

Risks Analysis and Development Prediction in Pharmaceutical Industry: A Case Study of Johnson and Johnson, Pfizer and Roche

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Abstract: Pharmaceutical innovations, including drugs and vaccines, consistently remain a top priority in development and research efforts. The COVID-19 pandemic has further emphasized the significance of drug research and development, prompting a growing number of nations to invest in this field. Governments have increased funding and introduced various incentive policies to stimulate innovation, bolstering the expansion of the pharmaceutical market. As a result, the pharmaceutical sector has evolved into a fundamental economic pillar, closely linked to economic growth, healthcare standards, and the overall well-being of the population. Consequently, economists and investors now pay greater attention to the industry than ever before. Despite the heightened focus on pharmaceuticals, the sector is not without its challenges, with numerous risks presenting obstacles for many companies. Identifying and understanding these risks, developing strategies to overcome them, and determining methods to maintain competitiveness and market share in the future is crucial for the continued success of these enterprises. This paper will focus on the WACC calculation to reckon the risks for Johnson and Johnson, Pfizer, and Roche as examples of pharmaceutical companies, put them down to contrast and predict the development. It shows that Johnson and Johnson owns the highest WACC, while Roche owns the lowest.

Keywords: pharmaceutical industry, innovative drugs, vaccines, COVID-19 pandemic

1. Introduction

1.1. Background

Innovative drugs and vaccines are always a major development and research focus. Especially after the global crisis caused by the COVID-19 pandemic, more and more countries attached more importance to drug research and development. Governments also allocated more money and issued a series of preferential policies to pharmaceutical enterprises to encourage research and develop innovation and expand the pharmaceutical market. Nowadays pharmaceutical industry has become a pillar of the economy and it is increasingly linked to economic development, medical standards, people's physical and mental health, etc, so economists and investors are paying attention to the pharmaceutical industry much more than before. However, the pharmaceutical industry is not plain

sailing as expected, and many enterprises face numerous risks and challenges. What are these risks? How could pharmaceutical companies overcome them? What may these enterprises do in the future to remain competitive and their positions in the market? The discussion of these issues will make a lot of sense.

1.2. Related research

Yadav et al. analyzed whether Johnson and Johnson's vaccines should be given through case studies of patient responses and outcomes after vaccination. The authors found that more and more people had rare adverse reactions to the vaccine. While considering the rarity of adverse reactions and the threat of COVID-19, vaccination still needs to be supported [1]. Jia et al. explore the interplay between Johnson and Johnson and its COVID-19 vaccine development. The authors utilized data such as cash flows, and stock prices from financial statements to assess the accounting outcomes of Johnson and Johnson's COVID-19 creation and used share price data to evaluate the market's response to the development of Johnson and Johnson's COVID-19 vaccine and the progress of clinical trials [2].

Thron et al. analyzed how Pfizer and Biontech collaborate and innovate to develop the first COVID-19 vaccine. The authors found that when Pfizer and facing COVID-19, it utilized years of experience and expertise, cooperated immediately with its suppliers, and accelerated the pace of research and development while ensuring the quality and safety of its vaccines. Pfizer made great efforts in response to the global crisis and gained huge profits at the same time [3]. Karicia Quiroz analyzed whether prioritizing product acquisitions over research and development as a strategy for increasing revenue is useful and implemented by Pfizer. The author found that Pfizer has experienced financial losses in two of its previous mergers motivated by a focus on obtaining existing products from targeting companies. Pfizer should have reduced its dependence on Allergan's product pipeline as its primary revenue source and modified its business approach to incorporate other methods, such as R&D, for innovation and creating future revenue streams [4].

Wuitschik et al. mainly studied Roche's green metrics when developing new drugs. The authors discovered that Roche used programs, and metrics and collected complete data to test and improve the drug sustainability. It used common metrics, PMI and other methods to implement green chemistry and contributed to global climate change [5]. Béraud et al. analyzed the talent management of Roche. The authors found that talent management emerged as a crucial distinguishing factor in the pharmaceutical industry and Roche had an excellent performance. It implemented a key talent retention strategy during the merger and negotiation period and a professional integration team theme completely. This strategy fully increases flexibility and efficiency, bringing new ways of thinking to Roche [6].

Demir and Min conducted in-depth research and analysis on CSR reports for the world's 15 biggest pharmaceutical enterprises. The authors highlighted the evolving nature of CSR reports and relevant discovery on a data basis. It was appealed that both managers, supervisors and researchers should pay more attention to the pharmaceutical industry [7]. Liza et al. analyzed the obstacles to sustainability supply chains the pharmaceutical industry had met during the COVID-19 period. The authors used the method of MICMAC and reachability matrix to test the degree of correlations between barriers like inadequate data, and disruption in sustainable procurement and gave relevant recommendations to solve these barriers [8].

