia Pacific, 5% in Latin America, and 3% in Other Locations, which proves the wide range of locations, leading to performance and profit opportunities as well.

R&D is the major key driver of profitability for Merck, and recent events has shown how much the company has been investing. The recent investment in Nebraska, the 15600 people employed in 2019, and the other facilities in Switzerland, China, New Jersey, Pennsylvania, California, and Massachusetts reinforce how much Merck recognizes this business component as a major strength. The aim is to keep and enlarge its product and patent portfolio, improve probability of success in the different research programs conducted, and also protect the company from competition. In FY2020 R&D accounted for 28.25% if the total sales, which is massive increase when compared to the previous fiscal year. This value will not decrease in the future.

Financial performance and high returns are extremely important for investors and Merck's market value. Net Operating profit as been growing at a positive pace, excluding FY2020 which has suffered the impacts of Covid-19. This financial strength has been bolstered by products such as Keytruda, Lynparza, Lenvima, and other animal health, and will allow the company to generate higher returns for shareholders and to reinvest its profits to other growth opportunities. Net income decreased in FY2020 compared to FY2019, but both values represent a huge increase from FY2018 and FY2019.

• **Weaknesses**

Having key products such as Keytruda. Janumet. Gardasil, and Bridion is an advantage that generates positive cash flows for the company. However, this dependency on key products also means an exposure that can harm Merck if any negative event regarding any of these products occur. For instance, any patent expiration, manufactures delays, side effects, and competition are some of the events that can negatively impact Merck's operating cash flow. Moreover, the legal risks can also be described as a weakness due to high restrictions applied by some markets.

• **Opportunities**

Merck can expect a constant growth for the global pharmaceutical market, including new emerging markets for the next years. Additionally, the Asia-Pacific area can also represent a huge opportunity for the company, as one third of the world population lives in this specific region. Corporate and strategic agreements will unlock value for the company, as it enables Merck to enter into these new emerging markets, while maintaining a keeping its position in the other markets where it already operates. For example, in November 2020 Merck secured an approval from the European Comission for cancer treatments with an agreement made with AstraZeneca in Lynparza product. In addition, M&A activity will also enable these types of achievements in other emerging markets.

• **Threats**

Besides all threats inherent to all companies in this industry, such as patent risk, pricing pressure, manufacturing delays, intense competition and counterfeit products, there is one that can be identified as Merck's specific threat at the moment. This threat is the Animal health industry uncertainty, that can impact the total sales of the company due to a variety of risk factors. Outbreak of diseases shifts in animal consumption and demand, or unexpected vaccines requirements can severely damage this segment and affect operating results. Furthermore, these events will increase as the company grows in this market.

Five Forces Analysis

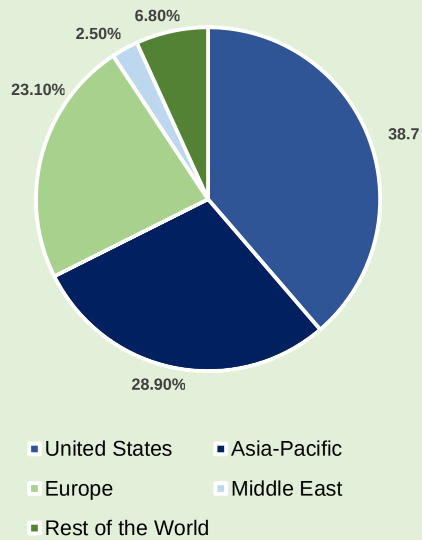
This section aims to study the company's competitive environment, by analysing the buyer and supplier power, the degree of rivalry, the new entrants, and the possible substitutes. Determining the buyers and suppliers in Merck's industry can be challenging and require a careful analysis, due to the dimension of the pharmaceutical market.

• **Buyers Power – MEDIUM HIGH (4)**

Bargaining power of Buyers in this industry is relatively strong, since it includes all powerful private institutions operating in the market, and governance forces that have been controlling regulations, prices, and taxation. This is no surprise as the industry deals with most precious asset of human life, healthcare.

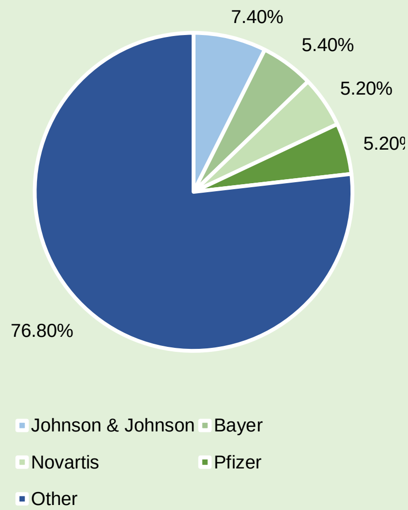
- Acquisition of expensive equipment, clinical testing services, drugs, and other materials. These acquisitions are often conducted by a small group of large public and private institutions (e.g., National Health Service in the UK,

Figure 24. Global Pharmaceuticals market geography segmentations: % share, by value, 2019



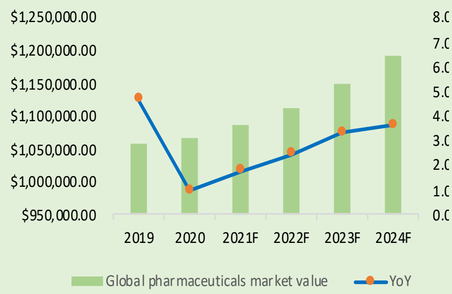
Source: MarketLine – Merck & Co., Inc. (Published: 14 Jun 2021)

Figure 25. Global Pharmaceuticals market share, % share, by value, 2019 (Merck is included in other with a market share of 3.948% in 2019**.**



Source: MarketLine – Merck & Co., Inc. (Published: 14 Jun 2021)

Figure 26: Global Pharmaceuticals market share: $ billion, 2015-2019 and Forecast 2019-2024



Source: MarketLine – Merck & Co., Inc. (Published: 14 Jun 2021)

CVS Corporation, etc.…), which increases the buyer power not only because of their size, but also because public institutions are adopting price control strategies.

- Financial strength can explain the first point, as the largest companies like Merck and public institutions are the only ones capable of purchasing large and expensive quantities of drugs and other healthcare products. This was on display during the handling of Covid-19 vaccines all over the world, where small independent companies were not able to dispute this.
- Progress and innovation in medicine has been modifying switching products, mainly due to new treatments that can replace existing products. The price of these treatments will require huge investments from companies, resulting in a high switching cost. Given this, it is fair to state that switching costs are no longer low in this industry. This also applies to Merck, as the importance of Oncology is growing for the last ten years.
- Following the last point, tendency to switch between products and services has also been increasing, as new information about side effects, new treatments and new developments strikes the market.

- **Supplier Power - MEDIUM HIGH (4)**

Although BASF, Bayer and DowDuPoint can be identified as three of the leading suppliers of raw materials, large pharmaceutical companies like Merck tend to manufacture a lot of their APIs, chemicals and raw materials to reduce high reliance on suppliers and to ass value to the company. However, small companies do not have enough resources to fund their own manufacturing of these materials, which will give more power to suppliers.

- Any pharmaceutical company trying to enter and compete in this market needs to find the best quality/cost relation, which will imply high investments. Covid-19 can be a turning point as it forced companies to reevaluate their dependency on suppliers, leading to new investments to mitigate this condition. If Merck and other companies start to produce these materials, suppliers' power might be reduced, but as for now, it remains quite high. In addition. quality versus cost relationship is quite similar within major suppliers, which might slightly reduce their power,
- Merck might consider this power as moderate, due to its size, but the reality changes when a new specific event like Covid-19 takes place, where companies struggle to find a specific supplier.

- **New Entrants – WEAK (2)**

The top 10 pharmaceutical companies have been operating for more than 70 years, and new companies have established themselves through alliances, mergers and even acquisitions. It is an extremely hard industry to enter, and the following reasons might explain why:

- Regulators like Health Sciences Authority in Singapore and FDA will restrict the entry of new players, especially start-ups with lack of up-front investment. Even if a new start-up possesses funds to cover those initial investments, there are still initial approvals a regulatory process that are time-consuming. The probability of new competitors entering the market is heavily impacted by these restrictions.
- On top of that, recent markets like China and the US are putting pressure to reduce prices, which will impact the overall returns of all companies

competing in those locations. Hence, new entrants will not be able to grow their earning, as the returns on drugs and other products is significantly reduced by this pressure.

- Finally, the recruitment process for start-ups is tougher due to the education required, and the salaries that come with it.
- To sum up, the threat of new entrants is low not only because of market conditions, but also because of barriers and time-consuming procedures.

- **Threat of substitutes – HIGH (4.5)**

Despite the low threat of new entrants, patients still have the chance to choose between a variety of drugs, treatments, and other medicines from different established big pharmaceutical companies, as a result of the high competition in the market. This is currently a trend, given the different genetic individual characteristics, which will force patients to switch from one product to another. The main reasons behind the current high threat of substitutes in the market are as follows:

- Counterfeit drugs: Up to 50% of drugs sold online can be fake, and countries like Russia can also have up to 27% of fake drugs on actual pharmacies. This is not applied to the U.S or Europe, but it still represents a substitute for companies like Merck, that are trying to expand their business in poor nations as well.
- Manufacturers of generics: Manufacturers can set much lower prices than branded drugs, due to the reduced costs of clinical tests.
- Old traditions: Modern medicine has discovered new ways of treatment and innovative products, but there are still old myths related to some diseases that prevail in Asian countries. People might choose to treat a severe disease with animal food or some traditional drink instead of investing in a new modern pharmaceutical product. Companies are hugely affected as investments on new discoveries are extremely expensive.

- **Degrees of rivalry – MODERATE HIGH (3.5)**

As seen before, Healthcare industry is dominated by a small group of companies, followed by smaller biotech companies. Companies need to collaborate with each other to bare the price of some drugs, and sometimes a group of specialized players compete against another group. This type of competition results in a moderate high level of rivalry. Some of the reasons behind this moderate level of rivalry are:

- Incentive to buy smaller companies: Mergers and acquisitions allow big pharmaceutical companies, such as Merck, Pfizer, AstraZeneca and Johnson & Johnson, to eliminate potential rivals. So, despite the large size of the top 10 pharmaceutical companies, this rivalry will tend to be between those 10 large companies, as new rivals will most likely be acquired or will just simply enter in a merge agreement. Patent expiration ca be viewed as one of the reasons for this recent trend of acquiring new smaller innovative companies.

It can be acceptable to categorize this section as high or strong, but the barriers of entry will slightly reduce the degree of rivalry to moderate high, as the number of big pharmaceutical companies will most likely not change in the short-term.

5. Investment Summary

After assessing the public information about Merck, and after performing the valuation models, it is possible to issue a BUY recommendation for 2022F, with a price target of $83.59/share and an upside potential of 15% (equivalent to an annualized return of 10%) against the adjusted closing price of $72.81 on the 15th of September. As for the risk of this recommendation, industry overview and market conditions indicate a final medium risk.

Merck has been underperforming its peers for the past few months, which might be explained by the slowing sales recorded in FY2020 of Januvia and Janumet, and due to Covid-19 speculation after the small involvement shown by the company.

The current undervaluation is then explained by i) Slower revenues growth in FY2020, ii) Covid-19 lack of involvement compared to its peers, iii) demand reduction on pharmaceutical products, iv) Animal Health uncertainty, and v) GDP massive reduction in the U.S, Europe, and China in 2020. According to EvaluatePharma, no other company experienced a fall on pharmaceutical revenues like Merck in 2020, with almost $1.7Bn deviation from guidance reports (Appendix 15).
Despite the plummet of revenues in FY2020, Merck's worldwide operations and diversified product portfolio assure the company a return to pre-pandemic values for the next 5 to 10 years. As a matter of fact, there were positive developments in some of the most promising pharmaceutical products that will mostly be leaders by 2026. To support this theory, pre-pandemic (2017-2019) CAGR of 8.05% in revenues will be reflected by the CAGR of 6.18% in the 10 forecasted years, compensating the low YoY growth of 2.46% in the 2019-2020 period.

Merck holds a solid position to tackle the future challenges and trends, due to the huge investments in R&D programs, and due to high developments in key products like Keytruda, which will mostly reach a leading position by 2026.
According to older studies by Mckinsey and Pablo Fernandez, analysts have been overoptimistic, and will tend to be overconfident about how companies grow their future earnings.

In this case, an upside potential of 15% for Merck seems reasonable due to impact that economic bubbles, periodic events, and recessions have. Judging by the strong financial position of Merck, it would be expected a higher upside potential, but since 2010 the data suggests otherwise, due to the factors mentioned before.

Hence, and adjusting all external factors, a 15% upside potential for 2022F can be considered as a conservative optimistic view of Merck.

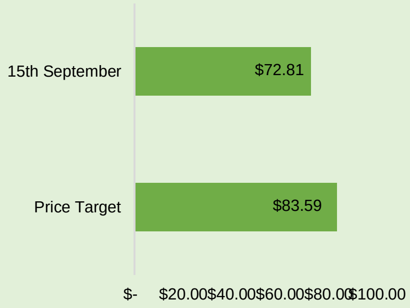
In addition, shareholders can be positive about recent policies and events, such as the spinoff of Organon in June 2021 where the total cumulative EPS can reach 67%. On top of this, annual dividends will most likely increase in FY2021 due to the quarterly dividend increases made by the company.

Valuation methods

Ranging from $76.22/share to $87.55/share, the absolute and relative methods applied returned close price targets in 2022F (Figure 29 and 27).

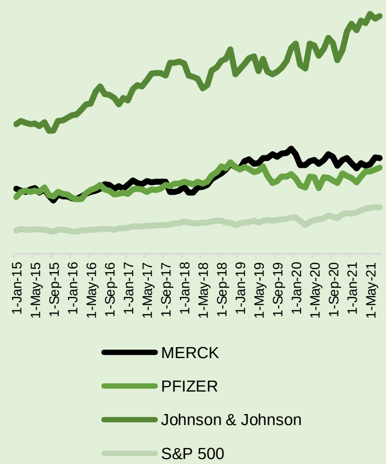
Focusing more on the absolute valuation methods used, the Flow-to-Equity was the model with the highest price target with a price target of $87.55/share.

Figure 27. Price target vs Current Stock Price



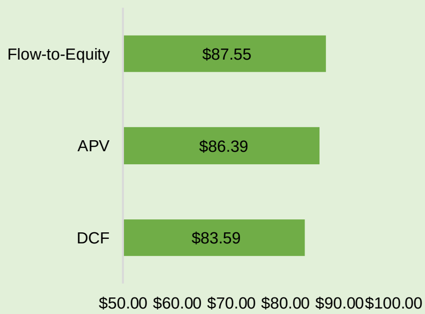
Source: *Author Analysis*

Figure 28. Merck vs Pfizer vs JnJ vs S&P 500 Index



Source: *Author Analysis (Data extracted from Reuters)*

Figure 29. Absolute valuation methods – Price Target



Source: *Author Analysis*

Hence, the recommendation does not change in any of the valuation models, with absolute valuation methods ranging from $83.59 in the WACC method to $87.55 in the Flow-to-Equity. To sum up, all valuation methods adopted support the current undervaluation of Merck and recognize the company's financial and operational strength worldwide.

6. Valuation

Enterprise Discounted Cash Flow – WACC Method

The first approach used to compute the price target of Merck was the Enterprise Discounted Cash Flow (DCF model), using the measure of free cash flow (FCF) with the weighted average cost of capital (WACC) as the discounted factor. This is usually the best method for projects, business units and companies that aim to reach and maintain a target level in their capital structure. By using this approach, the company's price target in 2022YE reached $83.59/share (Appendix 25), which represents an upside potential of 10% when compared to the current stock price of $76.29 on the 15th of September 2021.

Before performing this model, it is crucial to identify the main steps and variables used to reach the final price target.

The critical variables that influence this valuation are i) Revenue's growth ii) WACC assessment and iii) Long-term growth rate.

