APPLICABILITY OF M&A VALUATION MODELS IN THE PHARMACEUTICAL AND BIOTECHNOLOGY INDUSTRY

by

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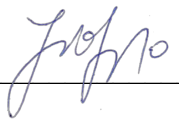

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To my family

Acknowledgements

I have always been interested in health and life sciences. After a couple of years competing in the sport of triathlon in my youth, including almost qualifying for the Ironman World Championship after a successful race in Zurich, Switzerland, I started to study a biotechnology engineering degree in 2011. My goal was to become a pharmaceutical researcher. Already after a year, I started to study a finance degree in parallel. I was thrilled about all the global possibilities in both these fields. After completing my finance degree with a thesis within quantitative finance as a final stage, I conducted a blood substitute research project, my engineering thesis, including genetic engineering. I almost ended up being a biotechnology researcher, which was my initial plan couple years before. However, I ended up working in finance, but I never left my interest in the life sciences field.

After a couple of years working in industry, I came across an MBA program at Swiss School of Business and Management. I really liked the flexibility it offered me as a busy working professional. I liked it so much that I continued with a Doctor of Business Administration degree. This dissertation is the result of this journey, where I was able to combine my two passions: finance and life sciences. I am grateful for this possibility that Swiss School of Business and Management gave me.

I would like to thank my supervisor Professor Dr. Dario Silic for inspiring me choosing my research topic within valuation, M&A and corporate finance, along with superior advice along the dissertation process journey. Furthermore, I would like to thank all my family for the support you have been giving me during this period writing the dissertation, which have been challenging while being a full-time working professional.

ABSTRACT

APPLICABILITY OF M&A VALUATION MODELS

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Gustav Lindéus
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Dissertation Chair: <Chair's Name>
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The purpose of this research was to evaluate the applicability of M&A valuation models in the pharmaceutical and biotechnology industry. A quantitative study with secondary data, using two modelling approaches, DCF and relative valuation, was conducted. The choice of the two modelling approaches was a result of an extensive literature study of different approaches to valuation. The two modelling approaches were applied to six target companies, involved in M&A deals in the pharmaceutical and biotechnology industry during the last decade, which are widely known to not have been as successful as anticipated with respect to sales growth, market capitalization, profitability as well as other important metrics. These target companies were Monsanto, Actelion, Kite Pharma, Bioverativ, Cubist and Questcor Pharmaceuticals, which were acquired by Bayer, Johnson & Johnson, Gilead Sciences, Sanofi, Merck and Mallinckrodt respectively.

Three research questions, related to differences between the models, sensitivity of assumptions and if the models contributed to reduction of important financial metrics such as sales growth as well as market capitalization, were answered in the thesis. Based on carefully chosen assumptions, the relative valuation generated more accurate and closer

results to the realized enterprise values as well as share prices than the DCF approach. Within the relative valuation, the EV/Sales multiple was more accurate than the other studied multiples: EV/EBITDA and P/E. When adjusting various assumptions in the DCF model, some of the targets generated almost identical results as the realized values.

Although being highly dependent on assumptions, both models tend to generate more undervalued results than overvalued ones, which may indicate that the valuation itself was not the major contributor to reduction of important financial metrics after realization of the M&A deals. Even though this study was unique that it combined the DCF and relative valuation modelling approaches and applied them to several companies at the same time, further research is needed to fully understand the applicability of M&A valuation in the pharmaceutical and biotechnology industry. A suggestion is to apply more targets to a similar study and perhaps also extend with other models.

KEYWORDS

Finance, Mergers & Acquisitions, M&A, Valuation, Corporate Finance, M&A Valuation, Discounted Cash Flow, DCF, Relative Valuation, Intrinsic Valuation, Extrinsic Valuation, Comparable Companies, Life Sciences, Pharmaceutical Industry, Biotechnology, Multiples, EV/EBITDA, EV/Sales, Big Pharma

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CHAPTER I:

INTRODUCTION

Mergers and acquisitions (here after M&A) is an important topic in corporate finance as well as financial management. A merger occurs when there is a combination of two joining companies. An acquisition is when one company acquires another one, which later loses its existence and transfer its assets and liabilities to the acquirer. There are different reasons why an M&A occurs, e.g., financial factors, expansion, synergies, hostile reasons (Gaughan, 2015). Two types of M&A, horizontal and vertical, mainly occur. The former is between two competing companies and therefore in most cases the market share increases. The latter is between two companies at different stages in the supply chain of an industry. There is a third merger type, a conglomerate merger, where there is no typical link between the two companies. Thus, the profiles of these kinds of companies may vary extensively between each other within this merger type, such as a tobacco and a broadcasting firm (Pepall et al., 2014).

Goedhart et al. (2017) argue that there are six types of successful acquisitions in general. The first type is when the acquiring company wants to improve and enhance the performance of the target. This performance improvement may relate to e.g., improving cash flows and/or reducing costs of various kinds. The second type is when the acquisition removes excess capacity in its operating industry. This may generate more productive operations such as research and development. The third type relates to when the acquisition accelerates market access. An example is when a combined company starts to generate sales in an area, where the other one did not operate yet. The fourth type is when technology and skills are acquired to a lower cost and at a faster pace. Such acquisitions may reduce competition because of e.g., avoiding royalty payments of products and services which are patented. The fifth type of successful acquisition relates to when the acquisition generates economies of scales, i.e., lower unit cost as well as larger production output, and exploits the scalability of an industry. The sixth type is when a new product line or industry gets picked early in the life cycle.

Except for these six types of acquisitions motives, there may also be harder strategies that might create value, although this is a rare fact. Four examples are buying cheap, the roll-up strategy, improving competitive behavior and entering a transformational merger. When buying cheap, the price of the target is simply below its intrinsic value, which is a rare fact. Focusing only on the price may have dire consequences for the acquirer in the long run. The roll-up strategy refers to when an acquirer buys targets which are too small to have economies of scale in the same industry. The purpose of improving competitive behavior is to enhance the return of invested capital, by making competitors less price-focused because of higher market concentration, which also keeps out new entrants. Entering a transformational merger is a rare strategy and the purpose of it is to transform both companies or one of them. An example may be the willingness to create a performance-oriented culture (Goedhart et al., 2017).

There are five financial characteristics which make targets desirable. The financial characteristics which make most, and direct benefit for an acquirer are earnings and cashflows that are steadily growing. If both the earnings and cashflows have been increasing historically, this may be a sign that they will probably do this later in the future as well. Having a low price to earnings ratio (here after P/E) is another desirable financial characteristic of a target. A low P/E ratio may mean that the target is undervalued. It is important to note that the P/E ratio may fluctuate because of changes in the market or liquidity problem. The patterns may vary from industry to industry. A temporary undervaluation, resulting from a dropping stock price, should be preferred over a reduction in earning power of the target due to the fact that the latter may be related to a future problem of generating income. It is crucial to be observant of this fact (Gaughan, 2015).

The third desirable financial characteristics is if the book value is higher than the market value. In some industries, the book value is more reliable than the market value as these companies often have more liquid assets. The fourth and the fifth desirable financial characteristics are low leverage and high liquidity. Low leverage ratios mean that there is a lower risk level. Furthermore, they also mean increasing debt capacity, a characteristic

which may be used later for financing purposes such as the takeover itself. Examples or leverage ratios are debt to equity ratio and debt ratio. A high liquidity may also be a useful financial characteristic. Another important topic, which is related to finance, is the tax issues that may occur. The type of financing methodology of the M&A deals will determine the tax outcome. Depending on this type, the M&A deals may be entirely tax-free. Various tax benefits may arise from factors such as tax synergies, e.g., income may be offset for a company that is combined with another one, although it is not able to use tax shields individually.

Another example of a tax benefit relates to depreciable assets, which market value may be greater than the book value of the target. It is not uncommon that tax specialists are involved in the M&A teams, as the importance of tax considerations is ever increasing. As for taxes, accounting is also important for M&A deals. Historically, there have been different methods to record the deals in the books, but since after 2001 the purchase accounting methodology is the only acceptable one to use. This methodology records the M&A transaction based on its fair market value, which is a measure that includes both the amount paid and the costs. It is also applicable to e.g., stocks, where the fair market value of them are recorded. It is not uncommon that there is an excessive value of the transaction. As this value cannot be assigned to assets, this will be converted into goodwill. The value of the goodwill should be checked in a regular manner and adjusted if it is not accurate. It is important to note that the acquirer is only allowed to obtain income from the combined entity after the purchase date has taken place (Gaughan, 2015).

1.1 M&A waves

Historically, there have been times when M&A deals intensively occur in cycles (here after M&A waves). An M&A wave is generally initiated by various extrinsic shocks. These shocks are either technological, regulatory, and/or economical. In the USA, where the most of M&A occur globally, there have been six M&A waves up to date, dating back to the end of the 19th century (Gaughan, 2015). The first M&A wave, initiated in the 1890s,

started with horizontal mergers and generated large monopolies such as the Standard Oil Company. This wave of M&A deals was mitigated by laws induced by the government, which were related to anti-competition behavior. Therefore, vertical integration started to emerge. The second wave started in the 1920s and included companies of smaller sizes which were excluded from the large horizontal M&A deals in the first wave. This wave was abruptly stopped by the Great Depression in 1929 (Petitt & Ferris, 2013).

The third wave occurred for three decades, between the 1950s and 1970s, and created what we today call the conglomerates. This was a response to mitigate various risks with diversification across various industries. An example of a conglomerate created was the today well-known General Electric Company, which includes many companies from a variety of different industries. The oil crisis in early 1970, caused this wave to stop. The fourth wave was induced by deregulation in the early 1980s, along with new development of financial markets, instruments as well as higher availability of credit. This caused a boom for companies to sell their unrelated, poorly performed businesses, acquired during the previous waves, which resulted in that leveraged buyouts (here after LBO) increased. In 1987, a combination of leveraged companies and the stock market crash paved an end to this M&A wave. The fifth wave, initiated in the 1990s, was heavily induced by the globalization such as the formation of the North Atlantic Free Trade Agreement and the European Union (here after the EU). This resulted in many cross-border acquisitions. The fifth wave ended in 2000 when the dotcom bubble burst. Shortly after, in 2003, the sixth wave started to emerge. This wave was initiated by older trends seen in the fourth and fifth wave such as the globalization as well as risky LBOs. It all ended with the global financial crisis of 2008 (Petitt & Ferris, 2013).

Now we are within the seventh M&A wave, which started in 2011. It is characterized by M&A deals in consumer goods, technology as well as healthcare (Jain, 2016). After the global financial crisis of 2008, the market has gradually gone back to optimism. Risk aversion is disappearing as organizations realize that in order to constantly deliver financial results it is not realistic to rely on organic growth. Obtaining growth through M&A is again easier than creating it solely inside the organizations themselves (Cordiero, 2019).

1.2 Legal frameworks

As previously mentioned, the M&A waves have been initiated and reduced or delayed by regulations to a great extent. Antitrust laws play a major role in the legal framework, which limits M&A deals. The main purpose of these laws is to hinder mergers if they would reduce the competition in the industry afterwards. Thus, an industry cannot be too concentrated and the companies operating within cannot be too few with each of them having a too high market share each. In the USA, the various antitrust acts are dating back to as early as the 1890s and have gradually developed the legal frameworks to be applied in today's modern business world. Examples of such acts are the Sherman and the Clayton acts.

The USA has had a longer history of antitrust laws compared to e.g., the EU, which was gradually formed during the second half of the 20th century. A century later, after the first antitrust laws in the USA, the EU implemented the merger regulation and has since then gradually developed as well as adapted it to the business world. One of the main differences between the antitrust laws in the EU and the USA, is that the mergers are blocked in the courts in the USA, meanwhile this is not mandatory in the EU. Except for the antitrust laws, the legal frameworks are also centered around the transaction type of the deal, i.e., stock or cash, and if it is a friendly or a hostile M&A deal. In the USA, the Securities and Exchange Commission (here after SEC) is heavily involved in these legal processes. Thus, SEC filings play a big role in the securities laws related to M&A. Law enforcement authorities follow certain guidelines when conducting the prospective M&A deals. The Justice Department in the USA provided five guidelines in 1992 which, with a few minor revisions, are followed today. These guidelines include evaluation of market definition and concentration, competitive effects, entry, efficiencies and failing firm defense (Gaughan, 2015).

1.3 M&A in the pharmaceutical industry

This section will highlight M&A in the pharmaceutical industry. Considering all industries together, the total value of M&A deals worldwide was $3.7 trillion during 2019, indicating the importance of it in today's global economy (Szmigiera, 2020). The pharmaceutical and biotechnology industry (here after the pharmaceutical industry) is an industry with an immense amount of M&A deals with a total global deal amount of $348 billion during 2019. The number of transactions has increased during the last 20 years (Figure 1).

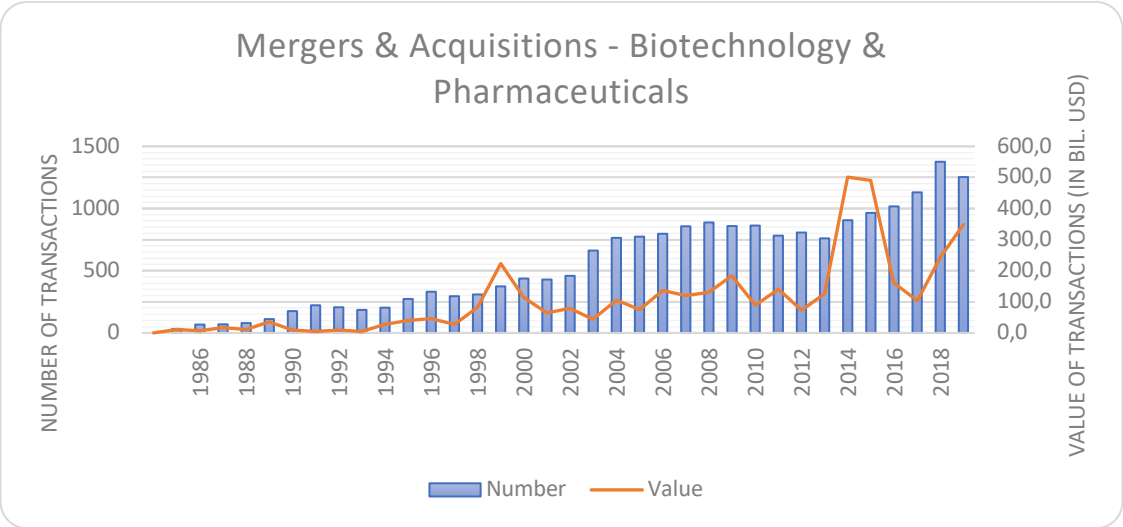


Figure 1. M&A in the biotechnology and pharmaceutical industry between 1985-2019. Both the number of M&A deals and the value of them have gradually increased over the years.
Source: IMAA (2020).

M&A deals are important in the pharmaceutical industry. There are several general motives. Firstly, M&A may act as an innovation source. Between 2001 and 2016, the share of revenues from novel products excluding the largest global pharmaceutical firms (here after Big Pharma), has gradually increased from 25 to 50 percent. This is very lucrative for Big Pharma and is a strong argument for acquiring smaller, innovative companies. For the smaller company, an M&A deal might be considered for cost reasons such as the inability to finance the early-stage investments in the drug development as well as the drug trials in

the later stages, which is also complicated from a regulatory perspective. The smaller company may simply not have the legal resources to successfully conduct the late-stage trials. Secondly, synergies in the pharmaceutical industry are unlocked by M&A deals. Consolidating usually provides advantages from an operational and financial point of view when scaling up the processes such as research and manufacturing. Thirdly, realigning portfolios is another important motive for M&A deals in the pharmaceutical industry, which may e.g., live up to changed strategy expectations and/or reduced tax (Bansal et al., 2018).

1.4 The M&A process

Typically, the M&A deal process consists of ten steps. The first step is to develop an acquisition strategy. It is important to have a clear view what to gain and expect from a prospective M&A deal. The second step is to determine key searching criteria for potential companies. These criteria may range from customer base to profit margins and target locations. This step is then followed by conducting the searching based on the above-mentioned criteria and look for target companies. The fourth step is to contact target companies which live up to the previously set searching criteria. If the initial conversations with the target company are successful, a valuation analysis is conducted. This valuation analysis is dependent on various data such as the latest financial information, which may be sent to from the prospective target.

The valuation analysis is followed by a negotiation step. An initial offer is based on the information that the valuation step created and is followed by more detailed negotiations (Corporate Finance Institute, 2020). The merger negotiations may be conducted in different ways. They may be either conducted in an auction way, which are believed to generate increased takeover premiums, and in a private way. Confidentiality agreements, also referred as non-disclosure agreements, are often made in merger deals, especially if the acquirer wants to have non-public information (Gaughan, 2015).

If the offer was accepted, the next step is the M&A due diligence process, which is a detailed check of the operations in the target company. Here the value assessment of the

target may be confirmed. If the M&A due diligence step was successfully conducted without any major concerns, the contract will be finalized, and it will be decided whether the agreement is a share or asset purchase. After the two parties have signed the agreement, the financing strategy and its details will finally be revealed. This step is then followed by the tenth and last step, which is the integration and closing which usually involves the management of the two parties (Corporate Finance Institute, 2020). It is not uncommon that M&A professionals, providing specialized services, are hired during the M&A process. These professionals may be valuation experts, accountants and/or attorneys as well as lawyers (Gaughan, 2015).

1.5 The role of valuation in M&A

Since the fourth M&A wave, the importance of valuation has gradually been increasing (Gaughan, 2015). Although a successful M&A deal depends on the combination of the above-mentioned steps, the valuation is one of the most critical steps in the process. An absence of valuation could cause a company paying too much for a target. Another consequence could be that the target accepts a lower than acceptable price for the shareholders (Moeller & Brady, 2014). An appropriate valuation process should include a rigorous analysis of the forecasted and historical performance of the company (Petitt & Ferris, 2013). Two fundamental principles of a company's value are that the invested capital should give a fiscal gain that is greater than what the capital cost and that it should give the shareholders real economic value. For an acquirer in an M&A deal, the obtained value is the same as the value received minus the price paid. If the deal was successfully conducted for the acquirer, this difference should be positive (Koller et al., 2010).

Valuation in the pharmaceutical industry is important as it helps to assess the financial stability of the company and the possibility to acquire the company. The industry itself

is characterized to have immense costs of research and development, thus making it to be capital intensive which highly affects entrants (Dierks et al., 2018). However, many of the scientifical advances come from biotechnology as well as academic research from universities. Last years the consultant companies, advisory companies, equity funds and other financial investors have development much their expertise in valuations. Therefore, their novel products and sometimes even the whole companies are lucrative targets for Big Pharma. Small biotechnology companies and universities are dependent on funding, meanwhile they may not have as good valuation knowledge as Big Pharma. Therefore, gut feeling, and experience may be the foundation of the deals, instead of a sound valuation methodology usually practiced by investment professionals. The pharmaceutical sector is known for not starting the negotiations before a well-grounded valuation has been conducted. Often the projects deliver more value than expected and are more successful than anticipated. Then, as a consequence, it is hard for the universities and small biotechnology companies to renegotiate the deals and may result in millions of lost financial value for them (Bogdan & Villiger, 2010).

It is not uncommon that realized M&A deals fail to deliver expected value for shareholders, in other words fail to have increased profitability, growth of sales and/or market capitalization. In fact, one of the top reasons for realized M&A deals resulting in failure is misvaluation (Seth, 2020). Rappaport and Mauboussin (2002) already argued in Harvard Business Review that in order to create long-term value for the shareholders, there is a need for valuation expertise. The pharmaceutical industry is no different and is perhaps even more dependent on this kind of expertise due to the complexity of many factors as previously described. Among professionals in the pharmaceutical industry, there are discrepancies which approaches to use and how to determine as well as select various input parameters in the models. Some practitioners even argue that it is impossible to retrieve objective

numbers from the contemporary valuation models and therefore rather choose not to use them at all. Other pharmaceutical professionals argue that valuation is not a science, but an art (Bogdan & Villiger, 2010).

The shareholders of the selling companies often receive all the benefits which the acquisitions create and it is estimated that more than a third of the acquiring companies in M&A deals destroy shareholder value (Koller et al., 2010). This is not an exception in the pharmaceutical industry. Danzon et al. (2007) studied 383 firms in the pharmaceutical industry between the years 1988 and 2001. They concluded that the operating profit of large pharmaceutical companies had a slower growth compared to their counterparties which did not go through any M&A, thus destroying shareholder value. This is, however, not an old phenomenon, only dating back two decades or longer. During the past decade there have been several failed realized M&A deals in the pharmaceutical sector with tens of billions of USD each, including the transaction between Bayer and Monsanto of $63 billion (Sagonowsky, 2019).

1.6 Research Problem

Every year realized M&A deals all around the world result in billions of dollar lost shareholder value. This is especially problematic in the pharmaceutical industry, which is known to be a very M&A intense sector with respect to the deal sizes as well as the number of them. Furthermore, this trend is increasing. Since one of the most important steps in the M&A process is valuation, it is evident to oversee the applicability of M&A valuation models in the pharmaceutical industry, especially since misvaluation is one of the top reasons that realized M&A deals fail to deliver expected value for shareholders.

1.7 Purpose of Research

In this study, we shall try to demonstrate if misvaluation was a major contributor to realized M&A transactions during the last decade resulting in failure. We shall see if this was the case for none, some or all of the valuation models. From this, we shall be in position to conclude the differences and the sensitivity of them, in order to provide further recommendations as well as findings to investment professionals. Prior the research it is important to have in mind that a valuation model is a set of assumptions and a model itself cannot be responsible but rather the non-consideration of all parameters or unrealistic assumptions used in the modeling approach.

1.8 Significance of the Study

The research has a long-term goal of providing a better understanding of misvaluations of realized M&A transactions in the pharmaceutical industry. In other words, identifying factors within the valuation that may have contributed to reduction of profitability, sales growth and/or market capitalization. More specifically, the significance of the study may be broken down into the following sub-objectives:

- To develop a better understanding how non-consideration of certain assumptions or inputs may affect the valuation outputs.
- To clarify the differences between the M&A valuation models and evaluate how they fit to companies with different profiles.
- To provide recommendations and advice to investment professionals active in the pharmaceutical sector with respect to M&A transactions.

The outcome of this research will be helpful and valuable to investors as well as the pharmaceutical industry overall. If a less failure rate, with respect to reduction of profitability, sales growth and/or market capitalization, of realized M&A transaction would be obtained in the pharmaceutical industry, this would likely sustain important life-saving drug projects which otherwise perhaps might have been abandoned. Thus, the outcome of the research might have a societal impact as well. Although this reasearch will focus on public pharmaceutical companies, other areas that might benefit from the research also include universities and small biotechnology companies, which often sell projects as well as products that, in the end, are more successful than anticipated, followed by that they are then unable to renegotiate the deals.

1.9 Research Purpose and Questions

In order to assess if the M&A assumptions and models contribute to ease or to make it difficult for investors to bring them closer in commercial positions, it is important to oversee the applicability of M&A valuation models in the pharmaceutical sector. The following research questions need to be addressed:

1. How much do the valuation results of different M&A valuation models differ from each other and should some of them not be recommended for M&A deals in the pharmaceutical industry?
2. Considering pharmaceutical companies, how sensitive are the M&A valuation models to non-consideration or unrealistic use of certain assumptions?

3. Considering public pharmaceutical companies that were involved in realized M&A transactions during the last decade, may M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization?

1.10 Outline of the thesis

The thesis will be structured in six parts. In this first part of this thesis, M&A in general, including its history, legal framework as well as process steps, and its role in the pharmaceutical industry were explained as well as demonstrated. Definition of terms as well as a background to the topic were introduced. Furthermore, the problem statement, research questions and significance of them were also demonstrated in this first part of thesis. In the second chapter, relevant academic literature shall extensively be reviewed, both empirical and theoretical to give adequate support and grounding to the rest of the upcoming chapters. Some concepts relevant to the study will also be reviewed in detail to eliminate any form of ambiguity.

In the third part, methodological frameworks, including models, shall be elaborated. These methodological frameworks will help with the estimation of the various objectives of the study while in the fourth part, the major findings as well as the results of the research shall be presented and evaluated. Then, a discussion of all the previous parts included in this thesis shall be presented. In the last and sixth chapter, a summary, including implications as well as suggestions for future research, will be demonstrated.

CHAPTER II:
REVIEW OF LITERATURE

The purpose of the research is to evaluate different M&A valuation models and apply them to realized M&A transactions of public companies in the pharmaceutical industry during the last decade. The research will have a holistic approach, in order draw general conclusions, to assess if such assumptions and models contributed to ease or to make it difficult for investors to bring them closer in positions. The research will also evaluate if some or all the M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization to public pharmaceutical companies that were involved in realized M&A transaction during the last decade

This literature review serves a purpose to extensively review relevant academic literature both empirical and theoretical to give adequate support and grounding to the rest of the upcoming chapters. The scope of the literature review will not only be limited to M&A valuation within the pharmaceutical industry, but also M&A valuation in general will be covered. The literature review will be structured in several parts. The literature review will start with M&A valuation in general. This section will be followed by valuation in the pharmaceutical industry from a general perspective, which gradually will be narrowed down and evaluate different models one by one, also including more complex frameworks, in order to draw conclusions from the latest academic research in the field. Then, articles about how valuation approaches are used by professionals in industry will be demonstrated. In the end of the literature review, there will be a section related to M&A valuation in theory and practice.

The academic articles and findings will be compared with each other as well as critically evaluated. The inclusion criteria have been articles as well as literature related to

valuation, applicable to M&A, in general and valuation related to pharmaceutical companies. There has been no inclusion regarding the degree of complexity in the articles, thus both simplicity and accuracy have been taken into account in order to get a realistic view of the current state of the art in this field of research.

2.1 General approaches to valuation

There are two main valuation approaches. These are the discounted cash flow (here after DCF) and relative valuation, also referred as comparables as well as extrinsic valuation (Bogdan & Villiger, 2010). The valuation derived from the DCF approach, which is also called the intrinsic value, is based on the present value (here after PV), which in turn is usually based on free cash flow (here after FCF) projections. Behind the FCF projections lays a myriad of judgements and assumptions such as e.g., sales growth rates as well as net working capital requirements. The DCF approach has a wide range of applications related to e.g., various investment decisions, including M&A activities (Rosenbaum & Pearl, 2020).

The second main approach, relative valuation, is based on market benchmarking, which uses similar companies as a reference when valuing the target. These companies are usually operating within the same industry as the target, due to the fact that they share common characteristics such as risks, and drivers related to the performance. The most used multiples in the approach are price-to-earnings ratio (here after P/E) and enterprise value to earnings before interests, taxes, depreciation, and amortization (here after EV/EBITDA) (Rosenbaum & Pearl, 2020). The reliability of the P/E and EV/EBITDA multiples is not a new phenomenon. Fernandez (2001) conducted an extensive multiple study consisting of 1,200 firms operating and active in different locations. In this study,

175 multiples were evaluated, and it was confirmed that P/E as well as EV/EBITDA were the most used ones. Similar to the DCF approach, relative valuation has many applications, including M&A activities (Rosenbaum & Pearl, 2020).

Although the DCF approach is most often using FCF projections, there are other variants as well, including approaches based on e.g., capital and equity cash flow. However, these approaches give the same values as end result, which is not surprising due to the fact that they are based on the same hypotheses and do not differ more than in the starting point, where the cash flows may not be identical (Magni et al., 2007).

There has been a debate which of the two approaches that is the most appropriate one to use. Both the DCF and the relative valuation approach have challenges in their practical usage. The DCF model is sensitive because of its input parameters and assumptions. An example is the discount rate. Regarding relative valuation, comparable companies as well as cases might sometimes be difficult to find (Kang, 2018). Koller et al. (2010) argue that the FCF method is most suitable for banks. The reason for this is that the financial and operational cash flows are not separated in this sector, which is a plausible scenario for the FCF model. Kaplan and Ruback (1996) argue that the DCF approach generate better valuation performance than relative valuation, but it may be beneficial to combine them in order to gain explanatory power (Kaplan & Ruback, 1995).

Goedhart et al. (2005) from McKinsey & Co, also confirm that the DCF approach is the one method generating the best outcomes, but that multiples also provide good insight if they are combined with the DCF model. Liu et al., (2002) argue, on the other hand, that the valuation performance of the DCF model gradually declines as it gets more and more complex. They also concluded that multiples based on cash flow measures performed

worse than multiples based on reported earnings. This was also confirmed in another, extended study by Liu el al. (2007), where they concluded that valuations based on reported earnings are dominating the ones that are based on cash flows.

2.2 Valuation in life science

Regarding the scientific approach within the life sciences, where the pharmaceutical industry is included, two main approaches of valuation have historically been considered. These are the DCF model and real options. The DCF model, which, as also previously described, is based on future cash flows and calculates the PV, came first and was for a long time the main approach in the pharmaceutical industry (Bogdan & Villiger, 2010). Real options are options on investment projects and their values increase with the volatility of the forecasted cash flows (Banerjee, 2003). In other words, estimates of sales with real options may fluctuate, in contrast to the DCF model, which has a fixed sales peak (Villiger & Bogdan, 2006). Relative options may also be explained as the sum of two values: the value of the DCF and a flexibility parameter which relates to a scenario if the investment is being abandoned (Bogdan & Villiger, 2010).

2.3 Real options valuation

Villiger and Bogdan (2005) concluded that the real option value is a better approach to use than DCF when valuing companies that develop new drugs. They argue that DCF is inappropriate due to the high failure rate of projects in the pharmaceutical industry, along with it is demanding to pass clinical trials in a successful manner with respect to the regulatory requirements. Furthermore, they also state that using the real options approach would

make it easier for companies to handle valuation related to license contract, portfolio as well as project management and venture capital negotiations. Banerjee (2003) evaluated real options of an Indian pharmaceutical company over time. The conclusion was the same, that real options outperformed the DCF model with respect to realization of the actual market capitalization value. However, Hartmann and Hassan (2006) evaluated the applications of real options for research and development in the pharmaceutical sector with surveys from the industry. They concluded that the pharmaceutical sector used this approach more than other sectors, but there was not any standardization of the methods due to lack of consistent results.

Both the studies from Banerjee (2003) and Villiger and Bogdan (2005) are limited, in order to draw conclusions for the whole pharmaceutical industry. Banerjee's study evaluated one company over time, which is a limitation. If several companies, preferably from different regions, were evaluated in the same manner, the conclusion that the DCF model only could explain 39 percent of the market capitalization would be more reliable. The study from Villiger and Bogdan (2005) focused on research and development projects, which are a significant part of pharmaceutical companies' operations, but not the entire one. Therefore, their conclusion that there is a catch 22 of the DCF model cannot be applied when valuing an entire pharmaceutical company. Thus, the conclusion from Hartmann and Hassan (2006), which they obtained from a survey study, that there was not any standardization of the methods due to inconsistent results, seems reliable.

Except for valuing projects, research activities and entire companies, another relevant M&A valuation application of real options in the pharmaceutical industry was conducted by Loukianova et al. (2017). They valued synergies of strategic M&A. There were eight synergies included in the research: cost reduction, growth, revenue, increased borrowing capacity, decreased discount rate and tax benefits, both for asset write up and NOL

carry forwards. Two premium M&A deals, Actavis and Allegan, Pfizer and Hospira, were analyzed, using a Datar-Mathews approach, a methodology where simulation modelling is necessary. In the Actavis and Allegan deal, the cumulative value of the synergies was less than the premium paid for the deal, which, as the authors states, may have been among the top reasons why its share price dropped by almost 20% during the first one and a half year after the deal. Regarding the Pfizer and Hospira deal, the opposite result occurred, the cumulative value of the synergies was higher than the premium paid. The market did not respond either positively or negatively during the first year after the M&A deal as the stock price of Pfizer did not change in a significant manner.

Thus, the longer-term effects of the synergy may perhaps be realized as the market did not perceive this deal as a failure. Similarly, to the above-mentioned studies, this research has several limitations. Since the approach is using real options, including advanced simulations, it may not be as user-friendly as other, less complex methods such as the DCF approach. In addition, the authors argue that the number of synergies could be extended further. In this study they, as stated previously, were limited to eight. Another limitation, according to the authors, were the used probability density function, which all the calculations were based on. Furthermore, the only performance indicator used was change in the stock price, which is also a limiting factor. The stock price may be affected by various factors, which are all most likely not internal ones. However, the authors clearly states that there are possibilities to include other probability density functions as well as adding additional synergies to the proposed real options model.

2.4 Academic progression of valuation in the pharmaceutical industry

Since these real option studies, research related to a new methodology, risk-adjusted net present value (here after rNPV) has evolved. The reason for this is that e.g., option methods are not favored by medical specialists due to the fact that they are too complicated as well as theoretical, providing insufficient outcomes (Woo et al., 2019). The rNPV approach has the advantage of evaluating changes in the present value and risk by adding "probabilities of success at each stage of development" (Staisor et al., 2018). Examples of such research have been conducted by Svennebring and Wikberg (2013) and Woo et al. (2019), where the former study suggested three rNPV scenarios based on post discovery cash-flows. The latter study matched the success rates of new pharmaceuticals with periods in the clinical development, when developing the rNPV models.

Walker et al. (2015) argues that the rNPV approach is not entirely sufficient, due to the fact that overlooking various factors such as ranges of probabilities and uncertainties may lead to misjudgments, impacting the valuation. They suggested that Monte Carlo simulations should be implemented in the rNPV model, resulting in an rpNPV model. Another study using a more complex modelling framework, similar to the Monte Carlo simulations, was a study from Park and Shin (2018). They evaluated a research and development project in the pharmaceutical industry and considered changes in the economic environment, which is highly relevant in today's turbulent business world. A mean-reverting binominal lattice model under Markov regime switching (MRBL-MRS) outperformed other models such as DCF, real options and Monte Carlo-based simulations concerning changes in economic environment.