Grinier and Brass introduced how to predict the sustainability of COVID-19 vaccines. The authors thought the prediction of the sustainability of the vaccines is challenging for pharmaceutical companies and then used phenomenological and mathematical models to calculate and evaluate the sustainability of vaccines which was beneficial and useful for pharmaceutical companies [9]. Sabat et al. analyzed the circular economy in the pharmaceutical industry. The authors found that green

information technology systems, internal environment management and other factors are vital in stimulating the development of a circular economy [10].

1.3. Objective

This paper will start with the introduction of WACC and the development environment based on COVID-19. Then, it will continue analyzing the risks of three outstanding companies in the pharmaceutical industry by calculating the WACC and other data and making a clear comparison. After that, some investment suggestions will be presented among the three companies. Finally, this paper will predict the future development prediction about the three companies. Through the methods above, it will place the hot topics of the pharmaceutical industry in the test of objective data.

2. Analysis method and development background

2.1. WACC

The weighted average cost of capital(WACC) is a method used to calculate the capital cost of investment projects in enterprise financial management. It considers the factors of different types of capital in the capital structure and reflects the overall financing cost of the enterprise, including both debt and equity. It is influenced by capital structure, cost of capital for each method of financing, tax policies and other factors. The following equation is the calculation method of WACC.

$$WACC = (1 - L) * RE + L * (1 - T) * RD \quad (1)$$

Taking the year 2022 as an example, it was estimated that the WACC of Johnson and Johnson was around 0.0619, the WACC of Pfizer was approximately 0.0595, WACC of Roche was about 0.0417. From the data, it can be easily seen that the WACC of Roche is the lowest, which demonstrates that the risk for Roche may be the lowest among these 3 companies and the firm value is the biggest when other factors remain the same and the pressure on generating profits was lower than other two companies. While the WACC of Johnson and Johnson was the highest, which means it had the highest cost of raising capital.

2.2. COVID-19

As a global crisis, COVID-19 has dealt a huge blow to the global pharmaceutical industry.

Firstly, COVID-19 had a huge impact on the companies supply chain, especially for some small and medium-sized enterprises. Shortage of drugs and the lack of capacity causes many enterprises on the verge of shutting down. This impact didn't get eliminated in the following years as much of the demands comes from vaccines and pharmaceutical companies needed their suppliers to invest and provide more.

Secondly, COVID-19 brought a negative effect on companies' financial conditions and growth rates. This is mainly due to most pharmaceutical companies sacrificing the production of other product lines to meet the demand for COVID-19 vaccines. Though some well-known companies such as Pfizer, Johnson and Johnson, and Moderna developed effective vaccines during the period, there were still numerous companies looking for solutions to treat COVID-19. This ultimately shifted the focus of the entire pharmaceutical industry from development projects and commercial drugs to COVID-19. Besides, grants that normally fund research and development projects then were used to fund manufacturing equipment and vaccine development.

Thirdly, COVID-19 resulted in staffing difficulties and increased scale of automation. The outbreak of COVID-19 prevented some staff from being on-site in factories and offices, which means sometimes some technical staff and employees can not communicate effectively and timely. This also led to increased demand and relevant investment in automation equipment. Moreover, to some extent, it increased the unemployed rate and some people were unable to find new jobs after COVID-19 gradually disappeared.

Finally, COVID-19 increased the pressure on CDMO and CRO companies. Affected by the delayed resumption of work and isolation, more and more companies intended to use outsourcing services. Projects unrelated to COVID-19 had also been delayed and canceled. This meant ill for certain service providers, especially those not involved in COVID-19 research and development or production.

3. Analysis of WACC

When calculating the WACC of these companies, several key factors should be considered and calculated first, including capital structure, risk-free rate, risk premium, equity beta, cost of equity, cost of debt, etc. Then the article mainly focuses on these factors for the three companies in 2022 and does the analysis below, as shown in Table 1.

Table 1: WACC Analysis.

2022	Johnson and Johnson	Pfizer	Roche
Leverage ratio(D/E)	10.28%	17.84%	14.80%
Equity beta	0.53	0.58	0.19
Risk-free rate	4.14%	4.14%	4.14%
Risk premium	4.35%	3.9%	3.5%
Cost of equity	6.45%	6.40%	4.81%
Cost of debt	5.00%	4.90%	4.80%
WACC	0.0619	0.0595	0.0466

3.1. Capital Structure

To determine the capital structure, the market value of value and debt of each company should be found to calculate the leverage ratio which equals the market value of debt divided by the sum of the market value of debt and equity. Among the three companies above, Pfizer had the highest leverage ratio, which means its capital structure had a larger proportion of debt.