Only after assessing those critical variables, it is possible compute the four steps to value Merck's equity. The first step is to discount the FCF by using the WACC, to assess the value of operations, which will lead to an Operating Enterprise Value for each forecasted year. Next, the identification and valuation of nonoperating assets (Non-Core Invested Capital), operating leases, non-controlling interests needs to be done, in order to reach the Enterprise value. The next step is to include Gross Debt and Excess Cash to identify and valuate the Net Debt. At last, the simple subtraction of those nonoperating assets, operating leases, non-controlling leases, and Net Debt to the Operating Enterprise Value, will give the value of common equity. From this value it is possible to assess the value per share by dividing that equity value by the number of shares outstanding.

Revenues by Segment

As stated before, Merck divides its business segments into two major categories: Pharmaceutical and Animal Healthcare. As a whole, total revenues should reach a value close to $51.8bn according to the company's report. Covid-19 slowed down sales, so it is reasonable to assume a bounce back.

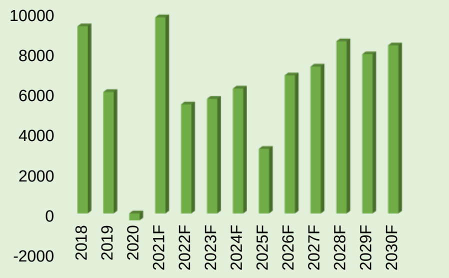
According to MarketLine, Global Pharmaceutical revenues had a compound annual growth rate (CAGR) of 3.22% between 2017 and 2020, and forecasted values assume a CAGR of 2.78% between 2021 and 2024. The forecasted growth between 2025 and 2030 is estimated by the global inflation (surrounding 3%), extracted from the IMF and Statista data.

Merck's market share reached 4.029% in FY2020 and based on the historical average year-over-year growth of 0.128%, revenues for 2021 and 2022 will reach $50.6bn and 54bn, respectively. This annual growth will maintain throughout the forecast period. To add up to these assumptions, it is also relevant to mention the product of Keytruda, which can reach the double amount of revenues by 2026, according to EvaluatePharma. Taking all this information into account, revenues of $69.6Bn in 2026 is reasonable, as the market share of Merck will stay close to 4%.

Despite Merck's comfortable and leading position in the Animal Health market, its market share evolution has not been reflecting that. A drop of more than 1% since 2018 raised questions about how Merck will approach this market in the future, due to the rising competition and global economic conditions.

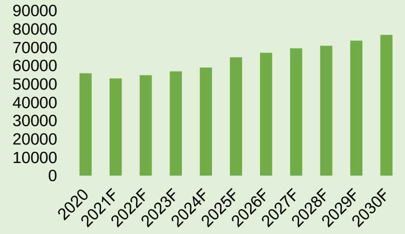
As stated before, Covid-19 affected revenues in FY2020, but they are expected to increase in the future, due to Merck's leading position in this market, and due to the 17 new product approvals in 2020. This aligned with the 4 keys development business transactions, will mostly likely result in a bounce back from the company

Figure 30. Free Cash Flow Core Business ($M)



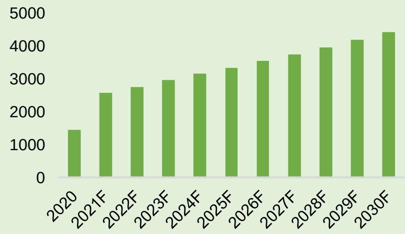
Source: *Author Analysis*

Figure 31. Total Invested Capital ($M)



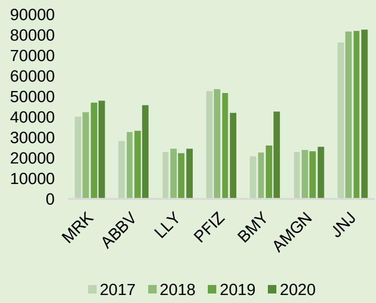
Source: *Author Analysis*

Figure 32. Working Capital ($M)



Source: *Author Analysis*

Figure 33. Revenues of Peers (2017-2020) ($M)



Source: *Author Analysis*

Figure 34. Net Operating Assets – Invested Capital Core Business ($M)

Source: *Author Analysis*

in 2021 onwards. To support these developments, Merck invested $100m in its manufacturing facilities in Kansas (U.S)

The board has also stated this segment has been outperforming all expectations. Hence, based on this information, Merck's market share in this segment can be expected to grow 0.4% per year, which will allow the company to get back to a 12% market share by 2023. Pre pandemic values also reinforce this growth, and the recent plans show an intend to explore more this segment.

To conclude, it is relevant to mention the company's future strategy, which will aim to diversify its portfolio, in order to mitigate the severe risk inherent to both segments.

WACC Assessment

There are important steps to assess the discount factor (WACC) in the Enterprise Discounted Cash Flow, which need to be computed considering Merck and its peers. Following the previous intentions to maintain a target level in its capital structure, WACC will remain constant throughout the forecasted years. The Total Debt to Enterprise Value will stay at 12%, as a response to the previous years, resulting in a Equity to Enterprise Value of 88%.

Estimating the Unlevered and Relevered Beta – Beta of Equity

After computing and estimating the previous components of the capital structure, it is crucial to assess Merck's unlevered beta. By collecting the stock price of the company's peer group from the last 3 years and computing the respective returns against the Standard & Poor index (S&P), it is possible to assess the unlevered beta of each of the 7 companies. Next, the Beta formula is applied by dividing the covariance of each company return against the benchmark by the variance of the return of the benchmark over the last 3 years. This resulted in a levered Beta of 0.69 for Merck, and a lower limit of 0.63 and an upper limit of 0.74 with a confidence level of 95% (Appendix 22).

The subsequent Relevered beta used to assess the unlevered cost of equity was computed in two different ways, leading to the same relevered beta of 0.73. First approach used the Debt-to-Equity ratio of each company and the corporate tax of 21% to remove the impact of debt to the levered betas estimated before. The average of those betas is then used to add back the impact of debt to estimate the relevered beta of each company. The average relevered beta is then used as the beta of equity.

The second approach was to use the constant ratio of debt to equity (also constant to operating leases), the beta of the company's debt and the beta of the company's operating leases.

Using this approach requires a few steps to assess the values of both betas.

Implied Beta of the company´s debt computation starts by looking into Merck's notes due to pay in 10 years (1.45%), followed by the assessment of the probability of default. Bond rating helps to find this probability, and by using Moody's credit rating of A1 and its default report of 2020 the loss giving default that fits companies like Merk is 68.18%. With this probability and the annualized A1 probability of default (computed with information in the same report – 0.16%) a cost of debt of 1.34% was assessed, which resulted in an implied beta of the company's debt of 0.003. USA market risk premium of 5.5% by Fernandez and US 10Y bonds of 1.32% extracted from Bloomberg were both used in all computations.

As for the implied beta of operating leases the same procedure is used with a different loss given default, 40.24%, leading to a 0.012 beta.

Finally, the last step is to include these betas in the beta equity equation: Be = Bu + ND/E * (Bu – implied Bd) + (OL/E) * (Bu – implied BoI).

Table 7. Merck and Peers 3Y Beta computation

Merck's Bond Rating	2020	Source
Moody's	A1	Moody's
S&P Global	A+	S&P Global

Source: *Author analysis (Regression)*

Table 8. Capital Structure for forecast

Bu	0.64
Be	0.73
Re	5.31%
Rd	1.34%
RoI	1.39%
WACC t	**4.80%**
Ru t	**4.84%**

Source: *Author analysis*

Table 9. Merck and Peers 1Y Beta computation

Company	1Y Beta
Merck	0.70
Abbvie	0.71
Eli Lilly	0.73
Pfizer	0.68
Bristol-Myers	0.62
Amgen	0.80
Johnson & Johnson	0.68

Source: *Author analysis (Regression)*

Table 10. Merck and Peers 3Y Beta computation

Company	3Y Beta
Merck	0.69
Abbvie	0.81
Eli Lilly	0.73
Pfizer	0.71
Bristol-Myers	0.67
Amgen	0.83
Johnson & Johnson	0.68

Source: *Author analysis (Regression)*

Table 11. Summary Output

Regression Statistics	
Multiple R	0.66460226
R Square	0.44169617
Adjusted R Square	0.44095669
Standard Error	0.01137358
Observations	757

Source: *Author analysis (Regression)*

By including the corporate marginal tax rate of 22.55% the value of the WACC is 4.80% throughout the forecasted period.

Long-term growth rate

Estimating the growth rate based on historical data of Merck and its peers is not sustainable. Historical growth rate of the last 5 years accounted for 6.35%, which is not a good measure to use in valuations. To come up with a better measure, both USA and Europe Gross Domestic long-term projections were used, by assessing OECD dataset. Projections from 2022 up to 2060 predict an average growth rate of 1.89% for USA and 1.67% for Europe. Merck's main operations take place in these two geographical areas, with a weight of 61% in the USA and 39% for Europe. When applying these weights to the average growth rates, the long-term growth rate in real terms accounted for 1.81%.

The next step includes the estimation of the average inflation rate in both geographical areas, by assessing the same dataset of OECD. Both inflation average inflation rates were close, with 2.03% in the USA and 2.02% in Europe. By using the fisher formula, the long-term growth rate in nominal terms accounted for 3.87%. The final growth rate used for Merck ended up being the weighted average long-term one, due to the industry the company operates. A growth rate close to 2% is the right one, as the 3.87% would be too optimist and not realistic in this type of Industry.

Table 12. Long-term growth rate computations

Zone	Weight
USA	61%
Euro Area	39%

Average Inflation Rate (USA)	**2.03%**
Average Inflation Rate (Euro Area)	2.02%
Long-term Growth Rate (nominal)	**3.87%**

Average Growth Rate (USA)	1.89%
Average Growth Rate (Euro Area)	1.67%
Weighted Average Long-term Growth Rate (real)	**1.81%**

Source: *Author analysis (Regression)*

Adjusted Present Value (APV)

Although APV uses the same free cash flow used in the DCF model, the discount factor used is the unlevered cost of equity (Ru), instead of the WACC. This excluded tax benefits related to debt, so in order to reach the equity value those tax benefits need to be added back.

Unlevered cost of equity for Merck is 4.84% and it is computed by the following formula: Cost of equity * E/EV + Cost of debt * ND/EV + Cost of operating leases * OL/EV.

Again, the discount will always be stable for the future, and it leads to a price target of $86.39 in FY2022, which is close to the one obtained in the DCF model. This represents an upside potential of 13%.

Flow-To-Equity

Mixing assets with different risks and the blending of capital structure with operating performance are the main reasons as to why this model is not recommended. However, this can be a good model to use in banks or financial institutions, since the core operations of these type of institutions are not separated from their capital structure. Despite all of this, Flow-to-Equity can help to validate the accuracy of Merck's DCF valuation, by checking the proximity of both values.

This model also assumes a stable capital structure throughout time, and it includes a cost of Equity of 5.31% as the discount factor. This value is obtained by simply adding the risk-free rate to the multiplication of the equity beta and the market risk premium.

This method results in a price target of $87.55/share in FY2022, which is close to the ones obtained in the DCF and APV models. Hence, this can guarantee a minimum level of accuracy, especially in the DCF one.

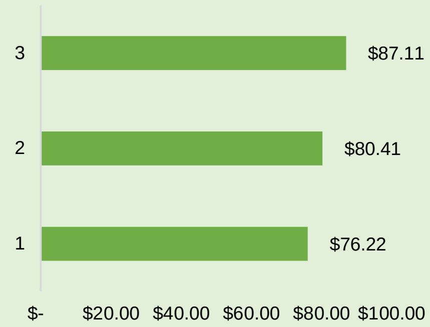
Multiples

Valuing a company using the DCF model appears to be the most accurate, but it is also insightful to perform a relative valuation approach, where the peer group is used to assess the different types of multiples.

Figure 35 shows the three multiples used, which resulted in the following price targets:

- **EV/EBITDA Ratio:** Median and Average of the peers is 11.18x and 10.96x respectively, leading to a Market Value of $218.17Bn, a Market Equity value of $193.48Bn, and a final price target of $76.22/share. This lower value can be explained by the exclusion of two companies from the computations, due to their extremely high ratios. When included, the EV/EBITDA ratio goes up to $88.60/share.
- **P/E Ratio:** Median and Average of the peers is 26.94x and 28.82x respectively, leading to a Market Value of $228.79Bn, a Market Equity value of $204.1Bn, and a final price target of $80.41/share.
- **P/Sales Ratio:** Median and Average of the peers is 4.76x and 5.12x respectively, leading to a Market Value of $245.79Bn, a Market Equity value of $221.11Bn, and a final price target of $87.11/share.

Figure 35. Multiples Valuation



Source: *Author Analysis*

7. Financial Analysis

Operational Performance

Merck experienced a significant growth in revenues, as they went from $40.1Bn in 2017 to $47.9Bn in 2020, representing a CAGR of 20%. Although it was a positive and encouraging growth, the period of 2019-2020 reflected the Covid-19 impact, as it only grew from $46.8Bn to $4EV7.9Bn. This is a small increase when compared to the period of 2018-2019, where sales grew from $42.2Bn to $46.8Bn. Despite the disappointing numbers, the recent developments related to the pandemic worldwide can guarantee a return to normal, in terms of growth. Revenues will reach at least $51Bn in FY2021 according to the board, which is aligned with the forecast assessed. 2025F predicts revenues of $65.7Bn, mainly driven by the Keytruda and other strong products in the pharmaceutical portfolio. The final year 2030F forecasts revenues of $86.9Bn, due to the large size and key drivers of profitability within the industry. Increasing aging of the population, pandemics similar to Covid-19 and cancer will most likely be the boosters of Merck's Revenues.

Operating EBITDA margin grew from 18.4% to 19.8% in 2017-2020 period, with a surprising level in 2019, as it reached 28.2%. Forecast predict a stable operating EBITDA with 19.1% for 2025F and 2030F, only shifting 0.1% between the forecast period. The reason behind this has to do with the high risk in this type of industry, where operational earning are highly driven by R&D returns, which represents a huge risk if the projects don not meet their goals.

As expected, operating EBIT margin follows the operating EBITDA margin trend with 15.8% from 2025F to 2030F.

Activity

To measure the company's efficiency and to understand how it manages its resources, a few ratios are worth mentioning. First of all, the operating cash conversion cycle of Merck decreased from 118.9 to 102.3 days in the 2017-2020 period. It is believed that the pressure on supply chains might have had an impact on this short number of days in 2020, so it is normal to reach cash conversion cycle of 113.1 days in 2025F and 113.4 days in 2030F. This will probably stabilize around these numbers, as historical data indicates, but the shorter the better, so Merck should also try to improve this ratio as best as it can.

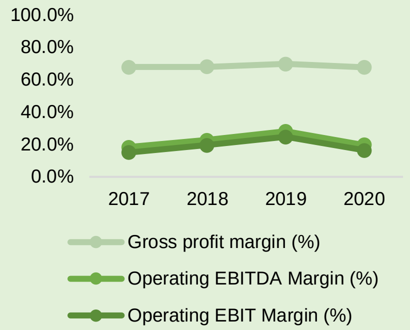
Liquidity

Merck's ability to pay its current liabilities with cash and cash equivalents can be measured by the cash ratio, which has been between 0.4x and 0.6x in the 2017-2020 period, with 0.5x in 2025F and a decrease to 0.4x in 2030F. Merck should analyze this ratio, as it would be beneficial for shareholders to have a slightly higher ratio, preferably between 0.5x and 1x.The current ratio follows the same trend and it could also be improved as a value for FY2020 of 1.1x (equal to the forecasted years) should be closer to 1.5x.