Ahn et al. (2015) integrated an effectuation model with the DCF approach and is an approach similar to the real options. The effectuation included effectuation elements of

means, affordable loss, partnership and expect the unexpected principle. The principles of effectuation rather prefer control than prediction. Based on data from 2000 to 2012, eleven of the largest biopharmaceutical companies in the world were analyzed. They found this model to be strategically useful when integrating it with the DCF model and that it prevents underinvestment, especially in companies with greater amounts of research and development expenses.

These studies have both advantages and disadvantages. The study from Woo et al. (2019) is using the success rate of different types of drugs in the modelling approach. These success rates are retrieved from medical databases such as ClinicalTrial.gov and MedTrack DB. This approach is promising, because it is taking an important factor into consideration. However, using this approach outside academia is too optimistic for two reasons. Firstly, being dependent on medical databases in the modelling approach would be too complicated. Secondly, investors would need to possess biological and chemical knowledge in order to interpret the data. The study from Svennebring and Wikberg (2013), which suggested three rNPV scenarios based on post discovery cash-flows, is more realistic. However, it is focused on drug discovery only and does not capture the holistic approach of the whole company, but perhaps it could be combined with other methods in an efficient way.

The study from Walker et al. (2015), who suggest a rNPV model, is promising due to the fact that it is more adapted to portfolio management, compared to the other approaches. Furthermore, it is applicable from biotechnology companies with few projects to Big Pharma, which has many more ones within each entity. However, a drawback is that this methodology is more complex, due to the fact that it is using Monte Carlo simulations, which is a disadvantage if this model is to be applied by a greater range of different investors. Regarding the study from Park and Shin (2018), it is useful to evaluate how well models adapt to changes in the economic environment, especially for decision makers.

However, limitations of this study are that a research and development project was analyzed and not a whole company as well as the complexity of the modelling approach overall, using Markov processes.

The study from Ahn et al. (2015) is also promising due to the fact that they analyzed large biopharmaceutical companies, when integrating the effectuation with the DCF approach, and not only a project within a single company or just a small single company itself. However, similarly to the above-mentioned studies, it is too complex to make this model a standard approach in the industry as it requires knowledge about effectuation principles such as elements of means, affordable loss, partnership and the expect the unexpected principle.

2.5 Relative valuation in the pharmaceutical industry

As previously described, when valuing companies in the pharmaceutical industry, much effort has been made to research related to M&A valuation methods that are cash flow based, also called intrinsic valuation, using various input parameters. This valuation approach is one of the two main approaches used when valuating companies. The second one, as previously described, is related to relative valuation, where multiples from comparable companies in the same or similar industry are used in the valuation approach (Bogdan & Villiger, 2010). In other words, multiples such as revenue or earnings are used so similar assets can be converted into standard multiples, which are then used in the valuation (Harbula, 2009).

In general, there is much less research related to relative valuation in the pharmaceutical industry, compared to the cash flow-based approaches, in contrast to other industries. Chari and Bhardwaj (2015) conducted an empirical study and analyzed companies in the

pharmaceutical industry, in order to get insight which is the best multiple to value pharmaceutical stocks. The analyzed companies were grouped by net profit margins and return on equity (here after ROE). The multiples that were outperforming the other ones were P/E, EV/EBITDA and price to book value (here after PBV). This study is using a good approach due to the fact that only pharmaceutical companies were evaluated, which is advantageous since they are comparable to each other with respect to margins, growth, and risk. A drawback is that the period 2005-2010 and not later was analyzed. The multiples that outperformed the other ones might therefore have changed during the past decade and may therefore not be applicable to contemporary analyses.

A study related to M&A, using multiples, was by Hristov and Chirico (2019). They conducted an M&A valuation study of 73 pharmaceutical companies. These were listed on the stock exchange in New York. The purpose of the study was to evaluate how the enterprise value, as dependent variable, was affected by factors such as R&D, size, and profitability. Any positive dependency for profitability was not statistically significant, but R&D and size were positively related to the enterprise value. This study disagrees with the one from Chari and Bhardwaj (2015), who grouped their analyzed companies in their study by net profit margin, a profitability measure, and confirms that Bhardwaj's conclusions might be outdated, as previously discussed.

2.6 Valuation in practice by professionals in pharmaceutical industry

In the pharmaceutical industry itself, relative valuation is more common than in academic research. Mayhew (2010) conducted a survey study where 69 professionals in the life science industry, dealing with valuations, answered which valuation approaches that are used in practice. 80% said that they use comparables, i.e., multiples, compared to a

figure of approximately 70% for DCF and 15% for real options, indicating that this is the most used one in practice. Pinto et al. (2019) conducted a similar study for 13,500 investment professionals, CFA institute members, ranging from various sectors. The result was the same, that a relative valuation approach was most used, followed by the DCF methodology.

Brotherson et al. (2014) interviewed experienced investment bankers, with an average of 13.5 years in the industry, from well-renowned firms such as JP Morgan, UBA, Lazard and Goldman Sachs & Co. All of them used the DCF valuation methodology, but only for information purposes, indicating that this is not the entire basis of the decision if used. In the study, the interviewees clearly stated that the DCF approach did not apply well to young, early companies, which still do not generate enough cash, in addition to phases of high growth as well as risk. Five major conclusions were drawn from this study. The first conclusion was that investment banks used the DCF approach when they have M&A assignments from clients.

The second conclusion was that investor alternatives in the financial markets are the basis for the estimation of discount rates, thus consistent with existing finance theory. However, adjusting this parameter based on the size of the firms does not seem to be a standardized routine due to the fact that this approach varies. The third conclusion was that the uncertainty of forecasts, especially the terminal value estimation, is treated in different ways by practitioners in industry. Here, to counter this issue, used approaches include using another input parameter or methodology in the DCF modelling as a sanity check and/or simply using another valuation method. The fourth conclusion was related to multiple business companies and if a sum of parts valuation should be used for these. In general, according to the investment bankers in the interviews, valuation based on sum of parts should only be applied under two certain circumstances for multiple business cases: for attributes

to the financial market or for merger strategies. The fifth conclusion obtained from this study was that, most often, valuing synergies are treated in several steps, instead of just discounting all their cash flows to an identical discount rate. However, the additional steps are varying among the practitioners.

The two latter studies from Pinto et al. (2019) and Brotherson et al. (2014) were based on surveys covering investment professionals in general and not only individuals valuing pharmaceutical companies. Therefore, these conclusions might not be as accurate for the pharmaceutical sector as the one from Mayhew, who conducted the surveys having life science professionals as respondents. A drawback from the Mayhew (2010) study is that 69 professionals were included in the surveys, compared to 13,500 in the study from Pinto et al. (2019).

Although relative valuation seems to be one of the most used approaches by investment professionals in industry, it is not an error-prone method. As previously mentioned, the choice of comparable companies may sometimes be difficult and is a bottleneck in the methodology. Plenborg and Pimentel (2016) systematically evaluated more potential implementation issues of the relative valuation approach. Except for the choice of comparable companies' issue, they highlight seven more ones. Picking value drivers to the relative valuation is an issue. Their key finding related to this was that drivers based on cash flows are dominated by accrual-based ones. Another issue is using forecasted earnings versus reported ones, where their conclusion was that the former one of these two earnings dominated. The fourth issue in their research was related to measurement of averages. Their finding and recommendation to this issue was that mean values performed less well than median as well as harmonic ones. Accounting differences is another issue in relative valuation and their findings related to this issue was that the accuracy is affected in a negative

way of these. The sixth issue was related to normalization of earnings. Their recommendation mitigating this issue was that non-recurring items should be removed from the earnings, because they provide noise in the data. The impact of size was their seventh issue, and their finding was that smaller firms generate less accurate results compared to larger ones. Their eight and last implementation issue was related to majority stake trading and illiquidity discount. Their recommendation to counter this issue was that both control premiums and illiquidity discounts should be integrated into the valuation.

2.7 Combination of cash flow based and relative valuation research for pharmaceutical companies

From the above literature review, it can be concluded that research related to cash flow based and relative valuation exist for pharmaceutical companies in academic research. However, research related to a combination of these two approaches is rare. An existing study of this nature was conducted by Price (2013), where the payback, dividend discount, balance sheet and the DCF valuation methods were applied to Pfizer's realized acquisition of Wyeth, both pharmaceutical companies. This acquisition is widely known to be a failed one with respect to e.g., less a less combined market capitalization than expected. The valuation methods were systematically evaluated, leading to conclusions which suggested what could be done to reduce failures related to M&A misvaluations, including a checklist for board members and executives concerning what to ask themselves before conducting an acquisition deal.

Price (2013) mentions ten questions which are important to address prior an acquiring a target. The level of equity is the first question for the board members and the CEO to ask themselves. Then, the second question relates to growth, net profit, and revenue. If it

will provide growth and is it a stable entity, are important factors to consider. The third question to ask themselves is the ROE and how it developed over the past years. Preferably, the ROE should be stable and high. The fifth question relates to the debt levels of the target and if this debt was used in a productive manner as well as used for other appropriate purposes. Remuneration policy for the senior executives is the fifth question to ask. Here, it is important to address its relation to risk as well as growth.

The sixth question to ask relates to the management behavior, where rationality and honesty should be preferred over other ones such as non-fact-based driven behaviors. If the target is an attractive acquisition, is the seventh question to address. The payback period and intrinsic value, after making the necessary forecasts, mainly reveal if the target is attractive to consider. Then, margin of safety should be applied to the modelling approach and its forecasts, in order to determine if the target is still a viable option with respect to the payback period as well as intrinsic value. This is the eight question. Putting the results of the two former questions all together and compare them to the final valuation, including the relationship benefits, is the ninth question to ask. This result is more likely to be higher than the previous ones. The tenth and last question relates to reasonableness of the final valuation.

The topic of research is similar to this study in a number of ways. Firstly, a widely known failed realized M&A case, Pfizer's acquisition of Wyeth, was applied. Secondly, several valuation methods were applied to the case. Thirdly, it relates to the pharmaceutical industry. However, there are also a number of research gaps which will be filled by the topic of research in this study. The study from Price (2013) only evaluates a single company, involved in an M&A deal, and the topic of research in this study will be applied to several new ones in the pharmaceutical industry. Moreover, there are several other methods

which were not applied in the study, including relative valuation, which was previously described earlier in the literature review.

In an expert review related to critical analysis of M&A valuation in the pharmaceutical industry, Dierks et al. (2018) used three multiples when comparing companies, of both the acquirer of the target, involved in realized as well as non-realized M&A deals above $1 billon during 2016. These multiples, EV/EBITDA, P/E and price per cash flow (here after P/CF), were compared to the MSCI World Index as a benchmark. They argue that the EV/EBITDA multiple is more accurate than the P/E value, although it provides an advantage to include both, in this context due to the fact that it takes into consideration the operational earnings rather than the next profit as well as the value of the company overall. Moreover, this multiple is especially useful due to the fact that it is capital structure neutral as it is applicable for companies which are capital intensive. Furthermore, including cash flows also provides an advantage as it shows the financial health of the companies analyzed as well as the liquidity of the firms.

Nine deals were examined: Shire and Baxalta, Pfizer and Medivation, Mylan and Meda, AbbVie and StemCentRx, Pfizer and Anacor Pharmaceuticals, Pfizer and AstraZeneca, Horizon Pharma and Raptor Pharmaceutical, Galencia, Relypsa, Jazz Pharmaceuticals and Celator Pharmaceuticals. The obtained average results from the study compared to the benchmarks were 14.59 vs. 12.05 for EV/EBITDA, 17.37 vs. 21.05 for P/E and 12.66 vs. 11.43 for P/CF. All the acquiring companies were above the EV/EBITDA benchmarks and all of these were below the corresponding ones for the P/E multiples. Regarding the P/CF multiples, two of the acquiring companies, Horizon Pharma and Mylan, were below the benchmark average.

Similarly, to the study from Price (2013), the topic of research in this study is similar to this expert review in two major ways. Firstly, M&A deals were examined with methodologies including both cash flows and relative valuation methodologies. Secondly, the analyzed M&A deals included large publicly traded pharmaceutical companies. However, there are also differences. In this study both realized and non-realized deals were analyzed. In the upcoming research, only realized transactions will be applied. Furthermore, a larger time span than just a single year will be considered in the research. Moreover, a special consideration of failed deals, with respect to reduction of market capitalization, sales growth and/or profitability, will be included in the research instead of solely large, realized M&A deals in the pharmaceutical industry.

Using benchmarks is an important tool for investors. Hammond and Subramanian (2013) states that benchmarks are useful, precise as well as practical in all the stages of investment processes. Benchmarks assist investors to better control the investment risk, make the assets more efficient as well as provide guidance in the investment management performance. They should be transparent, consistent over time and accurate, in order to prevent confusion and they should treat e.g., M&A in a neutral way, so all investors have the same starting point, thus providing no advantage for anyone. A widely used benchmark is the MSCI World Index, which was used in the study from Dierks et al. (2018) previously described. The MSCI World Index contains enterprises data from 23 developed markets, including entities with both mid- and large market capitalization values (Cayón & Sarmiento, 2020). Similar to research related to relative valuation in the pharmaceutical industry, using the MSCI World Index as a benchmark in the valuation approach is also rare within this industry in academic research.

2.8 Theory and practice of M&A valuation

In this section, the theory and practice of M&A valuation will be highlighted. Mazzariol and Thomas (2016) examined theory and practice in M&A valuations. A figure between 40-50 percent above the current value is not uncommon to be paid for companies in M&A deals, thus targets are often overpaid, in other words, premium priced. There are five factors and reasons related to premium pricing in M&A deals. The first reason is if there are more than one company that want to buy the target. Thus, there is a bidding process between the companies, which drives the increase of the price. An overestimation of the target is the second reason. This reason is usually linked to forecasting errors. The third reason is when the expected synergies, e.g., cross-selling products, are overestimated. If there is management hubris, this may result in overpayment as well as overbidding and this is the fourth reason to premium pricing. Management hubris may lead to e.g., emotional attachment, which gradually bid up the price in M&A deals.

The fifth reason is related to improperly conducted due diligence in the M&A process. After an M&A deal, an acquiring company may later write off value from a target company if the real value is less, e.g., hidden by accounting tricks and/or improper internal operations, which pave a significant risk to the acquiring company. Concluding remarks from this study is that the modeling has impact on the deviations between theory and practice, but it is not the entire story as external factor may also contribute to these discrepancies to a great extent. As previously stated, it is important to have in mind that a valuation model is a set of assumptions and a model itself cannot be responsible for a misvaluation, but rather the non-consideration of all parameters in the modeling approach or unrealistic assumptions in projections, which might have been affected by some of the reasons that Mazzariol and Thomas (2016) describe such as management hubris.

As briefly mentioned in earlier sections in this literature review, real options are too complex as well as theoretical for practitioners and they are not used as much as other valuation methods. Triantis (2005) listed five major challenges for real options, in order to get more insight in the theory and practice of the approach. The first challenge relates to that the models should be refined with respect to the distributions used in the approach, encouraging a consistent guidance of the price of risk and using superior computational methods. The second challenge relates to splitting options between more than one party and that there are potential gains from it. The third challenge is how to model managerial behavior. Here, two issues are frequently occurring: intentional actions and unintended mistakes. These kinds of managerial behavior may be e.g., derived from misaligned incentives as well as cognitive biases.

The fourth challenge relates to developing heuristics. In other words, making real options more user-friendly. If the approach is considered too complex, it will obviously not be used by the majority of the investors. The various complexities need to be addressed for specific scenarios and they need to have clear purposes, otherwise the potential gains from the modeling approach will never be realized. The fifth challenge relates to valuing and managing the firm. Depending on which metrics analysts and investors use to value the companies, executives will focus on having a sound growth in this metric, although this may affect the value in the long-term. As described in the earlier sections, real options are not as widespread by practitioners in industry as other approaches. This will affect how responsive the executives are to this approach and consequently they will not prioritize a sound growth to this modeling approach. A bottleneck of the real option approach is that it is accurate at the project level but making an overall valuation of a whole company is significantly more complex. In order to solve this matter, it is important to get more insight

into the interactions of the different projects and how they may be summed up to an overall valuation.

To summarize this evaluation and the findings from Triantis (2005), it further confirms as well strengthen what was previously concluded by the other research articles in this chapter. Although its superior accuracy and future potential simultaneously as it is more applicable to the valuation at a project level, the methodology is too complex to apply in practice in everyday investing activities by practitioners and it is simply more dedicated to academic research. Therefore, as this is a practical research study with objectives also outside academia, this methodology along the rNPV should not be considered in the upcoming research concerning to oversee the applicability of M&A valuation models in the pharmaceutical industry.

2.9 Summary

Valuation, in the pharmaceutical industry, has for a long time been directed to two approaches in academic research: DCF and real options, although the two main approaches in general are DCF and relative valuation. This literature review revealed the weaknesses of real options such as it is a too theoretical as well as complex approach to use. Other valuation approaches, mainly related to DCF, have then emerged such as extended rNPV. More complex models using Monte Carlo simulations and Markov processes have also emerged in academic research. These models are considered to be too complex to use within mainstream valuation. In other words, it is evident that models developed within academic research mainly focus on the accuracy rather than the simplicity as well as user-friendliness. Relative valuation in the pharmaceutical industry is little mentioned in academic research but is widely spread in industry by professionals. The combination of the

two main valuation approaches, DCF and relative valuation, is rare in academic research. In the last section of the literature review, theory and practice in M&A valuations was examined.

From the above literature review and background, it is evident that the research, to oversee the applicability of M&A valuation models in the pharmaceutical industry, is highly relevant, which was also concluded in the introduction chapter. Clearly, based on the literature review, it can be concluded that there are discrepancies between what is practiced in industry and academia. A holistic approach like the topic of research in this study would reduce these ambiguities and provide guidance about the best practice. To summarize, as previously stated, the research is unique and will fill several research gaps related to M&A valuation in the pharmaceutical industry. In the next chapter, the methodology of the research will be demonstrated. Methodological frameworks, including clarifications of the models in a detailed way, shall be elaborated. These frameworks will help with the estimation of the various objectives of the study. Detailed procedures shall be included, in order to reassure the possibility of reproducing the study and research. The research design will be elaborated, and its framework will answer the research questions. The methodology chapter will also include analysis, measurement as well as selection and collection of the data. Various data treatments will also be included. Furthermore, a section related to research design limitations will be highlighted as well.

CHAPTER III:
METHODOLOGY

In this chapter, methodological frameworks of the research shall be elaborated, which will help with the estimation as well as evaluation of the various objectives of the study. This chapter will begin with an overview of the research problem, which will be followed by a section dedicated to operationalization of theoretical constructs. The operationalization of theoretical constructs will demonstrate the results from the literature review and will be the basis of the upcoming empirical research. In this section, the used models will be clarified in a systematic manner. After this section, the research purpose and questions will be demonstrated once again, which will be followed by the research design. In the research design section, the framework which will answer the research questions will be elaborated. The research design will thus act as a blueprint of the research and the various essential research components such as analysis, measurements and collection will be based on it.

After the research design, a section dedicated to population and data sampling will be demonstrated. Here, the chosen sample will be defined, and it will be explained with a clear rationale why it is representative as well as relevant for the study. This section will be followed by detailed data collection procedures, in order to reassure the possibility of reproducing the study. In the appendices, various detailed parts, related to the data collection as well as calculation, among others, will be included. A section dedicated to data analysis of the research will then presented. In this section, it will be described how the data analysis was conducted in a detailed manner, including various data treatments. In the end of this chapter, a section related to research design limitations and a conclusion will be demonstrated.

3.1 Overview of the Research Problem

Although a properly conducted valuation step have been included in the M&A process, there is no guarantee that the realized deals will deliver value with respect to increased market capitalization, sales growth and/or profitability. There are numerous examples of large realized failed M&A deals, including tens of billions of USD, in the pharmaceutical sector, dating back several decades ago up to today's date. As previously mentioned in chapter one, one of the top reasons for failed M&A deals is misvaluation. M&A valuation models consist of a set of assumptions and the models themselves cannot be responsible for the misvaluation but rather the non-consideration of all parameters in the modelling approach.

However, several factors and trends in the pharmaceutical industry may contribute to an increased valuation complexity and promote non-consideration of important input parameters, including assumptions. Therefore, it is of high importance that the applicability of M&A valuation models is overseen in the pharmaceutical industry, thus assessing if such assumptions and models contributed to ease or to make it difficult for investors to bring them closer in positions. In other words, identifying factors within the valuation that may have contributed to reduction of profitability, sales growth and/or market capitalization. M&A deals in the pharmaceutical industry will most likely increase in the future, meanwhile the climate in the sector is getting more and more complicated with respect to factors such as pricing pressures, in addition to the ever-increasing regulatory requirements.

3.2 Operationalization of Theoretical Constructs

Taking the literature review and its finding into consideration, both academic research as well as what is practiced by professionals in industry, it is plausible to include the DCF and relative modeling approach in the research. By practitioners, other models are considered to be too complex and not user friendly. A notable example is the real options approach, which have been extensively applied to academic valuation research in the pharmaceutical industry. Although, this approach has an immense potential, practitioners in industry are not applying it to such a great extent as the DCF approach, which has been a standard stable, approach for a long time. As mentioned in the literature review, scholars have identified several practical drawbacks related to the real options approach, such as it is challenging to value a whole company instead of just projects, model managerial behavior, along with it is not user-friendly.

In contrast to the real options approach, relative valuation has been little applied in academic research which relates to the pharmaceutical industry, but survey studies of practitioners and industry professionals reveal that it is a widely used approach in general. Therefore, it is plausible to include this approach in this research study, in order to reveal further advantages of it in this particular sector. The research will thus combine and evaluate two modelling approaches, DCF and relative valuation, which have not been studied together in such an extensive manner with several realized M&A transactions in this industry during the last decade. In other words, both intrinsic and extrinsic valuation will be applied to the target companies in this research study.

3.2.1 The DCF approach

The DCF approach, as previously mentioned in the literature review chapter, is an intrinsic valuation approach which is based on discounted future cash flows, which in turn is initially based on the following general idea, seen in formula 1. This idea describes a projection of future benefits in relation to an initial investment, which may be used to determine the feasibility of an investment. In the formula, I_0 is the initial investment, FB_i is the future benefit and r is the discount rate. A net present value (here after NPV) which is positive value means that the investment paid off and a negative one that it did not. In formula 2, the PV, which may also be referred as the business value, is calculated based on future FCF and the remaining value of the FCF, which is also called perpetuity or terminal value. In formula 2, this is the rightmost fraction. The forecasted period is usually five years, which is also highlighted in the formula, including each of the periods. The g parameter represents the growth rate after the end of the period, also called the terminal growth rate, or long-term growth-rate, in this case after the fifth year (Gaughan, 2015).

The terminal growth rate is often estimated based on in which growth stage the company operates in, i.e., the expansion, decelerated or the mature growth stage. If the company operates in the expansion stage, a terminal growth rate of above 10% is usually applied in the modelling approach. Regarding the decelerated stage, a terminal growth rate between 5%-8% is applied as a rule of thumb. For companies that already reached the mature growth stage in the business cycle, a terminal growth rate between the historical inflation as well as GDP growth rate, which translates to a figure of approximately 3% (Corporate Finance Institute, 2020). Another way of calculating the terminal value is to multiply an estimated EBITDA figure in the end of the forecasting period with an exit multiple, which may be derived from comparable companies.

$$NPV = I_0 - \sum_{i=1}^{n} \frac{FB_1}{(1+r)} + \sum_{i=2}^{n} \frac{FB_2}{(1+r)^2} + \sum_{i=3}^{n} \frac{FB_3}{(1+r)^3} \dots = \frac{FB_n}{(1+r)^n} \quad (1)$$

$$PV = \frac{FCF_1}{(1+r)} + \frac{FCF_2}{(1+r)^2} + \frac{FCF_3}{(1+r)^3} + \frac{FCF_4}{(1+r)^4} + \frac{FCF_5}{(1+r)^5} + \frac{\frac{FCF_5}{(r-g)}}{(1+r)^5} \quad (2)$$

The FCF is defined by formula 3. In other words, it represents the cash flow, which is available to capital providers such as debt and equity holders, thus what is valuable for the investors. EBIT is the earnings before interests and taxes. DA is the depreciation and amortization. The other parameters in the formula relates to net working capital (NWC) and capital expenditure (CAPEX) (Gaughan, 2015).

$$FCF = EBIT(1 - Tax\ rate) + DA - NWC - CAPEX \quad (3)$$

The cost of capital, the discount rate, is of high importance in the DCF approach. It is usually calculated with a methodology called the weighted cost of capital (here after WACC). WACC is calculated by formula 4, where D is the market value of debt, E is the market value of equity, t is the marginal tax rate, r_e is the cost of equity and r_d is the cost of debt. In other words, it is the cost of debt times its share of debt in the capital structure plus the cost of equity times the share of equity in the capital structure (Rosenbaum & Pearl, 2020). Furthermore, in addition to the above-mentioned financial instruments, other instruments such as bonds and preferred stocks may also be used for financing purposes.

$$WACC = \left(r_d * (1 - t)\right) * \frac{D}{D+E} + r_e * \frac{E}{D+E} \quad (4)$$

If the target company is a public one, the capital structure of debt and equity may be examined with current available as well as historical figures, along with comparable

companies. The cost of debt may e.g., be derived from the current yields if the company has publicly traded bonds as its debt in the capital structure. If not already available for the publicly traded company, the cost of equity may be derived from the capital asset pricing model (here after CAPM), seen in formula 5. In other words, the cost of equity is the risk-free rate, r_f, plus the levered beta, β_L, times the market risk premium, $(r_m - r_f)$.

This formula may also be adjusted with a size premium, notably for smaller and riskier companies, which is added to the formula, thus making the cost of equity higher. The risk-free rate may be derived from riskless securities such as governmental securities such as US treasury bonds. The beta is calculated taking both the overall market as well as the stock of the target company into consideration and its measure describes the covariance between them. There are levered and unlevered beta values. The market risk premium is the difference between the market risk premium and the risk-free rate (Rosenbaum & Pearl, 2020).

$$r_e = r_f + \beta_L * (r_m - r_f) \quad (5)$$

3.2.2 Relative valuation

Several multiples were mentioned in the literature review. The most used multiples within relative valuation are either based on size, profitability, growth profile, return on investment and/or credit profile. Based on the multiples of the comparable companies, an enterprise valuation will most often be determined, which is described in formula 6, where EQV is the equity value, TD is the total debt, PS is the preferred stock, NI is the noncon-trolling interest and CCE is the cash and cash equivalents. (Rosenbaum & Pearl, 2020).

$$Enterprise\ value = EQV + TD + PS + NI - CCE \quad (6)$$

Another way of interpreting and calculating the enterprise value is represented in formula 7. Here, in this simplified expression, the enterprise value is equal to the market capitalization, MC, which is the product of the number of shares and the share price, TD, which is the total debt, and CCE is the cash and equivalents, which was also previously mentioned in formula 6 (Murphy, 2020). MC and TD may be used as the market value of equity and debt in the calculation of WACC, presented in formula 4.

$$Enterprise\ value = MC + TD - CCE \tag{7}$$

The two most popular multiples are, as also previously mentioned in the literature review, P/E and EV/EBITDA. P/E can be calculated in two ways each, seen in formula 8 and 9. The EV/EBITDA is calculated in the way it is stated in its definition. Two other commonly used multiples are EV/EBIT and EV/Sales (Rosenbaum & Pearl, 2020). The latter, EV/Sales is especially useful when the EBITDA and/or the earnings are negative, thus generating negative P/E as well as EV/EBITDA multiples (Corporate Finance Institute, 2020). Both median and average values may be used when conducting a relative valuation analysis. However, median values are preferred to use over the average value. The reason is that the median value approach, which is the middle number in a sample, handles the outliers better in a sample than the average, which is simply the sum of a certain numbers divided by the number of individual numbers (Abbott, 2018). To illustrate an example how the median approach better handles outliers is e.g., if we have five numbers in a series, where four of them have a value of five and an outlier has a value of 20. Here, the median will have a value of five and the average will be eight.

$$\frac{Share\ Price}{Diluted\ earnings\ per\ share} \tag{8}$$

$$\frac{Equity\ Value}{Net\ Income} \tag{9}$$

3.3 Research Design

There are three approaches to research, quantitative, qualitative, and mixed methods of the two former approaches (Creswell, 2003). Generally, a quantitative research methodology is based on numerical data, i.e., that can be quantified, and a qualitative approach is based on non-numerical data. The quantitative approach is often based on large-scale sets of data, either primary or secondary, while the qualitative methodology is focusing on exploring as much details as possible (Hughes, 2006). Primary data is dedicated and/or collected for a specific aim in the research, meanwhile the secondary data may be used for other research than the original one, thus it initially had a different purpose when it was collected (Hox & Boeije, 2005). To illustrate an example about these differences in practice, the primary date is collected by the researcher and the secondary date may be derived from external data sources such as Yahoo Finance.

There are also other differences between the quantitative and qualitative approaches. Due to the extensive focus on details, including non-numerical data, the dimension of group studies may be bigger in qualitative than in quantitative research. Furthermore, in quantitative research, the researcher may also be closer to the problem being studied and focus more on comprehending the context of the research problem, while in quantitative approaches theoretical frameworks as well as hypotheses may be more well-structured. There are several ways of conducting quantitative and qualitative research. Examples

of quantitative methods are simulations, surveys, correlation studies and multivariate analyses. Qualitative methods may include observations, ethnography, field research, focus groups as well as structured and in-depth interviews.

There are also multiple strengths and weaknesses of both of the approaches. Examples of advantages of quantitative approaches may be that they enable various sophisticated statistical techniques to be applied, are often cost-effective in the data collection, enable large scale research and that they are replicable. Disadvantages may include that expensive statistical software may be required for the analyses, it is often time consuming and requires deep expertise for various modelling approaches. While the qualitative approach may share some of the same advantages and disadvantages as the quantitative approach, such as time consuming, there are other ones as well. Example of an advantage is the detailed results that are often retrieved from the qualitative methods. Disadvantages may be that e.g., interviews are not generalizable and that there are ethical issues in the data collection process (Queirós et al., 2017).

This study was of a quantitative nature and used secondary sources as its data. In the relative modelling approach, a selection of comparable companies from the pharmaceutical industry were firstly made. In order to get as good and reliable data as possible, the selection was gradually narrowed down from a larger than necessary scope, including the selected companies related to the realized M&A transactions previously described. Then, the required financial information was obtained from external sources, followed by spreading key multiples, including ratios and statistics. The spreading step was followed by benchmarking, where the comparable companies were analyzed in depth. From this analysis, discrepancies, and similarities with respect to factors such as margins, size, sales growth was examined, in order to determine a relative ranking of the companies. The

benchmarking determined the most suitable companies for the valuation and will be the foundation for the last step, to determine the valuation (Rosenbaum & Pearl, 2013).

When conducting the DCF methodology, the first step was to determine important drivers, with respect to performance, of the pharmaceutical sector in general as well as the selected companies previously described. External data sources such as SEC filings, annual reports as well as Yahoo Finance were used in this step and were the basis for the rest of the preceding steps. This step was followed by free cash flow projections, calculation of WACC and determining the terminal value. In the last step, the present value was calculated, which determined the valuation of the selected companies (Rosenbaum & Pearl, 2013).

3.4 Population and Sample

The initial selection of realized M&A deals, which were briefly mentioned in the research problem section, is presented in table 1. This selection of deals was further confirmed in an article on the popular investment platform Yahoo Finance (2019), indicating the relevance of them. These M&A deals were examined one by one in a detailed way, including various facts related to the deals, in order to determine which targets that were the most appropriate ones to conduct the research on.

Table 1. Failed M&A deals for different reasons in the pharmaceutical industry during the last decade.

Acquirer/Target	**Deal size ($)**	**Date announced**
Bayer/Monsanto	63 billion	September 14, 2016
Teva/Allergan Generics	40.5 billion	July 27, 2015
Shire/Baxalta	32 billion	January 11, 2016

Johnson & Johnson/Actelion	30 billion	June 16,2017
Bayer/Merck Consumer Health	14.2 billion	May 6, 2014
Gilead Sciences/Kite Pharma	11.9 billion	August 28, 2017
Sanofi/Bioverativ	11.6 billion	January 22, 2018
Amgen/Onyx	10.4 billion	August 25, 2013
AbbVie/Stemcentrx	10.2 billion	April 28, 2016
Merck/Cubist Pharmaceuticals	8.4 billion	December 8, 2014
Alexion/Synageva	8.4 billion	May 6, 2015
Mallinckrodt/Questcor Pharmaceuticals	5.6 billion	April 7, 2014
Teva/Rimsa	2.3 billion	October 1, 2015
Allergan/Kythera	2.1 billion	June 17, 2015
Valeant/Sprout Pharmaceuticals	1 billion	August 19, 2015

Source: Sagonowsky (2019)

Bayer/Monsanto

On September 14, 2016, the German company Bayer, acquired Monsanto for a deal size of $63 billion after negotiation the price three times from an initial bid at $122 per share, ending at $128. Bayer's main purpose of the deal was to enlarge its agrichemical business as other companies in the same industry were obtaining increasing market concentration in similar ways. Although having a larger market concentration, competition was still tough for Bayer, which also faced a major lawsuit, which claimed that one of the products from Monsanto, Roundup, caused cancer. As Bayer started to have TV ads, plaintiffs started to increase rapidly. This fact worried investors, which made the stock value go down 30%. By this, almost the whole purchase price and value of from the Monsanto acquisition disappeared.

By the end of 2018, the debt load from the M&A deal was about $39.5 billion. Various restructurings have been implemented such as cutting 12,000 jobs, C-executives that left and selling away units such as Dr Scholl's, a consumer health brand. According to Bayer, they are now on the right track together with Monsanto and Bayer is continuously screening the market in order to enhance the value creation by acquiring new companies (Liu, 2019). Monsanto was a public company before Bayer acquired it and its IPO was on October 27, 2000, on the New York Stock exchange. Bayer is a listed company on the Frankfurt Stock exchange since October 2, 2009 (Crunchbase, 2020).