3.2. Equity beta

Equity beta is a measure of a stock's sensitivity to changes in the market. Among the three companies, the equity beta of Pfizer was the highest, indicating that its stock was much more volatile than the market.

3.3. Risk-free rate

This article chooses the yield on the US 20-year treasury note as the risk-free rate which reached 4.14%.

3.4. Risk premium

The market risk premium is the additional return investors expect to receive for investing in the asset and is calculated by the difference between the expected return on the share market and the risk-free interest rate. Among these three companies, Johnson and Johnson had the highest risk premium, which means investors demanded a greater return for taking on additional risk.

3.5. Cost of equity

The cost of equity is the rate of return that an investor expects to earn from an investment in a company's stock. It takes into account the risk-free rate, equity beta and the market risk premium. It is calculated by the sum of the risk-free rate and equity beta multiply the market risk premium.

3.6. Cost of debt

The cost of debt is the interest rate that a company pays on its debt. It is the cost of borrowing money from lenders such as banks, bondholders, or other financial institutions. Among the three companies, Johnson and Johnson had the highest cost of debt, which means it had to pay a higher interest rate on its debt. This could be problematic for the company as it would reduce the profit and had difficulty securing additional funding in the future.

Based on the data table and analysis, the WACC of Roche was the lowest among these companies and the WACC of Johnson and Johnson reached the highest, which means that Roche had to pay relatively the least to raise capital, while Johnson and Johnson had to pay much more than other two companies.

4. Investment analysis

4.1. Main business and risks

All these three are the leading companies in the pharmaceutical industry. Their main business is similar, but Johnson and Johnson has a wider business scope. Johnson and Johnson mainly covers pharmaceuticals, medical devices and consumer healthcare. But Johnson and Johnson currently is heavily influenced by lawsuits. It was alleged that its baby powder and other talc products contain asbestos which could cause cancer. Although Johnson and Johnson denied that, it still caused lots of trouble and made Johnson and Johnson pay more than billions of fines. This leads to a higher risk premium and increases its risk to a large extent.

Pfizer is a relatively pure pharmaceutical company that is mainly engaged in the manufacturing and sales of biological and chemical drugs, innovative drugs, vaccines, etc. As the data table presents, Pfizer has the highest leverage ratio, as its main financing method is debt financing. It is adept at using financial leverage to bring economic benefits and satisfies its liquidity demand. In this way, Pfizer can invest more money into research and development of innovative drugs, and can effectively avoid the break in the funding chain in the face of innovation failure.

Roche is a Swiss pharmaceutical company focusing on the development, manufacturing and marketing of innovative medicines and diagnostic technologies. From the data table, it can be easily seen that Roche has a lower equity beta and risk premium, indicating that it has lower risks. Although these years Roche's three flagship cancer drugs are threatened by biosimilars and patent expires, it has handled these problems successfully and launched other new drugs such as Perjeta and Ocrevus to take the lead.

4.2. Investment recommendation

When making investment choices, multiple aspects should be considered and evaluated. Among these three companies, taking an investor's point of view, Johnson and Johnson may be the best choice. Although it has the highest WACC and risk premium among the three companies, its future development is still brighter. Johnson and Johnson has continuously been at the forefront of market capitalization and sales. In the first quarter of 2023, the revenue of Johnson and Johnson even reached around 24.75 billion dollars, exceeding over 6 billion dollars of Pfizer which took up the second place. Then when considering the dividend yield, Johnson and Johnson still occupies the first position. That means Johnson and Johnson has the strongest capacity to gain profits. Then when investing in Johnson and Johnson, shareholders can get the maximum earnings.

4.3. Future development forecast

For Johnson and Johnson, building better supply chains and strengthening the supervision of supply chains is vital to prevent the negative impact of supply chain disruption. Besides, Johnson and Johnson should proactively resolve the numerous claims and lawsuits, such as lawsuits arising out of the use of body powders containing talc, which request the company to pay significant amounts. It needs to continue to use digital technology, 3D printing and other technological fields to develop new products.

As for Pfizer, it ought to make efforts to respond to the influence of COVID-19, including plans and expectations regarding Comirnaty and Paxlovid, and any potential future vaccines or treatments, the revenue, demand, manufacturing and supply of Comirnaty and Paxlovid, including expectations for the commercial market for Comirnaty and Paxlovid as the durability of the COVID-19 pandemic cannot be predicted accurately. Moreover, the development of new drugs and vaccines is a long and uncertain process so Pfizer should continue to introduce more advanced technology and talents.