Profitability

While assessing ratios such as ROIC, ROE, Asset Turnover and Net Profit Margin, it is possible to evaluate the overall ability of Merck to generate profits. Net Profit margin increased from 6% to 14.8% in 2017-2020 period, with a surprising 20.9% margin in FY2019. This ratio will most likely decrease to 13.4% in 2025F and to 12.9% in 2030F, mainly explained by pandemic impact and future trends in pharmaceutical industry identified before. As for the ROE, Merck experienced a similar unroll as the Net Profit Margin with 7% in FY2017, 28% in FY2020, 30.3% in

Figure 36. Business Margins

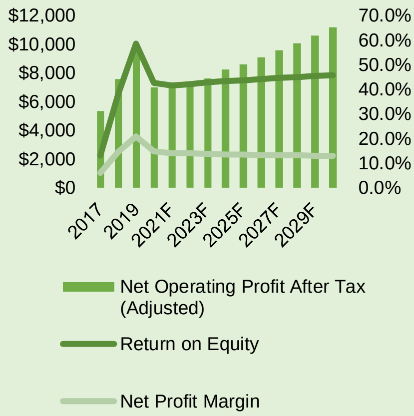


Source: *Author Analysis*

Figure 37. Debt Coverage
vs
Interest Coverage

Source: *Author Analysis*

Figure 38. NOPLAT and ROE ($M)



Source: *Author Analysis*

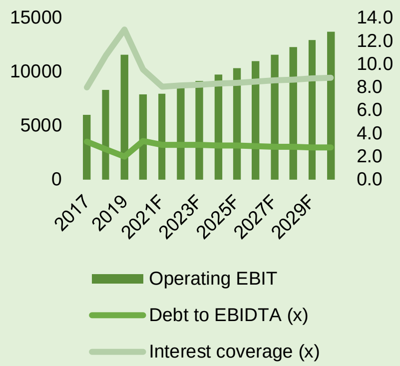
2025F and 32.9% in 2030F. The Dupont Analysis provided a detailed assessment of ROE, on which was possible to identify the Net Profit Margin as the main responsible for the way ROE is growing. The Equity Multiplier and Asset Turnover had a more stabilized growth.

Solvency

Moving on to the solvency ratios, there's a need to assess the Interest Coverage Ratio, the Debt to EBITDA, among others to check how Merck is meeting its long-term debt obligations. Interest Coverage ratio increased from 8.0x to 9.5x in the 2017-2020 period and decreased to 8.8x in 2030F. As for the Debt to EBITDA, it accounted for 3.3x in both FY2017 and FY2020, with a value of 2.9x in 2025F and 2.8x in 2030F. which is an acceptable forecasted level of financial leverage.

In conclusion, there's room for the company to improve its profitability and liquidity, as some of the ratios should be closer to a healthier level. The increase on R&D expenditures could explain the recent/ future struggle as returns are so certain due to this new crisis. Despite this, solvency and financial strength show a growth, due to the strong operational model, that covers up all short-term and long-term obligations.

Figure 39. Operating EBIT vs Debt to EBITDA vs Interest coverage (x)



Source: *Author Analysis*

8. Investment Risks

Merck's business prospects can be changed due to a variety of risks, which can be defined as set of uncertain future events or outcomes that can severely impact those same prospects. There are external and internal risks to take into account, but the main focus will remain on the internal ones, which can be controlled by Merck.
For Merck, external risks identified are more related to macroeconomic factors and market risks. Compliance risk, among others, will be considered as internal risks due to the way pharmaceutical companies operate. The core operations of Merck demand a careful assessment of the rules, regulations, patents, and restrictions applied to their products, so it is reasonable to include this type of risk as internal. Other internal risks involve operational risk and investment risks, which are critical to understand as an investor perspective.

Macroeconomics Risks

External risks are constantly challenging Merck, as events like Evergrande, Brexit and Covid-19 keep on happening unexpectedly. Despite the recent crisis, the company can be confident about long-term sustainable growth guaranteed by a strong product portfolio and future forecasts of GDP growth in the three main markets, USA, Europe, and China. GDP in the second quarter of 2020 decreased 19.5% in the UK, 9% in the US, and 11.6% in Europe, against an increase of 11.6% in China. IMF forecasts a long-term GDP growth of 1.89% in the US and 1.67% in Europe, which allows Merck to have some stability as both markets represent the majority of the company's operations. It is almost certain that events of this magnitude will occur again, forcing Merck to have answers and resources to react to them. For instance, China is one of the emerging markets that Merck is trying to penetrate, but recent events regarding Evergrande can delay and negatively impact the company's operations. These risks cannot be controlled, but they can be mitigated by diversification of both locations and products. In addition, GDP growth might escalate in the next quarters, as a reflection of the huge drop in 2020.
Furthermore, OECD predicts an average long-term inflation of 2.03% for the US and 2.02% for Europe.

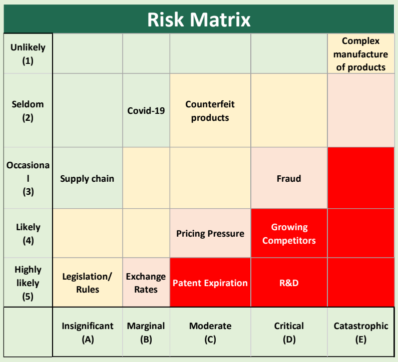
Approvals and Regulatory

Pricing pressure is being adopted by governments to adjust prices to the actual demand, rather than the costs incurred by pharmaceutical companies. Despite the postponed restrictions due to the pandemic, Merck can expect public institutions to apply those same restrictions soon, which will decrease the company's return on a variety of products.
On the other hand, Merck holds a solid position in FDA approvals compared to its competitors. According to EvaluatePharma, Oncology will contribute 21.7% of total revenues by 2026, and will also reach 37.4% of clinical development spending. With Merck being one of the best companies in the area of Oncology, this represents a smaller risk when compared to other areas where the company operate. It is also worth mentioning that every geographical region possesses different restrictions, pressuring Merck to adapt and invest more into clinical testing to avoid huge losses.

Covid-19

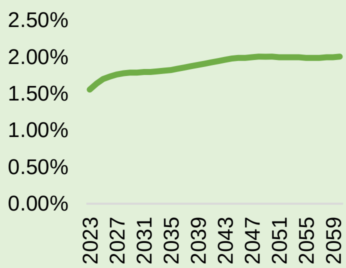
The unexpected pandemic is raising a lot of questions about the probability of future similar events. Overall, Covid-19 impact was mainly focused on physician-administered drugs and chronic diseases, with the central nervous system experiencing thew highest fall in 2020 ($1.4Bn) just in three months.

Figure 40. Risk Matrix



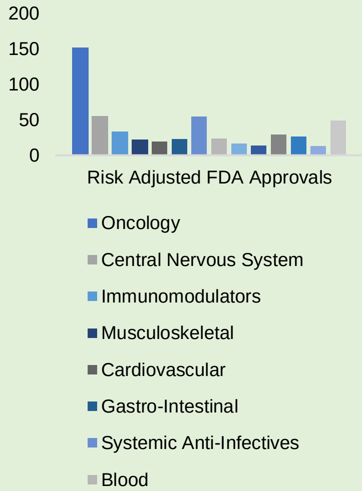
Source: *Author analysis*

Figure 41. USA GDP Growth rate



Source: *OECD Dataset Forecast*

Figure 42. Risk Adjusted FDA Approvals ($Bn)



Source: *EvaluatePharma (2020 p.13)*

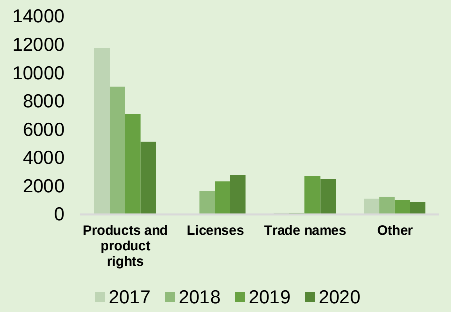
Merck's anesthesia products like Bridion are a prime example of how lockdown measures directly impacted the company's overall revenues, due to the reduced number of worldwide surgeries.
Despite the huge investment opportunities that come with a disease, such as Covid-19, the risks associated with it are too high to be ignored. A diversified portfolio can reduce the impact, but it cannot eliminate it, as it will always reduce the demand of physician-administered drugs and chronic diseases, areas where Merck is strong.
On top of this, Merck also incurred in costs with Covid-19 programs that were shut down after a few months, proving how risky this type of investments can be.

Operational Risks

Operational risks are arguably the most controlled ones by the company and can be assessed by taking a look into the geographical and segmental core operations. As stated before, geographical risks present a high correlation with government interference and sporadic events, especially in the USA, Europe, and China. Despite its worldwide operational model, Merck has still a long way to grow and truly diversify its operations, reducing then the risk of collapse in one of those markets.
Equally important, pharmaceutical, and animal health segments drive Merck's revenues, overall performance, and cash flow from operations. Each segment compresses the following risks:

- **Pharmaceutical:** Besides the recent crisis impact on physician-administered drugs and chronic diseases, Merck is also facing pricing pressure and the risk of substitutes products. The decrease in demand due to external risks are not as big of a threat than the internal risks related to these substitutes drugs that are taking advantage of patent expiration, pricing pressure and the low switching costs associated to these types of products.
- **Animal Health:** Outbreak of diseases in animals represent the major risk in this segment, due to the impact it has on demand and production, Merck is the leader on this booming market, and that condition comes with an escalation of risks such as epidemics, pandemics, pricing pressure and weather changes.

Figure 43. Acquired Intangibles FY2020 ($M)



Source: *Author Analysis (Data from Merck's Proxy Statement 2020*

Compliance Risks

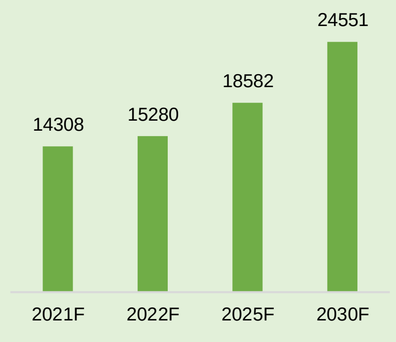
Although Merck is not associated with recent fraudulent events, pharmaceutical companies are always on the scope of regulatory and healthcare entities for possible bad conduct during the development of products and treatments.

Despite the low fees applied to companies that don't follow the rules and minimum requires, it is still a relevant risk for Merck to pay attention to, as it can affect the public perception of the whole company, leading to a decrease in demand and in revenues.

R&D

Being the major driver of profitability of this industry, R&D programs and investments also represent a huge risk for all companies. Similar to other companies, Merck's cost burden has been increasing over the years, with a weight of 28.25% in percentage of revenues in FY2020. R&D spending doubled the growth rate of total sales in the 2012-2019, and it expected to grow 3.62% between 2021 and 2026, according to EvaluatePharma.
Both negative and positive impacts on R&D returns represent a huge change in the final valuation for Merck, as it constitutes the core driver for the company's performance and financial strength.

Figure 44. R&D Forecasts ($M)



Source: *Author Analysis*

Delayed approvals, failed clinical tests, patents, and setbacks in research are some of the risks to be aware of, within the umpteen R&D investment opportunities.

Price Target Sensitivity Analysis

By considering the investment risks mentioned above, and the critical variables in the capital structure assessment, it was possible to see which variables impact the final valuation, and by how much. The four variables selected were the cost of debt, the cost of equity, long-term growth rate and weighted average cost of capital, since they have a huge impact on the final price target.

Long-term Growth Rate vs WACC

For the first sensitivity simulation, both long-term growth rate and WACC variation of 0.25% were simultaneous simulated to check how the price target changes. As shown in table 13, the price target drops to $77.47/share for a growth rate of 1.56% and increases to $90.83/share for a growth rate of 2.06%, keeping everything else constant. This variation is wider when the same methodology is applied to the cost of capital, with a price target of $76.11 for a WACC of 5.05% and a price target of $92.44/share for a WACC of 4.55%, keeping everything else constant.

Table 13. WACC vs g

		Growth Rate				
	$ 83.59	1.31%	1.56%	1.81%	2.06%	2.31%
WACC	4.30%	$ 86.59	$ 94.08	$ 103.06	$ 114.05	$ 127.79
	4.55%	$ 78.85	$ 85.08	$ 92.44	$ 101.27	$ 112.08
	4.80%	$ 72.22	$ 77.47	€ 83.59	$ 90.83	€ 99.52
	5.05%	$ 66.48	$ 70.95	$ 76.11	$ 82.13	$ 89.25
	5.30%	$ 61.46	$ 65.31	$ 69.70	$ 74.78	$ 80.70

Sensitivity Conclusions

After performing these simulations, it is possible to conclude that the final price target is more sensitive with the variables of WACC, cost of Equity and Growth Rate. By changing 0.25% in each variable the price target changes 10.58% with the WACC, 9.21% with the cost of equity, 7.32% with the long-term growth rate and only 0.85% with the cost of debt. As expected, revenues, the cost of capital and the long-term growth rate are the main critical variables that need to be carefully assessed, as every shift result in a hefty change on the final valuation of Merck.

Scenario Analysis

Four different scenarios, based on Revenues and EBIT Margin, were created to check what would be the impact on the final valuation:

- **Optimistic:** 5% growth in both Revenues and EBIT margin YoY growth from the Base Case result in a price target of $91.41 and an upside potential of 26%.

Table 14. Optimistic

DCF	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF				10202	5892	6206	6747	3769	7468	7938	9231	8627	9068
WACC				4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%
g													1.81%
Operating Enterprise Value				252874	259119	265350	271339	280594	286593	292411	297214	302852	
Net Debt				21669	22885	24340	25747	26986	28262	29600	30972	32400	
Operating Leases				1810	1647	1222	1059	4346	4346	4346	3475	3671	
(+)Operating EV				252874	259119	265350	271339	280594	286593	292411	297214	302852	
(-)Net Debt				-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
(-)Operating Leases				-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
(-)Non Core Invested Capital				-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
(-)Non Controlling Interests				-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value				**226944**	**232027**	**237097**	**241721**	**246329**	**250929**	**255279**	**259448**	**263321**	
#Shares				2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price				$ 89.41	$ 91.41	$ 93.41	$ 95.23	$ 97.04	$ 98.86	$ 100.57	$ 102.21	$ 103.74	
31st August					**$ 72.81**								
Upside/downside potential					26%								
Recommendation					BUY								

- **Pessimist:**5% decrease in both Revenues and EBIT margin YoY growth from the Base Case result in a price target of $75.46. and a downside potential of only 4%.

Table 15. Pessimistic

DCF	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF				9362	4986	5225	5709	2674	6309	6714	7938	7261	7664
WACC				4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%
g													1.81%
Operating Enterprise Value				213385	218641	223911	228948	237263	242342	247259	251189	255985	
Net Debt				21669	22885	24340	25747	26986	28262	29600	30972	32400	
Operating Leases				1810	1647	1222	1059	4346	4346	4346	3475	3671	
(+)Operating EV				213385	218641	223911	228948	237263	242342	247259	251189	255985	
(-)Net Debt				-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
(-)Operating Leases				-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
(-)Non Core Invested Capital				-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
(-)Non Controlling Interests				-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value				**187455**	**191549**	**195658**	**199330**	**202998**	**206677**	**210128**	**213424**	**216453**	
#Shares				2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price				$ 73.85	$ 75.46	$ 77.08	$ 78.53	$ 79.97	$ 81.42	$ 82.78	$ 84.08	$ 85.27	
31st August					**$ 72.81**								
Upside/downside potential					4%								
Recommendation					BUY								

- **Super Optimistic:** An increase of 20% in both Revenues and EBIT margin YoY growth from the Base Case result in a price target of $116.54 and an upside potential of 60%.