Teva/Allergan Generics

Teva's main goal of taking over Allergan was to obtain a sustainable growth in the long-term. Allergan had a lucrative generics business. However, after the $40.5 billion deal was closed on July 27, 2015, fierce competition affected the prices of the generical drugs, which significantly decreased. Furthermore, Teva is and has been defending against a price-fixing probe, related to generics in the USA. In the short-term, it went well for Teva. After the takeover, the share price went up to $70 per share from $62, but then it gradually decreased to only $8.60 four years later, in November 2019. Since this M&A deal, jobs have been cut to a great extent, including 10,000 positions in the middle of 2019, as the company battles with a $3 billion savings plan. The debt load has been large and other costs have been cut as well. Investors say that the M&A deal was overpaid by approximately 25% (Sagonowsky, 2019). Allergan was a public company before Teva acquired it and its IPO was on October 11, 2013, on the New York Stock exchange. Teva is a listed company on the New York Stock exchange since February 26, 1982 (Crunchbase, 2020).

Shire/Baxalta

By acquiring Baxalta, Shire wanted to reach a sales figure of $20 billion within four years, from its deal date on January 11, 2016, to 2020. Baxalta's rare-disease drugs were promising to Shire and was the main driving force of the M&A deal. The total sales were not as good as expected and sank by 3%, including 6% in the hematology, a rare disease, product business already in the first quarter after the integration of the two companies. Analysts predicted that emerging therapies from other companies, such as Roche, could challenge 40% of the existing hemophilia treatments. The share price of Shire decreased gradually. It decreased so much that a breakup of the two companies were recommended by an activist hedge fund. Shire was later acquired by Takeda, another pharmaceutical company (Helfand, 2019). Baxalta was a public company before Shire acquired it and its IPO was on June 26, 2015, on the New York Stock exchange. Shire is a listed company on the Nasdaq Stock exchange since January 10, 2003 (Crunchbase, 2020).

Johnson & Johnson/Actelion

The main goal of acquiring Actelion for Johnson & Johnson was to expand its portfolio of pulmonary arterial hypertension, a rare disease, drugs. Actelion's infamous drug within this category, Tracleer, was hit by generic competition. This was a devastating fact for Johnson & Johnson because the next generation drugs had previously contributed to a growth of 5% in the pulmonary arterial hypertension segment. This growth may not be enough to justify the purchase price in the M&A deal. Analysts argue that the purchase of Actelion destroy value up to $15 billion. Factors that may have driven up the price was that Sanofi, another pharmaceutical company, also wanted to acquire Actelion (Weintraub, 2019). Actelion was a public company before Johnson & Johnson acquired it and its IPO

was on March 14, 2003, on the Swiss stock exchange. Johnson & Johnson is a listed company on the New York Stock exchange since January 13, 1978 (Crunchbase, 2020).

Bayer/Merck Consumer Health

By acquiring Merck Consumer Health, Bayer wanted to become a global leader in the over-the-counter business. However, the over-the-counter tended to decline after realization of the deal on May 6, 2014. The trend has continued, which is now heavily impacted by online sales, which drives the prices downwards. There are numerous examples of over-the-counter brands which have dropped in sales since then, such as Claritin, an allergy solution. Other large pharmaceutical companies, such as Pfizer, Bristol-Myers Squibb, among others, have sold their consumer businesses due to this notable industry trend. Furthermore, analysts argue that the purchase price of Merck consumer health at $14.2 billion was about 6.5 times its sales. Bayer has also admitted themselves that growth and value expectations have not been met after the M&A deal (Liu, 2019). Merck consumer health was not itself a listed company before the acquisition as it was a subsidiary of Merck. Bayer is, as previously described, listed on the Frankfurt Stock exchange (Crunchbase, 2020).

Gilead Sciences/Kite Pharma

The Gilead Sciences and Kite Pharma deal is a deal which analysts say have created as well as resulted in zero value. Two years after the realization of the $11.9 billion deal, on August 28, 2017, the only approved drug Yescarta has generated a global sales figure of $118 million. This was a total underestimation as analysts predicted a peak sale of $2 billion after Yescarta was granted approval. However, Gilead themselves believes that the acquisition of Kite Pharma will be a key player of its future growth as it deals with cell therapy, which has the potential to treat cancer variants that have no or few options left

(Helfand, 2019). Kite Pharma was a public company before Gilead Sciences acquired it and its IPO was on June 27, 2014, on the Nasdaq stock exchange. Gilead Sciences is listed on the Milan Stock exchange since October 27, 2017 (Crunchbase, 2020).

Sanofi/Bioverativ

Sanofi wanted to boost its portfolio and presence in rare diseases. This was the reason why it acquired Bioverativ on January 22, 2018. Bioverativ had many hemophilia therapies, which Sanofi was interested in. However, competition was more though than expected as Roche launched another successful hemophilia drugs just months before the acquisition took place. This affected e.g., the sales of Eloctate, which was one of Bioverativ's hemophilia drugs. It sank by 14.7% during the first quarter the year after the acquisition, including a reduction of 4.2% in year-over-year sales during the same period of time. Competition has grown ever since. Sanofi says that the acquisition will the deliver value as first anticipated and will enable expansion outside the hemophilia segment to combat other rare blood disorders (Sagonowsky, 2019). Bioverativ was a public company before Sanofi acquired it and its IPO was on January 13, 2017, on the Nasdaq stock exchange. Sanofi is listed on the New York Stock exchange since July 5, 2002 (Crunchbase, 2020).

Amgen/Onyx

Onyx star drug, Kyprolis, combatting multiple myeloma, was the main reason why it was acquired by Amgen on August 25, 2013. However, six year after the M&A deal, Kyprolis has generated a revenue of $4.19 billion, which is significantly lower than the purchase price of $10.4 billion. The foundation of the deal was that Kyprolis was a drug that was expected to have an immense potential and that Amgens expertise could add value to it. Before the acquisition, it rapidly doubled the sales during the first year available on

the market. However, the competition has increased, meanwhile some of the line extensions of Kyprolis got stuck in clinical trials. Furthermore, analysts predicted a peak sale of $2-$3 billion and the first nine months of 2019 only ended up in $778 million, which is another justification why the purchase price was higher than it should have been (Helfand, 2019). Onyx was not a public company before Amgen acquired it. Amgen is listed on the Nasdaq Stock exchange since June 24, 1983 (Crunchbase, 2020).

AbbVie/Stemcentrx

A treatment for small cell lung cancer, Rova-T, was the main reason why AbbVie acquired Stemcentrx for $10.2 billion on April 28, 2016. It was not an M&A deal that resulted in the value creation that AbbVie had hoped for, rather the opposite. Several developments, related to non-successful clinical trials, during the following years resulted in that AbbVie had to write-off $5.1 billion of the acquisition, including cut jobs. The Rova-T drug was expected to obtain a first approval by 2018, altogether with an estimated sales peak of $5 billion. Failed clinical trials for several years continued, until that AbbVie announced that they quit the drug in mid-2019. AbbVie did not only encounter failure with clinical trials related to the Rova-T drug from Stemcentrx, but also another one, SC-007, which was an antibody drug conjugate targeting solid tumors (Liu, 2019). Stemcentrx was not a public company before AbbVie acquired it. Abbvie is listed on the New York Stock exchange since December 21, 2012 (Crunchbase, 2020).

Merck/Cubist Pharmaceuticals

On December 8, 2014, Merck bought Cubist Pharmaceuticals for $8.4 billion. They main reason why the deal occurred was the antibiotics business that Cubist Pharmaceuticals possessed. During the very same day of the acquisition, the Cubist Pharmaceuticals drug

with the most sale, Cubicin, lost its patent when key patents were invalidated by a USA court. With sales of $700 during the first three quarters of the year, Cubicin now faced generic competition. Merck decided to move forward anyway. Due to this fact, it is estimated by analysts that the Merck paid $2-$3 billion too much for Cubist Pharmaceuticals. However, Merck clearly states that challenges such as antibiotic resistance is an important topic in today's world and there are not many large pharmaceutical companies operating in this field, indicating the potential of it. Furthermore, the decreased sales prospects of Cubicin did not have a major impact on Merck overall, since it also had other successful drugs at the time being such as Keytruda, which generated billions of dollars in revenue (Sagonowsky, 2019). Cubist Pharmaceuticals was a public company before Merck acquired it and its IPO was on March 15, 2002, on the Nasdaq stock exchange. Merck is listed on the New York Stock exchange since January 13, 1978 (Crunchbase, 2020).

Alexion/Synageva

Alexion wanted to expand its rare disease business and the company thought that acquiring Synageva was a good way to do so. On May 6, 2015, Alexion bought Synageva for $8.4 billion, which was a 135% premium on the stock price of Synageva. However, Synageva's top drug, Kanuma, was estimated by analysts to have a sales peak between $1-$1.5 billion, but its real sales figures were only $28.4 million in the third quarter during the same year as the acquisition took place. Analysts were now skeptical of the sales peak and believed it would take a long time to reach these sales figures. Furthermore, two years after the M&A deal, a new CEO was appointed, who was more defensive towards risky M&A deals like the one with Synageva, which is a good sign for Alexion. Synageva had no products on the market when the deal was announced (Blankenship, 2019). Synageva was a public company before Alexion acquired it and its IPO was on November 11, 2011, on the

Nasdaq stock exchange. Alexion is listed on the Nasdaq Stock exchange since March 8, 1996 (Crunchbase, 2020).

Mallinckrodt/Questcor Pharmaceuticals

By acquiring Questcor Pharmaceuticals for $5.6 billion on April 7, 2014, Mallinckrodt also got the infamous drug Achtar, an infantile spasms medication, in the portfolio. The sales of Achtar were not as good as expected. One of the reasons for this was that barriers of using the drug were implemented. Furthermore, after the M&A deal, Mallinckrodt did also face several legal problems related to the Achtar drug, including settlements. Questcor Pharmaceuticals was accused of manipulating the Anchar data which affected the patients, which were misled with respect to factors such as the product safety. Moreover, doctors were allegedly paid in order to enhance the progress of the drug. Another legal issue which Questcor Pharmaceuticals was later accused of was that they bought a rival company, Synacthen Depot, which had a similar drug to Achtar, in order to boost the price. This resulted in a $100 million settlement. Not enough with that, Humana, an insurance company, has now claimed that it has been highly affected by the doctor kickbacks made by Questcor Pharmaceuticals. This sum is estimated to be $700 million, which Mallinckrodt was being sued of (Blankenship, 2019). Questcor Pharmaceuticals was a public company before Mallinckrodt acquired it and its IPO was on November 1, 1992, on the Nasdaq stock exchange. Mallinckrodt is listed on the New York Stock exchange since June 28, 2013 (Crunchbase, 2020).

Teva/Rimsa

This $2.3 billion deal, which took place on October 1, 2015, between Teva and Rimsa was a major flaw that ended up in that Teva walked away with a settlement. According to Teva, there were many shortcomings to regulators, patients and Teva itself. Discrepancies between processes in the manufacturing and regulatory registrations were discovered. In all, there were questionable figures, lawsuits and work stoppages before the settlement, which took place a year after the date announced of the M&A deal (Sagonowsky, 2019). Rimsa was not a public company before Teva acquired it. Teva is, as previously described, a listed company on the New York Stock exchange (Crunchbase, 2020).

Allergan/Kythera

The main goal for Allergan of acquiring Kythera on June 17, 2015, was to enlarge its aesthetics pipeline within the business. At this point of time, there was an upcoming and promising drug called Kybella, a chin-fat drug. However, Kybella did not show as good sales figures as expected and this negative trend continued several years after M&A deal. After the 2018 fiscal year ended, $1.6 billion was written off the Kybella, a sum which was only $500 million less of purchase price of Kythera. Furthermore, Allergan, including Kythera's Kybella, was later sold to AbbVie (Blankenship, 2019). Kythera was a public company before Allergan acquired it and its IPO was on October 11, 2012, on the Nasdaq stock exchange (Crunchbase, 2020).

Valeant/Sprout Pharmaceuticals

On August 19, 2015, Valeant acquired Sprout Pharmaceuticals for $1 billion. Valeant's main interest in Sprout Pharmaceuticals was Addyi, a female libido drug, which

just before got an FDA approval. Valeant wanted to enlarge its portfolio of medicines that impact women. The drug was simple too expensive for the patients and the marketing was not prominent, which resulted in sales which were not as good as expected, including its shares were reduced with 90% of the value. After a new leadership was established in Valeant in 2017, Sprout Pharmaceuticals was sold to former investors of the target (Sagonowsky, 2019). Sprout Pharmaceuticals was not a public company before Valeant acquired it. Valeant, now called Bausch Health, is a listed company on the Mexican Stock exchange since September 26, 2014 (Crunchbase, 2020).

Exclusion of the targets

Based on the 15 deals previously described, there were some cases, which were more appropriate to conduct the M&A valuation study on than other ones. Since this study exclusively include public companies, both the targets and acquirers should have been listed companies at the time right before the deal dates. This was the first exclusion criteria. Therefore, the deals Bayer/Merck Consumer Health, Amgen/Onyx, AbbVie/Stemcentrx, Teva/Rima and Valeant/Sprout Pharmaceuticals were excluded from the scope. Secondly, in order to both be able to analyze short- and long-term effects of the cases, deals where either the acquirer or the target, as for now, are not in the same organization, i.e., got purchased by another entity, should be excluded from the study. Based on the second exclusion criteria, the Teva/Allergan generics deal, Shire/Baxalta, Allergan/Kythera and Valeant/Sprout Pharmaceuticals, were not included in the study. Leftover, after the two exclusion criteria, there were the following seven deals: Bayer/Monsanto, Johnson & Johnson/Actelion, Gilead Sciences/Kite Pharma, Sanofi/Bioverativ, Merck/Cubist Pharmaceuticals, Alexion/Synageva and Mallinckrodt/Questcor Pharmaceuticals. Within this selection, Synageva were excluded due to the fact that it had no commercial products on the

market at the time being of the deal announcement, thus the sales and earnings will be misleading in the analysis.

3.5 Data Collection Procedures

In this section, the data collection procedures will be demonstrated. Firstly, the selection of the comparable companies will be emphasized, followed by presenting the obtained data. Secondly, the collection procedures for the DCF valuation will be demonstrated.

3.5.1 Choice of comparable companies

In this section, comparable companies to the six targets were chosen, which were together used to conduct the relative valuation of the targets. Before starting to present the selection of the comparable companies, it is important to identify certain characteristics of the targets such as the business and financial profile of the individual company. These characteristics were used when selecting the comparable companies, i.e., the comparable companies should have similar characteristics. Regarding the business profile, the sector as well as products and services are highly relevant. The sector is equivalent to the industry where the target is operating, in this case all the targets are operating in the pharmaceutical and biotechnology industry. The sector may be further divided into sub-sectors, which refines the analysis due to the fact that they reveal a great deal of the opportunities, risks and key drivers, which are all important factors when conducting a successful relative valuation. Comparable companies within the same sub-sector may be further enhanced if they

provide products and services that are identical or, somewhat, similar (Rosenbaum & Pearl, 2020).

Factors such as size, profitability, growth profile, return on investment and credit profile are relevant when examine the financial profile. The size usually refers to the market valuation such as the enterprise as well as the equity value. Other measures within the size characteristics may be net income, EBIT, EBITDA, sales and gross profit. Companies of similar sizes combined with the same sector and sub-sector usually have multiples that are similar, among other important characteristics such as purchasing power, economics or scale, growth, customers, trading liquidity and pricing leverage. The profitability is another important factor which highly affects the valuation due to the fact that it is the ability for companies to generate profit from sales. In general, the more profitable a company is, the higher the valuation should be. Another general rule relates to the growth profile of a company. The higher growth profile of a company, the higher valuation, as investors usually refer this as a lucrative characteristic. It may be obtained through both estimated future and historical performance.

Regarding the return on investment, the return on invested capital (ROIC), ROE and assets are important metrics to consider. The higher these returns are, the better for the valuation, in contrast to the credit profile, where the debt levels should be low. The three credit rating agencies Standard & Poor's, Moody's Investor Service and Fitch Ratings are issuing credit profiles for a wide range of companies (Rosenbaum & Pearl, 2020).

In the sub-sections below, the six targets were further analyzed with respect to some or all of the key characteristics related to the business and financial profile, whereafter, based on these characteristics, comparable companies were selected. The time of the M&A deals was taken into consideration when identifying these key characteristics and selecting

the comparable companies, e.g., the financial data for both the target as well as its comparable companies were retrieved at the end of the year before the announced acquisition dates. The sub-sectors of the targets were first considered. If there were large differences, with respect to e.g., market capitalization and revenue, within each peer group, comparable companies in the pharmaceutical sector and not only the specific sub-sector was considered.

The reason for the distinguishing was that some of the sub-sectors are more unique than the other ones and therefore there might not be as many companies with similar financial metrics as in other sub-sectors. Web pages, mainly those including financial data as well as information, and search engines were investigated on the internet, in order to retrieve the necessary financial information to conduct the relative valuation of the targets. In order to validate the data, multiple data sources were considered due to the fact that some of the companies were not active anymore on the various stock exchanges.

Monsanto

During the period of time when the acquisition with Bayer was announced, Monsanto operated within the biotechnology industry and the sub-sector agriculture. Its market capitalization and revenue during the last twelve months (here after LTM) were $46.7 and $13.3 billion. Furthermore, its enterprise value and LTM EBITDA were $55.8 and $3.6 billion. Before the deal announcement, its share price was $89 (Pillars of Wall Street, 2016). The ROE, return on assets (here after ROA) and earnings were 23.2%, 6.4% and $1.3 billion (Macroaxis, 2020).

Similar as well as comparable companies within this sub-sector are Syngenta AG, DuPont Nemours and FMC with market capitalization values of $36.6, $27.3 and $4.5 billion respectively in the end of 2015. The EBITDA and enterprise value were $2.4 and $39.0

billion for Syngenta, $13.4 and $40.7 billion for DuPont as well as -$68 million billion and $6.7 billion for FMC. During the same period of time, the ROE equity was 15.5%, 30.5% and 28.8% for the companies. The ROA values were 6.9%, 11.3% and 7.7%. Other relevant metrics include the revenue. Syngenta reported sales of $13.4 billion. For DuPont, this figure was $48.8 billion. Regarding FMC, the sales was $2.5 billion. Furthermore, the share price in the end of the year was $76, $74 and $34 for the companies. The earnings, net incomes, were $1.3 billion, $7.7 billion and $489 million (GuruFocus, 2020). A summary table, consisting of the above-mentioned metrics is presented below, in table 2.

Table 2. Comparable companies to Monsanto within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROA**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Monsanto (target)	46.7 billion	55.8 billion	23.2%/ 6.4%	3.6 billion	13.3 billion	89	1.3 billion
Syngenta	36.6 billion	39.0 billion	15.5%/ 6.9%	2.4 billion	13.4 billion	76	1.3 billion
DuPont	27.3 billion	40.7 billion	0.5%/ 11.3%	13.4 billion	48.8 billion	74	7.7 billion
FMC	4.5 billion	6.7 billion	28.8%/ 7.7%	-68 million	2.5 billion	34	489 million

Source: Pillars of Wall Street (2016), Macroaxis (2020), Gurufocus (2020).

An extension to the above presented comparable companies is presented in table 3. These companies are Regeneron Pharmaceuticals, Shire, Teva Pharmaceuticals and Biogen. They are all operating in the pharmaceutical as well as biotechnology industry, but not

the agricultural biotechnology sub-sector, and are comparable with respect to the market capitalization figures. Similar to the comparable companies in table 2, the values were retrieved from the end of 2015, which is the year before the M&A deal announcement date. Regeneron pharmaceuticals had a market capitalization and enterprise value of $56.8 and $56.1 billion respectively.

The ROE, revenue and EBITDA were 20.5%, $4.1 and $1.3 billion. For Shire the figures were $40.5 billion, $42.0 billion, 14.1%, $6.4 and $2.1 billion. Teva and Biogen had market capitalization and enterprise values of $59.6 and $66.0 billion as well as $61.7 and $64.8 billion respectively. Their ROE figures were 5.9% and 35.2%. Regarding the sales and EBITDA, the figures were $19.7 and $3.9 billion for Teva. The same values were $10.8 and $5.5 billion for Biogen. In the end of the year, the share prices were $543, $203, $62 and $282 for all of the companies. The earnings, net incomes, were $636 million, $1.3 billion, $1.6 billion and $3.5 billion. For all the companies, the ROA values were 11.3%, 6.9%, 2.9% and 18.2% (Gurufocus, 2020).

Table 3. Comparable companies to Monsanto within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Regeneron Pharmaceuti-cals	56.8 billion	56.1 billion	20.5%/ 11.3%	1.3 billion	4.1 billion	543	636 million
Shire	40.5 billion	42.0 billion	14.1%/ 6.9%	2.1 billion	6.4 bil-lion	203	1.3 billion
Teva	59.6 billion	66.0 billion	5.9%/ 2.9%	3.9 billion	19.7 billion	62	1.6 billion

Biogen	61.7 billion	64.8 billion	35.2%/ 18.2%	5.5 billion	10.8 billion	282	3.5 billion

Source: Gurufocus (2020).

Actelion

As previously mentioned, Actelion operated in the rare disease sub-sector, mainly the pulmonary arterial hypertension sector, of the biotechnology and pharmaceutical industry. Its market capitalization and LTM revenue were $27.2 and $2.3 billion. Furthermore, its enterprise value and LTM EBITDA were $27.6 billion and $882 million. The share price was $228 before the deal announcement (Pillars of Wall Street, 2017). Furthermore, the ROE, ROA and earnings were 52.1%, 34.2% and $683 million in 2016, the year before the deal announcement (GuruFocus, 2020).

Comparable companies in the rare disease and pulmonary arterial hypertension sub-sector, are Alexion, Incyte, Biomarine and Seattle Genetics with market capitalization values of $27.4, $18.9, $14.3, $7.5 billion respectively in the end of 2016. The EBITDA and enterprise value were $29.4 and $1.1 billion for Alexion, $18.8 billion and $205 million for Incyte, 14.2 billion and -$606 million for Biomarine as well as $6.9 billion and -$125 million for Seattle Genetics. During the same period of time, the ROE was 4.7%, 35.3%, -24.4%, -26.9% for the companies. The ROA values were 3.0%, 7.9%, -16.3% and -16.2% respectively. Alexion reported sales of $3.1 billion. For Incyte, this figure was $1.1 billion. Regarding Biomarine and Seattle Genetics, the sales were $1.1 billion and $418 million. The share prices were $122, $100, $83 and $53 for the companies. The earnings, net incomes, were $399, $104, -$630 and -$140 million (GuruFocus, 2020). A summary table, consisting of the above-mentioned metrics is presented below, in table 4.

Table 4. Comparable companies to Actelion within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Actelion (target)	27.2 billion	27.6 billion	52.1%/ 34.2%	882 million	2.3 billion	228	683 million
Alexion	27.4 billion	29.4 billion	4.7%/ 3.0%	1.1 billion	3.1 billion	122	399 million
Incyte	18.9 billion	18.8 billion	35.3%/ 7.9%	205 million	1.1 billion	100	104 million
Biomarine	14.3 billion	14.2 billion	-24.4%/ -16.3%	-606 million	1.1 billion	83	-630 million
Seattle Genetics	7.5 billion	6.9 billion	-26.9%/ -16.2%	-125 million	418 million	53	-140 million

Source: Pillars of Wall Street (2017), Gurufocus (2020).

Other comparable companies in the pharmaceutical industry, outside the same sub-sector, with respect to market capitalization values are presented in table 5. These companies are Baxalta, DuPont and Astellas Pharma. Data for DuPont was also collected in the Monsanto case, but for a different period of time. The figures were retrieved from 2015 and 2016, which were the two years before the M&A deal announcement date. More specifically, the market capitalization, enterprise value and ROE values for Baxalta were retrieved from March 2016 and the rest of the figures from the end of 2015. The reason for this was that Baxalta was involved in an M&A deal, as previously described, during the latter part of 2016. For DuPont and Astellas Pharma, the figures were retrieved from the

end of 2016. The market capitalization values were $27.6, $32.9 and $28.2 billion for the three companies. Regarding the enterprise values, the values were $32.3, $48.9 and $24.9 billion. The ROE values were 14.2%, 15.4% and 15.5%. The ROA values were 5.9%, 5.9% and 10.4%. Furthermore, the EBITDA and revenue were $1.5 and $6.1 billion for Baxalta. Regarding DuPont, these values were $8.1 and $48.2 billion. For Astellas Pharma, the values were $2.9 and $12.2 billion. The share prices were $40, $82 and $14 for the companies. Furthermore, the earnings, net incomes, were $956 million, $4.3 billion and $1.6 billion (Gurufocus, 2020).

Table 5. Comparable companies to Actelion within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Baxalta	27.6 billion	32.3 billion	14.2%/ 5.9%	1.5 billion	6.1 billion	40	956 million
DuPont	32.9 billion	48.9 billion	15.4%/ 5.9%	8.1 billion	48.2 billion	82	4.3 billion
Astellas Pharma	28.2 billion	24.9 billion	15.5%/ 10.4%	2.9 billion	12.2 billion	14	1.6 billion

Source: Gurufocus (2020).

Kite Pharma

Prior the M&A deal announcement, Kite Pharma, the immunotherapy specialized company, had a market capitalization and LTM revenue of $10.2 billion and $32.1 million. Its enterprise value was $9.4 billion. The share price was $140 before the deal announcement (Pillar of Wall Street, 2017). The EBITDA and the earnings were negative of -$259

and -$267 million, i.e., the company did not make any profit. The ROE and ROA in 2016 were -13.4% and -10.3% (GuruFocus, 2020). Comparable companies within the immuno-therapy sub-sector are Juno Therapeutics, Galapagos NV and Bluebird Bio. Their market capitalization values were $1.9, $3.0, and $2.5 billion respectively in the end of 2016. The EBITDA and enterprise value were $1.2 billion and -$241 million for Juno Therapeutics, $1.9 billion and $63 million for Galapagos, 1.9 billion and -$254 million for Bluebird Bio. During the same period of time, the ROE was 4.7%, 35.3% and -24.4% for the companies. The ROA values were -19.0%, 7.0% and -0.5%. Juno Therapeutics reported sales of $79 million. For Galapagos, this figure was $137 million. Regarding Bluebird Bio, the sales was $6 million. The share prices were $19, $64 and $62 for the companies. Furthermore, the earnings, net incomes, were -$246, $60 and -$264 million (GuruFocus, 2020). A summary table, consisting of the above-mentioned metrics is presented below, in table 6.

Table 6. Comparable companies to Kite Pharma within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Kite Pharma (target)	10.2 billion	9.4 billion	-13.4%/ -10.3	-259 million	32 million	140	-267 million
Juno Therapeutics	1.9 billion	1.2 billion	-23.9%/ -19.0%	-241 million	79 million	19	-246 million
Galapagos	3.0 billion	1.9 billion	35.3%/ 7.0%	63 million	137 million	64	60 million
Bluebird Bio	2.5 billion	1.9 billion	-24.4%/ -0.5%	-254 million	6 million	62	-264 million

Source: Pillars of Wall Street (2017), Gurufocus (2020).

Comparable companies outside the immunotherapy sub-sector with similar market capitalization values are presented in table 7. These companies are Genmab A/S, Seagen, Jazz Pharmaceuticals, Ionis Pharmaceuticals and H. Lundbeck A/S. Retrieved from the end of 2016, their market capitalization values were $9.6, $7.5, $6.5, $5.8 billion and $7.9. The enterprise values were $9.0, $6.9, $8.1, $5.7 and $7.9 billion during the same period of time. The ROE values were 28.2%, -21.2%, 22.8%, -40.2% and 12.9%. The ROA values were 25.7%, -16.2%, 9.8%, -6.5% and 5.8%.

Regarding Genmab A/S the sales and EBITDA values were $258 and $166 million. For Seagen, these figures were $418 and -$125 million. Jazz and Ionis Pharmaceuticals had sales values of $1.5 billion and $373 million. Their EBITDA figures were $708 and -$9.6 million. H. Lundbeck A/S had a sales and EBITDA figure of $2.2 billion and $349 million respectively. The share prices were $159, $53, $109, $48 and $40 for the companies. Furthermore, the earnings, net incomes, were $168, -$140, $397, -$60 and $172 million (Gurufocus, 2020).

Table 7. Comparable companies to Kite Pharma within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Genmab A/S	9.6 billion	9.0 billion	28.2%/ 25.7%	166 million	258 million	159	168 million
Seagen	7.5 billion	6.9 billion	-21.2%/ -16.2%	-125 million	418 million	53	-140 million
Jazz Pharmaceuticals	6.5 billion	8.1 billion	22.8%/ 9.8%	708 million	1.5 billion	109	397 million

Ionis Pharmaceuticals	$5.8 billion	$5.7 billion	-40.2%/ -6.5%	-$9.6 million	$373 million	$48	-$60 million
H. Lundbeck A/S	$7.9 billion	$7.9 billion	12.9%/ 5.8%	$349 million	$2.2 billion	$40	$172 million

Source: Gurufocus (2020).

Bioverativ

The haemophilia specialized company Bioverativ had a market capitalization value of $11.2 billion and an enterprise value of $10.8 billion, prior the M&A deal announcement. Its LTM revenue as well as EBITDA was $1.2 billion and $462 million. The share price before the deal announcement was $64 (MergerSight Group, 2018). In 2017, the year before the M&A deal, the ROE, ROA and earnings, net income, were 48.2%, 27.2% and $356 million (GuruFocus, 2020).

Comparable companies, also operating in the haemophilia sphere include Spark Therapeutics, Chugai Pharmaceutical and Shire. Their market capitalization values were $1.9, $28.0 and $47.0 billion in 2017. The ROE values were -60.1%, 11.0% and 13.1%. The ROA values were -55.1%, 8.5% and 6.3%. During the end of 2013, the year before the deal announcement date, the enterprise values were $1.4, $25.8 and $66.0 billion. Other relevant metrics include the sales and EBITDA. For Spark Therapeutics these figures were $12.1 million and -$238 million. Regarding Chugai Pharmaceutical the numbers were $4.7 billion and $860 billion. For Shire, the figures were $15.2 billion and $4.7 billion. The share prices were $51, $9 and $155 for the companies. Furthermore, the earnings, net incomes, were -$253 million, $644 million and $4.3 billion (GuruFocus, 2020). A summary table, consisting of the above-mentioned metrics is presented below, in table 8 (Gurufocus, 2020).

Table 8. Comparable companies to Bioverativ within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Bioverativ (target)	11.2 billion	10.8 billion	48.2%/ 27.2%	462 million	1.2 billion	64	356 million
Spark Therapeutics	1.9 billion	1.4 billion	-60.1%/ -55.1%	-238 million	12 million	51	-253 million
Chugai Pharmaceutical	28.0 billion	25.8 billion	11.0%/ 8.5%	860 million	4.7 billion	9	644 million
Shire	47.0 billion	66.0 billion	13.1%/ 6.3%	4.7 billion	15.2 billion	155	4.3 billion

Source: MergerSight Group (2018), Gurufocus (2020).

Other comparable companies outside the hemophilia sub-sector, based on market capitalization values, include Jazz Pharmaceuticals, Neurocrine Biosciences, Seagen and Genmab A/S. Jazz Pharmaceuticals, Seagen, Genmab A/S and H. Lundbeck A/S were also present in table 7, representing the comparable companies for Kite Pharma, but the values differ due to the fact that the values were retrieved from year 2017 and not 2016, which was the year before the acquisition date announcement of Bioverativ. Their market capitalization values were $8.1, $6.9, $7.7, $10.0 and $10.1 billion. Regarding the enterprise values, these figures were $9.0, $6.7, $7.3, $9.2 and $9.5 billion. The ROE values were 21.3%, -41.5%, -19.1%, 20.9% and 25.2%. The ROA values were 9.8%, -24.1%, -14.6%, 19.6% and 13.9%. Jazz Pharmaceuticals had sales and EBTDA values of $1.6 billion and $684 million. For Neurocrine Biosciences, these values were $162 million and -$121 million. Seagen and Genmab A/S had sales figures of $482 and $376 million. Their EBITDA

values were -$172 and $237 million. H. Lundbeck A/S had a sales and EBITDA figure of $2.7 billion and $701 million respectively. The share prices for the five companies were $135, $78, $54, $17 and $49. Their earnings, net incomes, were $488, -$143, -$126, $176 and $417 million (Gurufocus, 2020).

Table 9. Comparable companies to Bioverativ within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Jazz Pharma-ceuticals	8.1 billion	9.0 bil-lion	21.3%/ 9.8%	684 million	1.6 billion	135	488 million
Neurocrine Bio-sciences	6.9 billion	6.7 bil-lion	-41.5%/ -24.1%	-121 million	162 mil-lion	78	-143 million
Seagen	7.7 billion	7.3 bil-lion	-19.1%/ -14.6%	-172 million	482 mil-lion	54	-126 million
Genmab A/S	10.0 billion	9.2 bil-lion	20.9%/ 19.6%	237 million	376 mil-lion	17	176 million
H. Lundbeck A/S	10.1 billion	9.5 bil-lion	25.2%/ 13.9%	701 million	2.7 billion	49	417 million

Source: Gurufocus (2020).

Cubist Pharmaceuticals

Cubist Pharmaceuticals operated in the antibiotics sub-sector in the pharmaceutical at the time of the deal announcement in 2014. The market capital was $7.3 billion, and the enterprise value was $7.5 billion. Furthermore, the LTM EBITDA and revenue was $204 million and $1.2 billion. The share price was $76 (Pillars of Wall Street, 2014). The ROE and ROA were 4.5% and 2.1% (Finscreener, 2020). The earnings, net income, was $29 million in the end of 2013 (Cubist Pharmaceuticals, 2014).