For Roche, it should actively deal with the threat posed by biosimilars. Roche should constantly increase investment in developing innovative drugs and push the development of Perjeta, Ocrevus, etc. Furthermore, in 2022, Roche failed in several trials, the most well-known of which was the determination of the trial for Alzheimer's treatment. It can deepen the industry-university-research cooperation and strengthen the introduction of personnel training to cope with trial failures.

Through the above measures, Johnson and Johnson, Pfizer and Roche may better develop in the future, consolidate and enhance the leading position in the global pharmaceutical industry.

5. Conclusion

This paper generally analyses the risks of Johnson and Johnson, Pfizer, and Roche by calculating the WACC of these three companies in 2022, puts forward the investment recommendation and predicts the future development of them. The calculation results show Johnson and Johnson has the largest WACC is 2022, while the figure for Pfizer ranked second place and Roche possessed the smallest.

Through the analysis, these three companies face some similar risks in some ways, such as legal matters, government regulation, collapse or failure of the collaboration with the third party, while they own some unique risks at the same time. For Johnson and Johnson, it faces lawsuits that cut down its profits and tarnish its reputation. As for Pfizer, its main business is around innovative drugs and vaccines, which may easily lead to failures in the process of development. For Roche, it has suffered from falling sales and decreasing profits from biosimilars.

In the future, Johnson and Johnson should address its lawsuits and claims properly, meanwhile, resolve the disputes of its subsidiaries. Pfizer may devote itself to coping with the impact of

COVID-19 and continuously introducing new talent pools and technology. Roche needs to protect the patents of its main drugs and promote the development of its new drugs. In these ways, three companies will continue to shine and stay on the throne in the pharmaceutical industry.

References

- [1] Rukesh Yadav, Sangam Shah, Santosh Chhetri (2022), ANCA-associated vasculitis following Johnson and Johnson COVID-19 vaccine, *Annals of Medicine and Surgery*, Volume 79, 104123, ISSN 2049-0801, <https://doi.org/10.1016/j.amsu.2022.104123>.
- [2] Jia, H., Jin, J.Y. and Lindsay, B. (2023), "Case analysis: Johnson & Johnson and the COVID-19 vaccine", *The CASE Journal*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/TCJ-06-2021-0089>
- [3] Chelsea R Thorn, Divya Sharma, Rodney Combs, Sonal Bhujbal, Jennifer Romine, Xiaolu Zheng, Khurram Sunasara, Advait Badkar (2022), The journey of a lifetime — development of Pfizer's COVID-19 vaccine, *Current Opinion in Biotechnology*, Volume 78, 102803, ISSN 0958-1669, <https://doi.org/10.1016/j.copbio.2022.102803>.
- [4] Quiroz, K. (2016), "Pharmaceutical megamergers' dependence on existing products: The case for R&D in the Pfizer-Allergan merger", *Strategic Direction*, Vol. 32 No. 6, pp. 30-32. <https://doi.org/10.1108/SD-03-2016-0041>
- [5] Georg Wuitschik, Martin Olbrich, Stefan Hildbrand (2022), Roche's approach to green metrics in drug development, *Current Research in Green and Sustainable Chemistry*, Volume 5, 100293, ISSN 2666-0865, <https://doi.org/10.1016/j.crgsc.2022.100293>.
- [6] Béraud, M., Drajac, C. and Thomas, M. (2021), "Talent management after an acquisition: a case study of Roche and Genentech", *Strategic HR Review*, Vol. 20 No. 1, pp. 30-35. <https://doi.org/10.1108/SHR-09-2020-0082>
- [7] Demir, M. and Min, M. (2019), "Consistencies and discrepancies in corporate social responsibility reporting in the pharmaceutical industry", *Sustainability Accounting, Management and Policy Journal*, Vol. 10 No. 2, pp. 333-364. <https://doi.org/10.1108/SAMPJ-03-2018-0094>
- [8] Liza, S.A., Chowdhury, N.R., Paul, S.K., Morshed, M., Morshed, S.M., Bhuiyan, M.A.T. and Rahim, M.A. (2022), "Barriers to achieving sustainability in pharmaceutical supply chains in the post-COVID-19 era", *International Journal of Emerging Markets*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/IJOEM-11-2021-1680>
- [9] Brass, Olivier and Grenier, Emmanuel (2023), *Stability Prediction Methodology to Manage Vaccines and Pharmaceutical Products*. <https://ssrn.com/abstract=4406130>
- [10] Sabat, K.C., Bhattacharyya, S.S. and Krishnamoorthy, B. (2022), "Circular economy in pharmaceutical industry through the lens of stimulus organism response theory", *European Business Review*, Vol. 34 No. 6, pp. 936-964. <https://doi.org/10.1108/EBR-02-2022-0037>