Table 16. Super Optimistic

DCF	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF				11477	7271	7703	8326	5434	9229	9799	11197	10702	11295
WACC				4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%
g													1.81%
Operating Enterprise Value				315060	322911	330708	338255	349056	356581	363897	370167	377232	
Net Debt				21669	22885	24340	25747	26986	28262	29600	30972	32400	
Operating Leases				1810	1647	1222	1059	4346	4346	4346	3475	3671	
(+)Operating EV				315060	322911	330708	338255	349056	356581	363897	370167	377232	
(-)Net Debt				-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
(-)Operating Leases				-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
(-)Non Core Invested Capital				-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
(-)Non Controlling Interests				-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value				**289131**	**295819**	**302455**	**308637**	**314792**	**320917**	**326766**	**332401**	**337701**	
#Shares				2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price				$ 113.90	$ 116.54	$ 119.15	$ 121.59	$ 124.01	$ 126.43	$ 128.73	$ 130.95	$ 133.04	
31st August					**$ 72.81**								
Upside/downside potential					60%								
Recommendation					BUY								

- **Supper Pessimist:** A decrease of 20% in both Revenues and EBIT margin YoY growth from the Base Case result in a price target of $51.31 and a downside potential of 30%.

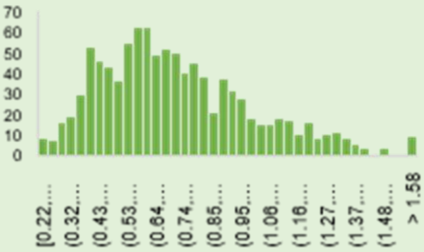
Table 17. Super Pessimistic

DCF	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF				8119	3647	3777	4176	1054	4594	4901	6022	5238	5530
WACC				4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%
g													1.81%
Operating Enterprise Value				153618	157345	161120	164678	171528	175166	178673	181226	184686	
Net Debt				21669	22885	24340	25747	26986	28262	29600	30972	32400	
Operating Leases				1810	1647	1222	1059	4346	4346	4346	3475	3671	
(+)Operating EV				153618	157345	161120	164678	171528	175166	178673	181226	184686	
(-)Net Debt				-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
(-)Operating Leases				-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
(-)Non Core Invested Capital				-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
(-)Non Controlling Interests				-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value				**127688**	**130253**	**132867**	**135059**	**137263**	**139502**	**141541**	**143460**	**145155**	
#Shares				2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price				$ 50.30	$ 51.31	$ 52.34	$ 53.21	$ 54.08	$ 54.96	$ 55.76	$ 56.52	$ 57.18	
31st August					**$ 72.81**								
Upside/downside potential					-30%								
Recommendation					SELL								

Monte Carlo Simulation

To complement the sensitivity and scenario analysis, a Monte Carlo simulation was computed to check how the current stock price moves, based on the historical volatility.

Figure 45. Monte Carlo



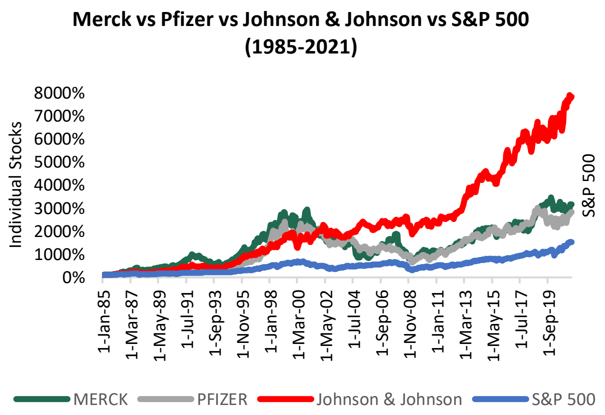
Source: *Author Analysis*

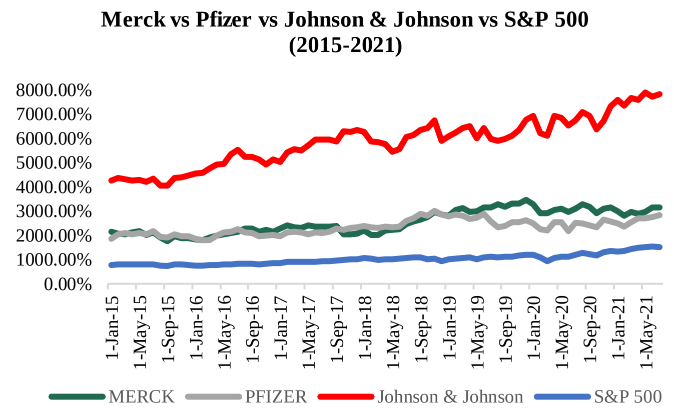
The inputs for the model include the current stock price of 15th of September 2021 and the daily volatility of FY2020. Daily volatility is then used as an input to inverse normal distribution function to simulate a thousand simulations to the current stock price.

Overall, Monte Carlo lacks transparency when compared to other models, and it is not common for banks and other Institutions to perform valuations using this method, as it doesn't account for risk.

Appendix

Appendix 1: Stock Performance





Appendix 2: Major Products and Services (Source: MaketLine)

Merck & Co., Inc.- Major Products and Services	
Products:	Brands:
Vaccine:	Antivenin
	Asmanex
Influenza Virus Vaccine	Bridion
BCG Vaccine	Belsomra
Haemophilus B Conjugate and Hepatitis B	Cancidas
(recombinant) Vaccine	Celestone Soluspan
Human Papillomavirus Quadrivalent	Clarinex
Recombinant Vaccine	Cozaar
Measles, Mumps and Rubella Virus	Crixivan
Vaccine	Cubicin
Live Haemophilus b Conjugate Vaccine	Dulera
Pneumococcal Vaccine	DiproleneDificid
Polyvalent Rotavirus Vaccine	Delstrigo
Zoster Vaccine	Ervebo
Varicella Virus Vaccine	Entereg
Hepatitis A Vaccine	Emend
Tetanus and Diptheria Toxoids Absorbed	Elocon
BCG Live	Follistim AQ/Puregon

	Fosamax/Fosamac
Prescription Drugs in Following	Gardasil
Therapeutic Areas:	Hyzaar
	Intron
Cardiovascular	IntegrilinInvanz
Endocrinology	Isentress
Gastroenterology	Janumet
Immunology	Januvia
Infectious	Keytruda
Diseases	Lotrisone
Neuroscience	M-M-R II
Oncology	Maxalt
Ophthalmics	Nasonex
Respiratory	Nexplanon
Urology	Noxafil
Women's Health	NuvaRing
Other Consumer Products	Ontruzant
	Liquid Pedvax HIB
Animal Health Products:	PegIntron
	Pneumovax 23
Vaccine	Porcilis
Anti-Infectives	Propecia
Anti-Parasitic	ProQuad
Fertility Management Products	Proventil
Pharmaceutical Specialty Products	Proscar
Consumer Care Products	Prinivil
	Primaxin
	Prevymis
	Pregnyl
	Pifeltro
	Renflexis
	Remeron
	Recombivax
	Recarbrio
	RotaTeq
	Segluromet
	Sinemet
	Sivextro
	Steglatro
	Steglujan
	Stromectol
	Sylatron
	Simponi
	Singulair
	Tice
	Temodar
	Trusopt
	Vaqta
	Vytorin

Appendix 3: Statement of Financial Position as Reported

Consolidated Balance Sheet ($ in millions except per share amounts)	2017	2018	2019	2020	CAGR
Assets					
Current Assets					
Cash and cash equivalents	6092	7965	9676	8062	9.79%
Short-term investments	2406	899	774	0	
Accounts receivable (net of allowance for doubtful accounts of $85 in 2020 and $86 in 2019)	6873	7071	6778	7851	4.53%
Inventories (excludes inventories of $2,197 in 2020 and $1,480 in 2019 classified in Other assets - see Note 7)	5096	5440	5978	6310	7.38%
Other current assets	4299	4500	4277	5541	8.83%
Total current assets	**24766**	**25875**	**27483**	**27764**	**3.88%**
Investments	12125	6233	1469	785	-59.85%
Property, Plant and Equipment (at cost)					
Land	365	333	343	350	-1.39%
Buildings	11726	11486	11989	12645	2.55%
Machinery, equipment and office furnishings	14649	14441	15394	16649	4.36%
Construction in progress	2301	3355	5013	7324	47.10%
	29041	29615	32739	36968	8.38%
Less: accumulated depreciation	16602	16324	17686	18982	4.57%
	12439	13291	15053	17986	13.08%
Goodwill	18284	18253	19425	20238	3.44%
Other Intangiles, Net	14183	13104	14196	14604	0.98%
Other Assets	5502	5225	6052	9317	19.19%
Deferred Income Taxes	573	656	719	894	15.98%
	87872	**82637**	**84397**	**91588**	**1.39%**
Liabilities and Equity					
Current Liabilities					
Loans payable and current portion of long-term debt	3057	5308	3610	6431	28.13%
Trade accounts payable	3102	3318	3738	4594	13.99%
Accrued and other current liabilities	10427	10151	12549	13053	7.77%
Income taxes payable	708	1971	736	1575	30.54%
Dividends payable	1320	1458	1587	1674	8.24%
Total current liabilities	**18614**	**22206**	**22220**	**27327**	**13.65%**
Long-Term Debt	21353	19806	22736	25360	5.90%
Deferred Income Taxes	2219	1702	1470	1015	-22.95%
Other Noncurrent Liabilities	11117	12041	11970	12482	3.94%
Merck & Co., Inc. Stockholders' Equity					
Common stock, $0.50 par value Authorized - 6,500,000,000 shares Issued - 3,577,103,522 shares in 2020 and 2019	1788	1788	1788	1788	0.00%
Other paid-in capital	39902	38808	39660	39588	-0.26%
Retained earnings	41350	42579	46602	47362	4.63%
Accumulated other comprehensive loss	-4910	-5545	-6193	-6634	10.55%
	78130	77630	81857	82104	1.67%
Less treasury stock, at cost:					
1,046,877,695 shares in 2020 and 1,038,087,496 shares in 2019	43794	50929	55950	56787	9.05%
Total Merck & Co., Inc. stockholders' equity	34336	26701	25907	25317	-9.66%
Noncontrolling Interests	233	181	94	87	-27.99%
Total equity	34569	26882	26001	25404	-9.76%
E + L	**87872**	**82637**	**84397**	**91588**	**1.39%**

Appendix 4: Reformulated Statement of Financial Position

Balance Sheet ($ in millions)	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Operating cash	802	846	937	960	1013	1082	1164	1241	1316	1393	1474	1558	1646	1738
% of revenues	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**	**2%**
Accounts receivable, net	6873	7071	6778	7851	8285	8848	9520	10148	10760	11397	12057	12746	13466	14217
avg number of days	**63**	**61**	**53**	**60**	***60***	***60***	***60***	***60***	***60***	***60***	***60***	***60***	***60***	***60***
Inventories, net	5096	5440	5978	6310	6518	6961	7489	7983	8465	8966	9485	10027	10593	11184
avg number of days	**46**	**47**	**47**	**48**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**	**47**
Other current assets	4299	4500	4277	5541	5322	5684	6115	6519	6912	7321	7745	8187	8650	9132
% of revenues	**10.71%**	**10.64%**	**9.13%**	**11.55%**	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*	*10.51%*
Operating Current Assets	**17070**	**17857**	**17970**	**20662**	**21137**	**22574**	**24289**	**25890**	**27452**	**29077**	**30760**	**32518**	**34354**	**36271**
Payables	3102	3318	3738	4594	3977	4247	4570	4871	5165	5471	5787	6118	6464	6824
avg number of days	**28**	**29**	**29**	**35**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**	**29**
Accrued and other current liabilities	10427	10151	12549	13053	13166	14060	15128	16126	17099	18111	19159	20254	21398	22591
avg number of days	**95**	**88**	**98**	**99**	***95***	***95***	***95***	***95***	***95***	***95***	***95***	***95***	***95***	***95***
Income Taxes payable	708	1971	736	1575	1428	1525	1641	1749	1855	1964	2078	2197	2321	2450
avg number of days	**6**	**17**	**6**	**12**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Operating Current Liabilities	**14237**	**15440**	**17023**	**19222**	**18571**	**19833**	**21339**	**22746**	**24118**	**25546**	**27024**	**28569**	**30182**	**31866**
Operating Net Working Capital Requirements	**2833**	**2417**	**947**	**1440**	**2567**	**2741**	**2950**	**3144**	**3334**	**3531**	**3736**	**3949**	**4172**	**4405**
Property, plant and equipment, net	12439	13291	15053	17986	16719	17855	19211	20478	21713	22998	24330	25721	27173	28689
% of revenues	**31.0%**	**31.4%**	**32.1%**	**37.5%**	**33%**	**33%**	**33%**	**33%**	**33%**	**33%**	**33%**	**33%**	**33%**	**33%**
Other Intangibles	1194	1064	1032	3228	1299	1387	1493	1591	1687	1787	1890	1999	2111	2229
% of revenues	**2.98%**	**2.52%**	**2.20%**	**6.73%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**
Acquired Intangibles	12989	12040	13164	11376	14263	15233	16390	17471	18524	19621	20757	21943	23182	24475
% of revenues	**32.37%**	**28.47%**	**28.10%**	**23.70%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**
Other Assets, net	-5615	-6816	-5918	-3165	-6247	-6672	-7179	-7652	-8114	-8594	-9091	-9611	-10154	-10720
% of revenues	**-13.99%**	**-16.12%**	**-12.63%**	**-6.59%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**	**-12.33%**
Capitalized Operating Leases	2105	2216	2261	2196	1810	1647	1222	1059	4346	4346	4346	3475	3671	3876
% of revenues	**5.25%**	**5.24%**	**4.83%**	**4.58%**	**3.57%**	**3.05%**	**2.10%**	**1.71%**	**6.61%**	**6.24%**	**5.90%**	**4.5%**	**4.5%**	**4.5%**
Core Invested Capital (excluding Goodwill)	**25945**	**24212**	**26539**	**33061**	**30411**	**32192**	**34087**	**36091**	**41492**	**43690**	**45968**	**47475**	**50156**	**52954**
Goodwill	18284	18253	19425	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238
Core Invested Capital (including Goodwill)	**44229**	**42465**	**45964**	**53299**	**50649**	**52430**	**54325**	**56329**	**61730**	**63928**	**66206**	**67713**	**70394**	**73192**
Investments	14531	7132	2243	785	785	785	785	785	785	785	785	785	785	785
Nonoperating deferred tax assets, net	1387	801	1501	1868	1576	1683	1811	1930	2047	2168	2294	2425	2562	2705
% of revenues	**3%**	**2%**	**3%**	**4%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**
Non-core Invested Capital	**15918**	**7933**	**3744**	**2653**	**2361**	**2468**	**2596**	**2715**	**2832**	**2953**	**3079**	**3210**	**3347**	**3490**
Total invested Capital	**60147**	**50398**	**49708**	**55952**	**53011**	**54898**	**56921**	**59045**	**64561**	**66881**	**69284**	**70923**	**73740**	**76682**
Short-term Debt	3057	5308	3610	6431										
Long-term Debt	21353	19806	22736	25360										
Total Debt	24410	25114	26346	31791	29558	31217	33202	35120	36811	38551	40376	42247	44196	46229
Excess Cash	-5290	-7119	-8739	-7102	-7889	-8332	-8862	-9374	-9825	-10289	-10776	-11276	-11796	-12339
% of Debt	**-27.7%**	**-39.6%**	**-49.6%**	**-28.8%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**	**-36.41%**
Net Debt	19120	17995	17607	24689	21669	22885	24340	25747	26986	28262	29600	30972	32400	33891
Capitalized Operating Leases	2105	2216	2261	2196	1810	1647	1222	1059	4346	4346	4346	3475	3671	3876
Debt and Debt Equivalents	**21225**	**20211**	**19868**	**26885**	**23479**	**24532**	**25563**	**26805**	**31333**	**32608**	**33946**	**34447**	**36071**	**37767**
Dividends payable	1320	1458	1587	1674	1675	1675	1675	1675	1675	1675	1675	1675	1675	1675
Operating DTLs, net of Operating DTAs	3033	1847	2252	1989	1777	1898	2130	2208	2353	2507	2637	2793	2953	3114
Total Merck & Co., Inc. stockholders' equity	34336	26701	25907	25317	25990	26701	27459	28259	29101	29988	30919	31899	32928	34009
Transactions with shareholders		***-13494***	***-9989***	***-7216***	***-6056***	***-6403***	***-6816***	***-7202***	***-7581***	***-7977***	***-8386***	***-8814***	***-9262***	***-9729***
% Payout Ratio		***230%***	***109%***	***109%***	***90%***	***90%***	***90%***	***90%***	***90%***	***90%***	***90%***	***90%***	***90%***	***90%***
Equity and equity equivalents	**38689**	**30006**	**29746**	**28980**	**29442**	**30275**	**31264**	**32142**	**33129**	**34170**	**35232**	**36367**	**37556**	**38798**
Non-controlling interests	233	181	94	87	89	92	94	97	100	103	106	110	113	117
% of shareholders' equity	**0.68%**	**0.68%**	**0.36%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**	**0.34%**
Total Sources of Funds	**60147**	**50398**	**49708**	**55952**	**53011**	**54898**	**56921**	**59045**	**64561**	**66881**	**69284**	**70923**	**73740**	**76682**