Companies with antibiotics operations during the same period of time are Astellas Pharma, Teva and Actavis. In the end of 2013, the year before the deal announcement date, the market capitalization, enterprise value, sales, EBITDA and ROE, ROA for Astellas Pharma were $26.1, $22.8 $10.7, and $2.3 billion (Macrotrends, 2020), 7.4% and 5.1% (Astellas Pharma Inc, 2014). For Teva the figures were $34.0, $45.2, $20.3, $4.1, 5.7% and 2.7% (Macrotrends, 2020). Regarding Actavis, in 2014, these numbers were $28.5, $34.7, $6.9, $1.6 billion (Tradespoon, 2013), -7.9% (Colomar Roig & De La Flor Julian, 2016) and -3.3% (Tradespoon, 2013). Furthermore, the share prices for the three companies were $12, $36 (Macrotrends, 2020) and $164 (Tradespoon, 2013). Furthermore, their earnings were $881 million, $1.3 billion (Macrotrends, 2020) and -$563 million (Tradespoon, 2013). A summary table, consisting of the above-mentioned metrics is presented below, table 10.

Table 10. Comparable companies to Cubist Pharmaceuticals within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Cubist Pharmaceuticals (target)	7.3 billion	7.5 billion	4.4%/ 2.1%	204 million	1.2 billion	76	29 million
Astellas Pharma	26.1 billion	22.8 billion	7.4%/ 5.1%	2.3 billion	10.7 billion	12	881 million
Teva	34.0 billion	45.2 billion	5.7%/ 2.7%	4.1 billion	20.3 billion	36	1.3 billion
Actavis	28.5 billion	34.7 billion	-7.9%/ -3.3%	1.6 billion	6.9 billion	164	-563 million

Source: Pillars of Wall Street (2014), Finscreener (2020), Cubist Pharmaceuticals (2014), Macrotrends (2020), Tradespoon (2013).

In table 11, comparable companies, within the pharmaceutical industry overall and not specifically the antibiotics sub-sector, to Cubist Pharmaceuticals with respect to market capitalization is presented. These companies were Incyte, Taro Pharmaceutical Industries, Jazz Pharmaceuticals and Biomarin. Incyte, Jazz Pharmaceuticals and Biomarin have previously been mentioned in the sections where the comparable companies for Kite Pharma, Bioverativ and Actelion were presented. The financial figures for these companies were from the end of 2013, instead of 2016 as well as 2017 used previously, which was the year before the M&A deal announcement date for Cubist Pharmaceuticals. The market capitalization values for the four companies were $7.5, $4.4, $7.4 and $9.7 billion (Macrotrends, 2020). Their enterprise values were $7.5, $4.7, $7.7 and $9.3 billion (Discoverci, 2020).

Their ROE figures at the same period of time were 94.4%, 33.5%, 17.6% and -13.8%. The ROA values were -13.2%, 26.6%, 9.7% and -7.9%.

Incyte had an EBITDA and revenue figure of $13 and $355 million respectively. For Taro Pharmaceutical industries, these figures were $410 and $737 million. Jazz Pharmaceuticals and Biomarin had EBITDA of $427 and -$114 million. Their revenues were $872 and $549 million. The share prices for the four companies were $51, $87, $127 and $70. Their earnings, net -$83, $267, $216 and -$176 million (Macrotrends, 2020).

Table 11. Comparable companies to Cubist Pharmaceuticals within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Incyte	7.5 billion	7.5 billion	43.1%/ -13.2%	13 million	355 million	51	-83 million
Taro Pharmaceutical industries	4.4 billion	4.7 billion	33.5%/ 26.6%	410 million	737 million	87	267 million
Jazz Pharmaceuticals	7.4 billion	7.7 billion	17.6%/ 9.7%	427 million	872 million	127	216 million
Biomarin	9.7 billion	9.3 billion	-13.8%/ -7.9%	-114 million	549 million	70	-176 million

Source: Macrotrends (2020), Discoverci (2020)

Questcor Pharmaceuticals

Questcor Pharmaceuticals operated in the autoimmune as well as inflammatory disorders field within the pharmaceutical industry when the deal announcement took place in 2014. Its market capitalization and enterprise value were $3.6 and $4.3 billion. Its LTM revenue as well as EBITDA were $799 and $461 million at the time of the M&A deal announcement date. The share price was $68 before the deal announcement (Pillar of Wall Street, 2014). The ROE and earnings, net income, were 91.0% and 293 million (Questcor Pharmaceuticals, 2014).

Companies which also operated in the autoimmune as well as inflammatory field at the same period of time include Arena pharmaceuticals, Astra Zeneca and Novartis. In the end of 2013, the year before the announcement date, the market capitalization values were $1.3, $74.0 and $194.6 billion. Furthermore, the enterprise values were $1.2, $76.8 and $208.7 billion. The ROE values for the three companies were -19%, 11% and 13%. The ROA values were -5.7%, 4.6% and 7.3%. The sales and EBITDA in 2013 were $81.4 and -$4 million for Arena pharmaceuticals. The figures were $25.8 and $8.3 billion for Astra Zeneca. For Novartis the sales and the EBITDA were $52.7 and $15.4 billion. The share prices for the three companies were $59, $23 and $58. Furthermore, their earnings were -$19 million, $2.6 billion and $9.2 billion (Macrotrends, 2020). A summary table, consisting of the above-mentioned metrics is presented below, in table 12.

Table 12. Comparable companies to Questcor Pharmaceuticals within the same sub-sector in the pharmaceutical industry.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Questcor Pharmaceuticals (target)	3.6 billion	4.3 billion	91.0%/ 44.9%	461 million	799 million	68	293 million
Arena Pharmaceuticals	1.3 billion	1.2 billion	-19%/ -5.7%	-4 million	81.4 million	59	-19 million
Astra Zeneca	74.0 billion	76.8 billion	11%/ 4.6%	8.3 billion	25.8 billion	23	2.6 billion
Novartis	194.6 billion	208.7 billion	13%/ 7.3%	15.4 billion	52.7 billion	58	9.2 billion

Source: Pillars of Wall Street (2014), Questcor Pharmaceuticals (2014), Macrotrends (2020).

An extension to table 12 is presented in table 13. These companies, Incyte, Taro Pharmaceutical industries, Jazz Pharmaceuticals and Biomarin, are comparable companies to Questcor Pharmaceuticals with respect to the market capitalization within the pharmaceutical industry and not limited only to the autoimmune as well as inflammatory subsector. The companies in table 13 are the same as the ones in table 11 and the data was from 2013, which was the year before the acquisition announcement date of Questcor Pharmaceuticals.

Table 13. Comparable companies to Questcor Pharmaceuticals within the pharmaceutical industry with similar market capitalization values and not in the same sub-sector.

Company	**Market Cap ($)**	**EV ($)**	**ROE/ ROI**	**EBITDA ($)**	**Sales ($)**	**Price ($)**	**Earnings ($)**
Incyte	7.5 billion	7.5 billion	43.1%/ -13.2%	13 million	355 million	51	-83 million
Taro Pharmaceutical industries	4.4 billion	4.7 billion	33.5%/ 26.6%	410 million	737 million	87	267 million
Jazz Pharmaceuti-cals	7.4 billion	7.7 billion	17.6%/ 9.7%	427 million	872 million	127	216 million
Biomarin	9.7 billion	9.3 billion	-13.8%/ -7.9%	-114 million	549 million	70	-176 million

Source: Macrotrends (2020), Discoverci (2020).

3.5.2 DCF valuation data

The data for the DCF valuation of the targets from the selected deals were retrieved from SEC filings and annual reports, the year before and during the year the M&A deal announcements took place. Historical performance of the income statements, balance sheets and cash flow statement were found. This data is presented in Appendix A. Additional data necessary, which could not be found in the SEC filings as well as annual reports, were retrieved from web pages, mainly those including financial data as well as information, and search engines on the internet.

3.6 Data Analysis

The tool used to conduct the data analysis was Microsoft Excel. In this software, the models were built, based on the theoretical frameworks previously described. In this section, the data analysis of the two valuation frameworks, relative valuation and DCF, will be demonstrated.

3.6.1 Relative valuation

The data analysis of the relative valuation was designed in the same manner for all the targets and their comparable companies. Three sections were set up in each of the analyses. Firstly, the market data to each company was displayed. This set of data included the enterprise value and market capitalization. Secondly, the financial data was displayed, including sales/revenue and EBITDA. Thirdly, the valuation ratios, including EV/EBITDA, EV/Sales and P/E, was calculated as well as demonstrated. Below each of the sections, the median and average values was calculated for all the companies in each analysis. Based on the multiples, the enterprise value and the share price were calculated and compared to the actual figures. If any of the multiples were negative, these were adjusted to and calculated as a value of zero in all of the analyses.

Three scenarios for each target were calculated and analyzed. The first type analysis was dedicated to the comparable companies including the same sub-sector. This analysis was followed by another one dedicated to the other comparable companies with similar market capitalization values, which were not only limited to the specific sub-sector. The third type of analysis merged and took the first as well as second analysis into consideration. An illustration of the analysis framework is displayed in figure 2.

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Company A (Target)									
Company B									
Company C									
Company D									
Company E									
Median									
Average									

Figure 2. The data analysis framework for the relative valuation.
Source: Lindéus (2021).

The three scenarios for each of the targets were then summarized in a condensed evaluation table, where the results, EV and price, were compared to each other. Then, these results were benchmarked to the actual M&A deal figures and a difference was retrieved, see figure 3. In the analysis, the cells which contain values which are within ten percent of the realized values were be highlighted with green color.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)						
EV/Sales	Average	EV ($Billion)						
EV/EBITDA	Median	EV ($Billion)						
EV/EBITDA	Average	EV ($Billion)						
P/E	Median	Price ($)						
P/E	Average	Price ($)						

Figure 3. Evaluation of the comparable companies' scenarios, including type of multiple, median/average and how many percent each of the combinations differed from the realized values.
Source: Lindéus (2021).

3.6.2 DCF

The structure of the DCF model, which was applied to the target companies, was based on the following sections: operating data, balance sheet and other financial information, free cash flow buildup, terminal value, enterprise to equity value and sensitivity analyses. The design of the model was based on the theory from the operationalization of

theoretical construct section, previously presented in this chapter. The different sections have the historical figures, A1-A2, and projections, P1-P5, in common, which represent the years prior as well as post the M&A deals were announced.

In the operating data section, figure 4, relevant financial data from SEC filings and similar sources, as previously mentioned, were used in the A1 and A2 sections for each of the applicable rows. The revenue growth rate for each of the targets were individually set based on market data and analyses and financial information available on the internet. Furthermore, the historical revenue growth rates were also considered. These assumptions are demonstrated in the DCF assumptions section, 3.7.4.

If the EBIT/EBITDA were not explicitly stated in the source data, EBIT was retrieved as the operating income and EBIDTA was calculated as the sum of the operating income as well as the depreciation/amortization for that given year. The shares of EBITDA, EBIT and D&A were calculated with the average of year A1 and A2 divided by the revenue averages for the same years. These figures were applied to all the five projection years in the analysis. If one of the figures in A1-A2 is highly deviating, the most reasonable figure was used in the calculation and not the average, see Appendix B for further details.

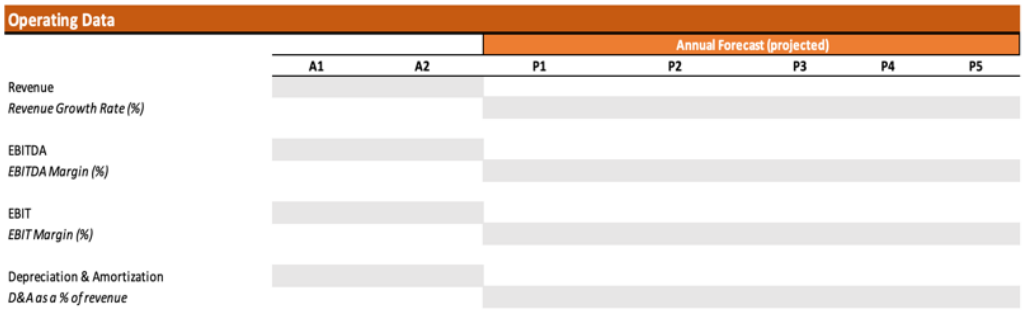


Figure 4. The Operating data section in the DCF model.
Source: Lindéus (2021).

In the balance sheet and other financial information section, figure 5, balance sheet data from the targets were used. In absence of prepaid expenses, the post current assets were used. The growth rates of the various financial data, within this section, were set to the same figures as the revenue growth rates chosen in the operating data section.

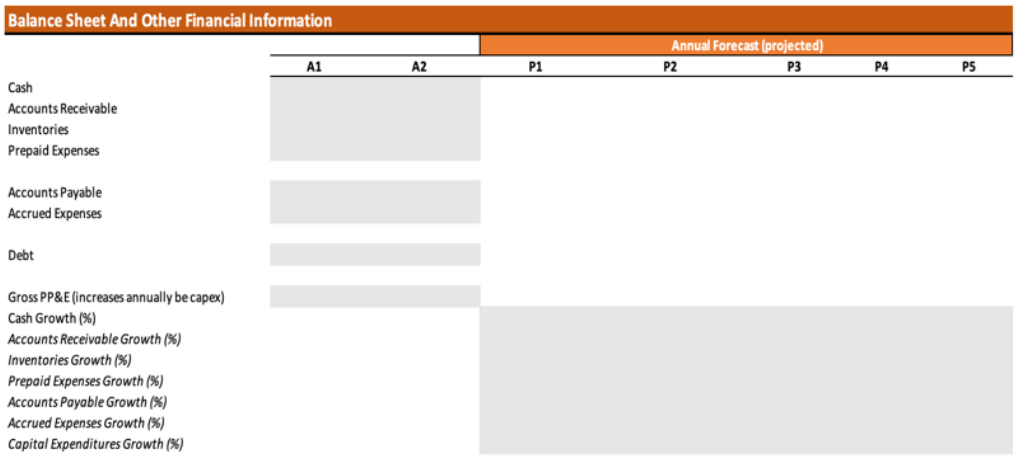
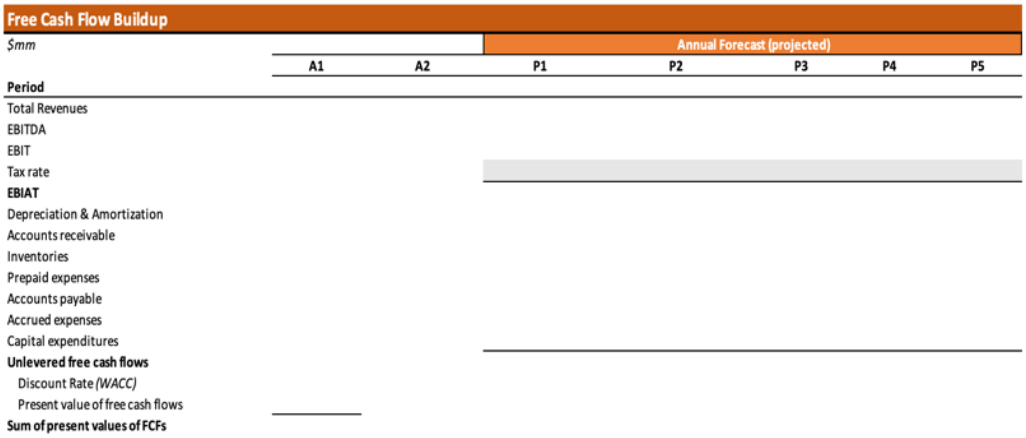


Figure 5. The Balance Sheet and Other Financial Information section in the DCF model. Source: Lindéus (2021).

In the free cash flow buildup section, the unlevered free cash flows and sum of present values of these were calculated. The structure of this section is presented in figure 6. Data from the operating and balance sheet data sections were used here. The tax and discount rates were retrieved from SEC filings as well as other financial information sources, including equity research reports. These assumptions and findings are demonstrated in the DCF assumptions section, 3.7.4. In the sensitivity analysis section, the impact of other figures, with respect to the tax and discount rates, WACC, were demonstrated.



Free Cash Flow Buildup							
$mm			Annual Forecast (projected)				
	A1	A2	P1	P2	P3	P4	P5
Period							
Total Revenues							
EBITDA							
EBIT							
Tax rate							
EBIAT							
Depreciation & Amortization							
Accounts receivable							
Inventories							
Prepaid expenses							
Accounts payable							
Accrued expenses							
Capital expenditures							
Unlevered free cash flows							
Discount Rate *(WACC)*							
Present value of free cash flows							
Sum of present values of FCFs							

Figure 6. The Free Cash Flow Buildup section in the DCF model.
Source: Lindéus (2021).

The terminal value section applied the perpetuity method to calculate the terminal value as well as the present value of it. As may be seen in figure 7, the long-term growth rate and WACC, the discount rate, play a major role in the calculations. Both the WACC and long-term growth rates assumptions are presented in the DCF assumptions section, 3.7.4.

Terminal Value	
Growth in perpetuity method:	
Long term growth rate	
WACC	
Free cash flow (t+1)	
Terminal Value	
Present Value of Terminal Value	

Figure 7. The terminal value section in the DCF model.
Source: Lindéus (2021).

In the enterprise value to equity value section, figure 8, the enterprise and equity values were calculated. The enterprise value was the sum of the present values of free cash flows, and the present value of the terminal value, which were previously demonstrated in figure 5 and 6. The equity value was based on the enterprise value as well as net debt, where the latter was retrieved from the balance sheet section, figure 4. The equity value

was then used to calculate the equity value per share, based on the diluted shares outstanding. The diluted shares outstanding were calculated from the actual market capitalization value prior the deal announcement, divided by the share price at the same period of time.

Figure 8. The Enterprise Value to Equity Value section.
Source: Lindéus (2021).

In figure 9, the structure of the sensitivity analyses, which was applied to each of the targets, is demonstrated. Figure 9 represents the impact of the long-term growth rate and WACC on the enterprise value, market capitalization as well as the share price. It also shows the impact of the tax rate on the enterprise value. All the sensitivity analyses for each of the target companies were based on the initial assumptions, such as the revenue growth rate and the other relevant growth rates in the operations as well as balance sheet sections within the model. In each of the sensitivity analysis, the cell which contain values which are within ten percent of the realized values were highlighted with green color. Due to the fact that the share price is the market capitalization value divided by the number of shares and therefore shows the same results with respect to the accuracy, the share price was only considered when presenting the results. The market capitalization values were, however, included in the analysis, in order to understand the origins of the presented share prices.

Figure 9. Sensitivity analysis with respect to the impact of WACC and the long-term growth rate on EV, market cap and share price. A sensitivity analysis with respect to the impact of the tax rate on the EV, market cap and share price is also demonstrated.
Source: Lindéus (2021).

3.6.3 DCF assumptions

In this section, the most important assumptions, revenue growth rate, discount rate, tax rate and long-term growth rate, made in the DCF valuation will be presented for each of the targets.

Growth rates

The revenue growth rates for each of the targets were individually set based on market data and analyses as well as financial information available on the internet. As a complement to these values, the historical growth rates for the two past years prior the deals were calculated, in order to evaluate if these estimations were reasonable. In a Schedule

14A report (2016), the forecasted sales for Monsanto were 17,976 million USD. Based on the sales in 2015 of 15,001 million USD (Appendix A), the average growth rate between the years 2016 to 2020 is 3.7%. Compared to the historical growth rate of -5.4% based on the data for 2014 and 2015 from the income statement (Appendix A), this figure indicates a positive sales growth instead and was applied in the DCF modeling approach.

The sales growth for Actelion was estimated in a report by Alantra (2017). An average growth rate of 6.3% was estimated for the years 2017 to 2036. Its peak revenue was estimated to be 13.9% in 2026. The sales growth decline after year 2026 is due to that Alantra did not make any assumptions about new sales coming from novel products. Due to the fact that the historical growth rate for 2015 and 2016 was 18.2% (Actelion Ltd, 2017), it was reasonable to estimate a growth rate of approximately 10% in the DCF model.

In a schedule 14D-9 report by SEC, the forecasted sales for Kite Pharma were estimated to be 2067 million USD in 2021. Based on the sales in 2016 of approximately 22 million USD (Appendix A), the average growth rate between the years 2017 to 2021 is 148% (Kite Pharma Inc, 2017). At the time of 2017, when the M&A deal was announced, Kite Pharma was clearly at an expansion phase in the business cycle. Due to the fact that Kite Pharma had negative earnings at the time of 2017, the forecasted data in the schedule 14D-9 report, e.g., sales, EBIT was used in the DCF modeling approach and is thus an exception from the other five targets. This data is available in Appendix 2.

Regarding Bioverativ, Credit Suisse (2017) estimated a sales growth rate of 10.2% in 2018. Its historical sales growth rate for 2016 and 2017 was 31.7% (Bioverativ Inc, 2018), indicating that the company was in the deceleration phase in 2018. A sales growth rate of 10% was applied in the DCF model.

Credit Suisse (2014) forecasted the US sales growth for Cubicin, Cubist Pharmaceuticals most prominent product, to 11%. This was similar to the historical growth rate

for Cubist Pharmaceuticals from 2012 to 2013 which was 13.8% (Cubist Pharmaceuticals, 2014). A sales growth rate of 11% was applied in the DCF model.

In a joint proxy statement for Mallinckrodt Pharmaceuticals (2014), the acquirer of Questcor Pharmaceuticals, the forecasted sales per year was estimated for Questcor Pharmaceuticals. From a sales revenue of approximately 799 million USD in 2013 (Appendix A) to a value of 2433 million USD in 2018, a growth rate of approximately 25.0% was estimated. Compared to the historical growth rate of 56.9% based on the data for 2012 and 2013 from the income statement, this figure is significantly lower and may indicate that the company starts to penetrate the deceleration phase. This may be confirmed by the forecasted sales data in the joint proxy statement. At the beginning, between year 2013 and 2014, the growth rate was 37.7%, compared to approximately 10.7% between 2017-2018.

The growth rates, both external findings and the historical ones, including a column with adjusted values if necessary, are summarized in table 14.

Table 14. Growth rates for the targets, both retrieved from external sources and historical data. The growth rates which were applied in the DCF model are included in the table. The growth rates applied in the DCF model were retrieved from market data analyses from well-renowned equity research reports as well as SEC filings, prior the M&A deals. In addition, the historical growth rates over the past two years prior the M&A deals were also highlighted, but only for information purposes about the trends. If historical growth rates would be only applied in the DCF model, longer periods should be considered since this input parameter highly affects the valuation results. Each of the targets were individually evaluated in the section above.

Target	**Growth rates from external sources**	**Historical growth rate, two past years prior the deals**	**Growth rates applied in the DCF model**
Monsanto	An average sales growth rate of 3.7% for the years 2016 to 2020.	-5.4% (Monsanto Company, 2016)	4%

Actelion	6,3% between 2017 and 2036 with a revenue peak rate of 13.9% in 2026 (Alantra, 2017).	18.2% (Actelion Ltd, 2017)	10%
Kite Pharma	An average sales growth rate of 148% for the years 2017 to 2021 (Kite Pharma Inc, 2017).	28.5% (Kite pharma Inc, 2017)	148%
Bioverativ	10.2% in 2018 (Credit Suisse, 2017).	31.7% (Bioverativ Inc, 2018)	10%
Cubist Pharmaceuticals	11.0% growth of Cubicin (Credit Suisse, 2014).	13.8% (Cubist Pharmaceuticals, 2014)	11%
Questcor Pharmaceuticals	An average sales growth rate of 25% for the years 2014 to 2018 (Mallinckrodt Pharmaceuticals, 2014).	56.9% (Questcor Pharmaceuticals, 2014)	25%

Source: See the table above.

Discount rates

As previously described, the discount rates in the modelling were retrieved from SEC filings and other information available on the internet such as equity research reports. The findings are summarized in table 15 and were initially applied in the DCF modeling approach. If a range was provided in the sources, the median within the range was applied in the initial modeling approach. In addition, as previously stated, a sensitivity analysis with various discount rates was applied. Regarding the discount rate for Questcor Pharmaceuticals, the discount rate was estimated to be equal its cost of capital, which was 11% in 2014, due to the fact that there was almost no debt in the capital structure, see Appendix A (Mallinckrodt Pharmaceuticals, 2014).

Table 15. The WACC rates, of the targets retrieved from external sources, which were applied in the base scenario in the DCF model.

Target	WACC rates (%)
Monsanto	7.0-7.8% (Monsanto Company, 2016)
Actelion	7.9% (Alantra, 2017)
Kite Pharma	10.8% (Semenkow, 2017)
Bioverativ	8.0% (Credit Suisse, 2017)
Cubist Pharmaceuticals	10.0-12.0% (Cubist Pharmaceuticals, 2014).
Questcor Pharmaceuticals	11.0% (Mallinckrodt Pharmaceuticals, 2014).

Source: See the table above.

Tax rates

The tax rates initially used in the DCF modeling approach, were based on the tax rated retrieved from the SEC filings of the targets with the exception of Actelion, which used the tax rate in a report from Alantra (2017). All the companies, except for Actelion,

which is a Swiss company, are USA-based. Therefore, the federal income taxes should be identical for these companies because the M&A deals were announced within a similar time span, i.e., 2014-2018. An exception was Bioverativ. In the end of 2017, there were a reduction in the income tax in the USA from 35% to 21% (Bioverativ Inc, 2018). Furthermore, as previously described, other tax rates were included in the sensitivity analysis, in order to evaluate the impact of the tax on the enterprise value. The assumptions are summarized in table 16.

Table 16. The tax rates of the targets, which were be applied in the base scenario in the DCF model.

Target	Income Tax rate (%)
Monsanto (Monsanto Company, 2016)	35.0%
Actelion (Alantra, 2017)	12.7%
Kite Pharma (Kite Pharma Inc, 2017)	34.0%
Bioverativ (Bioverativ Inc, 2018)	21.0%
Cubist Pharmaceuticals (Cubist Pharmaceuticals, 2014)	35.0%
Questcor Pharmaceuticals (Questcor Pharmaceuticals, 2014)	35.0%

Source: See the table above.

Long term growth rates

As previously described in the operationalization of theoretical constructs section, the long-term growth rate is usually estimated from which stage the analyzed company was operating in, i.e., in the expansion, decelerated or mature growth stage phase, at the time of the

M&A deal announcement. The historical revenue growth rates, retrieved from the financial statements, and the forecasted ones from external sources, presented in table 14, were used to estimate the terminal growth rates. Monsanto was the only company of the targets to be estimated as mature in business cycle terms.

As a rule of thumb, also described in the operationalization of theoretical constructs section, this translates to a value of approximately 3%. The deceleration phase was considered for Actelion, Bioverativ, Cubist and Questcor Pharmaceuticals. A terminal growth value of 5% was applied for these companies. Regarding Kite Pharma, the expansion phase was considered and a terminal growth rate value of 10%. The sensitivity analysis evaluated multiple terminal growth rates for each of the targets.

Table 17. The terminal growth rates, which were applied in the base scenario in the DCF model, and the stage of the business cycle the targets were operating in at the time of the M&A deal announcements. The long-term, terminal, growth rate highly affects the enterprise value and erroneous assumptions may either over and underestimate the valuation results to a great extent. There are other methods to estimate the long-term growth rate of companies (Lindéus, 2021).

Target	**Terminal growth rate**
Monsanto	Mature, 3%
Actelion	Deceleration, 5%
Kite Pharma	Expansion, 10%
Bioverativ	Deceleration, 5%
Cubist Pharmaceuticals	Deceleration, 5%
Questcor Pharmaceuticals	Deceleration, 5%

Source: Lindéus (2021).

3.7 Research Design Limitations

The research methodology used in this dissertation was of a quantitative nature with secondary data. Although the financial data, retrieved from various reliable sources, were considered precise and consistent, there were research design limitations with these used features. The largest limitations in the research design were linked to the assumptions, data and the data selection.

Firstly, the assumptions and if they are realistic as well as reliable for the valuation is probably the largest limitation of the above-mentioned ones. In the DCF valuation the results are dependent on the assumptions to a great extent. As previously mentioned earlier in the methodology section, the long-term growth rate, WACC and the sales growth rate have a great impact on the enterprise value. However, there are other assumptions that also impact the enterprise value such as the NWC assumptions. Besides all these input parameters, acting as the assumptions in the modeling approach, we also have macroeconomical as well as systematic risks. Therefore, there are several factors that may contribute to a skewed valuation result, thus non-considering of certain assumptions is the greatest research design limitation. Furthermore, unrealistic assumptions may thus contribute to failure with respect to reduced important financial metrics such as sales growth, profitability as well as market capitalization values.

Secondly, the selection of targets companies, which was initially based on contemporary pharmaceutical journalism, was based on certain criteria. The main exclusion factor was that the targets should have been public companies at the time of the M&A deal announcement. All the companies had been public companies for a long time before each of the M&A transaction and none of them had an IPO right before the transactions. Therefore, all kinds of generally considered failed M&A deals, with respect to reduction of

profitability, sales growth and/or market capitalization, were not considered in the research, which is a limitation because the context of understanding these other, excluded, companies and their impact were therefore abandoned. However, as previously described in this chapter, it would have been difficult to find reliable financial data for the private companies in e.g., terms of annual reports and/or SEC filings, and this was the main reason why excluding these from the research. If any data would have been found, this information would certainly not have been as complex enough as for the public companies to use in the modelling approaches, described in the data analysis section.

Thirdly, top-notch financial data resources, such as Bloomberg Terminal, used by e.g., global, well-renown equity research firms and investment banks, which are considered to have better quality than free content, were not considered due to cost reasons. Thus, there was also a financial resource limitation in the data retrieval process and research. Therefore, to ensure the reliability, a wide range of free financial data resources were used and compared to each other, public SEC filings as well as annual reports. Due to the fact that the targets were no longer active on the stock exchanges and now operate under the acquirers as privately owned entities, not all of the financial sources had information related to the stock data at the time of the M&A deal announcements, which made the data retrieval process challenging. Furthermore, these top-notch financial data resources are also able to automatically select relevant comparable companies to targets used in the relative valuation, which were manually selected in this research study. As previously mentioned in the literature review, the selection of comparable companies is a limitation of the relative valuation approach.

Two other research design limitations, which were not related to the data collection as well as retrieval processes, were the software used to conduct the modelling and lack of

previous research on the topic. The modelling of the relative and DCF valuation was conducted in Microsoft Excel. These models were designed entirely from scratch and may not be as sophisticated as ready-made commercial software. Although the designed Microsoft Excel models were based on well-renowned financial theory and its applications, this is a limitation of the research. However, the advantages of Microsoft Excel, such as cost-efficient, flexibility and customization, were still considered over the disadvantages. Regarding lack of previous research on the topic, as previously mentioned, this research combined and evaluated two modelling approaches, DCF and relative valuation, which have not been studied together in such an extensive manner with several realized M&A transactions in this industry during the last decade. Therefore, this was also a limitation to the research design.

3.8 Conclusion

In this chapter, methodological frameworks of the research were elaborated. The chapter started with an overview of the research problem and was followed by a section related to operationalization of theoretical concepts. The operationalization of theoretical constructs section evaluated the results from the literature review in chapter 2 and clarified the used M&A valuation models, including formulas, the DCF and relative valuation approach. In the research design section, the framework which is supposed to answer the research questions was elaborated. The research design acted as a blueprint of the research and the various essential research components such as analysis, measurements and collection. After the research design followed a section dedicated to population and data sample. Detailed facts and backgrounds of the initial targets were presented. The scope of research was then narrowed down, via several exclusion criteria, to the final population of targets.

Six targets were chosen to be included in the research, including Monsanto, Actelion, Kite Pharma, Bioverativ, Cubist and Questcor Pharmaceuticals, which were acquired by Bayer, Johnson & Johnson and Johnson, Gilead Sciences, Sanofi, Merck and Mallinckrodt. This section was followed by the data collection process. Data for the DCF and relative valuation were here presented in a systematic manner. The data analysis section was then presented. Here, the tools used, and structure of the analyses were shown. Various assumptions in the modelling approaches were also included in this section. After the data analysis section, the research design limitations within this chapter were presented. Limitations related to the data collection process, software and previous research on the topic were elaborated. In the next chapter, the results of the research and the answers to the research questions will be answered. The selected targets from this chapter will be evaluated in the same structure as presented in the data analysis section. Each of the three research questions will be presented in separate sections.

CHAPTER IV:

RESULTS

In this chapter, the results from the research will be evaluated. Each of the research questions from chapter one will be evaluated and answered in separate sections. As a reminder to the reader, each of the research questions will be stated at the beginning of the sections. Following the research questions, detailed findings will be presented with respect to figures and tables. Each of the targets will first be evaluated individually and then there will be a summary of the findings as well as a conclusion of the sections. In the summary of the findings section, concise answers to the research questions will be presented with the support from the three preceding research question sections.

4.1 Research Question One

The first research question was the following:

How much do the results of different M&A valuation models differ from each other and should some of them not be recommended to be considered for M&A deals in the pharmaceutical industry?

This section will evaluate the targets based on the initial results. For the DCF modeling approach, this means not including the sensitivity analysis, which will be presented in the second research question. For the relative valuation this means that the median should be considered as the initial result as it is the preferred method over the average. Furthermore, for the relative valuation approach, all the three scenarios, described previously in the methodology chapter, will be considered. Scenario one includes comparable companies within the same sub-sector, scenario two, similar market capitalization

values and scenario three a mix of the two former scenarios. Each of the targets will be handled individually and will be summarized altogether in the end of the chapter.

Monsanto

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Monsanto are presented. The realized price which Bayer paid for Monsanto was $63 billion and the share price was $128 per share. In figure 10, the results, including description of each scenario, from the relative valuation for Monsato are presented. Scenario two and three were within ten percent of the realized enterprise value when evaluating the EV/EBITDA multiple. From these two scenarios, the second one had the closest value of $66.5 billion. The second scenario evaluated companies with similar market capitalization values and were more accurate than the third scenario, which was a mix of similar market capitalization values and companies from the same sub-sector. The first scenario, which focused on companies within the same sub-sector only, generated results which were further away from the realized values. Regarding the EV/Sales and P/E multiples, the results from these were less accurate compared to the EV/EBITDA multiple.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	37,2	-41%	83,5	33%	50,2	-20%
EV/EBITDA	Median	EV ($Billion)	33,4	-47%	66,5	5%	57,2	-9%
P/E	Median	Price ($)	46	-64%	85	-34%	73	-43%

Figure 10. The initial, median, results for Monsanto from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

The results retrieved from the initial DCF analysis are displayed in figure 11. Both the enterprise value and equity value per share were within 10% of the realized values at

the same date of the M&A transaction. The result retrieved from the EV/EBITDA multiple from scenario two in the relative valuation was slightlitly better, i.e. 5% vs. 6%, than the result for the enterprise value in the DCF analysis. However, due to the fact that they are in the same order of magnitude, these two results are comparable. Regarging the share price, equity value per share, the DCF analysis generated a more accurate result than the P/E multiple for all the three scenarios presented in figure 10.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$66 968,1	6%
Less: Net debt	4 728,0	
Equity Value	**$62 240,1**	
Diluted Shares Outstanding	524,7	
Equity Value Per Share	**$118,62**	-7%

Figure 11. Results from the DCF analysis. Enterprise, equity value and equity value per share for Monsanto with the initial assumptions.
Source: Lindéus (2021).