Appendix 5: Income Statement as Reported

Incomce Statement ($ in millions except per share amounts)	2017	2018	2019	2020	CAGR
Sales	40122	42294	46840	47994	20%
Costs, Expenses and Other					
Cost of Sales	12912	13509	14112	15485	20%
Selling, general and admnistrative	10074	10102	10615	10468	4%
Research and Development	10339	9752	9872	13558	31%
Restructuring costs	776	632	638	578	-26%
Other (income) expense, net	-500	-402	139	-886	77%
	33601	33593	35376	39203	17%
Income Before Taxes	6521	8701	11464	8791	35%
Taxes on Income	4103	2508	1687	1709	-58%
Net Income	**2418**	**6193**	**9777**	**7082**	**193%**
Less: Net Income (Loss) Attributable to Noncontrolling Interests	24	-27	-66	15	-38%
Net Income Attributable to Merck & Co., Inc	2394	6220	9843	7067	195%
Basic Earnings per Common Share Attributable to Merck & Co., Inc. Common Shareholders	0.88	2.34	3.84	2.79	217%
Earnings per Common Share Assuming Dilution Attributable to Merck & Co., Inc. Common Shareholders	0.87	2.32	3.81	2.78	220%

Appendix 6: Reformulated Income Statement

Operational Incomce Statement ($ in millions except per share amounts)	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Revenues	**40122**	**42294**	**46840**	**47994**	**50648**	**54090**	**58198**	**62036**	**65778**	**69671**	**73704**	**77917**	**82316**	**86909**
Cost of Sales	-12912	-13509	-14112	-15485	-16341	-17452	-18777	-20016	-21223	-22479	-23780	-25139	-26559	-28041
% of revenues	*32.18%*	*31.94%*	*30.13%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*	*32.26%*
Selling, general and admnistrative	-10074	-10102	-10615	-10468	-11262	-12028	-12941	-13795	-14627	-15492	-16389	-17326	-18304	-19326
% of revenues	*25.11%*	*23.89%*	*22.66%*	*21.81%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*	*22.24%*
Research and Development	-10339	-9752	-9872	-13558	-14308	-15280	-16441	-17525	-18582	-19682	-20821	-22011	-23254	-24551
% of revenues	*25.77%*	*23.06%*	*21.08%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*	*28.25%*
Restructuring costs	-776	-632	-638	-578	-759	-811	-872	-930	-986	-1044	-1105	-1168	-1234	-1303
% of revenues	*1.93%*	*1.49%*	*1.36%*	*1.20%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*	*1.50%*
Depreciation and amortization	1378	1352	1593	1602	1802	1785	1907	2051	2187	2319	2456	2598	2746	2902
% of net PP&E (t-1) + Other Intangibles (t-1)		*5%*	*6%*	*5%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*	*6%*
Operating EBITDA	**7399**	**9651**	**13196**	**9507**	**9780**	**10305**	**11073**	**11823**	**12547**	**13292**	**14065**	**14871**	**15712**	**16590**
	18.4%	*22.8%*	*28.2%*	*19.8%*	*19.3%*	*19.1%*	*19.0%*	*19.1%*	*19.1%*	*19.1%*	*19.1%*	*19.1%*	*19.1%*	*19.1%*
Operating EBIT	**6021**	**8299**	**11603**	**7905**	**7977**	**8520**	**9167**	**9771**	**10361**	**10974**	**11609**	**12273**	**12965**	**13689**
% EBIT Margin	*15.01%*	*19.62%*	*24.77%*	*16.47%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*	*15.75%*
Operating taxes	-1310	-1916	-1642	-1178	-1058	-1180	-1326	-1462	-1595	-1734	-1877	-2026	-2183	-2346
Increase (decrease) in deferred taxes	625	1186	-405	263	212	-121	-232	-78	-144	-155	-130	-156	-160	-161
NOPLAT	**5336**	**7569**	**9556**	**6990**	**7132**	**7218**	**7609**	**8231**	**8621**	**9085**	**9602**	**10090**	**10623**	**11182**
	13.30%	*17.90%*	*20.40%*	*14.56%*	*14.08%*	*13.34%*	*13.07%*	*13.27%*	*13.11%*	*13.04%*	*13.03%*	*12.95%*	*12.90%*	*12.87%*
Interest income	385	343	274	59	59	59	59	59	59	59	59	59	59	59
Exchange losses	11	-145	-187	-145	-145	-145	-145	-145	-145	-145	-145	-145	-145	-145
Income from investments in equity securities, net	352	324	170	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338	1338
Net periodic defined benefit plan (credit) cost other than service cost	512	512	545	339	339	339	339	339	339	339	339	339	339	339
Other, net	-6	140	-48	126	126	126	126	126	126	126	126	126	126	126
Net unrealized (loss) gain on derivatives, net of reclassifications	-446	297	-135	-297	-297	-297	-297	-297	-297	-297	-297	-297	-297	-297
Net unrealized (loss) gain on investments, net of reclassifications	-58	-10	96	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18	-18
Benefit plan net (loss) gain and prior service (cost) credit, net of amortization	419	-425	-705	-279	-279	-279	-279	-279	-279	-279	-279	-279	-279	-279
Cumulative translation adjustment	401	-223	96	153	153	153	153	153	153	153	153	153	153	153
Nonoperating result before taxes	**1570**	**813**	**106**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**	**1276**
Nonoperating taxes	-3691	-1958	172	-975	-926	-585	-465	-611	-536	-517	-533	-498	-484	-472
Total Nonoperating result	**-2121**	**-1145**	**278**	**301**	**350**	**691**	**811**	**665**	**740**	**759**	**743**	**778**	**792**	**804**
NPLAT	**3215**	**6424**	**9834**	**7291**	**7482**	**7909**	**8419**	**8896**	**9361**	**9844**	**10345**	**10868**	**11415**	**11985**
Interest expense	-754	-772	-893	-831	-991	-1047	-1113	-1177	-1234	-1292	-1354	-1416	-1482	-1550
% of Net Debt (t-1)		-4.04%	-4.96%	-4.72%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%	-4.57%
Tax shield	273	180	188	181	223	236	251	266	278	291	305	319	334	350
Financial Result	**-481**	**-592**	**-705**	**-650**	**-768**	**-811**	**-862**	**-912**	**-956**	**-1001**	**-1048**	**-1097**	**-1148**	**-1200**
Noncontrolling interests	-24	27	66	-15	14	15	17	18	19	20	21	22	23	25
% Revenues	-0.06%	0.06%	0.14%	-0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Total Comprehensive Income	**2710**	**5859**	**9195**	**6626**	**6729**	**7114**	**7574**	**8002**	**8424**	**8863**	**9318**	**9794**	**10291**	**10810**
Net Income	**2418**	**6193**	**9777**	**7082**	**7155**	**7540**	**7998**	**8425**	**8846**	**9284**	**9738**	**10212**	**10708**	**11226**
Shares Outstanding	2748	2647	2546	2538	2538	2538	2538	2538	2538	2538	2538	2538	2538	2538
EPS	0.88	2.34	3.84	2.79	2.82	2.97	3.15	3.32	3.48	3.66	3.84	4.02	4.22	4.42

Appendix 7: Cash Flow Statement as Reported

Consolidated Statement of Cash Flows ($ in millions except per share amounts)	2017	2018	2019	2020
Cash Flows from Operating Activities				
Net income	2418	6193	9777	7082
Adjustments to reconcile net income to net cash provided by operating activities:				
Amortization	3221	3103	1973	1899
Depreciation	1455	1416	1679	1726
Intangible asset impairment charges	646	296	1040	1718
Change for the acquisition of VelosBio, Inc.				2660
Charge for the acquisition of Peloton Therapeutics, Inc			993	
Charge for future payments related to collaboration license options	500	650		
Deferred income taxes	-2621	-509	-556	-668
Share-based compensation	312	348	417	475
Other	190	978	184	-49
Net changes in assets and liabilities:				
Accounts receivable	297	-418	294	1002
Inventories	-145	-911	-508	-855
Trade accounts payable	254	230	399	724
Accrued and other current liabilities	-922	-341	376	-1138
Income taxes payable	-3291	827	-2359	560
Noncurrent liabilities	-123	-266	-237	-453
Other	-1087	-674	-32	-2426
Net Cash Provided by Operating Activities	**6451**	**10922**	**13440**	**10253**
Cash Flows from Investing Activities				
Capital expenditures	-1888	-2615	-3473	-4684
Purchase of Seagen Inc. common stock				-1000
Purchases of securities and other investments	-10739	-7994	-3202	-95
Proceeds from sales of securities and other investments	15664	15252	8622	2812
Acquisition of VelosBio Inc., net of cash acquired				-2696
Acquisition of ArQule, Inc., net of cash acquired				-2545
Acquisition of Antelliq Corporation, net of cash acquired			-3620	
Acquisition of Peloton Therapeutics, Inc., net of cash acquired			-1040	
Other acquisitions, net of cash acquired	-396	-431	-294	-1365
Other	38	102	378	130
Net Cash (Used in) Provided by Investing Activities	**2679**	**4314**	**-2629**	**-9443**
Cash Flows from Financing Activities				
Net change in short-term borrowings	-26	5124	-3710	2549
Payments on debt	-1103	-4287		-1957
Proceeds from issuance of debt			4958	4419
Purchases of treasury stock	-4014	-9091	-4780	-1281
Dividends paid to stockholders	-5167	-5172	-5695	-6215
Proceeds from exercise of stock options	499	591	361	89
Other	-195	-325	5	-438
Net Cash Used in Financing Activities	**-10006**	**-13160**	**-8861**	**-2832**
Effect of Exchange Rate Changes on Cash, Cash Equivalents and Restricted Cash	457	-205	17	253
Net Increase (Decrease) in Cash, Cash Equivalents and Restricted Cash	-419	1871	1967	-1769
Cash, Cash Equivalents and Restricted Cash at Beginning of Year (includes $268 of restricted cash at January 1, 2020 included in Other Assets)	6515	6096	7967	9934
Cash, Cash Equivalents and Restricted Cash at End of Year (includes $103 of restricted cash at December 31, 2020 included in Other Assets)	6096	7967	9934	8165

Appendix 8: Reformulated Cash Flow Statement

	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Operational Cash Flow Statement														
NOPLAT (adjusted for operating cash taxes)		7569	9556	6990	7132	7218	7609	8231	8621	9085	9602	10090	10623	11182
Depreciation and amortization		1352	1593	1602	1802	1785	1907	2051	2187	2319	2456	2598	2746	2902
Gross Cash Flow		8921	11149	8592	8934	9003	9515	10282	10808	11404	12058	12688	13369	14083
Invested Capital - Net PP&E		2204	3355	4535	535	2922	3262	3318	3422	3604	3787	3989	4199	4418
Invested Capital - Operating Leases (net)		111	46	-65	-386	-163	-425	-163	3288	0	0	-871	196	205
Invested Capital - Goodwill	18284	18253	19425	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238
Invested Capital - NWC and Others	11401	8705	9225	12879	11882	12690	13653	14554	15432	16345	17291	18280	19312	20389
Investment - Goodwill, Operating Leases, NWC and Others		-2728	1692	4467	-997	808	964	901	878	913	946	988	1032	1078
Investment Cash Flow		412	-5093	-8937	847	-3566	-3801	-4056	-7587	-4517	-4733	-4105	-5427	-5700
Free Cash Flow Core Business		**9334**	**6057**	**-345**	**9781**	**5437**	**5714**	**6227**	**3220**	**6887**	**7324**	**8583**	**7942**	**8383**
Non Core Business Cash Flow Statement														
Non-core Result	-2121	-1145	278	301	350	691	811	665	740	759	743	778	792	804
Invested Capital	15918	7933	3744	2653	2361	2468	2596	2715	2832	2953	3079	3210	3347	3490
Investment Cash Flow		7985	4189	1091	292	-107	-128	-119	-116	-121	-126	-131	-137	-143
Free Cash Flow Non Core Business		6840	4467	1392	642	584	683	546	623	638	618	647	655	661
Free Cash Flow		**16174**	**10524**	**1047**	**10423**	**6022**	**6397**	**6772**	**3844**	**7525**	**7942**	**9230**	**8598**	**9044**
Financial Cash Flow Statement														
Noncontrolling interests		-25	-21	-22	17	18	19	20	22	23	24	26	27	28
Financial Result	-481	-592	-705	-650	-768	-811	-862	-912	-956	-1001	-1048	-1097	-1148	-1200
Net Financial Assets	-25578	-23516	-23707	-30548	-26931	-28105	-29368	-30689	-35360	-36790	-38259	-38914	-40699	-42556
Investment in Net Financial Assets		2062	-192	-6841	3617	-1174	-1263	-1321	-4672	-1430	-1468	-656	-1785	-1857
Net Cash transactions with Shareholders		-13494	-9989	-7216	-6056	-6403	-6816	-7202	-7581	-7977	-8386	-8814	-9262	-9729
Financing Cash Flow		**-16174**	**-10524**	**-1047**	**-10423**	**-6022**	**-6397**	**-6772**	**-3844**	**-7525**	**-7942**	**-9230**	**-8598**	**-9044**

Appendix 9: Shareholder’s Equity Statement as Reported

Consolidated Statement of Equity ($ in millions except per share amounts)	Common Stock	Other Paid-In Capital	Retained Earnings	Accumulated Other Comprehensive Loss	Treasury Stock	Non-controlling Interests	Total
Balance December 31, 2017	**1788**	**39902**	**41350**	**´-4910**	**-43794**	**233**	**34569**
Net Income attributable to Merck & Co., Inc			6220				6220
Adoption of new accounting standards			322	-274			48
Other comprehensive loss, net of taxes				-361			-361
Cash dividends declared on common stock ($1.99 per share)			-5313				-5313
Treasury stock shares purchased		-1000			-8091		-9091
Net loss attributable to noncontrolling interests						-27	-27
Distributions attributable to noncontrolling interests						-25	-25
Share-based compensation plans and other		-94			956		862
Balance December 31, 2018	**1788**	**38808**	**42579**	**-5545**	**-50929**	**181**	**26882**
Net Income attributable to Merck & Co., Inc			9843				9843
Other comprehensive loss, net of taxes				-648			-648
Cash dividends declared on common stock ($1.99 per share)			-5820				-5820
Treasury stock shares purchased		1000			-5780		-4780
Net loss attributable to noncontrolling interests						-66	-66
Distributions attributable to noncontrolling interests						-21	-21
Share-based compensation plans and other		-148			759		611
Balance December 31, 2019	**1788**	**39660**	**46602**	**-6193**	**-55950**	**94**	**26001**
Net Income attributable to Merck & Co., Inc			7067				7067
Other comprehensive loss, net of taxes				-441			-441
Cash dividends declared on common stock ($1.99 per share)			-6307				-6307
Treasury stock shares purchased					-1281		-1281
Net loss attributable to noncontrolling interests						15	15
Distributions attributable to noncontrolling interests						-22	-22
Share-based compensation plans and other		-72			444		372
Balance December 31, 2020	**1788**	**39588**	**47362**	**-6634**	**-56787**	**87**	**25404**

Appendix 10: Reformulated Shareholder’s Equity Statement

2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Begining Equity	34569	26882	26001	25404	26079	26793	27553	28356	29201	30091	31026	32008	33041
Comprehensive Income (loss)	5859	9195	6626	6729	7114	7574	8002	8424	8863	9318	9794	10291	10810
Net Income	6220	9843	7067										
Other comprehensive income (loss)	-361	-648	-441										
Net Transactions to Shareholders	-13494	-9989	-7216	-6056	-6403	-6816	-7202	-7581	-7977	-8386	-8814	-9262	-9729
Share Issues	862	611	372										
Share Repurchases	-9091	-4780	-1281										
Dividends	-5313	-5820	-6307										
Other	48	0	0										
Noncontrolling interests	-52	-87	-7	2	2	3	3	3	3	3	3	4	4
Ending Equity	**26882**	**26001**	**25404**	**26079**	**26793**	**27553**	**28356**	**29201**	**30091**	**31026**	**32008**	**33041**	**34126**

Appendix 11: Adjustments

($ in millions)	2017		2018		2019		2020	
Deferred income taxes at December 31 consisted of:	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Product intangibles and licenses	307	2256	720	1640	442	1778	141	1250
Inventory related	29	499	32	377	32	354	43	335
Accelerated depreciation	28	642		582		594		588
Equity investments								175
Pensions and other postretirement benefits	498	192	565	151	785	191	834	248
Compensation related	314		291		322		252	
Unrecognized tax benefits	156		174		109		117	
Net operating losses and other tax credit carryforwards	654		715		897		794	
Other	909	52	621	66	764	84	808	81
Subtotal	2895	3641	3118	2816	3351	3001	2989	2677
Valuation allowance	-900		-1348		-1101		-433	
Total deferred taxes	1995	3641	1770	2816	2250	3001	2556	2677
Net deferred income taxes		1646		1046		750		121
Recognized as:								
Other assets	573		656		719		894	
Deferred Income Taxes		2219		1702		1470		1015

Deferred Tax Assets	2017	2018	2019	2020
Product intangibles and licenses	307	720	442	141
Inventory related	29	32	32	43
Accelerated depreciation	28	0	0	0
Equity investments	0	0	0	0
Pensions and other postretirement benefits	498	565	785	834
Compensation related	314	291	322	252
Unrecognized tax benefits	156	174	109	117
Net operating losses and other tax credit carryforwards	654	715	897	794
Other	909	621	764	808
Subtotal	2895	3118	3351	2989
Valuation allowance	-900	-1348	-1101	-433
Total	1995	1770	2250	2556
Operating Tax Assets	**364**	**752**	**474**	**184**

	2017	2018	2019	2020
Product intangibles and licenses	2256	1640	1778	1250
Inventory related	499	377	354	335
Accelerated depreciation	642	582	594	588
Equity investments	0	0	0	175
Pensions and other postretirement benefits	192	151	191	248
Compensation related	0	0	0	0
Unrecognized tax benefits	0	0	0	0
Net operating losses and other tax credit carryforwards	0	0	0	0
Other	52	66	84	81
Subtotal	3641	2816	3001	2677
Valuation allowance	0	0	0	0
Total	3641	2816	3001	2677
Operating Tax Liabilities	**3397**	**2599**	**2726**	**2173**

	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Operating deferred Tax Assets, Net	-3033	-1847	-2252	-1989	-1777	-1898	-2130	-2208	-2353	-2507	-2637	-2793	-2953	-3114
	-50.4%	-22.3%	-19.4%	-25.2%	-22.3%	-22.3%	-23.2%	-22.6%	-22.7%	-22.8%	-22.7%	-22.8%	-22.8%	-22.8%
Increase (Decrease) in operating deferred taxes	625	1186	-405	263	212	-121	-232	-78	-144	-155	-130	-156	-160	-161

Nonoperating tax assets	1631	1018	1776	2372										
Nonoperating tax liabilities	244	217	275	504										
	1387	**801**	**1501**	**1868**	1576	1683	1811	1930	2047	2168	2294	2425	2562	2705
	-1646	**-1046**	**-751**	**-121**	-201	-215	-319	-278	-306	-339	-344	-368	-391	-410

Appendix 12: Tax Adjustments

Taxes on Income (Reconciliation between the effective tax rate and the U.S statutory rate)	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
U.S statutory rate applied to income before taxes	2282	1827	2408	1846	1828	1930	2052	2165	2277	2394	2514	2640	2772	2910
%	35.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%	21.00%
Differential arising from:														
Foreign earnings	-1654	-245	-1020	-1242	**-836**	**-836**	**-836**	**-836**	**-836**	**-836**	**-836**	**-836**	**-836**	**-836**
%	-25.40%	-2.80%	-8.90%	-14.10%	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**	**-8.60%**
GILTI and the foreign-derived intagible income deduction		-25	336	364	**225**	**225**	**225**	**225**	**225**	**225**	**225**	**225**	**225**	**225**
%		-0.30%	2.90%	4.10%	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**	**2.23%**
Tax settlements	-356	-22	-403	-13	**-146**	**-146**	**-146**	**-146**	**-146**	**-146**	**-146**	**-146**	**-146**	**-146**
%	-5.50%	-0.30%	-3.50%	-0.20%	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**	**-1.33%**
R&D tax credit	-71	-96	-118	-110	**-108**	**-108**	**-108**	**-108**	**-108**	**-108**	**-108**	**-108**	**-108**	**-108**
%	-1.10%	-1.10%	-1.00%	-1.30%	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**	**-1.13%**
Acquisition of VelosBio				559										
%				6.30%										
Acquisition of Peloton			209											
%			1.80%											
TCJA	2625	289	117		**203**	**203**	**203**	**203**	**203**	**203**	**203**	**203**	**203**	**203**
%	40.30%	3.30%	1.00%		**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**	**2.15%**
Restructuring	142	56	39	105	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**	**67**
%	2.20%	0.60%	0.30%	1.20%	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**	**0.70%**
Acquisition of OncoImmune				97										
%				1.10%										
State taxes	77	201	-2	67	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**	**89**
%	1.20%	2.30%		0.80%	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**	**1.55%**
Valuation allowances	632	269	113	42	**141**	**141**	**141**	**141**	**141**	**141**	**141**	**141**	**141**	**141**
%	9.70%	3.10%	1.00%	0.50%	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**	**1.53%**
Acquisition-related costs, including amortization	713	267	95	46	**136**	**136**	**136**	**136**	**136**	**136**	**136**	**136**	**136**	**136**
%	10.90%	3.10%	0.80%	0.50%	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**	**1.47%**
Other	-287	-13	-87	-52	**-51**	**-51**	**-51**	**-51**	**-51**	**-51**	**-51**	**-51**	**-51**	**-51**
%	-4.40%	-0.10%	-0.70%	-0.50%	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**	**-0.43%**
Effective Tax Rate	4103	2508	1687	1709	1548	1650	1772	1886	1997	2114	2235	2361	2492	2630
%	62.9%	28.8%	14.7%	19.4%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%
Effective Tax Rate	62.92%	28.82%	14.72%	19.44%	15.36%	15.33%	15.30%	15.27%	15.26%	15.24%	15.23%	15.22%	15.21%	15.20%

Operating Cash Taxes Calculation	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Marginal Tax Rate	36.20%	23.30%	21.00%	21.80%	22.55%	22.55%	22.55%	22.55%	22.55%	22.55%	22.55%	22.55%	22.55%	22.55%
EBIT	6021	8299	11603	7905	7977	8520	9167	9771	10361	10974	11609	12273	12965	13689
Marginal Tax Rate on EBIT	2180	1934	2437	1723	1799	1921	2067	2203	2336	2475	2618	2767	2924	3087
Other Operating Taxes	-870	-18	-795	-545	-741	-741	-741	-741	-741	-741	-741	-741	-741	-741
Operating Taxes	**1310**	**1916**	**1642**	**1178**	**1058**	**1180**	**1326**	**1462**	**1595**	**1734**	**1877**	**2026**	**2183**	**2346**

Reconciliation to reported taxes	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Operating Taxes	1310	1916	1642	1178	1058	1180	1326	1462	1595	1734	1877	2026	2183	2346
Nonoperating Taxes	2793	592	45	531	490	470	446	423	402	380	358	334	310	284
Reported Taxes	4103	2508	1687	1709	1548	1650	1772	1886	1997	2114	2235	2361	2492	2630
CHECK	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*	*TRUE*
Operating Taxes	1310	1916	1642	1178	1058	1180	1326	1462	1595	1734	1877	2026	2183	2346
Increase (Decrease) in operating deferred taxes	625	1186	-405	263	212	-121	-232	-78	-144	-155	-130	-156	-160	-161
Operating cash taxes	**1935**	**3102**	**1237**	**1441**	**1270**	**1059**	**1094**	**1385**	**1451**	**1579**	**1747**	**1871**	**2023**	**2184**

	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Taxes before income (based on % of revenues)	16.25%	20.57%	24.47%	18.32%	19.90%	19.90%	19.90%	19.90%	19.90%	19.90%	19.90%	19.90%	19.90%	19.90%
Taxes before income					10081	10766	11584	12348	13093	13867	14670	15509	16384	17299

Appendix 13: Capitalized Operating Leases

Operating Leases	2016	2017	2018	2019	2020	2021e	2022e	2023e	2024e	2025e	2026e	2027e	2028e
Value of lease obligations	2137	2105	2216	2261	2196	1810	1647	1222	1059	4346	4346	4346	
Rent Expense under operating leases	292	327	322	339	346	336	277	252	187	162	665	665	665

Weighted-average discount rate - operating leases	2.80%
Weighted - average remaining lease term (years)	8

Appendix 14: Key Financial Ratios

RATIOS	Description	2017	2018	2019	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Activity	**Efficiency Ratios - How the company uses its resources**														
Collection Period (days)	Time to collect its Accounts Receivable	62.5	60.2	54.0	55.6	58.1	57.8	57.6	57.9	58.0	58.0	58.1	58.1	58.1	58.1
Total assets turnover (x)	How effeciently is the company using its current and fixed assets to generate revenue	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2
Inventory Turnover (x)	Number of times the inventory was turned over during the fiscal year	2.5	2.6	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Days of inventory at hand (DOH)		144.1	142.3	147.7	144.8	143.3	140.9	140.4	141.1	141.4	141.5	141.6	141.6	141.7	141.7
Receivables Turnover (x)	Time between the sale and the cash collection	5.8	6.1	6.8	6.6	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Days of sales outstanding (DSO)		62.5	60.2	54.0	55.6	58.1	57.8	57.6	57.9	58.0	58.0	58.1	58.1	58.1	58.1
Payables Turnover (x)	Average number of days the company takes to pay its suppliers	4.2	4.2	4.0	3.7	3.8	4.2	4.3	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Number of days of payables (days)		87.7	86.7	91.3	98.2	95.7	86.0	85.7	86.1	86.3	86.3	86.4	86.4	86.5	86.5
Operating Cash Conversion Cycle (days)	Time between the cash paid and the cash received	118.9	115.8	110.4	102.3	105.7	112.7	112.3	112.9	113.1	113.2	113.3	113.3	113.3	113.4
Liquidity	**Firm's ability to meet short-term obligations - how fast can assets be converted into cash**														
Current Ratio (x)	Ability to pay its current liabilities	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Quick Ratio (x)	Ability to pay it current liabilities with more liquid assets	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cash Ratio (x)	Ability to pay its current liabilities with cash or cash equivalents	0.4	0.5	0.6	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Profitability	**Ability to generate profits**														
Gross profit margin (%)	Percentage of revenue available to spend on operating expenses, other expenses and cash	67.8%	68.1%	69.9%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%	67.7%
Operating EBITDA Margin (%)	How much the company is eaearing before interest, taxes, depreciation and amortization	18.4%	22.8%	28.2%	19.8%	19.3%	19.1%	19.0%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%	19.1%
Operating EBIT Margin (%)	How much the company is earning before interest and taxes	15.0%	19.6%	24.8%	16.5%	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%
NOPAT ($M)	Net Operating Profit After Tax (Adjusted)	5336	7569	9556	6990	7132	7218	7609	8231	8621	9085	9602	10090	10623	11182
IC ($M)	Total Invested Capital	60147	50398	49708	55952	53011	54898	56921	59045	64561	66881	69284	70923	73740	76682
ROIC (%)	Return on Invested Capital	8.9%	15.0%	19.2%	12.5%	13.5%	13.1%	13.4%	13.9%	13.4%	13.6%	13.9%	14.2%	14.4%	14.6%
NI margin (%)	Net Profit Margin	6.0%	14.6%	20.9%	14.8%	14.1%	13.9%	13.7%	13.6%	13.4%	13.3%	13.2%	13.1%	13.0%	12.9%
ROA (%)	Return on Assets	4.3%	9.7%	14.0%	9.1%	9.7%	9.8%	9.9%	9.9%	9.6%	9.7%	9.7%	9.8%	9.8%	9.8%
ROE (%)	Return on Equity	7.0%	23.2%	37.7%	28.0%	27.4%	28.1%	29.0%	29.7%	30.3%	30.9%	31.4%	31.9%	32.4%	32.9%
NI/S (%)	Net Profit Margin	6.0%	14.6%	20.9%	14.8%	14.1%	13.9%	13.7%	13.6%	13.4%	13.3%	13.2%	13.1%	13.0%	12.9%
S/TA (%)	Total assets turnover	45.7%	49.6%	56.1%	54.5%	56.2%	59.6%	60.8%	61.4%	62.1%	62.8%	63.5%	64.2%	64.8%	65.5%
TA/E (%)	Equity Multiplier	255.9%	319.3%	322.4%	347.6%	345.4%	339.0%	347.6%	356.1%	362.7%	368.4%	373.9%	379.1%	384.2%	389.1%
DuPont analysis	**Profitability detailed assessment**	**7.0%**	**23.2%**	**37.7%**	**28.0%**	**27.4%**	**28.1%**	**29.0%**	**29.7%**	**30.3%**	**30.9%**	**31.4%**	**31.9%**	**32.4%**	**32.9%**
SG&A/Sales (%)		25.1%	23.9%	22.7%	21.8%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%	22.2%
R&D/Sales (%)		25.8%	23.1%	21.1%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%	28.2%
Solvency	**Firm's ability to meet its long-term debt obligations**														
Debt-to-assets	Percentage of total assets financed by debt	40.6%	49.8%	53.0%	56.8%	55.8%	56.9%	58.3%	59.5%	57.0%	57.6%	58.3%	59.6%	59.9%	60.3%
Debt-to-capital	Firm's capital made up of debt	41.4%	48.3%	50.3%	55.6%	53.1%	53.8%	54.6%	55.3%	55.8%	56.2%	56.5%	56.9%	57.2%	57.5%
Debt-to-equity (x)	Amount of debt compared to the amount of equity	0.7	0.9	1.0	1.3	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4
Interest coverage (x)	How can the company pay its interest expenses	8.0	10.8	13.0	9.5	8.1	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.8
Fixed charge coverage (x)	How can the company pay its interest expenses and fixed charges such as leases	2.8	3.5	4.4	3.3	3.5	3.8	4.4	4.8	2.6	2.7	2.8	3.2	3.2	3.2
Debt to EBIDTA (x)	Financial Leverage	3.3	2.6	2.0	3.3	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.8	2.8	2.8
Equity Multiplier (x)	How is the company financing its assets via equity	1.7	1.9	1.9	2.2	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2
Valuation	**Investors's return**														
Economic Value Added ($M)	Its aims to measure the profitability of projects	5336	7569	9556	6990	7132	7218	7609	8231	8621	9085	9602	10090	10623	11182
Debt Coverage (%)	How the company pays its debt obligations with its operating income	**29%**	**37%**	**48%**	**29%**	**32%**	**32%**	**32%**	**33%**	**33%**	**33%**	**34%**	**34%**	**34%**	**35%**
Growth Ratios															
Sales Growth (%)			5.4%	10.7%	2.5%	5.5%	6.8%	7.6%	6.6%	6.0%	5.9%	5.8%	5.7%	5.6%	5.6%
Operating Income Growth (%)			41.8%	26.3%	-26.9%	2.0%	1.2%	5.4%	8.2%	4.7%	5.4%	5.7%	5.1%	5.3%	5.3%
EBITDA Growth			30.4%	36.7%	-28.0%	2.9%	5.4%	7.5%	6.8%	6.1%	5.9%	5.8%	5.7%	5.7%	5.6%
Net Income Growth			156.1%	57.9%	-27.6%	1.0%	5.4%	6.1%	5.3%	5.0%	5.0%	4.9%	4.9%	4.9%	4.8%
EPS Growth (%)			165.9%	64.1%	-27.3%	1.0%	5.4%	6.1%	5.3%	5.0%	5.0%	4.9%	4.9%	4.9%	4.8%
Working Caoital Growth (%)			-14.7%	-60.8%	52.1%	78.3%	6.8%	7.6%	6.6%	6.0%	5.9%	5.8%	5.7%	5.6%	5.6%