Actelion

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Actelion are presented. The realized price, at the same date of the M&A transaction, which Johnson & Johnson paid for Actelion was $30 billion and the share price was $280 per share. In figure 12, the results, including description of each scenario, of the relative valuation for Actelion are presented. The first scenario, which focused on companies within the same sub-sector, together with the EV/Sales multiple, generated the most accurate result when comparing to the realized values. A value of $32.8 billion was retrieved, which is within 10% of the realized value of $30 billion. Regarding the EV/EBITDA and P/E multiples, the results from these were less accurate compared to the EV/Sales multiple with no results within ten percent of the realized values. When comparing to the Monsanto case and the relative valuation part, the EV/Sales multiple

performed less accurate than the EV/EBITDA multiple. Thus, there is no similarity between these two cases with respect to the most accure results. The P/E multiple generated no results within ten percent of the realized values for neither Monsanto nor Actelion and therefore this is consistent for the two cases. However, one P/E value together with the first scenario, generated a result of $311 per share, which was in the same order of magnitude and was 11% larger than the realized share price. Furthermore, all the results obtained from scenario one generated more accurate results than the rest of them.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	32,8	9%	4,7	-84%	24,7	-18%
EV/EBITDA	Median	EV ($Billion)	25,6	-15%	7,6	-75%	13,3	-56%
P/E	Median	Price ($)	311	11%	101	-64%	133	-52%

Figure 12. The initial, median, results for Actelion from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

The DCF results for Actelion are displayed in figure 13. Similar to the Monsanto case, the most accurate result from the relative valuation was slightly more accurate than the one retrieved from the DCF modeling approach, although the conditions within the relative valuation differed in each of the cases. However, due to the fact that they are in the same order of magnitude, these two results are comparable.

For both Monsanto and Actelion, the enterpise values, retrieved from the DCF, were within ten percent of the realized values. Regarging the share price, equity value per share, the first of the relative valuation scenarios, combined with the P/E multiple, generated a more accurate result than the DCF analysis, although they are in the same order of magnitude, i.e. 11% vs 12%.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	33 128,8	10%
Less: Net debt	(495,4)	
Equity Value	**33 624,2**	
Diluted Shares Outstanding	107,3	
Equity Value Per Share	**313,4**	12%

Figure 13. Results from the DCF analysis. Enterprise, equity value and equity value per share for Actelion with the initial assumptions.
Source: Lindéus (2021).

Kite Pharma

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Kite Pharma are presented. In figure 14, the results, including description of each scenario, from the relative valuation, at the same date of the M&A transaction, for Kite Pharma are displayed. Due to the fact that Kite Pharma did not generate any earnings as well as income at the time of the M&A deal, the EV/EBITDA and P/E multiples were negative, which generated negative values with respect to the share price and enterprise values. However, the applicable multiple, EV/Sales, did not generate any results which were in proximity to the realized ones, in any of the scenarios. As previously described, the realized values for Kite Pharma were a deal price of $11.9 billion and a share price of $180.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	4,9	-58%	0,4	-97%	0,5	-96%
EV/EBITDA	Median	EV ($Billion)	- 2,6	-122%	- 4,4	-137%	-	-100%
P/E	Median	Price ($)	-	-100%	- 114	-163%	-	-100%

Figure 14. The initial, median, results for Kite Pharma from the relative valuation analysis. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

Similar to the results from the relative valuation analysis, the DCF approach did not generate any reasonable values for Kite Pharma, which were in the same order of

magnitude as the realized values, although some of the assumptions were taken from experts in the field. The results from the DCF analysis are presented in figure 15.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$130 330,6	995%
Less: Net debt	(114,6)	
Equity Value	**$130 445,2**	
Diluted Shares Outstanding	73,0	
Equity Value Per Share	**$1 786,92**	893%

Figure 15. Results from the DCF analysis. Enterprise, equity value and equity value per share for Kite Pharma with the initial assumptions.
Source: Lindéus (2021).

Bioverativ

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Bioverativ are presented. The sum, at the same date of the M&A transaction, which Sanofi paid for Bioverativ was $11.6 billion and the share price was $105 per share. In figure 16, the results, including description of each scenario, from the relative valuation for Bioverativ are presented. At an enterprise value of $12.5 billion, scenario two was within ten percent of the realized value when evaluating the EV/Sales multiple. The rest of the eight combinations in the analysis, including the other multiples, were deviating up to 84% of the realized values. However, the result, that the EV/Sales multiple generated the closets value to the realized ones, is consistent with the Actelion analysis, although the scenario was not the same.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	8,7	-25%	12,5	7%	8,8	-24%
EV/EBITDA	Median	EV ($Billion)	8,6	-25%	3,0	-74%	6,2	-47%
P/E	Median	Price ($)	43	-59%	17	-84%	28	-73%

Figure 16. The initial, median, results for Bioverativ from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

Similar to the results from the relative valuation analysis, except for one scenario combined with one of the multiples, the DCF approach did not generate any reasonable values for Bioverativ due to the fact that they differ between 39% to -47% from the realized values. The DCF analysis results for Bioverativ are presented in figure 17. These results are also similar to the Actelion and Kite Pharma analyses, which also did not generate any results which were within ten percent of the realized values.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$16 155,7	39%
Less: Net debt	(436,5)	
Equity Value	**$16 592,2**	
Diluted Shares Outstanding	175,0	
Equity Value Per Share	**$94,81**	-47%

Figure 17. Results from the DCF analysis. Enterprise, equity value and equity value per share for Bioverativ with the initial assumptions.
Source: Lindéus (2021).

Cubist Pharmaceuticals

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Cubist Pharmaceuticals are presented. The sum, at the same date of the M&A transaction, which Merck paid for Cubist Pharmaceuticals was $8.4 billion and the share price was $102 per share. In figure 18, the results, including description of each scenario, from the relative valuation for Cubist Pharmacetucals are presented. At an enterprise value of $7.6 billion, scenario three was within ten percent of the realized value when evaluating the EV/Sales multiple. The rest of the eight combinations in the analysis, including the other multiples, were deviating up to 94% of the realized values. This is consistent with the results from the analyses of both Actelion as well as Bioverativ, alhtough the scenarios were not the same.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	4,4	-48%	15,5	84%	7,6	-10%
EV/EBITDA	Median	EV ($Billion)	3,3	-60%	3,0	-64%	3,0	-64%
P/E	Median	Price ($)	8	-92%	2	-98%	6	-94%

Figure 18. The initial, median, results for Cubist Pharmaceuticals from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

Similar to Actelion, Kite Pharma and Bioverativ, the DCF valuation analysis for Cubist Pharmaceuticals did not generate any results which were within ten percent of the realized values. The DCF analysis results for Cubist Pharmaceuticals are presented in figure 19.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$5 181,8	-38%
Less: Net debt	726,8	
Equity Value	**$4 455,0**	
Diluted Shares Outstanding	96,1	
Equity Value Per Share	**$46,38**	-55%

Figure 19. Results from the DCF analysis. Enterprise, equity value and equity value per share for Cubist Pharmaceuticals with the initial assumptions.
Source: Lindéus (2021).

Questcor Pharmaceuticals

In this section, the initial valuation results, both the relative valuation as well as the DCF approach, for Questcor Pharmaceuticals are presented. The realized price, at the same date of the M&A transaction, which Mallinckrodt paid for Questcor Pharmaceuticals was $5.6 billion and the share price was $86 per share. In figure 20, the results, including description of each scenario, of the relative valuation for Questcor Pharmaceuticals are presented. Three combinations of scenarios as well as multiples generated results which were within ten percent of the realized values. The most accurate result was retrieved from the P/E multiple, combined with the third scenario, followed by the P/E, combined with

the first scenario as well as the EV/Sales multiple combined with the third scenario. The rest of the six combinations in the analysis, including the other multiples, were deviating up to 84% of the realized values. The results are partly similar to the Actelion, Bioverativ and Cubist Pharmaceuticals cases, where the EV/Sales multiple all generated results which were within ten percent of the realized values. The combination of the EV/Sales multiple and scenario three was also seen in the Cubist Pharmaceutical case. However, the accurate results retrieved from the P/E multiples did not occur for any other case.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	3,7	-33%	10,3	84%	6,1	8%
EV/EBITDA	Median	EV ($Billion)	4,3	-24%	6,8	21%	4,8	-14%
P/E	Median	Price ($)	93	8%	46	-47%	80	-7%

Figure 20. The initial, median, results for Questcor Pharmaceuticals from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

Similar to Actelion, Kite Pharma, Bioverativ and Cubist Pharmaceuticals, the DCF valuation analysis for Questcor Pharmaceuticals did not generate any results which were within ten percent of the realized values. The DCF analysis results for Questcor Pharmaceuticals are presented in figure 21.

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$10 925,6	95%
Less: Net debt	(160,2)	
Equity Value	**$11 085,8**	
Diluted Shares Outstanding	52,9	
Equity Value Per Share	**$209,40**	143%

Figure 21. Results from the DCF analysis. Enterprise, equity value and equity value per share for Questcor Pharmaceuticals with the initial assumptions.
Source: Lindéus (2021).

4.2 Research Question Two

The second research question was the following:

Considering pharmaceutical companies, how sensitive are the M&A valuation models to non-consideration or unrealistic assumptions of important assumptions?

This section will evaluate the sensitivity analyses of the targets and thus evaluate the sensitivity of non-consideration of important assumptions. As previously described at the beginning of this chapter, each of the targets will be handled individually. As described in the methodology chapter, the sensitivity analyses will be based on the relative valuation and the DCF approach. Regarding the relative valuation, the analysis will be extended to include average values instead of only median ones, which were presented in the first research question. The DCF sensitivity analyses will consist of the impact of long-term growth rate and WACC, discount rate, on the enterprise value, market capitalization value as well as the share price. A sensitivity analysis related to the impact of different tax rates on the enterprise value, market capitalization value and the share price will also be included.

Monsanto

In this section, the sensitivity and extended analyses with different assumptions for the Monsanto case are presented. The extended relative valuation analysis, including a description of the scenarios, for Monsanto is presented in figure 22. Except for the EV/EBITDA multiple results for scenario two and three from the first research question, which were within ten percent of the realized values, two other results within this range were obtained in this extended analysis presented in figure 22. Both of these results were retrieved from the average type methodology, which was excluded in the first research

question. These results were both retreived from the thrid scenario and included both the EV/Sales as well as EV/EBITDA multiples. The EV/Sales multiple for scenario three did almost have an identical value as the EV/EBITDA value for scenario two, described in the previous research question, i.e. in real terms $66.9 vs $66.5 billion.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	37,2	-41%	83,5	33%	50,2	-20%
EV/Sales	Average	EV ($Billion)	35,3	-44%	98,4	56%	66,9	6%
EV/EBITDA	Median	EV ($Billion)	33,4	-47%	66,5	5%	57,2	-9%
EV/EBITDA	Average	EV ($Billion)	31,3	-50%	82,7	31%	57,0	-10%
P/E	Median	Price ($)	46	-64%	85	-34%	73	-43%
P/E	Average	Price ($)	48	-63%	109	-15%	78	-39%

Figure 22. All the results for Monsanto from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 23, the results from the DCF sensitivity analysis with respect to the enterprise value for Monsanto are presented. Four scenarios with results within ten percent of the realized value of $63 billion were obtained. These were with long-term growth rates of two, three, four and five percent, combined with WACC of seven, eight and nine percent, in the same order. The most accurate result was with the assumptions of two percent long-term growth rate together with a value of seven percent. This result of approximately $60.9 billion deviated three percent from the realized enterprise value.

EV	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
7%	46 340	52 387	60 853	73 551	94 716	137 045
8%	40 753	45 123	50 949	59 105	71 340	91 731
9%	36 473	39 748	43 960	49 575	57 436	69 228
10%	33 103	35 629	38 787	42 848	48 261	55 841
11%	30 392	32 386	34 822	37 868	41 784	47 006
12%	28 174	29 776	31 700	34 050	36 989	40 767

Figure 23. Results from the DCF sensitivity analysis for Monsanto. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 24, the market capitalization, equity, and share price values from the sensitivity analysis are presented. Three share prices were within ten percent of the realized share price. These combinations were with long-term growth rates of three, four and five percent, together with WACC of seven, eight as well as nine percent. The most accurate result of these three combinations were the one with four percent long-term growth rate, combined with a WACC of eight percent. This combination resulted in a value of $127, which is less than one percent from the realized value of $128.

Market Cap	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
7%	41 612	47 659	56 125	68 823	89 988	132 317
8%	36 025	40 395	46 221	54 377	66 612	87 003
9%	31 745	35 020	39 232	44 847	52 708	64 500
10%	28 375	30 901	34 059	38 120	43 533	51 113
11%	25 664	27 658	30 094	33 140	37 056	42 278
12%	23 446	25 048	26 972	29 322	32 261	36 039

Share Price	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
7%	79	91	107	131	171	252
8%	69	77	88	104	127	166
9%	60	67	75	85	100	123
10%	54	59	65	73	83	97
11%	49	53	57	63	71	81
12%	45	48	51	56	61	69

Figure 24. Results from the DCF sensitivity analysis for Monsanto. The impact of the WACC, discount rate, and the long-term growth rate on the market capitalization value as well as share price is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

The third sensitivity analysis for Monsanto, with respect to the impact of different tax rates on the enterprise value, market capitalization values as well as share price, is presented in figure 25. Given the other initial assumptions presented in the methodology chapter, the two tax rates of 35% and 40% generated enterprise values which were within ten percent of the realized value. Of these two results, a tax rate of 40% generated an enterprise value of approximately $62.4 billion, which is less than one percent of the realized value

of $63 billion. Regarding the share price, three values were within ten percent of the realized value with the tax rates between 25%-35%. Of these three results, the one with a tax rate of 30% generated a share price of $127, which is less than one percent within the realized value of $128 per share, similar to the previous sensitivity analysis focusing on the long-term growth rate as well as WACC.

Tax rate	15%	20%	25%	30%	35%	40%
EV	85 033	80 517	76 001	71 484	66 968	62 452
Market cap	80 305	75 789	71 273	66 756	62 240	57 724
Share Price	153	144	136	127	119	110

Figure 25. The sensitivity analysis, from the DCF modelling, for Monsanto with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share.
Source: Lindéus (2021).

Actelion

In this section, the sensitivity and extended analyses with different assumptions for the Actelion case are presented. The results, including a description of the scenarios, from the extended relative valuation analysis are presented in figure 26. In addition to the initial relative valuation analysis presented in the first resarch question, figure 12, a result based on average values generated another result which was within ten percent of the realized enterprise value. The EV/Sales multiple, combined with the first scenario generated an enterprise value of $32.8 billion, which is nine percent higher than the realized value of $30 billion for Actelion. This combination, with multiple and scenario, is the same as the previous one obtained in the initial results from the first research question. Thus, both the median and average methodologies are consistent with each other. Other results, which was not within the ten percent range of the realized values, but in a similar order a magnitude, include the EV/EBITDA multiple combined with the first scenario and average

methodology as well as the P/E together, median, with scenario one, which was described earlier in the first research question.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	32,8	9%	4,7	-84%	24,7	-18%
EV/Sales	Average	EV ($Billion)	31,7	6%	6,4	-79%	21,9	-27%
EV/EBITDA	Median	EV ($Billion)	25,6	-15%	7,6	-75%	13,3	-56%
EV/EBITDA	Average	EV ($Billion)	33,0	10%	10,6	-65%	20,5	-32%
P/E	Median	Price ($)	311	11%	101	-64%	133	-52%
P/E	Average	Price ($)	415	48%	103	-63%	246	-12%

Figure 26. All the results for Actelion from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 27, the results from the DCF sensitivity analysis for Actelion with respect to the enterprise value are presented. One scenario with a result within ten percent of the realized value of $30 billion were obtained. This combination was of long-term growth rate of five percent and a WACC of eight percent. The obtained result was $32 billion, which is approximately seven percent higher than the realized enterprise value previously described. The combination of four percent long-term growth rate and a WACC of seven percent generated a value of $33 billion which is just above ten percent of the realized value.

EV	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	18 597	21 716	26 394	34 192	49 786	96 569
7%	15 917	18 063	21 067	25 573	33 082	48 102
8%	13 935	15 485	17 553	20 447	24 788	32 023
9%	12 416	13 578	15 073	17 065	19 854	24 039
10%	11 220	12 117	13 237	14 678	16 599	19 288
11%	10 258	10 966	11 830	12 911	14 301	16 153

Figure 27. Results from the DCF sensitivity analysis for Actelion. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 28 the market capitalization, equity, and share price values from the sensitivity analysis for Actelion are presented. One share price was within ten percent of the realized share price of $128. This combination, five percent of long-term growth rate and a WACC of eight percent, was the same combination as described in the sensitivity analysis related to the enterprise value, in figure 27. This result of $303 per share was approximately eight percent higher than the realized value. Furthermore, the combination of a two percent long-term growth rate and a WACC of six percent generated a value of $251, which is just below ten percent of the realized share price.

Market Cap	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	19 093	22 211	26 890	34 687	50 281	97 064
7%	16 413	18 558	21 562	26 068	33 578	48 597
8%	14 430	15 981	18 048	20 942	25 283	32 519
9%	12 911	14 074	15 568	17 560	20 350	24 534
10%	11 716	12 612	13 733	15 173	17 094	19 784
11%	10 754	11 461	12 326	13 407	14 796	16 649

Share Price	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	178	207	251	323	469	905
7%	153	173	201	243	313	453
8%	134	149	168	195	236	303
9%	120	131	145	164	190	229
10%	109	118	128	141	159	184
11%	100	107	115	125	138	155

Figure 28. Results from the DCF sensitivity analysis for Actelion. The impact of the WACC, discount rate, and the long-term growth rate on the market capitalization value as well as share price is demonstrated. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

Regarding the tax rate sensitivity analysis for Actelion, three enterprise values and four share price values generated results which were within ten percent of the realized values. The three tax rates combination of 15%, 20% and 25% were the ones that generated the most accurate results for the enterprise value. Of these three results, the tax rate of 20% generated the most accurate result of approximately $30.5 billion, which is less than two

percent of the realized enterprise value of $30 billion. Regarding the share price, the same tax rates as for the enterprise values, including the 30% tax rate figure, generated results which were within ten percent of the realized share price. Of these four tax rates, a rate of 25% generated the most accurate result of $273 per share, which is less than three percent of the realized value of $280. The results from the tax sensitivity analysis are displayed in figure 29.

Tax rate	10%	15%	20%	25%	30%	35%
EV	34 084	32 315	30 546	28 776	27 007	25 238
Market cap	34 580	32 810	31 041	29 272	27 502	25 733
Share Price	322	306	289	273	256	240

Figure 29. The sensitivity analysis, from the DCF modelling, for Actelion with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share.
Source: Lindéus (2021).

Kite Pharma

In this section, the sensitivity and extended analyses with different assumptions for the Kite Pharma case are presented. In figure 30, the relative valuation sensitivity analysis, including a description of the scenarios, for Kite Pharma is presented. Similar to the relative valuation analysis presented in the first research question, there were no results which were within ten percent of the realized enterprise and share price values. As previously described, the EV/EBITDA and P/E multiples were of a negative nature due to the fact that Kite Pharma did not have any earnings during the time of the M&A deal announcement.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	4,9	-58%	0,4	-97%	0,5	-96%
EV/Sales	Average	EV ($Billion)	5,1	-57%	0,5	-96%	2,8	-76%
EV/EBITDA	Median	EV ($Billion)	- 2,6	-122%	- 4,4	-137%	-	-100%
EV/EBITDA	Average	EV ($Billion)	- 2,0	-116%	- 5,7	-148%	- 3,5	-129%
P/E	Median	Price ($)	-	-100%	- 114	-163%	-	-100%
P/E	Average	Price ($)	- 46	-125%	- 109	-161%	- 70	-139%

Figure 30. All the results for Kite Pharma from the relative valuation analysis. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 31, the results of the DCF sensitivity analysis, with respect to the impact of the long-term growth rate and WACC on the enterprise value, is presented for Kite Pharma. One of the results were within ten percent of the realized enterprise value of $11.9 billion. This result had a combination of a five-percent long-term growth rate as well as a WACC of 13% and generated a result of approximately $12.2 billion, which is just above two percent higher than the realized value. The second most accurate combination of assumptions in the sensitivity analysis included a long-term growth rate of six percent and a WACC of 13%. This combination generated an enterprise value of $13.9 billion, which is just below 17% of the realized value.

EV	Long term growth rate					
WACC	5%	6%	7%	8%	9%	10%
8%	38 405	57 649	115 382		- 115 548	- 57 816
9%	27 786	37 060	55 608	111 250		- 111 321
10%	21 469	26 834	35 775	53 657	107 304	
11%	17 300	20 749	25 923	34 547	51 793	103 533
12%	14 356	16 733	20 061	25 053	33 372	50 011
13%	12 176	13 897	16 191	19 402	24 219	32 248

Figure 31. Results from the DCF sensitivity analysis for Kite Pharma. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 32, the market capitalization and share price values from the DCF sensitivity analysis for Kite Pharma are presented. Two share price values were within ten percent of the realized share price of $180. These combinations were long-term growth rates of five and six percent, combined with a WACC of 13% for both, which also generated the most accurate results in the previous sensitivity analysis representing the enterprise value, figure 31. These two results of $168 and $192 were almost identical with respect to the accuracy. The combination of a long-term growth rate of five percent, combined with a WACC of 13%, were deviating -6.5% of the realized share price value and the other one +6.6%.

Market Cap	Long term growth rate					
WACC	5%	6%	7%	8%	9%	10%
8%	38 520	57 764	115 496		- 115 434	- 57 701
9%	27 901	37 175	55 722	111 365		- 111 206
10%	21 584	26 948	35 889	53 772	107 419	
11%	17 415	20 864	26 038	34 661	51 908	103 647
12%	14 471	16 848	20 175	25 167	33 487	50 125
13%	12 291	14 011	16 305	19 517	24 334	32 363

Share Price	Long term growth rate					
WACC	5%	6%	7%	8%	9%	10%
8%	528	791	1 582		- 1 581	- 790
9%	382	509	763	1 526		- 1 523
10%	296	369	492	737	1 471	
11%	239	286	357	475	711	1 420
12%	198	231	276	345	459	687
13%	168	192	223	267	333	443

Figure 32. Results from the DCF sensitivity analysis, from the DCF modelling, for Kite Pharma. The impact of the WACC, discount rate, and the long-term growth rate on the market capitalization value as well as share price is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

In figure 33, the results related to the tax rate sensitivity analysis for Kite Pharma are presented. Similar to the results from the relative valuation sensitivity analysis in figure 30, none of the combinations generated a result which was within ten percent of the realized values.

Tax rate	15%	20%	25%	30%	35%	40%
EV	144 689	141 099	137 510	133 920	130 331	126 741
Market cap	144 803	141 214	137 624	134 035	130 445	126 856
Share Price	1 984	1 934	1 885	1 836	1 787	1 738

Figure 33. The sensitivity analysis for Kite Pharma with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share.
Source: Lindéus (2021).

Bioverativ

In this section, the sensitivity and extended analyses with different assumptions for the Bioverativ case are presented. In figure 34, the relative valuation sensitivity analysis, including a description of the scenarios, for Bioverativ is presented. Similar to the relative valuation analysis presented in the first research question, there were one result which was within ten percenrage of the realized enterprise value and share price. As described in the first research question, the EV/Sales multiple, combined with the second scenario and the median type methodology generated an enterprise value of $12.5 billion, which deviates seven percent from the realized value of $11.6 billion.

Adding the average type methodology did not add any results which were wihitn ten percent of the realized values. The combination from the average type methodology which generated the most accurate result was the EV/EBITDA multiple and scenario one. An enterprise value of $7.8 billion was retrieved, which is 33% less than the realized value.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	8,7	-25%	12,5	7%	8,8	-24%
EV/Sales	Average	EV ($Billion)	40,6	250%	19,7	70%	30,2	160%
EV/EBITDA	Median	EV ($Billion)	8,6	-25%	3,0	-74%	6,2	-47%
EV/EBITDA	Average	EV ($Billion)	7,8	-33%	3,1	-73%	5,4	-53%
P/E	Median	Price ($)	43	-59%	17	-84%	28	-73%
P/E	Average	Price ($)	44	-58%	21	-80%	32	-69%

Figure 34. All the results for Bioverativ from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 35, the results of the DCF sensitivity analysis, with respect to the impact of the long-term growth rate and WACC on the enterprise value, is presented for Bioverativ. Four combinations of different assumptions generated results which were within ten percent of the realized enterprise value of $11.6 billion. The result which was the most accurate of these four combinations was with the assumptions of a five-percent long-term growth rate, combined with a WACC of nine percent. This combination generated an enterprise value of approximately $12.2 billion, which is just below five percent from the realized value. The second most accurate result of approximately $11.0 billion has a similar deviation of just above five percent. This result was retrieved from a combination of a one percent long-term growth rate and a six percent WACC. The other two combinations which generated results within ten percent of the realized enterprise value were long-term growth rates of two and four percent, combined with WACC of seven as well as eight percent respectively.

EV	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	9 411	10 990	13 359	17 307	25 204	48 892
7%	8 054	9 141	10 662	12 943	16 746	24 351
8%	7 050	7 835	8 882	10 348	12 546	16 210
9%	6 281	6 870	7 626	8 635	10 048	12 166
10%	5 676	6 130	6 697	7 427	8 399	9 761
11%	5 189	5 547	5 985	6 532	7 236	8 174

Figure 35. Results from the DCF sensitivity analysis for Bioverativ. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 36 the market capitalization, equity, and share price values from the DCF sensitivity analysis for Bioverativ are presented. Three share price values were within ten percent of the realized share price of $105. The most accurate combination, a long-term growth rate of three percent together with a WACC of six percent, generated a share price of $101, which is just deviating approximately three percent from the realized value. The

other two combinations, which resulted in values within ten percent of the realized values, were long-term growth rates of four and five percent, together with WACC of seven as well as eight percent respectively.

Market Cap	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	9 848	11 427	13 796	17 744	25 640	49 329
7%	8 491	9 577	11 098	13 380	17 182	24 787
8%	7 487	8 272	9 319	10 784	12 982	16 646
9%	6 718	7 306	8 063	9 072	10 484	12 603
10%	6 112	6 566	7 134	7 863	8 836	10 198
11%	5 625	5 984	6 421	6 969	7 672	8 610

Share Price	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	56	65	79	101	147	282
7%	49	55	63	76	98	142
8%	43	47	53	62	74	95
9%	38	42	46	52	60	72
10%	35	38	41	45	50	58
11%	32	34	37	40	44	49

Figure 36. Results from the DCF sensitivity analysis for Bioverativ. The impact of the WACC, discount rate, and the long-term growth rate on the market capitalization value as well as share price is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

Regarding the tax rate sensitivity analysis for Bioverativ, one enterprise value and two share price values generated results which were within ten percent of the realized values. The tax rate combination of 40% was the one that generated the most accurate result for the enterprise value, with a deviation of approximately nine percent. Regarding the share price, the two tax rates of 15% and 20% were within ten percent of the realized share price. Of these two tax rates, the tax rate of 15 % generated the most accurate result of 101$ per share, which deviates approximately four percent from the realized value of $105.

Tax rate	15%	20%	25%	30%	35%	40%
EV	17 254	16 339	15 424	14 509	13 594	12 679
Market cap	17 690	16 775	15 860	14 945	14 030	13 115
Share Price	101	96	91	85	80	75

Figure 37. The sensitivity analysis, from the DCF modelling, for Bioverativ with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share.
Source: Lindéus (2021).

Cubist Pharmaceuticals

In this section, the sensitivity and extended analyses with different assumptions for the Cubist Pharmaceuticals case are presented. In figure 38, the relative valuation sensitivity analysis, including a description of the scenarios, for Cubist Pharmaceuticals is presented. Similar to the relative valuation analysis presented in the first research question, there were one result which was within ten percent of the realized enterprise. As described in the first research question, the EV/Sales multiple, combined with the third scenario and the median type methodology measuring generated an enterprise value of $7.6 billion, which deviates ten percent from the realized value of $8.4 billion. Adding the average type measuring methodology did not add any results which were within ten percent of the realized values. The combination from the average type measuring methodology which generated the most accurate result was the EV/Sales multiple and scenario three. An enterprise value of $10.3 billion was retrieved, which is 23% larger than the realized value.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	4,4	-48%	15,5	84%	7,6	-10%
EV/Sales	Average	EV ($Billion)	4,7	-44%	16,0	90%	10,3	23%
EV/EBITDA	Median	EV ($Billion)	3,3	-60%	3,0	-64%	3,0	-64%
EV/EBITDA	Average	EV ($Billion)	4,0	-52%	30,9	268%	17,5	108%
P/E	Median	Price ($)	8	-92%	2	-98%	6	-94%
P/E	Average	Price ($)	23	-77%	4	-96%	14	-87%

Figure 38. All the results for Cubist Pharmaceuticals from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 39, the results of the DCF sensitivity analysis, with respect to the impact of the long-term growth rate and WACC on the enterprise value, is presented for Cubist Pharmaceuticals. Four combinations of different assumptions generated results which were within ten percent of the realized enterprise value of $8.4 billion. The result which was the most accurate of these four combinations was with the assumptions of a three-percent long-term growth rate, combined with a WACC of seven percent. This combination generated an enterprise value of approximately $8.3 billion, which is approximately one and a half percent from the realized value. The second most accurate result of approximately $8.5 billion has a similar deviation of just below two percent. This result was retrieved from a combination of a two-percent long-term growth rate and a six percent WACC. The other two combinations which generated results within ten percent of the realized enterprise value were long-term growth rates of four and five percent, combined with WACC of eight as well as nine percent respectively.

EV	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	5 985	7 009	8 546	11 108	16 231	31 602
7%	5 104	5 809	6 796	8 276	10 744	15 678
8%	4 453	4 962	5 642	6 592	8 019	10 396
9%	3 954	4 336	4 827	5 481	6 398	7 772
10%	3 561	3 856	4 224	4 697	5 328	6 212
11%	3 245	3 478	3 762	4 117	4 573	5 182

Figure 39. Results from the DCF sensitivity analysis for Cubist Pharmaceuticals. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 40, the market capitalization, equity, and share price values from the DCF sensitivity analysis for Cubist Pharmaceuticals are presented. Three share price values were within ten percent of the realized share price of $102. The most accurate combination, a long-term growth rate of five percent together with a WACC of eight percent, generated a

share price of $101, which is just deviating approximately one percent from the realized value. The other two combinations, which resulted in values within ten percent of the realized values, were long-term growth rates of three and four percent, together with WACC of six as well as seven percent respectively, where the latter one was the most accurate of them, deviating approximately two percent from the share price realized value.

Market Cap	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	5 258	6 283	7 820	10 381	15 505	30 875
7%	4 377	5 082	6 069	7 550	10 017	14 951
8%	3 726	4 236	4 915	5 866	7 292	9 669
10%	3 227	3 609	4 100	4 755	5 671	7 046
11%	2 834	3 129	3 497	3 970	4 601	5 485
12%	2 518	2 751	3 035	3 390	3 846	4 455

Share Price	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
6%	55	65	81	108	161	321
7%	46	53	63	79	104	156
8%	39	44	51	61	76	101
9%	34	38	43	49	59	73
11%	30	33	36	41	48	57
12%	26	29	32	35	40	46

Figure 40. The sensitivity analysis for Cubist Pharmaceuticals with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

The tax rate sensitivity analysis for Cubist Pharmaceuticals is presented in figure 41. Similar to the results retrieved for Kite Pharma in figure 33, none of the tax-rate combinations generated a result which was within ten percent of the realized values.

Tax rate	15%	20%	25%	30%	35%	40%
EV	6 401	6 096	5 791	5 487	5 182	4 877
Market cap	5 674	5 370	5 065	4 760	4 455	4 150
Share Price	59	56	53	50	46	43

Figure 41. The sensitivity analysis, from the DCF modelling, for Cubist Pharmaceuticals with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share (Lindéus, 2021).

Questcor Pharmaceuticals

In this section, the sensitivity and extended analyses with different assumptions for the Questcor Pharmaceuticals case are presented. In figure 42, the results for the relative valuation sensitivity analysis, including a description of the scenarios, for Questcor Pharmaceuticals are presented. Six results were within ten percent of the realized enterprise value of $5.6 billion as well as share price of $86. Three of these results were already emphasized in the first research question, figure 20, due to the fact that they were of a median methodology measuring type. Thus, the remaining three results were retrieved by using the average methodology. Of these three results, the P/E multiple combined with the first scenario generated a share price result of $86, which is identical of the realized value. The EV/Sales multiple, combined with the first scenario, generated an enterprise value of $5.4 billion, which deviates approximately three percent from the realized value. The P/E value, combined with the third scenario generated a share price of $78, which deviates approximately nine percent from the realized value. Thus, two of the results from the P/E value multiple, combined with the average type methodology generated results which were within ten percent of the realized share price.