Appendix 15: Forecasting Assumptions – Revenues

	Notes	Source/Rational
SALES	Total Sales are expected to reach a value between 51.8 and 53.8 billion dollars according to the board. Covid 19 slowed down sales, so it is wise to project a number closer to 51.8 billion dollars, and also look back at 2019 to verify the pattern before the pandemic. This covid 19 impact on the company's 2020 revenue is well documented in the annual report. The $1.7Bn deviation in 2020 is not expected to happen as covid programs were cancelled in 2021, which will stabilize the forecasts. However, projection will not be close to 53.8Bn for FY2021, due to this event and market conditions. The final total sales are computed by summing the two major segments.	MarketLine, Statista and IMF
Global Pharmaceutical market value		MarketLine Forecast
Merck Pharmaceutical Sales	Merck's market share has been increasing for the past 3/4 years, and the recent developments and agreements on products like Keytruda, Lynoarza and Lenvim can confer a comfortable position for the next 5 years. YoY is based on historical values	YoY historical average
Global Animal Health Sales		Statista and IMF (Inflation forecast)
Merck Animal Health Sales	As stated in Total Sales, revenues slowed down in 2020 due to covid, but they are expected to increase in the future, due to Merck's leading position in the market and due to the 17 new product approvals in 2020. This, aligned with the 4 key development business transactions, will mostly likely result in a bounce back from the company in 2021 onwards. The board has also stated this segment has been outperforming all expectations. Based on this, it can be expected a growth of 0.4% YoY that will allow the company to get back to a 12% market share. This is also aligned with the pre-pandemic growth.	YoY historical value before the pandemic

Appendix 16: Revenues Forecasts – Global Pharmaceutical and Animal Health market value

($ in millions)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Global pharmaceuticals market value	1067800	1086600	1113200	1150000	1191500	1228198	1265658	1303628	1342737	1383019	1424510
YoY	0.97%	1.76%	2.45%	3.31%	3.61%	3.08%	3.05%	3%	3%	3%	3%

($ in millions)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Global Animal Health market value	42700	48000	54100	61000	62891	64828	66805	68809	70874	73000	75190
YoY	12.37%	12.41%	12.71%	12.75%	3.10%	3.08%	3.05%	3.00%	3.00%	3.00%	3.00%

Source: Statista, Statista and IMF (Global Inflation)

Appendix 17: Revenues Forecasts –Merck

($ in millions)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Total Sales	47994	50648	54090	58198	62036	65778	69671	73704	77917	82316	86909
Pharmaceutical	**43021**	**45169**	**47699**	**50747**	**54103**	**57341**	**60709**	**64199**	**67843**	**71648**	**75620**
%Market value	4.029%	4.157%	4.285%	4.413%	4.541%	4.669%	4.797%	4.925%	5.053%	5.181%	5.308%
YoY	0.081%	0.128%	0.128%	0.128%	0.128%	0.128%	0.128%	0.128%	0.128%	0.128%	0.128%
Animal Health	**4703**	**5479**	**6391**	**7451**	**7933**	**8437**	**8961**	**9505**	**10074**	**10668**	**11289**
%Market value	11.01%	11.414%	11.814%	12.214%	12.614%	13.014%	13.414%	13.814%	14.214%	14.614%	15.014%
YoY	-0.55%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%	0.40%

Appendix 18: Forecasting Assumptions – Reformulated Income Statement

	Notes	Source/Rational
Cost of Sales	Cost of sales reached 32.26% of total Revenues in FY2020, representing the highest value of all three previous years. Due to the historical data, industry dynamics and prospects, this high percentage will be stabilized for the forecasted period 2021YE-2030F.	FY2020 constant (% of revenues)
Selling, general and administrative	FY2019 and FY2020 decreased the expenditure on SGA in percentage of revenues, due to a need to allocate funds to research and innovative programs. For this reason, the historical average of SGA in percentage of revenues in 2019-2020 period will be stabilized for the forecasted period 2021YE-2030F.	Historical average data FY2019-FY2020 (% of Revenues)
Research and Development	Following the same rational of SGA, R&D gain importance for the future. Covid-19 increased this expenditure to a 28.25% of revenues, which is stabilized for the forecasted period 2021YE-2030F due to the increasing important of this variable in Merck's performance. Stabilizing this value is reasonable since the YoY % change between FY2019 and FY2020 accounted for 37.34%, an unusual growth mostly due to the pandemic impact on the company's strategic approach.	FY2020 constant (% of Revenues)
Restructuring costs	Accounting for only 1% to 2% of total revenues, historical average data of 1.50%/Revenues is used to forecast the 2021YE-2030F period.	Historical average data FY2017-FY2020 (% of Revenues)
Depreciation and amortization	(Check Forecast of PP&E and CapEx sheet) - Historical average data of percentage of Net PP&E from the previous FY plus other intangibles from the previous FY is stabilized to forecast the 2021YE-2030F period.	% Of net PP&E (t-1) + Other Intangibles (t-1)
Operating taxes	(Check Tax Reconciliation in Adjustments Sheet) - Computed based on the Marginal Tax rate of 22.55% to reach the portion of taxes related to operating activities	
Increase (decrease) in deferred taxes	(Check Deferred Taxes in Adjustments Sheet) - Operating deferred taxes	
Nonoperating Result Before Taxes	The nonoperating activities are considered constant.	
Nonoperating taxes	(Check Deferred Taxes in Adjustments Sheet) - Reported Taxes	
NPLAT		
Interest Expense		% Of net Debt (t-1)
Tax shield		
Financial Result		
Noncontrolling interests		Historical average data FY2017-FY2020 (% of Revenues)
Total Comprehensive Income		
Net Income		
Shares Outstanding	Assumed to be constant for the next years.	FY2020 constant (#M)
EPS		

Appendix 19: Forecasting Assumptions – Reformulated Balance Sheet

	Notes	Source/Rational
Operating cash	Estimated at 2% of the total revenues as the different literature suggest for operating cash computation.	McKinsey's 7th edition guide to corporate valuation "Measuring and Managing the Value of Companies" (% of Revenues)
Accounts receivable, net	FY2020 accounted for 60 average days receivable.	FY2020 constant average number of days receivable (#Days)
Inventories, net	Historical average number of inventory days in FY2017-FY2020 accounted for 47 days.	Historical average number of inventory days (#Days)
Other current assets	Historical average of other current assets in proportion of total revenues in FY2017-FY2020 accounted for 10.51%.	% of Revenues
Payables	Covid-19 may have delayed certain payments to suppliers and other entities. For this reason, only the historical average of days payable from FY2017 to FY2019 are considered. This number accounted for 29 days.	Historical average number of days payable FY2017-FY2019 (#Days)
Accrued and other current liabilities	Historical average number of accrued and other liabilities days in FY2017-FY2020 accounted for 95 days.	Historical average number of accrued and other liabilities days FY2017-FY2019 (#Days)
Income Taxes payable	Historical average number of income taxes payable days in FY2017-FY2020 accounted for 10 days.	Historical average number of income taxes payable days FY2017-FY2019 (#Days)
Property, plant and equipment, net	Historical data average from FY2017-FY2020 resulted in a 33% of Total Revenues	Historical average data FY2017-FY2020 (% of Revenues)
Other Intangibles	FY2020 was excluded from the historical data average due to the 212.79% YoY increase when compared to FY2019. The average accounted for 2.56%/Total Revenues	Historical average data FY2017-FY2019 (% of Revenues)
Acquired Intangibles	Historical data average from FY2017-FY2020 resulted in a 28.16% of Total Revenues	Historical average data FY2017-FY2020 (% of Revenues)
Other Assets, net	Historical data average from FY2017-FY2020 resulted in a 12.33% of Total Revenues	Historical average data FY2017-FY2020 (% of Revenues)
Capitalized Operating Leases	Since the December 2019, accounting standards require companies to incorporate their capitalized operating leases in the balance sheet. Based on the weighted-average discount rate of operating leases and weighted average remaining lease term (8 years in this case) included in financial reports, it is possible to estimate the value of leases obligations and rent expense under operating leases.	Merck's Financial Reports
Goodwill	It is not possible to estimate the goodwill, so it assumed equal to FY2020.	FY2020 constant ($M)
Investments	It is not possible to estimate future nonoperating investments, so it assumed equal to FY2020.	FY2020 constant ($M)
Nonoperating deferred tax assets, net	(Check Deferred Taxes in Adjustments Sheet) - Nonoperating deferred tax assets	
Excess Cash	Difference between cash & cash equivalents/ short term investments and operating cash for the historical years FY2017-FY2020. Forecasted years 2021YE-2030F is computed using the historical average percentage of Excess cash in terms of Net Debt, which is 36.41%	Historical average data FY2017-FY2020 (% of Net Debt)
Dividends payable	It is not possible to predict, so it is assumed as $1675M (Similar to the previous Fiscal Year)	
Operating DTLs, net of Operating DTAs	(Check Deferred Taxes in Adjustments Sheet) - Operating Deferred Tax Assets and Liabilities	
Total Merck & Co., Inc. stockholders' equity	Computation based on the addition of transactions made to shareholders, the payout ratio and the total comprehensive income.	
% Payout Ratio	FY2018 accounted for an excessive payout ratio of 230%, follow by a ratio of 109% in FY2019 and FY2020. A payout ratio of 90% is assumed in the forecasted period 2021YE-2030F following the approvals of sustainable payment programs to shareholders.	Adjusted to 90%
Non-controlling interests	Assumed to represent the same weight in terms of total revenues as the one experienced in FY2020	FY2020 constant (% of Revenues)

Appendix 20: Forecasting Assumptions – Operating and Non-Operating Reformulation

Operating Assets (OA)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Operating cash	960	1013	1082	1164	1241	1316	1393	1474	1558	1646	1738
Accounts receivable, net	7851	8285	8848	9520	10148	10760	11397	12057	12746	13466	14217
Inventories, net	6310	6518	6961	7489	7983	8465	8966	9485	10027	10593	11184
Other current assets	5541	5322	5684	6115	6519	6912	7321	7745	8187	8650	9132
Property, plant and equipment, net	17986	16719	17855	19211	20478	21713	22998	24330	25721	27173	28689
Other Intangibles	3228	1299	1387	1493	1591	1687	1787	1890	1999	2111	2229
Acquired Intangibles	11376	14263	15233	16390	17471	18524	19621	20757	21943	23182	24475
Other Assets	9317	6247	6672	7179	7652	8114	8594	9091	9611	10154	10720
Capitalized Operating Leases	2196	1810	1647	1222	1059	4346	4346	4346	3475	3671	3876
Goodwill	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238
Total Operating Assets	85003	81715	85607	90021	94380	102075	106661	111413	115504	120883	126499

Operating Liabilities (OL)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Payables	4594	3977	4247	4570	4871	5165	5471	5787	6118	6464	6824
Accrued and other current liabilities	13053	13166	14060	15128	16126	17099	18111	19159	20254	21398	22591
Income Tax payable	1575	1428	1525	1641	1749	1855	1964	2078	2197	2321	2450
Other Liabilities	12482	12495	13344	14357	15304	16227	17188	18183	19222	20307	21440
Total Operating Liabilities	31704	31065	33177	35696	38051	40345	42733	45207	47791	50489	53307
Net Operating Assets - Invested Capital Core Business	**53299**	**50649**	**52430**	**54325**	**56329**	**61730**	**63928**	**66206**	**67713**	**70394**	**73192**

Invested Capital (Non-Core Business)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Investments	785	785	785	785	785	785	785	785	785	785	785
Nonoperating deferred tax assets, net	1868	1576	1683	1811	1930	2047	2168	2294	2425	2562	2705
Total Invested Capital Non-Core Business	2653	2361	2468	2596	2715	2832	2953	3079	3210	3347	3490

Net Financial Assets (NFA)	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Excess Cash	7102	7889	8332	8862	9374	9825	10289	10776	11276	11796	12339
Short-term Debt	-6431										
Long-term Debt, net	-25360										
Total Debt	-31791	-29558	-31217	-33202	-35120	-36811	-38551	-40376	-42247	-44196	-46229
Capitalized Operating Leases	-2196	-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	-3876
Dividends payable	-1674	-1675	-1675	-1675	-1675	-1675	-1675	-1675	-1675	-1675	-1675
Operating DTLs, net of Operating DTAs	-1989	-1777	-1898	-2130	-2208	-2353	-2507	-2637	-2793	-2953	-3114
Total Financial Assets	-30548	-26931	-28105	-29368	-30689	-35360	-36790	-38259	-38914	-40699	-42556
Total Common's Shareholder Equity	**25404**	**26079**	**26793**	**27553**	**28356**	**29201**	**30091**	**31026**	**32008**	**33041**	**34126**

Total Invested Capital	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F

Invested Capital Core Business	**53299**	**50649**	**52430**	**54325**	**56329**	**61730**	**63928**	**66206**	**67713**	**70394**	**73192**
Invested Capital Core Business (excluding Goodwill)	**33061**	**30411**	**32192**	**34087**	**36091**	**41492**	**43690**	**45968**	**47475**	**50156**	**52954**
Property, plant and equipment, net	17986	16719	17855	19211	20478	21713	22998	24330	25721	27173	28689
Working Capital	1440	2567	2741	2950	3144	3334	3531	3736	3949	4172	4405
Capitalized Operating Leases	2196	1810	1647	1222	1059	4346	4346	4346	3475	3671	3876
Goodwill	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238	20238
Other Intangibles	14604	15562	16620	17882	19062	20212	21408	22647	23942	25293	26705
Other Assets, net	-3165	-6247	-6672	-7179	-7652	-8114	-8594	-9091	-9611	-10154	-10720
Invested Capital Non Core Business	**2653**	**2361**	**2468**	**2596**	**2715**	**2832**	**2953**	**3079**	**3210**	**3347**	**3490**
Total Invested Capital	**55952**	**53011**	**54898**	**56921**	**59045**	**64561**	**66881**	**69284**	**70923**	**73740**	**76682**
Net Financial Assets	**-30548**	**-26931**	**-28105**	**-29368**	**-30689**	**-35360**	**-36790**	**-38259**	**-38914**	**-40699**	**-42556**
Total Equity	**25404**	**26079**	**26793**	**27553**	**28356**	**29201**	**30091**	**31026**	**32008**	**33041**	**34126**