Multiple	Media/Average	Valuation	Scenario 1	Difference (%)	Scenario 2	Difference (%)	Scenario 3	Difference (%)
EV/Sales	Median	EV ($Billion)	3,7	-33%	10,3	84%	6,1	8%
EV/Sales	Average	EV ($Billion)	5,4	-3%	10,6	90%	8,0	43%
EV/EBITDA	Median	EV ($Billion)	4,3	-24%	6,8	21%	4,8	-14%
EV/EBITDA	Average	EV ($Billion)	3,7	-34%	69,9	1148%	36,8	557%
P/E	Median	Price ($)	93	8%	46	-47%	80	-7%
P/E	Average	Price ($)	86	0%	70	-18%	78	-9%

Figure 42. All the results for Questcor Pharmaceuticals from the relative valuation analysis. Green color indicates that the result is within ten percent of the actual, realized value. Scenario 1 includes comparable companies within the same sub-sector, scenario 2, similar market capitalization values and scenario 3 and mix of the two former scenarios. The enterprise value and share price were evaluated.
Source: Lindéus (2021).

In figure 43, the results of the DCF sensitivity analysis, with respect to the impact of the long-term growth rate and WACC on the enterprise value, is presented for Questcor Pharmaceuticals. Three combinations of different assumptions generated results which were within ten percent of the realized enterprise value of $5.6 billion. The result which was the most accurate of these three combinations was with the assumptions of a zero-percent long-term growth rate, combined with a WACC of 13%. This combination generated an enterprise value of approximately $5.6 billion, which is identical to the realized value.

The second most accurate result was an enterprise value of approximately $5.9 billion, which deviates approximately six percent. This result was retrieved from a combination of a one percent long-term growth rate and a 13% WACC. The remaining combination which generated a result within ten percent of the realized enterprise value is a long-term growth rates of zero percent, combined with a WACC of 12%.

EV	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
8%	9 317	10 441	11 940	14 038	17 186	22 431
9%	8 216	9 059	10 142	11 587	13 609	16 642
10%	7 349	7 999	8 812	9 856	11 249	13 198
11%	6 652	7 165	7 792	8 575	9 583	10 926
12%	6 081	6 494	6 988	7 593	8 349	9 321
13%	5 607	5 944	6 342	6 819	7 403	8 132

Figure 43. Results from the DCF sensitivity analysis for Questcor Pharmaceuticals. The impact of the WACC, discount rate, and the long-term growth rate on the enterprise value is demonstrated. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million.
Source: Lindéus (2021).

In figure 44, the market capitalization, equity, and share price values from the DCF sensitivity analysis for Questcor Pharmaceuticals are presented. None of the combinations generated a result which was within ten percent of the realized values. Compared to the same results for the same sensitivity analysis for the other targets, this outcome deviates.

The most accurate result in this sensitivity analysis is a combination of a zero-percent growth rate together with a WACC of 13%. This combination generated a share price of $109, which deviates approximately 27% from the realized share price value.

Market Cap	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
8%	9 477	10 601	12 100	14 198	17 346	22 591
9%	8 376	9 219	10 302	11 747	13 769	16 802
10%	7 509	8 159	8 972	10 016	11 409	13 359
11%	6 812	7 325	7 952	8 735	9 743	11 086
12%	6 241	6 654	7 149	7 753	8 509	9 481
13%	5 767	6 104	6 502	6 980	7 563	8 293

Share Price	Long term growth rate					
WACC	0%	1%	2%	3%	4%	5%
8%	179	200	229	268	328	427
9%	158	174	195	222	260	317
10%	142	154	169	189	216	252
11%	129	138	150	165	184	209
12%	118	126	135	146	161	179
13%	109	115	123	132	143	157

Figure 44. Results from the DCF sensitivity analysis for Questcor Pharmaceuticals. The impact of the WACC, discount rate, and the long-term growth rate on the market capitalization value as well as share price is demonstrated. The results are presented in $ million for the market capitalization value and $ per share. The share price was obtained by dividing the market capitalization value by the number of shares.
Source: Lindéus (2021).

The tax rate sensitivity analysis for Questcor Pharmaceuticals is presented in figure 45. Similar to the results retrieved for Kite Pharma in figure 33, and Cubist Pharmaceuticals in figure 41 none of the tax-rate combinations generated a result which was within ten percent of the realized values.

Tax rate	15%	20%	25%	30%	35%	40%
EV	14 428	13 553	12 677	11 801	10 926	10 050
Market cap	14 588	13 713	12 837	11 961	11 086	10 210
Share Price	276	259	242	226	209	193

Figure 45. The sensitivity analysis, from the DCF modelling, for Questcor Pharmaceuticals with respect to the impact of different tax rates on the enterprise value, market capitalization as well as share price. Green color indicates that the result is within ten percent of the actual, realized value. The results are presented in $ million for the enterprise value and market capitalization. The share price is $ per share.
Source: Lindéus (2021).

4.3 Research Question Three

The third research question was the following:

> *Considering public pharmaceutical companies that were involved in realized M&A transactions during the last decade, may M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization?*

This research question relates to if the M&A valuation models overvalued the targets. As described in the introduction chapter, there might be several reasons why reduction of profitability, sales growth and/or market capitalization occur after an M&A deal. Overvaluation by the models is one of the main reasons. In order to determine the frequency of the overvaluation in this study, the results from research question one and two, figure 10 to 45, will be evaluated from a quantitative perspective. In other words, to what extent is overvaluation of the targets present in this study. Overvaluation and undervaluation are defined as above or below the realized enterprise as well as share price values.

In table 18, the number of overvalued and undervalued cases as well as results, which occurred in the first research question, are presented. In the relative valuation part of the table, there are nine results for each of the targets, three dedicated to each of the multiples, EV/Sales, EV/EBITDA and P/E. Regarding the results for the DCF valuation, there are two results for each of the targets, one for the enterpirse value and one for the share price. The results for the multiples based on earnings, i.e. EV/EBITDA and P/E were excluded for Kite Pharma in the relative valuation part of the table. The reason is that Kite Pharma did not have any earnings prior the M&A deal announcement. Thus, it has three

relative valuation results in the table, instead of nine. After summarising the results on the last row in the table, the total results show that the relative valuation tends to undervalue the targets (79%), meanwhile the DCF methodology tends to overvalue them (67%).

Table 18. The number of undervalued as well as overvalued cases, including percentages, obtained in the first research question. Both of the selected M&A valuation models are highlighted for each of the targets. Overvaluation and undervaluation are defined as above or below the realized values.

	Relative valuation		**DCF**	
Target	**Undervalued**	**Overvalued**	**Undervalued**	**Overvalued**
Monsanto	7 (78%)	2 (22%)	1 (50%)	1 (50%)
Actelion	7 (78%)	2 (22%)	0 (0%)	2 (100%)
Kite Pharma	3 (100%)	0 (0%)	0 (0%)	2 (100%)
Bioverativ	8 (89%)	1 (11%)	1 (50%)	1 (50%)
Cubist Pharmaceuticals	8 (89%)	1 (11%)	2 (100%)	0 (0%)
Questcor Pharmaceuticals	5 (56%)	4 (44%)	0 (0%)	2 (100%)
Total	38 (79%)	10 (21%)	4 (33%)	8 (67%)

Source: Lindéus (2021).

In table 19, the number of overvalued and undervalued cases and results, including percentages, which occurred in the second research question are presented. The relative valuation sensitivity analysis had 18 results for each of the targets, which is twice as many as in research question one, due to the fact that also the average methodology measurement was considered here. Regarding the DCF sensitivity analysis, there were 84 results for each of the targets. 36 of these results were related to the impact of the long-term growth rate and WACC on the enterprise value. Another 36 of results were related to the impact of the long-term growth rate and WACC on the share price. The remaining 12 results were related to the impact of the tax rate on the enterprise value and share price. As previously mentioned, the market capitalization values were not considered and evaluated as results,

due to the fact that the share prices used them by dividing with the number of shares, thus including them would generate duplicate results.

As described in table 18, the results for the multiples based on earnings, i.e. EV/EBITDA and P/E were excluded for Kite Pharma in the relative valuation part of the table. The reason is that Kite Pharma did not have any earnings prior the M&A deal announcement. Thus, it has six relative valuation results in the table, instead of 18. Furthermore, six of the results were not applicable for Kite Pharma in the DCF sensitivity analysis, thus 78 of out 84 results were applicable here for this target. Similarly to the results obtained in the first research question, the relative valuation methodology tend to generate undervalued results with a total of 69 undervalued (72%) versus 27 overvalued ones (28%). Thus, both of the research questions are consistent with each other. Regarding the DCF approach, the sensitivity analyses showed more undervalued results than overvalued ones, 276 (55%) vs 222 (45%). This is not consistent with the first research question, where the overvalued results were overrepresented.

Table 19. The number of undervalued as well as overvalued cases, including percentages, obtained in the second research question. Both of the selected M&A valuation models are highlighted for each of the targets. Overvaluation and undervaluation are defined as above or below the realized values.

	Relative valuation		**DCF**	
Target	**Undervalued**	**Overvalued**	**Undervalued**	**Overvalued**
Monsanto	13 (72%)	5 (28%)	66 (79%)	18 (21%)
Actelion	13 (72%)	5 (28%)	66 (79%)	18 (21%)
Kite Pharma	6 (100%)	0 (0%)	7 (9%)	71 (91%)
Bioverativ	14 (78%)	4 (22%)	65 (77%)	19 (23%)
Cubist Pharmaceuticals	13 (72%)	5 (28%)	72 (86%)	12 (14%)
Questcor Pharmaceuticals	10 (56%)	8 (44%)	0 (0%)	84 (100%)
Total	69 (72%)	27 (28%)	276 (55%)	222 (45%)

Source: Lindéus (2021).

In table 20, the number of overvalued and undervalued cases and results, including percentages, which occurred in both of the first as well as the second research question combined are presented. The summarized results for the two methodologies, with each of the six targets combined, seen in the total row, indicate that both of the valuation methodologies, relative valuation and DCF, tend to generate undervalued results with 74% and 55% of the cases respectively.

Table 20. The number of undervalued as well as overvalued cases, including percentages, obtained in both of the first and the second research questions combined. Both of the selected M&A valuation models are highlighted for each of the targets. Overvaluation and undervaluation are defined as above or below the realized values.

	Relative valuation		**DCF**	
Target	**Undervalued**	**Overvalued**	**Undervalued**	**Overvalued**
Monsanto	20 (74%)	7 (26%)	67 (78%)	19 (22%)
Actelion	20 (74%)	7 (26%)	66 (77%)	20 (23%)
Kite Pharma	9 (100%)	0 (0%)	7 (9%)	73 (91%)
Bioverativ	22 (81%)	5 (19%)	66 (77%)	20 (23%)
Cubist Pharmaceuticals	21 (78%)	6 (22%)	74 (86%)	12 (14%)
Questcor Pharmaceuticals	15 (56%)	12 (44%)	0 (0%)	86 (100%)
Total	107 (74%)	37 (26%)	280 (55%)	230 (45%)

Source: Lindéus (2021).

4.4 Summary of Findings

In this section, a summary of the findings from the three research questions will be presented. Each of the research questions will be handled one after another. Furthermore, since this section is a summary, the research questions will be answered in a more concise as well as holistic manner.

Regarding research question one, the relative valuation approach generated more accurate results than the DCF methodology. For all the targets, the relative valuation approach was more accurate. However, it is important to have in mind that the valuation depends much on many limitations as well as assumptions and erroneous ones may have a great impact on the results. The multiples, which generated the most accurate results, within the relative valuation approach were different for the targets in this study. The EV/Sales multiple generated the most accurate results for Actelion, Bioverativ and Cubist Pharmaceuticals with values that deviated nine, seven and ten percent from the realized values. Furthermore, Questcor Pharmaceuticals also had an accurate result of the EV/Sales multiple of an eight-percent deviation from the realized enterprise value, although its P/E multiple performed slightly better with a deviation of seven percent.

Regarding Monsanto, the EV/EBITDA multiple generated the most accurate result with a deviation of five percent, which was the most accurate one for all of the targets in this research question. Kite Pharma did not generate any relative valuation results, which were within ten percent of the realized values, but was more accurate than the DCF approach. The DCF methodology only generated reasonable results for Monsanto and Actelion, which enterprise values deviated approximately six as well as ten percent from the realized values respectively. For the other targets, none of the results were within a reasonable range from the realized values. Based on the findings from this study, the DCF approach should preferably be used for larger public pharmaceutical companies with similar sizes to Actelion as well as Monsanto with enterprise values of $30 billion and above. It should not be recommended for smaller ones such as Questcor Pharmaceuticals, Cubist Pharmaceuticals, Bioverativ and Kite Pharma.

The relative valuation approach, in particular the EV/Sales multiple, consistently generated accurate results for four out of six of the targets. Another finding is that the

selection type of the comparable companies seems to be dependent on what kind of sub-sector within the pharmaceutical industry, e.g. Monsanto, which is within the agricultural biotechnology sector, generated best results when the comparable companies were based on market capitalization values only, meanwhile Actelion, which mainly operates in the pulmonary arterial hypertension sector, had the most accurate results when selecting companies within the same sub-sector despite the size.

Regarding research question two, which included the sensitivity analyses for the targets, more accurate results with respect to the realized values were obtained when adjusting some of the assumptions and considering other than the initial ones. As previously described both in the literature review and methodology chapter, the median methodology measuring type is preferred when conducting relative valuation in general. In this study, there were several results within ten percent of the realized values, using the average methodology measuring type. Some of the targets also generated more accurate results than when using the median. As an example, Actelion had an enterprise value which deviated six percent when using the EV/Sales multiple and the average type measuring methodology, compared to nine percent using the median. For Questcor Pharmaceuticals, two results were more accurate than all the other ones, retrieved in the first research question, when using the average. The first and most accurate of these two results was a share price value, which generated an exact match with zero percent deviation when using the P/E multiple. The second result was an enterprise value deviating three percent from the realized value, when using the EV/Sales. Another prominent result, using the average type measuring methodology, was for Monsanto when the EV/Sales multiple generated an enterprise value deviating six percent from the realized value, which is similar to the most accurate result retrieved in the first research question of five percent deviation.

Regarding the DCF modeling approach, some of the combinations in the sensitivity analyses generated more accurate results for all the targets than the initial ones obtained in the first research question. Furthermore, several results, in one or more of the three sensitivity analyses, for each of the targets were within ten percent of the realized values. Therefore, various combinations of assumptions for the different targets generated more realistic results than the initial ones retrieved from the first research question, indicating the importance of the assumptions in the DCF modeling approach.

Thus, the M&A valuation models are sensitive to non-consideration of certain assumptions, such as excluding the averages in relative valuation, which, based on the literature review, is considered to be a recommendation in industry as well as academia, and considering other assumptions in the DCF modeling approach. When comparing the two M&A valuation models, the DCF seems to be more sensitive than the relative valuation approach, which is logical due to the fact that the DCF valuation is mostly built on intrinsic assumptions and not benchmarked to external companies as the relative valuation is. These findings answer the second research question that non-considering of important assumptions affects the valuation results of both the relative as well as DCF modeling approaches.

Regarding research question three, which was a combination of the two first research questions from a quantitative perspective, thus the results from figure 10 to 45, both of the M&A valuation models tend to generate undervalued results for the targets, when comparing to the realized values. The relative valuation had 107 (74%) undervalued results in total from the research, compared to 37 (26%) overvalued ones. For the DCF, the number of undervalued results were 280 (55%), compared to 230 (45%). Thus, when combining both of the M&A valuation models together, 387 obtained results (59%) were undervalued in this research study, compared to 267 (41%).

Based on the findings in the third research question, overvaluation occurs by both of the models with various assumptions. It is therefore possible that the valuation models may have contributed to reduction of profitability and market capitalization for the acquiring companies as it is one of the main reasons why M&A deals do not go as expected. However, since the total frequency of overvaluation from this study is approximately 41%, it is therefore more likely that a target is not overvalued. When comparing the two models, the frequency of overvaluation for the relative valuation methodology is approximately 26% vs 45% for the DCF modeling approach. Therefore, the DCF methodology would have contributed to reduction of profitability and market capitalization for the acquiring companies to a greater extent than the relative valuation approach. However, it is important to keep in mind that some of the assumptions such as WACC, sales growth, tax-rate and the long-term growth rate have a great impact on the valuation results. Therefore, unrealistic assumptions may give an erroneous view of the cases and the frequency of over- and undervaluation in the study.

These findings thus answer the research question, if some or all the M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization values to public pharmaceutical companies that were involved in realized M&A transactions during the last decade.

4.5 Conclusion

In this chapter, the results from the research were presented. Three research questions were individually evaluated. The first research question was related to how much the results of different M&A valuation models differ from each other and if some of them should not be recommended for M&A deals in the pharmaceutical industry. The second

research question was related to how sensitive the M&A valuation models are to non-consideration of certain assumptions such as WACC, sales growth rate, tax-rate and the long-term growth rate, which all have a great impact on the enterprise value. The third and last research question was related to if some or all the M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization values to public pharmaceutical companies that were involved in realized M&A transactions during the last decade.

For the two first research questions, each of the targets were handled individually, meanwhile the third research question were enlightened in a more general manner. The three research questions were then followed by a summary of findings section. In the next chapter, a discussion of the results of the research will be elaborated. The results from the three research questions will be discussed and the separate findings from each of the targets will be further evaluated.

CHAPTER V:
DISCUSSION

5.1 Discussion of Results

In this chapter, the discussion of the results, presented in the previous chapter, will be presented and evaluated in a detailed manner. As a reminder to the reader, each of the research questions will be stated at the beginning of the sections, similar to the results chapter. The research questions will be handled one after another and the findings for each of the targets will be evaluated separately, combined with discussions from a more general as well as holistic perspective.

5.2 Discussion of Research Question One

The first research question was the following:

How much do the results of different M&A valuation models differ from each other and should some of them not be recommended to be used for M&A deals in the pharmaceutical industry?

In the first research question, the relative valuation generated more accurate results than the DCF approach. All the results for each of the targets will be discussed individually below.

Monsanto

The relative valuation generated the best results for the EV/EBITDA multiple together with the second scenario, followed by the third one. For Monsanto, which operates within the agricultural biotechnology sub-sector, this indicates that benchmarking companies with similar sized market capitalization values is more important than only comparing to companies in the same industry regardless their sizes. It is reasonable that the EV/EBITDA multiple generated more accurate results than the other multiples, since it was also one of the conclusions retrieved from the literature review and previous research. The results from the DCF analysis are also reasonable, since they are in the same order of magnitude as the most accurate relative valuation results, indicating that the initial assumptions made, such as sales growth, WACC, long-term growth rate, NWC and tax-rate, were reasonable.

Actelion

The most accurate result within the relative valuation approach was when the first scenario and the EV/Sales multiple were combined. This indicates that having comparable companies within the same sub-sector is more important than same sized ones as well as the combination of the two. Thus, companies operating in the pulmonary arterial hypertension sub-sector within the pharmaceutical industry seem to be more dependent on having the comparable companies industrywise when conducing a relative valuation than companies in the agricultural biotechnology sector, where Monsanto operates. This is reasonable due to the fact that companies in some sub-sectors may have different capital structures and are thus more dependent on other factors such as R&D, which may affect e.g., the earnings.

The fact that the EV/Sales multiple performed better than the other ones is not consistent with the previous research described in the literature review, where the EV/EBITDA was considered be the most accurate one. The second most accurate result was when the first scenario and P/E multiple were combined. This further strengthens the fact that companies in the pulmonary arterial hypertension sub-sector should be compared to companies in the same sub-industry. Regarding the DCF approach, both the enterprise value as well as share price were in the same order of magnitude as the two best results retrieved from the relative valuation, indicating that the initial assumptions were reasonable.

Kite Pharma

In the relative valuation analysis, the results for both of the EV/EBITDA as well as P/E multiples were not applicable for Kite Pharma. This is reasonable due to the fact that Kite Pharma did not have any earnings yet at the time of the M&A deal. Both of the applicable methodologies, the EV/Sales multiple within the relative valuation and the DCF approach, did not generate any reasonable results, indicating either that the assumptions were not appropriate or that the models do not fit a company profile like Kite Pharma. None of the selection scenarios for comparable companies in the relative valuation generated any reasonable results, indicating that the model itself was not appropriate rather than issues with some of the selections, in contrast to the previously discussed companies, Monsanto and Actelion. Regarding the assumptions in the DCF approach, the most important assumptions: growth rate, WACC and tax-rate were retrieved from reliable sources such as equity research from well-renowned institutions and SEC filings.

The long-term growth rate, which is one of the most critical assumptions, was assumed to be ten percent. This is reasonable due to the fact that Kite Pharma, as a company,

was in the expansion phase in the business cycle at the time of the M&A deal announcement. This further suggests that the DCF approach is not appropriate for company profiles such as Kite Pharma.

Bioverativ

The initial relative valuation results for Bioverativ generated the most accurate results when the second selection scenario was combined with the EV/Sales multiple. No other results within the initial relative valuation were in the same order of magnitude with respect to the accuracy. This further confirms that the EV/Sales multiple is more accurate than previously, based on the findings from the literature study, thought as we have also had this finding for both Actelion and Kite Pharma. Furthermore, the second selection scenario of comparable companies generated the most accurate result, which indicates that the sub-sector of rare diseases, in which Bioverativ operates, seems to be less sensitive to only having comparable companies within the sub-sector and more prone to have similar market capitalization values. This phenomenon was also observed for Monsanto. Regarding the DCF approach, neither the enterprise value nor the share price generated reasonable results with respect to the realized values, indicating that the assumptions could have been erroneous to some extent.

However, as also previously mentioned when discussing the results for Kite Pharma, the assumptions used were based on reliable sources such as equity research from well-renowned institutions and SEC filings. The long-term growth rate was set to be five percent, i.e., the company was assumed to be in the deceleration phase. Assuming a higher long-term growth rate would have generated a larger enterprise value, which was already far above the realized value in the modeling approach and assuming a lower one would not be realistic as well since the research-intensive rare disease sub-sector is not a mature one.

Cubist Pharmaceuticals

The initial relative valuation results for Cubist Pharmaceuticals further strengthens the fact that, within this study, the EV/Sales multiple is more accurate than the other multiples since the most accurate results contained this multiple, combined with the third scenario. The third selection scenario of comparable companies, which consists of companies in the same sub-sector and companies with similar market capitalization values, has previously not been seen generating the most accurate results.

This result indicates that conducting relative valuation of a company within the sub-sector of antibiotics is more suitable when mixing the comparable companies from the same sub-sector together with companies having similar market capitalization values. Regarding the DCF approach, neither the enterprise value nor the share price generated reasonable results. Similar to the previously mentioned companies, reliable sources such as equity research from well-renowned institutions and SEC filings were taken into consideration when making the assumptions and these are highly unlikely to be erroneous.

Unlike the case for Bioverativ, assuming a higher long-term growth rate would have generated a more accurate enterprise value in the valuation since the initial results were highly undervalued. However, from a realistic perspective, this is highly unlikely due to the fact that the company itself was founded in 1992, thus is it not reasonable to assume that the company would have been in the expansion phase at the time of the M&A deal announcement. It is not realistic to assume that the antibiotics resistance business to be mature as well since it is an increasing as well as emerging problem worldwide. Thus, the deceleration phase and a long-term growth rate of five percent are reasonable assumptions for Cubist Pharmaceuticals.

Questcor Pharmaceuticals

The most accurate result from the relative valuation part was the P/E multiple, combined with the third scenario, followed by the P/E value together with the first scenario and the EV/Sales multiple, combined with the third scenario. All these three results have almost identical accuracy with respect to the realized values. This further strengthens that the EV/Sales multiple is a reliable multiple to use when conducting relative valuations. Similar to the case for Kite Pharma, Bioverativ and Cubist Pharmaceuticals, the initial DCF results did not generate reasonable results with respect to the realized values.

Assuming a higher long-term growth rate than five percent, deceleration, would not have made the results more accurate since the initial results were highly overvalued, similar to the Bioverativ case. However, it may be more realistic to assume that Questcor Pharmaceuticals operated in a mature state of the business cycle at the time of the M&A announcement, since the Achtar gel, its most popular product at this time, had been on the market for decades. This fact would have made the DCF results more accurate with respect to the enterprise values as well as share price. The other assumptions were retrieved from equity research as well as SEC filings and are considered to be more rigid than the long-term growth rate.

5.3 Discussion of Research Question Two

The second research question was the following:

Considering pharmaceutical companies, how sensitive are the M&A valuation models to non-consideration of important assumptions?

In the sensitivity analyses, various assumptions with respect to WACC, long-term growth rate and tax-rate were made. Having correct assumptions are critical in order to

conduct a, somewhat, accurate valuation. When discussing, the results from the first research question, the limitation of an erroneous long-term growth rate was addressed. Another limitation is that the discount rates for the companies are constantly changing in practice as well as reality. The standard DCF modelling approach does not take this flexibility into account since it assumes a constant capital structure. Below, results from the sensitivity analyses will be discussed individually for each of the targets.

Monsanto

Extending the relative valuation to include averages when measuring the results, instead of only using the median, generated two more accurate results which were in the same order of magnitude as the ones retrieved in the first research question. These multiples were both EV/EBITDA and EV/Sales, where the latter was not considered to be accurate in the first research question. Although not being considered the standard practice as previously mentioned, these findings further strengthens that the EV/Sales multiple should be used when conducting relative valuation, along with that measuring the results using the averages should be considered as well.

Regarding the DCF valuation sensitivity analyses, several enterprise values as well as share prices within ten percent of the realized values were obtained when evaluating the impact of the WACC and the long-term growth rate, indicating the importance of somewhat accurate assumptions. A long-term growth rate of two percent, combined with a WACC of seven percent generated an enterprise values which deviated three percent from the realized value. This indicates that this combination of the two assumptions would be more appropriate to use than the ones made in the first research question such as a mature growth rate of three percent. The second sensitivity analysis, representing the impact on

the share price, had another combination, which generated the most accurate result, of the two assumptions than the recently described one.

One reason why these combinations from the two sensitivity analyses differed may be due to the fact that the same number of shares as before the M&A announcement, i.e., the market capitalization value divided with the price, was used in the calculations. Furthermore, the total debt was assumed to be the same as in the one retrieved in the latest SEC filing prior the M&A announcement, which may differ in reality. Regarding the tax rate, a tax-rate of 40%, which is five percent more than in the first research question, generated the most accurate enterprise value. This tax-rate may be reasonable if the future politics related to the corporate climate would have been assumed to be harsher. The share price, which generated the most accurate result, was different than the one for the enterprise value and may be due to the same reasons as previously described.

Actelion

In the relative valuation sensitivity analysis for Actelion, using the averages generated a more accurate result than the one obtained in the first research question. This combination was the same as previously, the EV/Sales multiple, combined with the first scenario. Once more, this further strengthens the fact that the EV/Sales multiple and averages should be considered when conducting relative valuation, along with that the selection of comparable companies should be customized depending on which sub-sector the target company operates within. Regarding the DCF analysis, the most accurate result for both of the enterprise value and as share price contained a WACC of eight percent as well as a long-term growth rate of five percent, which was almost identical to the initial assumptions made in the first research question.

No other combinations of long-term growth rates or WACC generated results which were within then percent of the realized values, indicating that these assumptions are reasonable and that Actelion is sensitive to other assumptions in a negative way. However, since these sensitivity analyses ranged between a WACC between six to eleven percent and a long-term growth rate between zero to five percent, there might have been other theoretical combinations which would generate, somewhat, accurate results. Since both of these sensitivity analyses included long-term growth rates between zero to five percent and WACC between six to eleven, there is a theoretical possibility that some other combinations of these input variables outside these ranges would have generated even more accurate results.

However, from a realistic perspective other combination are unlikely to be realistic, e.g., a long-term growth rate of more than five percent is unlikely for a company with an enterprise value as large as $30 billion USD. Regarding the tax-rate sensitivity analysis, a tax rate of 20% generated the most accurate enterprise value and 25% for the share price. The differences may be due to the reasons which were already discussed in the Monsanto case. However, a tax rate of 20% and less is most likely to be the most realistic scenario for Actelion, especially since Switzerland, where Actelion was registered at the time of the M&A deal announcement, is known to be a country with low corporate taxes. The results indicate that both of the enterprise and share price values are highly sensitive to different tax rates.

Kite Pharma

As previously mentioned in the result chapter of the second research question for Kite Pharma, none of the relative valuation combinations generated any accurate results,

although only the EV/Sales multiple could be applied in this case due to no earnings. Although the comparable companies were carefully selected and divided into three groups, there could be other companies to include as well, which hypothetically could generate more accurate results for the applicable EV/Sales multiple. However, the financial metrics for Kite Pharma were highly volatile at the time of the M&A deal, which makes the valuation process more difficult overall. Regarding the DCF sensitivity analyses, one combination generated a result which were within ten percent of the realized enterprise value and two for the share price.

These combinations were a long-term growth rate of five percent and a WACC of 13% for both of the analyses and also a long-term growth rate of six percent for the share price, combined with the same WACC as previously mentioned. Regarding that the most accurate combinations of assumptions from these two analyses differed; the reasons may be the same ones as already being discussed for both Monsanto as well as Actelion. However, due to the fact that Kite Pharma at the time of the M&A deal did not have any earnings and rather low sales, it is not reasonable to assume a long-term growth rate which corresponds to one within the deceleration phase. An expansion phase long-term growth rate, which was assumed in the initial analysis in the first research question, is the most reasonable assumption in this case. The tax-rate sensitivity analysis did not generate any reasonable results, which is due to the fact that the initial assumptions generated highly deviating results from the beginning and these different tax-rates were applied to the initial assumptions.

Bioverativ

The relative valuation sensitivity analysis for Bioverativ did not contribute with further accurate results within ten percent of the realized values, when taking the averages

into consideration. This was also the case for Kite Pharma, as previously discussed. One of the reasons why may be that the rare diseases sub-sector is rather volatile with respect to the sales as well as earnings, thus the outliers have more impact on the average than on the median. In the DCF sensitivity analyses, four combinations were within ten percent of the realized enterprise value and three for the share price. Regarding that the most accurate combinations these two analyses differed, the reasons may be the same ones as already being discussed for both Monsanto, Actelion and Kite Pharma. The most accurate results for the enterprise value had a five-percent long-term growth rate and nine percent WACC, meanwhile for the share price, this combination was three as well as six percent. Out of these two combinations, the one for the enterprise value is the most reasonable, which is similar to the initial assumption in the first research question. The reason why is that Bioverativ is company specializing in rare diseases, which is not a mature business, rather a growing one, thus a long-term growth rate of three percent is unreasonable.

Regarding the tax-rate sensitivity analysis, a tax rate of 40% generated the most accurate enterprise value and 15% for the share price. Another accurate result for the share price had a tax-rate of 20%. The differences may be due to the reasons which were already discussed in the Monsanto, Actelion cases and Kite Pharma cases. A likely as well as reasonable tax-rate would be in the same order of magnitude as the initial one in the first research question, i.e., 21%, due to the fact that there was a new political administration in the USA at the time being. To summarize, all the sensitivity analyses indicate that the various assumptions have a great impact on the valuation results.

Cubist Pharmaceuticals

The relative valuation sensitivity analysis for Cubist Pharmaceuticals did not contribute with further accurate results within ten percent of the realized values, when taking

the averages into consideration. This was also the case for Kite Pharma and Bioverativ. One of the reasons why may be that the counter antibiotics resistance sub-sector, which is a research intensive one, is rather volatile with respect to the sales as well as earnings, thus the outliers have more impact on the average than on the median.

In the DCF sensitivity analyses, the most accurate combination of assumptions for the enterprise value was a long-term growth rate of three percent, combined with a WACC of seven percent. For the share price this combination was a five-percent long-term growth rate and a WACC of eight percent.

The most realistic assumption of these two combinations is the latter one, due to the fact that the counter antibiotics resistance sub-sector is not a mature one, since antibiotic resistance is a growing problem in the modern world era, thus the business opportunities will most likely further expand. Furthermore, a WACC of seven percent is far away from the one which was retrieved from reliable sources as presented in the methodology chapter, thus eight percent is more reasonable in this case. Regarding that the most accurate combinations these two analyses differed, the reason may be the same ones as already being discussed for both Monsanto, Actelion, Kite Pharma and Bioverativ. The tax-rate sensitivity analysis did not generate any reasonable results, which is due to the fact that the initial assumptions generated highly deviating results from the beginning and these different tax-rates were applied to the initial assumptions. This phenomenon was also observed for Kite Pharma. As previously discussed for the other targets, all the sensitivity analyses indicate that the various assumptions have a great impact on the valuation results.

Questcor Pharmaceuticals

The relative valuation sensitivity analysis, using the averages contributed with more accurate results for both the EV/Sales as well as the P/E multiples than in the initial analysis. The averages for the P/E multiple, combined with the first scenario generated an identical share price as the realized one, followed by the average of the EV/Sales multiple together with the same scenario, which also showed an accurate result. A reason why the accuracy was so prominent in this case may be that this sub-sector is a more stable one with respect to the sales as well as earnings, which generates better conditions for conducting a relative valuation analysis.

Regarding the DCF analyses, only the one which showed the impact on the enterprise value generated accurate results within ten percent of the realized value. The most accurate combination was the one with a long-term growth rate of zero percent, combined with a WACC of 13%. Assuming a long-term growth rate of zero percent is not realistic, due to the fact that it is unlikely that an acquirer wants to buy a company with no long-term growth prospects. In the initial analysis, from the first research question, a long-term growth rate of five percent was assumed and when discussing the results from first research question, it was argued that perhaps this figure could be revised to a mature one, i.e., three percent, since the most popular product, Achtar, had been on the market for several decades at the time of the M&A deal announcement. Regarding that the most accurate combinations from these two analyses differed, the reason may be the same ones as already being discussed for both Monsanto, Actelion, Kite Pharma, Bioverativ and Cubist Pharmaceuticals. The tax-rate sensitivity analysis did not generate any reasonable results, which is due to the fact that the initial assumptions generated highly deviating results from the beginning and these different tax-rates were applied to the initial assumptions. This phenomenon was also

observed for Kite Pharma and Cubist Pharmaceuticals. As was also observed for the other targets, the various assumptions in the analyses had a great impact on the valuation results.

5.4 Discussion of Research Question Three

The third research question was the following:

Considering public pharmaceutical companies that were involved in realized M&A transactions during the last decade, may M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization?

The relative valuation had 107 undervalued results in total from the research, compared to 37 overvalued ones. For the DCF, the number of undervalued results were 280, compared to 230 overvalues ones. Thus, when combining both of the M&A valuation models together, 387 obtained results were undervalued in this research study, compared to 267. Based on the findings in the third research question, overvaluation occurs by both of the models with various assumptions. It is therefore possible that the valuation models may have contributed to reduction of profitability and market capitalization for the acquiring companies as it is one of the main reasons why M&A deals do not go as expected.

However, since the total frequency of overvaluation from this study is approximately 41%, it is therefore more likely that the targets were not overvalued by valuation models in the M&A processes of these companies. When comparing the two models, the frequency of overvaluation for the relative valuation methodology is approximately 26% vs 45% for the DCF modeling approach. Therefore, the DCF methodology would have contributed to reduction of profitability and market capitalization for the acquiring companies to a greater extent than the relative valuation approach. Furthermore, in the first research question where the initial assumptions were made, eight out of twelve results were

overvalued and some of the smaller companies with respect to enterprise value were highly overvalued, indicating that the DCF methodology is more suitable to the rather larger companies such as Monsanto. However, as previously mentioned in the discussion section of research question one, some of the assumptions may have been chosen differently such as assuming a mature long-term growth rate for Questcor Pharmaceuticals, but it is highly unlikely that this adjustment would have generated an undervalued result, since the initial results were highly overvalued. In gerneral terms, based on the results retrieved in the third research question, it may not be concluded that the M&A valuation models were a major contributor to reduction of profitablity, sales growth and/or market capitalization to the public pharmaceutical companies present in the study.

CHAPTER VI:
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The purpose of this research was to evaluate the applicability of M&A valuation models in the pharmaceutical and biotechnology industry. A quantitative study with secondary data, using two modelling approaches, DCF and relative valuation, was conducted. After a comprehensive, rigid introduction chapter, where necessary theory such as M&A in general, including processes, legal frameworks and its role in the pharmaceutical industry, was highlighted, an extensive literature study was presented. The choice of the two modelling approaches was the result of this literature study, which also included several other different modeling approaches, e.g. real options as well as risk- and probability adjusted DCF models. In this literature study, both academic and industry perspectives were enlightened. After a detailed selection process of target companies with various sampling criteria, the two chosen modelling approaches were then applied on six public target companies from widely known M&A deals in the pharmaceutical and biotechnology industry during the last decade.

The target companies were Monsanto, Actelion, Kite Pharma, Bioverativ, Cubist Pharmaceuticals and Questcor Pharmaceuticals, which were acquired by Bayer, Johnson & Johnson, Gilead Sciences, Sanofi, Merck and Mallinckrodt respectively. These deals have been widely known to not have been as successful as anticipated with respect to sales growth, market capitalization, profitability as well as other important financial metrics.

Three research questions, related to differences between the models, sensitivity of assumptions and if the models contributed to reduction of important financial metrics such as sales growth, profitability as well as market capitalization, were answered in the study. The relative valuation approach generated more accurate and close results to the realized enterprise value as well as share price than the DCF model. Within the relative valuation, the EV/Sales multiple was the most accurate as well as closest to the realized values than the other applied multiples: EV/EBITDA and P/E. Furthermore, the optimal selection of comparable companies varied depending on in which sub-sector, the target operated within. The DCF model was much more sensitive to non-consideration of important assumptions than the relative modelling approach, which was a likely fact since the DCF approach is an intrinsic one. When adjusting various assumptions when applying the DCF model, some of the targets generated almost identical results as the realized values. As seen in table 20, which is a summary of all the results from the first and second research question, i.e. figure 10 to 45, both of the models tend to generate more undervalued results than overvalued ones, where the relative valuation generated undervalued results to a greater extent when comparing the two approaches. This finding mostly indicate that the valuation modelling itself and its assumptions were not a major contributor to reduction of important financial metrics after realization of the M&A deals. However, although choosing the assumptions as realistically as possible, it is still important to keep in mind that the various assumptions, such as sales growth, WACC, tax-rate and long-term growth rate, made in this study have a great impact on the valuation results. Therefore, other assumptions could have generated a different outcome than the results from this study.

6.2 Implications

The implications obtained in this study, which some of them were already mentioned in the discussion chapter, are several and they may both help professionals in industry as well as in academics, dealing the with the pharmaceutical sector, to select proper modeling approaches in their research. Four major implications, which has not been addressed together in previous research, were obtained. Firstly, the relative valuation seems to be more accurate than the DCF approach. Secondly, the EV/Sales multiple seems to be more accurate, with respect to e.g. the enterprise values as well as share price, than the EV/EBITDA one in the relative valuation modeling approach. Thirdly, using averages should not be banned in the research metholology when conducting relative valuation, in some of the cases in this study the averages generated more accurate results than the medians did. Fourthly, the DCF valuation approach is more accurate for companies with larger enterprise as well as market capitalization values and depending on the sizes of the targets companies which are going to be valued, the modeling approaches should be carefully considered, especially for companies with no current earnings at the time of the data retrieval. A major reason for that larger companies tend to be valued more accurately with the DCF methodology than the smaller ones, is that DCF does not incooperate risks and uncertanities in the modeling approach. A larger company, especially in the pharmaceutical industry, is generally more stable with respect to earnings and successful projects as a result of more internal resources and a larger portfolio of products, than a smaller one. The risks and uncertainties are therefore much lower for a larger company than a smaller one, thus the DCF approach works better in this context. Another major reason is that a fixed investment rate is assumed in the DCF approach. This is more beneficial for the larger companies since they e.g. have a more steady growth rate,

compared to the smaller ones, where the growth rate fluctuates to a greather extent, which makes the future investments harder to predict.

Overall, these findings will be helpful to professionals conducting valuations of public pharmaceutical companies and provide complementary guidelines to the already existing knowledge in the field, in order to facilitate to a more accurate valuation practice as well as decrease the outcomes which contribute to reduction of important financial metrics such as sales growth, profitability and/or market capitalization values.

6.3 Recommendations for Future Research

Although this study is unique in a sense that it combines the DCF and relative valuation modelling approach to several companies at the same time, further research is needed to fully understand the applicability of M&A valuation in the pharmaceutical and biotechnology industry. In this study, six targets were evaluated, studied and analyzed. This selection should preferably be extended to a larger one, perhaps 20 targets or more, in order to draw further conclusions about the modeling approaches. Although reliable data sources were used in this study, a next step, in order to draw even more accurate conclusions, would be to use top notch data sources such as Bloomberg Terminal, where e.g. comparable companies are automatically presented by various algorithms, which was also mentioned in the research design limiation section, methodology chapter, section 3.8. Another recommendation for future research is to not only limit the study to widely known failed M&A deals in the pharmaceutical industry, but also successfully considered ones as well.

Thus, more data would be obtained and perhaps new patterns which were not seen in this study would also be seen. There might thus be more M&A deals that could be considered as failed from a valuation perspective, due to deviations. In this study, two

modeling approaches, the relative valuation as well as the DCF approach, were considered. A suggestion, although not being considered to be optimal in the literature study, would be to consider other valuation models such as the relative options approach and the risk adjusted NPV model, including success probability rates, which were also decribed in the literature review. Another suggestion for future research would also be to extend the sensitivity analyses even further, since valuation models, notably the DCF approach, are very sensitive to the various assumptions made in them.

6.4 Conclusion

The purpose of this research was to evaluate the applicability of M&A valuation models in the pharmaceutical and biotechnology industry. In chapter one, we demonstrated a comprehensive introduction to the reader, which gradually built up to a research problem as well as three research questions. Here we saw that a better understanding of M&A valuation in the pharmaceutical industry is evident, especially since the M&A deals tend to increase in the sector, meanwhile factors such as regulation are getting more complex, which in turn indirectly affects the companies' valuation. The literature study, chapter two, concluded that, after evaluating several valuation models from multiple scholars, the two valuation approaches DCF and relative valuation were the most appropriate ones to use in the study for the pharmaceutical industry. Other valuation models were e.g., considered by different authors to be more complex and not user-friendly. The literature study included approaches as well as studies from both academia and from industry, in order to evaluate the subject from a holistic approach. In the methodology chapter, a section dedicated to operationalization of theoretical constructs was firstly demonstrated. Here, the DCF and relative valuation were detailed explained with necessary theoretical concepts, including

formulas, for the research design. Then, a sample of six targets, large representative public pharmaceutical companies which were acquired during the last decade, were chosen based on an extensive analysis of fifteen well-known M&A deals with several exclusion factors. The research was designed with a quantitative approach and secondary data, based on the six targets and the DCF as well as relative valuation models with Microsoft Excel as the modeling tool. The limitations in the research design were mainly focused on the assumptions chosen and the data collection process itself.

In the results chapter we answered three research questions. Regarding the first research question, which was previously stated, "*How much do the results of different M&A valuation models differ from each other and should some of them not be recommended to be used for M&A deals in the pharmaceutical industry?* ", we have proven that the relative valuation approach tend to be more accurate and closer to the realized values, after acquisition, than the DCF approach. This result was obtained for all the scenarios made. However, the differences between the approaches are smaller for larger companies, with respect to the enterprise as well as market capitalization values. A reasonable conclusion for this is that the DCF model does not incorporate risks and uncertainities in its modeling approach, simultaneously as the investment rate is assumed to be fixed. Risk in this context may be anything or any situation that could affect the result of the valuation, e.g. an incident that could decrease the future cash flow. As previously mentioned in the literature review, there are risk-adjusted valuation approaches, which incorporate probability distributions of situations related to risk that may be objectively known. Both these characteristics are more advantageous for larger companies. Within the relative valuation, the EV/Sales multiple was the most accurate as well as closest to the realized values than the other applied multiples: EV/EBITDA and P/E. Taking the extensive literature study, chapter two, into consideration, we can conclude that this finding is a

unique contribution to the usage of M&A valuation models within the pharmaceutical industry, as the EV/Sales multiple is generally not considered to be one of the most prominent ones to use. Furthermore, the optimal selection of comparable companies tend to highly vary depending on in which sub-sector the target operated within. We may therefore conclude that there was not any consistency when selecting the comparable companies within the pharmaceutical industry. In order to conduct a fair relative valuation, we may thus conclude it is necessary to include different selections of the comparable companies and more than one scenario based on various criteria such as market capitalization, enterprise value as well as industry sub-sector.

Concluding the second research question, which was previously stated: "*Considering pharmaceutical companies, how sensitive are the M&A valuation models to non-consideration of important assumptions?",* the DCF model was much more sensitive to non-consideration of certain assumptions than the relative modelling approach, which is a reasonable finding since the DCF approach is the intrinsic valuation method. When adjusting various assumptions in the DCF model, some of the targets generated almost identical results as the realized values. Based on this, we have proven that the DCF approach is extremely sensitive to the various assumptions made in the modeling. Thus, as previously mentioned, we can conclude that unrealistic and/or erroneous assumptions have a great impact on the valuation results.

Regarding the third research question, which was previously stated: "*Considering public pharmaceutical companies that were involved in realized M&A transactions during the last decade, may M&A valuation models have contributed to reduction of profitability, sales growth and/or market capitalization?",* both of the two modeling approaches tend to generate undervalued results with respect to the realized values, thus it cannot be concluded that these M&A valuation models themselves were a

major contributor to reduction of sales growth, profitability as well as market capitalization values. However, when comparing the two models, the DCF approach tend to generate more overvalued results than the relative valuation. Here, it is important to have in mind that the third research question was a result of the first and the second research questions combined. Thus, although chosen carefully, any unrealistic assumption made in one and/or both of these questions may also impact the results in the third research question. The fact and nature that DCF uses assumptions in the modeling approach may also be the reason why the frequency of overvaluation was higher than the relative valuation in the study. It is using intrinsic parameters, in contrast to the relative valuation which incorporates external data from its competitors, which reflects the reality as well as market in a more realistic way.

In the discussion chapter, all the results from the three research questions were evaluated as well as discussed. A major conclusion from this chapter is that, although the DCF approach generated almost identical results as the realized values for many of the targets, the assumptions generating these outcome may necessarily not be the most reasonable ones. This further strengthens the conclusion that the DCF modeling approach is extremely sensitive to the assumptions made in the modeling and it is important to choose them carefully. This can be mainly explained by the fact that the DCF model considers the intrinsic values such as revenues, costs, CAPEX, WACC, perpetual growth rate, NWC, which impacts the enterprise value with different sensitivities.

Final concluding remarks from this study is that, depending on the target that should be valued, the choices of both modeling approaches as well as the assumptions highly affects the valuation outcomes. Although some scholars argue that valuation is more art than science, it is possible to obtain accurate and fair valuation results from the conventional frameworks, DCF and relative valuation, especially if reasonable

assumptions are carefully made as well as considered. This is why in most cases when valuation is done, especially before M&A transactions, different scenarios are evaluated: worst case, base case and best case, and in each time using min max values or tunnel values. As also mentioned in the suggestions for future research section, a suggestion to extend this research would be to test other models as well as extend the samples to more targets and include larger sensitivity analyses with a larger variety of assumptions. One of the possibilities to reduce the potential risks of valuations on the seller's or acquirer's side is to do the P95 or Monte Carlo simulations with a guarantee from experts doing such projections. In such case, the modellor will do the projections with at least 95% of probability which and will finacially gurantee for this which puts you in more confortable situation. However, most of such advisors do not take huge risks on large M&A deals, mostly due to the probability to face reputational risk in case of wrong valuation, and if they do such assumptions, they will most likely add a caption of responsibility and make many disclaimers to their valuations or assumptions. This is very often the case with advisory companies such as the Big 4.

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LIST OF FIGURES

APPENDIX A

In this appendix, financial data used in the DCF models are displayed. For each company a consolidated income, balance sheet and cash flow statement are presented. For Kite Pharma, forecasted earnings from a SEC filing are also demonstrated in this appendix.

Monsanto

The data below are represented in millions.

(Dollars in millions, except per share amounts)	Year Ended Aug. 31, 2015	2014
Net Sales	$ 15,001	$ 15,855
Cost of goods sold	6,819	7,281
Gross Profit	8,182	8,574
Operating Expenses:		
Selling, general and administrative expenses	2,686	2,774
Research and development expenses	1,580	1,725
Restructuring charges	393	—
Total Operating Expenses	4,659	4,499
Income from Operations	3,523	4,075
Interest expense	433	248
Interest income	(105)	(102)
Other expense, net	34	102
Income from Continuing Operations Before Income Taxes	3,161	3,827
Income tax provision	864	1,078
Income from Continuing Operations Including Portion Attributable to Noncontrolling Interest	2,297	2,749
Discontinued Operations:		
Income from operations of discontinued businesses	45	22
Income tax provision	17	9
Income on Discontinued Operations	28	13
Net Income	2,325	2,762
Less: Net income attributable to noncontrolling interest	11	22
Net Income Attributable to Monsanto Company	$ 2,314	$ 2,740
Amounts Attributable to Monsanto Company:		
Income from continuing operations	$ 2,286	$ 2,727
Income on discontinued operations	28	13
Net Income Attributable to Monsanto Company	$ 2,314	$ 2,740
Basic Earnings per Share Attributable to Monsanto Company:		
Income from continuing operations	$ 4.79	$ 5.25
Income on discontinued operations	0.06	0.03
Net Income Attributable to Monsanto Company	$ 4.85	$ 5.28
Diluted Earnings per Share Attributable to Monsanto Company:		
Income from continuing operations	$ 4.75	$ 5.19
Income on discontinued operations	0.06	0.03
Net Income Attributable to Monsanto Company	$ 4.81	$ 5.22
Weighted Average Shares Outstanding:		
Basic	476.9	519.3
Diluted	481.4	524.9

(Dollars in millions)	Year Ended Aug. 31, 2015	2014
Comprehensive Income Attributable to Monsanto Company		
Net Income Attributable to Monsanto Company	$ 2,314	$ 2,740
Other Comprehensive Income (Loss), Net of Tax:		
Foreign currency translation, net of tax of $(18), $(33) and $(24), respectively	(1,596)	100
Postretirement benefit plan activity, net of tax of $(39), $76 and $80, respectively	(65)	119
Unrealized net gains on investment holdings, net of tax of $0, $0 and $4, respectively	—	—
Realized net gains on investment holdings, net of tax of $(1), $(2) and $(3), respectively	(3)	(3
Unrealized net derivative losses, net of tax of $(46), $(42) and $(45), respectively	(54)	(69
Realized net derivative losses (gains), net of tax of $23, $9 and $(39), respectively	31	17
Total Other Comprehensive (Loss) Income, Net of Tax	(1,687)	164
Comprehensive Income Attributable to Monsanto Company	627	2,904
Comprehensive Income Attributable to Noncontrolling Interests		
Net Income Attributable to Noncontrolling Interests	11	22
Other Comprehensive (Loss) Income:		
Foreign currency translation	(4)	10
Total Other Comprehensive (Loss) Income	(4)	10
Comprehensive Income Attributable to Noncontrolling Interests	7	32
Total Comprehensive Income	$ 634	$ 2,936

(Dollars in millions, except share amounts)	As of Aug. 31, 2015	2014
Assets		
Current Assets:		
Cash and cash equivalents (variable interest entities restricted - 2015: $112 and 2014: $118)	$ 3,701	$ 2,367
Short-term investments	47	40
Trade receivables, net (variable interest entities restricted - 2015: $0 and 2014: $39)	1,636	2,014
Miscellaneous receivables	803	817
Deferred tax assets	743	635
Inventory, net	3,496	3,597
Other current assets	199	205
Total Current Assets	10,625	9,675
Total property, plant and equipment	10,428	10,357
Less: Accumulated depreciation	5,455	5,275
Property, Plant and Equipment, Net (variable interest entity restricted - 2015: $2 and 2014: $2)	4,973	5,082
Goodwill	4,061	4,319
Other Intangible Assets, Net	1,332	1,554
Noncurrent Deferred Tax Assets	277	450
Long-Term Receivables, Net	42	92
Other Assets	610	746
Total Assets	$ 21,920	$ 21,918

Liabilities and Shareowners' Equity		
Current Liabilities:		
Short-term debt, including current portion of long-term debt (variable interest entity restricted - 2015: $0 and 2014: $136)	**$ 615**	$ 233
Accounts payable (variable interest entity restricted - 2015: $6 and 2014: $25)	**836**	1,111
Income taxes payable	**234**	99
Accrued compensation and benefits (variable interest entity restricted - 2015: $2 and 2014: $1)	**304**	500
Accrued marketing programs	**1,492**	1,394
Deferred revenues	**370**	438
Grower production accruals	**39**	54
Dividends payable	**254**	239
Customer payable	**72**	82
Restructuring reserves	**170**	—
Miscellaneous short-term accruals (variable interest entity restricted - 2015: $7 and 2014: $0)	**791**	962
Total Current Liabilities	**5,177**	5,112
Long-Term Debt (variable interest entity restricted - 2015: $96 and 2014: $0)	**8,429**	7,465
Postretirement Liabilities	**336**	345
Long-Term Deferred Revenue	**47**	47
Noncurrent Deferred Tax Liabilities	**340**	509
Long-Term Portion of Environmental and Litigation Liabilities	**194**	184
Long-Term Restructuring Reserve	**47**	—
Other Liabilities	**345**	342
Shareowners' Equity:		
Common stock (authorized: 1,500,000,000 shares, par value $0.01)		
Issued 609,350,452 and 606,457,369 shares, respectively		
Outstanding 467,903,711 and 485,261,017 shares, respectively	**6**	6
Treasury stock 141,446,741 and 121,196,352 shares, respectively, at cost	**(12,053)**	(10,032)
Additional contributed capital	**11,464**	10,003
Retained earnings	**10,374**	9,012
Accumulated other comprehensive loss	**(2,801)**	(1,114)
Total Monsanto Company Shareowners' Equity	**6,990**	7,875
Noncontrolling Interest	**15**	39
Total Shareowners' Equity	**7,005**	7,914
Total Liabilities and Shareowners' Equity	**$ 21,920**	$ 21,918

(Dollars in millions)	Year Ended Aug. 31, 2015	2014
Operating Activities:		
Net Income	**$ 2,325**	$ 2,762
Adjustments to reconcile cash provided by operating activities:		
Items that did not require (provide) cash:		
Depreciation and amortization	**716**	691
Bad-debt expense	**45**	41
Stock-based compensation expense	**111**	120
Excess tax benefits from stock-based compensation	**(44)**	(72)
Deferred income taxes	**(271)**	12
Restructuring impairments	**276**	—
Equity affiliate (income) loss, net	**7**	4
Net gain on sales of a business or other assets	**(2)**	(11)
Other items, net	**118**	139
Changes in assets and liabilities that provided (required) cash, net of acquisitions:		
Trade receivables	**68**	(172)
Inventory, net	**(425)**	(650)
Deferred revenues	**32**	(163)
Accounts payable and other accrued liabilities	**235**	709
Restructuring reserves	**217**	—
Pension contributions	**(27)**	(64)
Other items, net	**(273)**	(292)
Net Cash Provided by Operating Activities	**3,108**	3,054
Cash Flows Provided (Required) by Investing Activities:		
Purchases of short-term investments	**(63)**	(145)
Maturities of short-term investments	**56**	359
Capital expenditures	**(967)**	(1,005)
Purchases of long-term debt and equity securities	**(30)**	(12)
Acquisition of businesses, net of cash acquired	**(8)**	(922)
Technology and other investments	**(48)**	(403)
Other investments and property disposal proceeds	**41**	33
Net Cash Required by Investing Activities	**(1,019)**	(2,095)
Cash Flows Provided (Required) by Financing Activities:		
Net change in financing with less than 90-day maturities	**45**	38
Short-term debt proceeds	**57**	50
Short-term debt reductions	**(36)**	(24)
Long-term debt proceeds	**1,279**	5,479
Long-term debt reductions	**(107)**	(7)
Payments on other financing	**—**	(39)
Debt issuance costs	**(12)**	(53)
Treasury stock purchases	**(835)**	(7,082)
Stock option exercises	**137**	248
Excess tax benefits from stock-based compensation	**44**	72
Tax withholding on restricted stock and restricted stock units	**(36)**	(9)
Dividend payments	**(938)**	(904)
Proceeds from noncontrolling interest	**—**	—
Payments to noncontrolling interests	**(28)**	(28)
Net Cash Required by Financing Activities	**(430)**	(2,259)
Effect of Exchange Rate Changes on Cash and Cash Equivalents	**(325)**	(1)
Net Increase (Decrease) in Cash and Cash Equivalents	**1,334**	(1,301)
Cash and Cash Equivalents at Beginning of Period	**2,367**	3,668
Cash and Cash Equivalents at End of Period	**$ 3,701**	$ 2,367

Source: Monsanto Company (2016).

Actelion

The data below are represented in thousands. If there are two sections of data, the rightmost column, which represent the whole Actelion organization including subsidiaries, was taken into consideration in the modelling approach.

(in CHF thousands, except per share amounts)	Three months ended December 31, 2016	2015	Twelve months ended December 31, 2016	2015
Net revenue				
Product sales	626'881	519'334	2'412'198	2'041'515
Contract revenue	60	421	5'740	3'547
Total net revenue	**626'941**	**519'755**	**2'417'938**	**2'045'062**
Operating (expenses) [1]				
Cost of sales [2]	(91'446)	(45'129)	(245'537)	(175'794)
Research and development	(168'586)	(132'664)	(568'534)	(463'842)
Selling, general and administration	(224'488)	(206'297)	(760'158)	(696'650)
Amortization of acquired intangible assets	(13'833)	(13'213)	(54'997)	(53'131)
Total operating (expenses)	**(498'353)**	**(397'303)**	**(1'629'226)**	**(1'389'417)**
Operating income	**128'588**	**122'452**	**788'712**	**655'645**
Interest income (expense), net	578	(1'903)	1'183	(8'186)
Other financial income (expense), net	(694)	786	2'539	(11'977)
Total financial income (expenses)	**(116)**	**(1'117)**	**3'722**	**(20'163)**
Income before income tax benefit (expense)	**128'472**	**121'335**	**792'434**	**635'482**
Income tax benefit (expense)	(13'748)	(22'394)	(97'599)	(87'547)
Net income	**114'724**	**98'941**	**694'835**	**547'935**
Less: Net loss attributable to the noncontrolling interests	303	752	1'551	3'924
Net income attributable to Actelion's shareholders	**115'027**	**99'693**	**696'386**	**551'859**
Basic net income per share attributable to Actelion's shareholders	**1.11**	**0.94**	**6.66**	**5.09**
Weighted-average number of common shares (in thousands)	103'349	105'697	104'626	108'320
Diluted net income per share attributable to Actelion's shareholders	**1.08**	**0.91**	**6.46**	**4.91**
Weighted-average number of common shares (in thousands)	106'236	109'718	107'811	112'484
[1] **Includes stock-based compensation as follows:**				
Research and development	(6'990)	(5'956)	(27'199)	(23'561)
Selling, general and administration	(10'383)	(9'044)	(38'025)	(33'235)
Total stock-based compensation	**(17'373)**	**(15'000)**	**(65'224)**	**(56'796)**

[2] Excludes amortization of intangible assets as presented separately.

Net income	**114'724**	**98'941**	**694'835**	**547'935**
Other comprehensive income (loss), net of tax:				
Foreign currency translation adjustments	(10'880)	(3'462)	(4'089)	(28'485)
Change of unrecognized components of net periodic benefit costs	5'231	1'810	5'231	(3'672)
Amortization of components of net periodic benefit costs	240	456	1'433	1'875
Other comprehensive income (loss), net of tax	**(5'409)**	**(1'196)**	**2'575**	**(30'282)**
Comprehensive income	**109'315**	**97'745**	**697'410**	**517'653**
Less: Comprehensive loss attributable to noncontrolling interests	303	752	1'551	3'924
Comprehensive income attributable to Actelion's shareholders	**109'618**	**98'497**	**698'961**	**521'577**

(in CHF thousands, except number of shares)	December 31, 2016	December 31, 2015
Assets		
Current assets		
Cash and cash equivalents	495'380	404'892
Trade and other receivables, net	445'868	427'223
Inventories	135'820	62'107
Other current assets	115'763	68'828
Total current assets	**1'192'831**	**963'050**
Noncurrent assets		
Property, plant and equipment, net	350'215	348'277
Intangible assets, net	382'705	413'542
Goodwill	135'048	134'494
Deferred tax assets	20'528	39'159
Other noncurrent assets	25'150	16'415
Total noncurrent assets	**913'646**	**951'887**
Total assets	**2'106'477**	**1'914'937**
Liabilities		
Current liabilities		
Trade and other payables	83'009	83'878
Accrued expenses	445'730	302'729
Other current liabilities	40'211	34'375
Total current liabilities	**568'950**	**420'982**
Noncurrent liabilities		
Pension liability	66'427	67'204
Contingent considerations	115'630	83'759
Other noncurrent liabilities	34'312	27'979
Total noncurrent liabilities	**216'369**	**178'942**
Total liabilities	**785'319**	**599'924**
Equity		
Actelion's shareholders' equity		
Common shares (par value CHF 0.50 per share; authorized 147,753,077 and 154,120,627; issued 107,761,427 and 114,128,427 shares in 2016 and 2015, respectively)	53'881	57'064
Accumulated profit	2'187'889	2'636'931
Treasury shares, at cost	(680'053)	(1'137'399)
Accumulated other comprehensive income (loss)	(236'220)	(238'795)
Total Actelion's shareholders' equity	**1'325'497**	**1'317'801**
Noncontrolling interests		
Equity attributable to noncontrolling interests	(4'339)	(2'788)
Total equity	**1'321'158**	**1'315'013**
Total liabilities and equity	**2'106'477**	**1'914'937**

(in CHF thousands)	Three months ended December 31, 2016	2015	Twelve months ended December 31, 2016	2015
Cash flow from operating activities				
Net income	114'724	98'941	694'835	547'935
Adjustments to reconcile net income to net cash provided from operating activities:				
Depreciation and amortization	22'714	22'436	87'879	89'500
Stock-based compensation, incl. treasury shares to members of Board of Directors	17'606	15'247	66'166	57'753
Excess tax benefits from share-based payment arrangements	(2'571)	(2'180)	(15'097)	(13'415)
Deferred taxes	(7'315)	1'334	30'353	52'068
Deferred revenue	(386)	143	(354)	(527)
(Gains) Losses on derivative instruments	(3'685)	(190)	(10'300)	(24'759)
Interest expense on bonds	-	(8'452)	-	545
Accretion expense (benefit) on contingent considerations	27'419	3'611	37'025	387
Changes in operating assets and liabilities:				
Trade and other receivables	46'758	(13'155)	(12'433)	(31'371)
Inventories	(15'463)	(3'447)	(73'768)	(1'609)
Trade and other payables	(11'288)	(1'948)	12'575	(5'190)
Accrued expenses	69'896	39'216	140'163	328
Changes in other operating cash flow items	(33'493)	(26'772)	(37'514)	(13'967)
Net cash flow provided by (used in) operating activities	**224'916**	**124'784**	**919'530**	**657'678**
Cash flow from investing activities				
Purchase of property, plant and equipment	(14'527)	(7'023)	(32'804)	(18'703)
Purchase of intangible assets	(1'296)	(22'384)	(24'638)	(25'277)
Acquisition of a business, incl. contingent consideration payments	(993)	(5'960)	(4'239)	(8'015)
Net cash flow provided by (used in) investing activities	**(16'816)**	**(35'367)**	**(61'681)**	**(51'995)**
Cash flow from financing activities				
Debt repayment	-	(235'000)	-	(235'000)
Dividend payment	-	39	(158'513)	(142'390)
Payments on capital leases	-	-	-	(3)
Proceeds from exercise of stock options, net of expense	14'217	11'999	39'263	78'936
Purchase of treasury shares	(138'229)	(165'734)	(662'967)	(1'111'918)
Excess tax benefits from share-based payment arrangements	2'571	2'180	15'097	13'415
Contributions from noncontrolling interests' owners	-	-	-	1'136
Net cash flow provided by (used in) financing activities	**(121'441)**	**(386'516)**	**(767'120)**	**(1'395'824)**
Net effect of exchange rates on cash and cash equivalents	(1'989)	3'502	(241)	(9'925)
Net change in cash and cash equivalents	**84'670**	**(293'597)**	**90'488**	**(800'066)**
Cash and cash equivalents at beginning of period	410'710	698'489	404'892	1'204'958
Cash and cash equivalents at end of period	**495'380**	**404'892**	**495'380**	**404'892**

Source: Actelion Ltd. (2017).

Kite Pharma

The data below are represented in thousands.

	2016	2015
Revenues	$ 22,170	$ 17,258
Operating expenses:		
Research and development	197,934	76,369
General and administrative	97,423	44,839
Total operating expenses	295,357	121,208
Loss from operations	(273,187)	(103,950)
Other income (expense):		
Interest income	3,624	1,809
Interest expense	(13)	(26)
Other income (expense), net	(388)	514
Total other income (expense), net	3,223	2,297
Loss before income taxes	(269,964)	(101,653)
Benefit from income taxes	2,894	—
Net loss	(267,070)	(101,653)
Series A preferred stock dividend	—	—
Net loss attributable to common stockholders	$ (267,070)	$ (101,653)
Net loss per share, basic and diluted	$ (5.46)	$ (2.33)
Weighted-average shares outstanding, basic and diluted	48,940,290	43,636,652
Comprehensive loss:		
Net loss	$ (267,070)	$ (101,653)
Foreign currency translation adjustments	(406)	599
Unrealized loss on available-for-sale securities, net	(291)	(522)
Comprehensive loss	$ (267,767)	$ (101,576)

	DECEMBER 31, 2016	DECEMBER 31, 2015
ASSETS		
Current assets:		
Cash and cash equivalents	$ 114,561	$ 392,843
Marketable securities	299,861	221,879
Prepaid expenses and other current assets	12,974	16,371
Total current assets	427,396	631,093
Restricted cash and investments	10,669	1,540
Property and equipment, net	44,409	30,116
Intangible assets, net	6,946	11,380
Goodwill	24,452	25,360
Other assets	10,432	8,474
Total assets	$ 524,304	$ 707,963
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 10,660	$ 8,049
Accrued expenses and other current liabilities	29,482	11,787
Deferred revenue	15,000	16,333
Total current liabilities	55,142	36,169
Deferred revenue, less current portion	19,779	32,176
Contingent consideration	14,218	16,080
Other non-current liabilities	7,195	7,778
Total liabilities	96,334	92,203
COMMITMENTS AND CONTINGENCIES (NOTE 11)		
STOCKHOLDERS' EQUITY		
Preferred Stock, $0.001 par value, 10,000,000 shares authorized, 0 shares issued and outstanding at December 31, 2016 and December 31, 2015	—	—
Common stock, $0.001 par value, 200,000,000 shares authorized; 50,083,355 and 48,671,757 shares issued and outstanding, excluding 298,758 and 1,091,306 shares subject to repurchase at December 31, 2016 and December 31, 2015, respectively	50	49
Additional paid-in capital	855,564	775,588
Accumulated other comprehensive loss	(917)	(220)
Accumulated deficit	(426,727)	(159,657)
Total stockholders' equity	427,970	615,760
Total liabilities and stockholders' equity	$ 524,304	$ 707,963

	2016	2015
Cash flows from operating activities		
Net loss	$ (267,070)	$ (101,653)
Adjustment to reconcile net loss to net cash from operating activities		
Depreciation and amortization	10,598	4,606
Stock-based compensation	73,579	40,420
Noncash interest expense	—	—
Deferred tax	(2,895)	—
Restricted cash	(2,122)	(1,540)
Fair value adjustment of contingent consideration	853	632
Amortization on marketable securities	1,617	630
Loss related to equity method investment	478	—
Other	391	(888)
Changes in operating assets and liabilities		
Deferred revenue	(13,731)	48,510
Deferred rent	3,625	1,649
Prepaid expenses and other current assets	3,284	(14,762)
Other assets	3,588	(8,344)
Accounts payable	2,255	4,534
Accrued expenses and other current liabilities	16,044	7,088
Due to related parties	602	86
Net cash used in operating activities	(168,904)	(19,032)
Cash flows from investing activities		
Purchase of property and equipment	(20,146)	(26,573)
Purchases of marketable securities	(351,739)	(222,135)
Sales and maturities of marketable securities	264,969	156,858
Cash paid for equity investment in Cell Design Labs	(6,025)	—
Net cash paid related to acquisition	—	(14,690)
Net cash used in investing activities	(112,941)	(106,540)
Cash flows from financing activities		
Principal payments on capital lease obligations	(126)	(16)
Payment of contingent consideration	(2,259)	—
Initial public offering costs	—	—
Proceeds from issuance of common stock	—	300,721
Proceeds from exercise of stock options	3,711	6,958
Proceeds from employee stock purchase plan	2,369	1,405
Proceeds from issuance of convertible notes	—	—
Net cash provided by financing activities	3,695	309,068
Effect of exchange rate changes on cash	(132)	49
Net change in cash and cash equivalents	(278,282)	183,545
Cash and cash equivalents at beginning of period	392,843	209,298
Cash and cash equivalents at end of period	$ 114,561	$ 392,843
Supplemental schedule of cash flows information:		
Cash paid for interest	$ 13	$ 2
Proceeds from employee stock plan received in advance of issuance	$ 1,212	$ 590
Supplemental schedule of non-cash investing and financing activities:		
Conversion of convertible notes and accrued interest into equity	$ —	$ —
Discount from conversion of securities convertible into equity	$ —	$ —
Conversion of convertible securities into equity	$ —	$ —
Tenant improvement allowance receivable	$ —	$ 2,614
Issuance of stock to purchase T-Cell Factory, B.V.	$ —	$ 4,209

Source: Kite Pharma Inc. (2017).