Appendix 21: Forecast of PP&E and CapEx

	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Land	350	400	427	460	490	519	550	582	615	650	686
% of Revenues	**0.73%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**	**0.79%**
Buildings	12645	13716	14648	15761	16800	17814	18868	19960	21101	22292	23536
% of Revenues	**26.35%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**	**27.08%**
Machinery, equipment and office furnishings	16649	17500	18690	20109	21435	22728	24073	25467	26922	28442	30029
% of Revenues	**34.69%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**	**34.55%**
Construction in progress	7324	5018	5359	5766	6146	6517	6903	7302	7720	8156	8611
% of Revenues	**15.26%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**	**9.91%**
PP&E	36968	36634	39124	42095	44872	47578	50394	53311	56358	59540	62862
% of revenues	**77.03%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**	**72.33%**
Less: accumulated depreciation	18982	19934	21289	22906	24417	25889	27421	29009	30667	32398	34206
% of Net PP&E	**51.35%**	**54%**	**54%**	**54%**	**54%**	**54%**	**54%**	**54%**	**54%**	**54%**	**54%**
Net PP&E	17986	16719	17855	19211	20478	21713	22998	24330	25721	27173	28689
	37.48%	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**	**33.01%**
Acquired Intangibles	11376	14263	15233	16390	17471	18524	19621	20757	21943	23182	24475
% of revenues	**23.70%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**	**28.16%**
Other Intangibles (IPR&D)	3228	1299	1387	1493	1591	1687	1787	1890	1999	2111	2229
% of revenues	**6.73%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**	**2.56%**
Depreciation and amortization	1602	1802	1785	1907	2051	2187	2319	2456	2598	2746	2902
% of Net PP&E (t-1) + Other Intangibles (t-1)	**5.48%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**	**5.53%**
Net Capex change	-4943	-1494	-3980	-4525	-4498	-4571	-4800	-5027	-5283	-5550	-5829
% of revenues	**10.55%**	**3.11%**	**7.86%**	**8.36%**	**7.73%**	**7.37%**	**7.30%**	**7.21%**	**7.17%**	**7.12%**	**7.08%**

Appendix 22: Beta Regression

Company Name	Ticker	Market Cap (Equity Value)	Net Debt	Levered Beta	D/E	Unlevered Beta	Relevered Beta
Merck Sharp and Dohme	MRK	185246	24689	0.69	13.3%	0.62	0.71
Abbvie Inc	ABBV	188169	78523	0.81	41.7%	0.61	0.85
Eli Lilly and Co	LLY	222969	13429	0.73	6.0%	0.70	0.67
Pfizer Inc	PFIZ	250675	37328	0.71	14.9%	0.64	0.71
Bristol-Myers Squibb Co	BMY	138016	37977	0.67	27.5%	0.55	0.78
Amgen Inc	AMGN	123065	27228	0.83	22.1%	0.71	0.75
Johnson & Johnson	JNJ	433833	22933	0.68	5.3%	0.65	0.67
Corporate Tax Rate	21%				Average	0.64	0.73
					Median	0.64	0.71

AstraZeneca was removed due to its headquarters being in Europe

1Y Beta		
	Merck	0.70
	Abbvie	0.71
	Eli Lilly	0.73
	Pfizer	0.68
	Bristol-Myers	0.62
	Amgen	0.80
	Johnson & Johnson	0.68

3Y Beta		
	Merck	0.69
	Abbvie	0.81
	Eli Lilly	0.73
	Pfizer	0.71
	Bristol-Myers	0.67
	Amgen	0.83
	Johnson & Johnson	0.68

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.66460226
R Square	0.44169617
Adjusted R Square	0.44095669
Standard Error	0.01137358
Observations	757

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.077266993	0.077266993	597.3102567	1.21114E-97
Residual	755	0.097665458	0.000129358		
Total	756	0.174932452			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.00033977	0.000413671	0.821364251	0.411698101	-0.000472307	0.001151856	-0.000472307	0.001151856
X Variable 1	0.68820033	0.028158848	24.4399316	1.21114E-97	0.632921384	0.743479276	0.632921384	0.743479276

Appendix 23: Capital Structure

Merck's Bond Rating	2020	Source
Moody's	A1	Moody's
S&P Global	A+	S&P Global

(in millions of dollars)	Dec-20	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Price Per Share	77.90										
Shares Outstanding	2538										
Market Cap	**197738**	**205488**	**210566**	**215644**	**220515**	**228265**	**233161**	**237907**	**241773**	**246388**	**250837**
Net Debt	24689	21669	22885	24340	25747	26986	28262	29600	30972	32400	33891
Operating. Leases	2196	1810	1647	1222	1059	4346	4346	4346	3475	3671	3876
Total Debt	26885	23479	24532	25563	26805	31333	32608	33946	34447	36071	37767
EV	**224623**	**233509**	**239279**	**245050**	**250585**	**259392**	**264956**	**270349**	**274742**	**279986**	**285042**
E/EV	88.03%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%
ND/EV	10.99%	11%	11%	12%	12%	10%	10%	10%	11%	11%	11%
OL/EV	0.98%	0.78%	0.69%	0.50%	0.42%	1.68%	1.64%	1.61%	1.26%	1.31%	1.36%
TD/EV	11.97%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
bu		0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
be		0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Re		5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%
Rd		1.34%	1.34%	1.34%	1.34%	1.34%	1.34%	1.34%	1.34%	1.34%	1.34%
RoI		1.39%	1.39%	1.39%	1.39%	1.39%	1.39%	1.39%	1.39%	1.39%	1.39%
WACC t		**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**	**4.80%**
Ru t		**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**	**4.84%**

Rf	**1.32%**	Bloomberg US 10y Bonds
MRP	**5.50%**	Fernandez - USA
Relevered Equity Beta	**0.73**	
Forward Looking Cost of Equity	**5.31%**	

Rd	**1.34%**	
YTM Merck & Co Corporate Bond	1.45%	(2030, $750 millions) - Merck's Annual Report - Notes
Loss Given Default	68.18%	moody's default report 28-feb-2020, exhibit 29 (sr. Unsec. Bond)
Probability of Default	0.16%	Annualized A1 probability of default moody's 2020 report, exhibit 46
implied bd	0.003	

RoI	**1.387%**	*yield of AA-rated debt using 10Y period*
YTM	1.45%	*AA ytm 10 years bloomberg 31/12/2020*
Loss Given Default	40.24%	*moody's default report 28-feb-2020, exhibit 29 (1st Linen, sem. Sec. Bond)*
Probability of Default	0.16%	*Annualized A1 probability of default moody's 2020 report, exhibit 46*
implied bol	0.012	

Bu	**0.64**
Ru	4.84%
TD/EV (new)	12%
E/EV (new)	88%

Appendix 24: Historical Growth Rate – Peers

Revenues	2008	2014	2015	2016	2017	2018	2019	2020
MRK	23850.3	42237	39498	39807	40122	42294	46840	47994
ABBV	14179	19960	22859	25638	28216	32753	33266	45804
LLY	20371.9	19615.6	19958.7	21222.1	22871.3	24555.7	22319.5	24539.8
PFIZ	48296	49605	48851	52824	52546	53647	51750	41908
BMY	17715	15879	16560	19427	20776	22561	26145	42518
AMGN	15003	20063	21662	22991	22849	23747	23362	25424
JNJ	63747	74331	70074	71890	76450	81581	82059	82584

Growth Rate	2008	2014	2015	2016	2017	2018	2019	2020
MRK		-4.08%	-6.48%	0.78%	0.79%	5.41%	10.75%	2.46%
ABBV		6.23%	14.52%	12.16%	10.06%	16.08%	1.57%	37.69%
LLY		-15.13%	1.75%	6.33%	7.77%	7.36%	-9.11%	9.95%
PFIZ		-3.84%	-1.52%	8.13%	-0.53%	2.10%	-3.54%	-19.02%
BMY		-3.09%	4.29%	17.31%	6.94%	8.59%	15.89%	62.62%
AMGN		7.43%	7.97%	6.14%	-0.62%	3.93%	-1.62%	8.83%
JNJ		4.23%	-5.73%	2.59%	6.34%	6.71%	0.59%	0.64%
Average		-1.18%	2.11%	7.63%	4.39%	7.17%	2.07%	14.74%

Historical Growth Rate 5Y	6.35%

Appendix 39: Long-term Growth Rate (2022-2060), extracted from OECD Dataset

Weigth	
USA	61%
Euro Area	39%

Average Growth Rate (USA)	1.89%
Average Growth Rate (Euro Area)	1.67%
Weighted Average Long-term Growth Rate (real)	**1.81%**

Average Inflation Rate (USA)	**2.03%**
Average Inflation Rate (Euro Area)	2.02%
Long-term Growth Rate (nominal)	**3.87%**

Appendix 25: DCF Model

DCF	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF		9781	5437	5714	6227	3220	6887	7324	8583	7942	8383
WACC		4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%	4.8%
g											1.8%
Operating Enterprise Value		233509	239279	245050	250585	259392	264956	270349	274742	279986	
Net Debt		21669	22885	24340	25747	26986	28262	29600	30972	32400	
Operating Leases		1810	1647	1222	1059	4346	4346	4346	3475	3671	
(+) Operating EV		233509	239279	245050	250585	259392	264956	270349	274742	279986	
(-) Net Debt		-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
(-) Operating Leases		-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
(-) Non-Core Invested Capital		-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
(-) Non-Controlling Interests		-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value		**207579**	**212187**	**216797**	**220967**	**225128**	**229292**	**233217**	**236976**	**240455**	
#Shares		2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price Target		$81.78	**$83.59**	$85.41	$87.05	$88.69	$90.33	$91.88	$93.36	$94.73	
15th September			$72.81								
Upside/downside potential			***14.81%***								
Recommendation			**BUY**								

Appendix 26: APV Model

APV	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Unlevered FCFF		9781	5437	5714	6227	3220	6887	7324	8583	7942	8383
Ru		4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%
g											1.81%
Operating Enterprise Value		230612	236328	242043	247521	256271	261778	267113	271448	276633	
Tax Shield		223	236	251	266	278	291	305	319	334	350
Ru		4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%	4.84%
Value of Tax Shields		9737	9972	10203	10431	10658	10882	11102	11320	11533	
Net Debt		-21669	-22885	-24340	-25747	-26986	-28262	-29600	-30972	-32400	
Operating Leases		-1810	-1647	-1222	-1059	-4346	-4346	-4346	-3475	-3671	
Non-core Invested capital		-2361	-2468	-2596	-2715	-2832	-2953	-3079	-3210	-3347	
Non-controlling interests		-89	-92	-94	-97	-100	-103	-106	-110	-113	
Equity Value		**214509**	**219300**	**224088**	**228432**	**232764**	**237098**	**241191**	**245112**	**248748**	
Shares Outstanding (in millions)		2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price Target		$84.51	**$86.39**	$88.28	$89.99	$91.70	$93.41	$95.02	$96.56	$98.00	
15th September			$72.81								
Upside/downside potential			**18.66%**								
Recommendation			**BUY**								

Appendix 27: Flow-to-Equity Model

Flow-to-Equity	2020	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Net Income		7155	7540	7998	8425	8846	9284	9738	10212	10708	11226
Depreciation		952	1355	1617	1511	1473	1532	1587	1658	1731	1808
Gross Cash Flow		8107	8895	9615	9936	10319	10816	11325	11871	12440	13034
(-) Changes in operating working capital		1127	174	208	195	190	197	204	214	223	233
(-) CAPEX, net		-1494	-3980	-4525	-4498	-4571	-4800	-5027	-5283	-5550	-5829
(+) Changes in Debt		-2233	1659	1985	1918	1691	1740	1825	1871	1949	2033
FCFE		3254	6400	6867	7162	7249	7559	7920	8245	8615	9005
Re		5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%	5.31%
g											1.81%
Equity Value		**217096**	**222230**	**227169**	**232077**	**237157**	**242196**	**247142**	**252026**	**256799**	
Shares Outstanding (in millions)		2538	2538	2538	2538	2538	2538	2538	2538	2538	
Price Target			**$87.55**								
15th September			$72.81								
Upside/downside potential			**20.24%**								
Recommendation			**BUY**								

Appendix 28: Risk Matrix

RISK	LIKELIHOOD (1-5)	CONSEQUENCE (A-E)	RISK RATING	Breakdown	ACTION
Patent Expiration	5	C	**5C**	Patents can create the ilusion of safety due to their conditions, but governments, third parties can seek to invalidate or circumvent them. There's also a risk associate with the expiration date and its respective renewance, as competitors will most likely try to steal it. Recently, Merck granted a patent in 2019 to create crypto-objects on artifical intelligence, which will mitigate the supply chain risk, and has also put an end to a dispute against Pfizer over a pneumococcal vaccine patent.	Invest more in R&D. New Jersey, California, Massachussetts, Nebraska, Pennsylvania, Switzerland and China are the current R&D facilities, that can expand the patent portfolio.
Pricing Pressure	4	C	**4C**	Pricing pressure is one of the biggest concerns for Merck and the increasing demand, aging of global population have been challenging all companies. These pressures are further compounded by controversies and political debates. Governments and international markets have been acting towards a reduction of prices in generics and patented drugs. This was boosted by the U.S recent health care system reform and third-parties pressure to reduce prices, which have been negatively impacting Merck's revenues.	
R&D	5	D	**5E**	R&D is by far the most important activity for a company like Meck, where sustainable growth and new medical developments play a massive role in future earnings. Having said that, this comes with a expensive cost and risk, due to the uncertainty and time to develop and start a R&D program. Success in R&D can result in an increase of market share, revenues and product portfolio.	It has hard and complex to present a solution to mitigate R&D risks, as they will always exist.
Covid-19	2	B	**2B**	Despite the intends of Merck to desinvest in Covid-19 programs, the company is still involved in a lot of agreements related to the pandemic. This agreements are more connected to the treatment of the disease, and do not represent a high risk. Companies like Pfizer, J&J and Moderna encountered major risks regarding this matter, due to the huge committments and investments made, which was way bigger than Merck.	Although the return will be lower than most of its competitors, Merck has mitigated this risk by not being so much involved.
Exchange Rates	5	B	**5C**	This is na external factor that can damage Merck's reported sales, costs and earnings, and even the value of assets, liabilities and cash flows.	Hedging strategies are crucial - Merck spends a reasonable amount on this type of strategies to mitigate this risk.
Legislation/ Rules	5	A	**5A**	Laws and health legislation needs to be complied with. They can be comlex, intensive, extensive and volatile, but Merck needs to comply with them in order to prevent fees, delays in production and future restrictions.	Respect and follow the rules depending on the country/continent the company is operating.
Growing competitors	4	D	**4D**	The large size of the industry means competitive peers, and it also means that every move is being followed by every major player. This also means that Merck can incurr in huge losses in terms of market share if the company misses an opportunity.	Invest more in R&D. New Jersey, California, Massachussetts, Nebraska, Pennsylvania, Switzerland and China are the current R&D facilities, that can expand the patent portfolio.
Fraud	3	D	**3D**	This is a concept that can be misunderstood and mixed with the legislation risk. Even though they are similar, here the risk is about the trend in the pharmaceutical industry of making fraudulent actions in order to achieve results faster, which have been damaging humam lives. There are a lot of recent cases involving the big pharma companies related to this type of fraud. Lawsuits and huge fees can be applied to this type of behaviour.	Respect and follow the rules depending on the country/continent the company is operating.
Counterfeit Products	2	C	**2C**	The presence of falsified medicines is growing, and patients are being threatened. Reports of adverse events can severely damage the company.	Diversify the supply chain.
Supply chain	3	A	**3A**	The Covid-19 pandemy has proved that external factors can damage the supply chains. Merck operates in more than 140 countries, and events like this can seriously affect the suppliers.	
Complex manufacture of products	1	E	**1E**	The complexity and dependency on sophisticated softwares and infrastructures can sometimes disrupt Merck's operations and cause delays in the process as a whole.	Invest more in R&D. New Jersey, California, Massachussetts, Nebraska, Pennsylvania, Switzerland and China are the current R&D facilities, that can expand the patent portfolio.

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Recommendation System

Level of Risk	SELL	REDUCE	HOLD/NEUTRAL	BUY	STRONG BUY
High Risk	0%≤	>0% & ≤10%	>10% & ≤20%	>20% & ≤45%	>45%
Medium Risk	-5%≤	>-5% & ≤5%	>5% & ≤15%	>15% & ≤30%	>30%
Low Risk	-10%≤	>-10% & ≤0%	>0% & ≤10%	>10% & ≤20%	>20%