Forecasted Kite pharma financial data between 2017-2021

($ in millions)	FY 2017E	FY 2018E	FY 2019E	FY 2020E	FY 2021E
Total revenue to the Company	**38**	**329**	**688**	**1,485**	**2,067**
Memo: Total product and royalty revenue	**7**	**285**	**643**	**1,468**	**2,051**
Gross profit	**35**	**230**	**481**	**1,060**	**1,544**
Total operating expenses	**(507)**	**(494)**	**(695)**	**(658)**	**(647)**
Total EBIT (1)	**(472)**	**(264)**	**(213)**	**402**	**897**

Source: Kite Pharma Inc. (2017).

Bioverativ

The data below are represented in millions.

Income - USD ($) shares in Millions, $ in Millions	Dec. 31, 2017	Dec. 31, 2016
Revenues:		
Product, net	$ 1,089.1	$ 846.6
Collaboration	79.4	40.8
Total revenues	1,168.5	887.4
Cost and expenses:		
Cost of sales	279.6	237.9
Research and development	224.6	210.1
Selling, general and administrative	217.1	147.0
Total cost and expenses	721.3	595.0
Income from operations	447.2	292.4
Other income (expense), net	4.7	(0.5)
Income before income tax expense (benefit)	451.9	291.9
Income tax expense (benefit)	96.3	(147.7)
Net income	$ 355.6	$ 439.6
Net income per share:		
Basic earnings (in dollars per share)	$ 3.29	$ 4.07
Diluted earnings (in dollars per share)	$ 3.28	$ 4.07
Weighted average shares used in calculating:		
Basic earnings per share (in shares)	108.1	108.0
Diluted earnings per share (in shares)	108.5	108.0
Other comprehensive income (loss):		
Net income	$ 355.6	$ 439.6
Currency translation adjustment	(1.8)	1.5
Total other comprehensive income (loss)	(1.8)	1.5
Comprehensive income	$ 353.8	$ 441.1

USD ($) $ in Millions	Dec. 31, 2017	Dec. 31, 2016
Current assets:		
Cash and cash equivalents	$ 436.5	$ 149.4
Accounts receivable, net	189.4	302.0
Inventory	40.6	
Restricted cash	40.0	
Other current assets	71.8	24.2
Total current assets	778.3	475.6
Property, plant and equipment, net	24.0	28.4
Intangible assets, net	635.9	51.7
Goodwill	170.7	
Deferred tax assets	1.0	154.2
Other long-term assets	8.4	22.0
Total assets	1,618.3	731.9
Current liabilities:		
Accounts payable	26.1	12.7
Accrued expenses and other current liabilities	233.5	89.3
Due to True North Therapeutics equityholders	40.0	
Due to Biogen	90.5	
Total current liabilities	390.1	102.0
Other long-term liabilities	92.5	63.7
Deferred tax liabilities, net	89.0	
Contingent consideration	149.1	
Total liabilities	720.7	165.7
Commitments and contingencies		
Equity:		
Preferred stock, $0.001 par value (shares authorized of 50,000,000 at December 31, 2017 and 0 at December 31, 2016; no shares issued and outstanding at December 31, 2017 or at December 31, 2016)		
Common stock, $0.001 par value (shares authorized of 800,000,000 at December 31, 2017 and 1,000 at December 31, 2016; shares issued and outstanding of 108,203,439 at December 31, 2017 and 1,000 at December 31, 2016)	0.1	
Additional paid-in capital	565.2	
Retained earnings	332.3	
Net parent company investment		564.4
Accumulated other comprehensive loss		1.8
Total equity	897.6	566.2
Total liabilities and equity	$ 1,618.3	$ 731.9

$ in Millions	Dec. 31, 2017	Dec. 31, 2016
Cash flows from operating activities:		
Net income	$ 355.6	$ 439.6
Adjustments to reconcile net income to net cash flows from operating activities:		
Depreciation and amortization	14.5	53.4
Stock-based compensation	32.0	15.3
Deferred taxes	(59.5)	(154.2)
Remeasurement of contingent consideration	9.9	
Changes in operating assets and liabilities, net:		
Accounts receivable	(39.9)	(55.0)
Inventory	82.4	(49.9)
Due from Biogen, net	90.5	
Other assets	(45.6)	(22.6)
Accounts payable	11.1	2.0
Accrued expenses and other current liabilities	110.9	40.0
Other liabilities	28.8	33.0
Net cash flows provided by operating activities	590.7	301.6
Cash flows from investing activities:		
Purchases of property, plant and equipment	(13.1)	(8.7)
Acquisition of True North Therapeutics, net of cash	(395.7)	
Acquisition of intangible assets		(26.5)
Net cash flows used in investing activities	(408.8)	(35.2)
Cash flows from financing activities:		
Transfers to Biogen	(45.3)	(266.4)
Cash from Biogen upon separation	325.0	
Working capital adjustments paid to Biogen, net	(23.5)	
Shares issued under employee benefit plans	(2.6)	
Net cash flows provided by (used in) financing activities	253.6	$ (266.4)
Effect of foreign exchange rate changes on cash and equivalents	1.0	
Net increase in cash and cash equivalents	436.5	
Cash and cash equivalents, end of the year	436.5	
Supplemental cash flow disclosure:		
Cash paid for income taxes	$ 144.5	

Source: Bioverativ Inc. (2018).

Cubist Pharmaceuticals

The data below are represented in thousands.

	2013	2012
Revenues:		
U.S. product revenues, net	$ 971,196	$ 849,371
International product revenues	61,237	50,454
Service revenues	12,287	23,249
Other revenues	9,722	3,285
Total revenues, net	1,054,442	926,359
Costs and expenses:		
Cost of product revenues	260,310	230,057
Research and development	477,740	277,729
Impairment charges	55,300	38,700
Contingent consideration	(47,577)	(29,021)
Selling, general and administrative	257,940	171,788
Restructuring charges	24,319	—
Total costs and expenses	1,028,032	689,253
Operating income	26,410	237,106
Other income (expense), net:		
Interest income	2,438	3,076
Interest expense	(37,602)	(32,991)
Other income (expense)	(34,890)	(7,595)
Total other income (expense), net	(70,054)	(37,510)
(Loss) income before income taxes	(43,644)	199,596
(Benefit) provision for income taxes	(25,073)	45,521
Net (loss) income	$ (18,571)	$ 154,075
Basic net (loss) income per common share	$ (0.27)	$ 2.42
Diluted net (loss) income per common share	$ (0.27)	$ 2.10
Shares used in calculating:		
Basic net (loss) income per common share	68,160,798	63,766,209
Diluted net (loss) income per common share	68,160,798	81,444,658

	2013	2012
Net (loss) income	$ (18,571)	$ 154,075
Other comprehensive income (loss):		
Unrealized gains (losses) on available-for-sale securities	197	126
Foreign currency translation adjustment	77	—
Total other comprehensive income (loss)	274	126
Comprehensive (loss) income	$ (18,297)	$ 154,201

	December 31,	
	2013	2012
ASSETS		
Current assets:		
Cash and cash equivalents	$ 91,058	$ 104,041
Short-term investments	487,500	872,188
Accounts receivable, net	123,155	93,467
Inventory	57,663	41,947
Deferred tax assets, net	52,108	14,190
Prepaid expenses and other current assets	58,285	31,217
Total current assets	869,769	1,157,050
Property and equipment, net	177,544	166,465
In-process research and development	896,400	272,700
Goodwill	383,018	114,130
Other intangible assets, net	721,066	152,830
Long-term investments	—	3,167
Other assets	98,024	66,043
Total assets	$ 3,145,821	$ 1,932,385
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 31,877	$ 45,603
Accrued liabilities	245,078	163,633
Short-term deferred revenue	6,411	6,784
Short-term contingent consideration	20,428	38,998
Other current liabilities	7,034	3,500
Total current liabilities	310,828	258,518
Long-term deferred revenue	31,010	34,091
Long-term deferred tax liabilities, net	357,802	103,081
Long-term contingent consideration	202,894	150,215
Long-term debt, net	817,830	367,811
Other long-term liabilities	31,726	27,921
Total liabilities	1,752,090	941,637
Commitments and contingencies (Notes C, D, K, M and O)		
Stockholders' equity:		
Preferred stock, non-cumulative; convertible, $.001 par value; authorized 5,000,000 shares; no shares issued and outstanding	—	—
Common stock, $.001 par value; authorized 150,000,000 shares; 74,428,087 and 64,713,695 shares issued and outstanding as of December 31, 2013 and 2012, respectively	74	65
Additional paid-in capital	1,362,240	940,969
Accumulated other comprehensive income (loss)	215	(59)
Retained earnings	31,202	49,773
Total stockholders' equity	1,393,731	990,748
Total liabilities and stockholders' equity	$ 3,145,821	$ 1,932,385

	2013	2012
Cash flows from operating activities:		
Net (loss) income	$ (18,571)	$ 154,075
Adjustments to reconcile net (loss) income to net cash provided by operating activities:		
Loss on extinguishment of convertible debt, including write-off of debt issuance costs	12,592	4,280
Depreciation and amortization	43,194	33,279
Amortization and accretion of investments	10,748	9,103
Amortization of debt discount and debt issuance costs, excluding write-off of debt issuance costs	23,381	18,924
Premium paid for convertible subordinated debt repurchase	—	(39,672)
Deferred income taxes	(38,984)	(32,942)
Stock-based compensation	32,357	25,702
Contingent consideration	(47,577)	(29,021)
Payment of contingent consideration	(24,254)	(17,408)
Impairment charges	55,300	38,700
Other non-cash	(2,554)	15,304
Changes in assets and liabilities, net of effects from acquisitions:		
Accounts receivable	(19,309)	(5,667)
Inventory	(11,758)	(11,531)
Prepaid expenses and other current assets	(14,964)	5,483
Other assets	207	3,558
Accounts payable and accrued liabilities	17,702	36,764
Deferred revenue and other liabilities	(1,101)	6,719
Total adjustments	34,980	61,575
Net cash provided by operating activities	16,409	215,650
Cash flows from investing activities:		
Acquisition of business, net of acquired cash	(1,211,000)	—
Purchases of property and equipment	(15,509)	(18,129)
Purchases of investments	(980,264)	(1,529,281)
Proceeds from maturities of investments	1,439,148	1,314,993
Payment for purchase option	(20,000)	—
Net cash used in investing activities	(787,625)	(232,417)
Cash flows from financing activities:		
Payment of contingent consideration	(15,746)	(12,592)
Issuance of common stock	39,066	36,127
Excess tax benefit on stock-based awards	17,711	10,787
Extinguishment of convertible debt	—	(109,218)
Proceeds from issuance of convertible debt	800,000	—
Payment of debt issuance costs	(25,156)	(1,914)
Proceeds from issuance of warrants	121,675	—
Purchase of convertible bond hedge	(179,390)	—
Net cash provided by (used in) financing activities	758,160	(76,810)
Net decrease in cash and cash equivalents	(13,056)	(93,577)
Effect of changes in foreign exchange rates on cash balances	73	—
Cash and cash equivalents at beginning of year	104,041	197,618
Cash and cash equivalents at end of year	$ 91,058	$ 104,041

	2013	2012
Cash paid during the year for:		
Interest, net of amounts capitalized	$ 8,485	$ 12,441
Income taxes	$ 20,350	$ 49,685
Supplemental disclosures of non-cash flow information:		
Non-cash investing and financing activities:		
Purchases of property and equipment	$ (5,242)	$ (4,354)

Source: Cubist Pharmaceuticals. (2014).

Questcor Pharmaceuticals

The data below are represented in thousands.

	Years Ended December 31,	
	2013	2012
Revenues		
Pharmaceutical net sales	$ 761,347	$ 509,292
Contract manufacturing net sales	37,582	—
Total net sales	798,929	509,292
Cost of sales (exclusive of amortization of purchased technology and IPR&D asset)	74,365	28,555
Gross profit	724,564	480,737
Operating expenses:		
Selling and marketing	152,856	114,139
General and administrative	56,408	33,596
Research and development	59,730	34,269
Depreciation and amortization	4,055	1,219
Change in fair value of contingent consideration	10,958	—
Impairment of goodwill and intangibles	719	987
Total operating expenses	284,726	184,210
Income from operations	439,838	296,527
Interest and other (expense) income, net	250	703
Foreign currency transaction loss	(548)	—
Income before income taxes	439,540	297,230
Income tax expense	146,931	99,555
Net income	$ 292,609	$ 197,675
Change in unrealized gains or losses on available-for-sale securities, net of related tax effects.	(35)	76
Change foreign currency translation adjustments.	(3,258)	—
Comprehensive Income	$ 289,316	$ 197,751
Net income per share applicable to common shareholders:		
Basic	$ 4.99	$ 3.28
Diluted	$ 4.76	$ 3.14
Shares used in computing net income per share applicable to common shareholders:		
Basic	58,616	60,243
Diluted	61,447	63,045
Dividends declared per common share	$ 1.10	$ 0.40

	December 31,	
	2013	2012
ASSETS		
Current assets:		
Cash and cash equivalents	$ 175,840	$ 80,608
Short-term investments	69,166	74,705
Total cash, cash equivalents and short-term investments	245,006	155,313
Accounts receivable, net of allowances for doubtful accounts of $475 and $0 at December 31, 2013 and December 31, 2012, respectively	87,069	61,417
Inventories, net of allowances of $1,329 and $52 at December 31, 2013 and December 31, 2012, respectively	16,368	9,909
Restricted cash - current portion	25,000	—
Prepaid expenses and other current assets	7,124	4,900
Deferred tax assets	16,209	5,737
Total current assets	396,776	237,276
Property and equipment, net	31,733	2,073
Purchased technology, net	—	1,493
Goodwill	20,464	—
In process R&D asset	191,451	—
Intangibles and other non current assets	30,131	—
Restricted cash	50,000	—
Deposits and other assets	389	70
Deferred tax assets	15,410	11,519
Total assets	$ 736,354	$ 252,431
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 14,302	$ 13,069
Accrued compensation	16,489	21,300
Sales-related reserves	35,370	37,376
Accrued royalties	35,163	9,802
Dividend payable	18,093	—
Current portion of contingent consideration	4,238	—
Current portion of in process R&D liability	25,000	—
Income taxes payable	3,693	7,360
Current portion of long-term debt	1,665	—
Other accrued liabilities	7,159	1,492
Total current liabilities	161,172	90,399
Long-term debt, less current portion	13,998	—
Contingent consideration	33,224	—
In process R&D liability	115,066	—
Non current deferred tax liability	10,569	—
Other non current liabilities	2,961	203
Total liabilities	336,990	90,602
Commitments and contingencies (see Note 7)		
Shareholders' equity:		
Preferred stock, no par value, 5,334,285 shares authorized; none outstanding	—	—
Common stock, no par value, 105,000,000 shares authorized, 60,137,758 and 58,544,206 shares issued and outstanding at December 31, 2013 and December 31, 2012, respectively	30,386	15,938
Retained earnings	372,231	145,851
Accumulated other comprehensive income (loss)	(3,253)	40
Total shareholders' equity	399,364	161,829
Total liabilities and shareholders' equity	$ 736,354	$ 252,431

	Years Ended December 31,	
	2013	2012
		(In thousands)
Cash Flows From Operating Activities		
Net income	$ 292,609	$ 197,675
Adjustments to reconcile net income to net cash provided by operating activities:		
Share-based compensation expense	28,753	15,792
Deferred income taxes	(14,849)	241
Amortization of investments	412	1,330
Depreciation and amortization	14,172	1,219
Impairment of goodwill and intangibles	719	987
Loss on disposal of property and equipment	95	72
Changes in fair value of contingent consideration	6,429	—
Imputed interest for contingent consideration and in-process R&D	4,529	—
Other compensation expense	1,892	—
Changes in operating assets and liabilities:		
Accounts receivable	(19,155)	(33,616)
Inventories	4,577	(4,683)
Prepaid income taxes	—	6,940
Prepaid expenses and other current assets	(1,335)	(1,509)
Accounts payable	(589)	7,566
Accrued compensation	(4,811)	9,710
Accrued royalties	25,361	5,463
Sales-related reserves	(2,006)	3,257
Income taxes payable	(3,667)	7,360
Other accrued liabilities	3,307	1,317
Other non-current liabilities	1,335	(84)
Net cash provided by operating activities	337,778	219,037
Cash Flows From Investing Activities		
Purchase of short-term investments	(120,645)	(145,384)
Proceeds from the sale and maturities of short-term investments	125,737	191,105
Purchase of property, equipment and leasehold improvements	(3,536)	(1,065)
Restricted cash associated with the acquisition of Synacthen	(75,000)	—
Acquisition of BioVectra, net of cash acquired	(46,692)	—
Acquisition of Synacthen	(60,000)	—
Proceeds from sale of Doral	700	—
Changes in deposits and other assets	2,119	(14)
Net cash (used in) / provided by investing activities	(177,317)	44,642
Cash Flows From Financing Activities		
Repayment of funded long-term debt	(1,219)	—
Repayment of other long-term debt	(491)	—
Income tax benefit realized from share-based compensation plans	22,809	7,488
Issuance of common stock, net	15,940	6,335
Dividends paid	(48,136)	(23,533)
Repurchase of common stock	(53,054)	(261,830)
Net cash (used in) / provided by financing activities	(64,151)	(271,540)
Impact of exchange rate on cash flows	(1,078)	—

Increase (decrease) in cash and cash equivalents		95,232		(7,861)
Cash and cash equivalents at beginning of year		80,608		88,469
Cash and cash equivalents at end of year	$	175,840	$	80,608
Supplemental disclosures of Cash Flow Information:				
Cash paid for interest	$	704	$	23
Cash paid for income taxes	$	141,515	$	77,556
Supplemental disclosures of Investing and Financing Activities:				
Dividend payable	$	18,093	$	11,691
Supplemental disclosure of non-cash investing and financing activities:				
Capital lease obligation	$	—	$	31
In conjunction with the acquisition of BioVectra at January 18, 2013:				
Incremental fair value of assets acquired, net	$	80,698		
Less: fair value of contingent consideration		(30,383)		
		50,315		
Loss on foreign exchange rate		488		
Total cash paid for acquisition of BioVectra	$	50,803		

Source: Questcor Pharmaceuticals. (2014).

APPENDIX B

In this appendix, the Excel calculations from where the results were retrieved are presented for each of the targets. First the relative valuation will be demonstrated, followed by the DCF approach. All calculations were performed by Lindéus (2021).

Monsanto

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Monsanto (target)	89	55 800	46 700	13 300	3 600	1 300	4,2	15,5	35,9
Syngenta	76	39 000	36 600	13 400	2 400	1 300	2,9	16,3	28,2
DuPont	74	40 700	27 300	48 800	13 400	7 700	0,8	3,0	3,5
FMC	34	6 700	4 500	2 500	- 68	489	2,7	-	9,2
Median	75	39 850	31 950	13 350	3 000	1 300	2,8	9,3	18,7
Average	68,25	35 550	28 775	19 500	4 833	2 697	2,7	8,7	19,2

EV/Sales (Median) ->	37 176
EV/Sales (Average) ->	35 311
EV/EBITDA (Median) ->	33 367
EV/EBITDA (Average) ->	31 309
P/E (Median) ->	46
P/E (Average) ->	48

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Regeneron Pharmaceuticals	543	56 100	56 800	4 100	1 300	636	13,7	43,2	89,3
Shire	203	42 000	40 500	6 400	2 100	1 300	6,6	20,0	31,2
Teva	62	66 000	59 600	19 700	3 900	1 600	3,4	16,9	37,3
Biogen	282	64 800	61 700	10 800	5 500	3 500	6,0	11,8	17,6
Median	243	60 450	58 200	8 600	3 000	1 450	6,3	18,5	34,2
Average	273	57 225	54 650	10 250	3 200	1 759	7,4	23,0	43,8

EV/Sales (Median) ->	83 541
EV/Sales (Average) ->	98 406
EV/EBITDA (Median) ->	66 462
EV/EBITDA (Average) ->	82 673
P/E (Median) ->	85
P/E (Average) ->	109

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Monsanto (target)	89	55 800	46 700	13 300	3 600	1 300	4,2	15,5	35,9
Syngenta	76	39 000	36 600	13 400	2 400	1 300	2,9	16,3	28,2
DuPont	74	40 700	27 300	48 800	13 400	7 700	0,8	3,0	3,5
FMC	34	6 700	4 500	2 500	- 68	489	2,7	-	9,2
Regeneron Pharmaceuticals	543	56 100	56 800	4 100	1 300	636	13,7	43,2	89,3
Shire	203	42 000	40 500	6 400	2 100	1 300	6,6	20,0	31,2
Teva	62	66 000	59 600	19 700	3 900	1 600	3,4	16,9	37,3
Biogen	282	64 800	61 700	10 800	5 500	3 500	6,0	11,8	17,6
Median	**83**	**48 900**	**43 600**	**12 050**	**3 000**	**1 300**	**3,8**	**15,9**	**29,7**
Average	**170**	**46 388**	**41 713**	**14 875**	**4 017**	**2 228**	**5,0**	**15,8**	**31,5**

EV/Sales (Median) ->	50 179
EV/Sales (Average) ->	66 858
EV/EBITDA (Median) ->	57 150
EV/EBITDA (Average) ->	56 991
P/E (Median) ->	73
P/E (Average) ->	78

DCF

Valuation Date:	2016-01-01
Share Price on Valuation Date:	$89,0
Diluted Shares Outstanding	525

Operating Data

			Annual Forecast (projected)				
	2014A	2015A	2016P	2017P	2018P	2019P	2020P
Revenue	$15 855,0	$15 001,0	$15 601,0	$16 225,1	$16 874,1	$17 549,0	$18 251,0
Revenue Growth Rate (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
EBITDA	$4 766,0	$4 239,0	$4 553,0	$4 737,7	$4 927,2	$5 124,3	$5 329,3
EBITDA Margin (%)			*29,2%*	*29,2%*	*29,2%*	*29,2%*	*29,2%*
EBIT	$4 075,0	$3 523,0	$3 841,6	$3 991,4	$4 151,0	$4 317,1	$4 489,7
EBIT Margin (%)			*24,6%*	*24,6%*	*24,6%*	*24,6%*	*24,6%*
Depreciation & Amortization	$691,0	$716,0	$711,4	$746,4	$776,2	$807,3	$839,5
D&A as a % of revenue			*4,6%*	*4,6%*	*4,6%*	*4,6%*	*4,6%*

Balance Sheet And Other Financial Information

			Annual Forecast (projected)				
	2014A	2015A	2016P	2017P	2018P	2019P	2020P
Cash	$2 367,0	$3 701,0	3 849,0	4 003,0	4 163,1	4 329,6	4 502,8
Accounts Receivable	$2 014,0	$1 636,0	1 701,4	1 769,5	1 840,3	1 913,9	1 990,4
Inventories	$3 597,0	$3 496,0	3 635,8	3 781,3	3 932,5	4 089,8	4 253,4
Prepaid Expenses	$205,0	$199,0	207,0	215,2	223,8	232,8	242,1
Accounts Payable	$1 111,0	$836,0	$869,4	$904,2	$940,4	$978,0	$1 017,1
Accrued Expenses	$500,0	$304,0	316,2	328,8	342,0	355,6	369,9
Debt	$7 465,0	$8 429,0	8 429,0	8 429,0	8 429,0	8 429,0	8 429,0
Gross PP&E (increases annually be capex)	$5 082,0	$4 973,0	5 171,9	5 378,8	5 593,9	5 817,7	6 050,4
Cash Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Accounts Receivable Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Inventories Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Prepaid Expenses Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Accounts Payable Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Accrued Expenses Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*
Capital Expenditures Growth (%)			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*

Free Cash Flow Buildup							
$mm			Annual Forecast (projected)				
	2014A	2015A	2016P	2017P	2018P	2019P	2020P
Period			1	2	3	4	5
Total Revenues			$15 601,0	$16 225,1	$16 874,1	$17 549,0	$18 251,0
EBITDA			4 553,0	4 737,7	4 927,2	5 124,3	5 329,3
EBIT			3 841,6	3 991,4	4 151,0	4 317,1	4 489,7
Tax rate			35,0%	35,0%	35,0%	35,0%	35,0%
EBIAT			**$2 497,0**	**$2 594,4**	**$2 698,2**	**$2 806,1**	**$2 918,3**
Depreciation & Amortization			711,4	746,4	776,2	807,3	839,5
Accounts receivable			(65,4)	(68,1)	(70,8)	(73,6)	(76,6)
Inventories			(139,8)	(145,4)	(151,3)	(157,3)	(163,6)
Prepaid expenses			(8,0)	(8,3)	(8,6)	(9,0)	(9,3)
Accounts payable			33,4	34,8	36,2	37,6	39,1
Accrued expenses			12,2	12,6	13,2	13,7	14,2
Capital expenditures			(198,9)	(206,9)	(215,2)	(223,8)	(232,7)
Unlevered free cash flows			**$2 841,9**	**$2 959,5**	**$3 077,9**	**$3 201,0**	**$3 329,1**
Discount Rate (WACC)			7,4%	7,4%	7,4%	7,4%	7,4%
Present value of free cash flows			$2 646,1	$2 565,7	$2 484,5	$2 405,9	$2 329,7
Sum of present values of FCFs	**$12 431,9**						

Terminal Value	
Growth in perpetuity method:	
Long term growth rate	3,0%
WACC	7,4%
Free cash flow (t+1)	3 428,9
Terminal Value	77 930,3
Present Value of Terminal Value	**$54 536,2**

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	$66 968,1	6%
Less: Net debt	4 728,0	
Equity Value	**$62 240,1**	
Diluted Shares Outstanding	524,7	
Equity Value Per Share	**$118,62**	-7%

Actelion

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Actelion (target)	228	27 600	27 200	2 300	882	683	12,0	31,3	39,8
Alexion	122	29 400	27 400	3 100	1 100	399	9,5	26,7	68,7
Incyte	100	18 800	18 900	1 100	205	104	17,1	91,7	181,7
Biomarine	83	14 200	14 300	1 100	- 606	- 630			
Seattle Genetics	53	6 900	7 500	418	- 125	- 140	16,5	-	-
Median	**100**	**18 800**	**18 900**	**1 100**	**205**	**104**	**14,3**	**29,0**	**54,2**
Average	**117**	**19 380**	**19 060**	**1 604**	**291**	**83**	**13,8**	**37,4**	**72,6**

EV/Sales (Median) ->	32 783
EV/Sales (Average) ->	31 672
EV/EBITDA (Median) ->	25 587
EV/EBITDA (Average) ->	33 015
P/E (Median) ->	311
P/E (Average) ->	415

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Baxalta	40	32 300,0	27 600,0	6 100	1 500	956	5,3	21,5	28,9
DuPont	82	48 900	32 900	48 200	8 100	4 300	1,0	6,0	7,7
Astellas Pharma	14	24 900	28 200	12 200	2 900	1 600	2,0	8,6	17,6
Median	**40**	**32 300**	**28 200**	**12 200**	**2 900**	**1 600**	**2,0**	**8,6**	**17,6**
Average	**45**	**35 367**	**29 567**	**22 167**	**4 167**	**2 285**	**2,8**	**12,1**	**18,0**

EV/Sales (Median) ->	4 694
EV/Sales (Average) ->	6 402
EV/EBITDA (Median) ->	7 573
EV/EBITDA (Average) ->	10 630
P/E (Median) ->	101
P/E (Average) ->	103

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Actelion (target)	228	27 600	27 200	2 300	882	683	12,0	31,3	39,8
Alexion	122	29 400	27 400	3 100	1 100	399	9,5	26,7	68,7
Incyte	100	18 800	18 900	1 100	205	104	17,1	91,7	181,7
Biomarine	83	14 200	14 300	1 100	- 606	- 630	12,9	-	-
Seattle Genetics	53	6 900	7 500	418	- 125	- 140	16,5	-	-
Baxalta	40	32 300,0	27 600,0	6 100	1 500	956	5,3	21,5	28,9
DuPont	82	48 900	32 900	48 200	8 100	4 300	1,0	6,0	7,7
Astellas Pharma	14	24 900	28 200	12 200	2 900	1 600	2,0	8,6	17,6
Median	**83**	**26 250**	**27 300**	**2 700**	**991**	**541**	**10,7**	**15,1**	**23,2**
Average	**90**	**25 375**	**23 000**	**9 315**	**1 745**	**909**	**9,5**	**23,2**	**43,0**

EV/Sales (Median) ->	24 706
EV/Sales (Average) ->	21 948
EV/EBITDA (Median) ->	13 283
EV/EBITDA (Average) ->	20 494
P/E (Median) ->	133
P/E (Average) ->	246

DCF

Valuation Date:	2017-01-01
Share Price on Valuation Date:	227,4 CHF
Diluted Shares Outstanding	107

Operating Data

			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Revenue	2 045,1	2 417,9	2 659,7	2 925,7	3 218,3	3 540,1	3 894,1
Revenue Growth Rate (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
EBITDA	745,1	876,6	966,5	1 062,0	1 168,2	1 285,1	1 413,6
EBITDA Margin (%)			*36,3%*	*36,3%*	*36,3%*	*36,3%*	*36,3%*
EBIT	655,6	788,7	860,8	947,9	1 042,7	1 147,0	1 261,7
EBIT Margin (%)			*32,4%*	*32,4%*	*32,4%*	*32,4%*	*32,4%*
Depreciation & Amortization	89,5	87,9	105,7	117,0	128,7	141,6	155,8
D&A as a % of revenue			*4,0%*	*4,0%*	*4,0%*	*4,0%*	*4,0%*

Balance Sheet And Other Financial Information

			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Cash	404,9	495,4	544,9	599,4	659,4	725,3	797,8
Accounts Receivable	427,2	445,9	490,5	539,5	593,5	652,8	718,1
Inventories	62,1	135,8	149,4	164,3	180,8	198,9	218,7
Prepaid Expenses	68,8	115,8	127,3	140,1	154,1	169,5	186,4
Accounts Payable	83,9	83,0	91,3	100,4	110,5	121,5	133,7
Accrued Expenses	302,7	445,7	490,3	539,3	593,3	652,6	717,9
Debt			-	-	-	-	-
Gross PP&E (increases annually be capex)	348,3	350,2	385,2	423,8	466,1	512,7	564,0
Cash Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accounts Receivable Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Inventories Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Prepaid Expenses Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accounts Payable Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accrued Expenses Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Capital Expenditures Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*

Free Cash Flow Buildup							
$mm			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Period			1	2	3	4	5
Total Revenues			2 659,7	2 925,7	3 218,3	3 540,1	3 894,1
EBITDA			966,5	1 062,0	1 168,2	1 285,1	1 413,6
EBIT			860,8	947,9	1 042,7	1 147,0	1 261,7
Tax rate			**12,7%**	**12,7%**	**12,7%**	**12,7%**	**12,7%**
EBIAT			**751,4**	**827,5**	**910,3**	**1 001,3**	**1 101,5**
Depreciation & Amortization			105,7	117,0	128,7	141,6	155,8
Accounts receivable			(44,6)	(49,0)	(54,0)	(59,3)	(65,3)
Inventories			(13,6)	(14,9)	(16,4)	(18,1)	(19,9)
Prepaid expenses			(11,6)	(12,7)	(14,0)	(15,4)	(16,9)
Accounts payable			8,3	9,1	10,0	11,0	12,2
Accrued expenses			44,6	49,0	53,9	59,3	65,3
Capital expenditures			(35,0)	(38,5)	(42,4)	(46,6)	(51,3)
Unlevered free cash flows			**805,3**	**887,5**	**976,2**	**1 073,9**	**1 181,2**
Discount Rate *(WACC)*			*7,9%*	*7,9%*	*7,9%*	*7,9%*	*7,9%*
Present value of free cash flows			746,3	762,3	777,1	792,2	807,7
Sum of present values of FCFs	**3 885,6**						

Terminal Value	
Growth in perpetuity method:	
Long term growth rate	5,0%
WACC	7,9%
Free cash flow (t+1)	1 240,3
Terminal Value	42 769,3
Present Value of Terminal Value	**29 243,2**

Enterprise Value to Equity Value		Difference (%)
Enterprise Value	33 128,8	10%
Less: Net debt	(495,4)	
Equity Value	**33 624,2**	
Diluted Shares Outstanding	107,3	
Equity Value Per Share	**313,4**	12%

Kite Pharma

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	*($/share)*	*($Million)*	*($Million)*	*($Million)*	*($Million)*	*($Million)*	x	x	x
Kite (target)	140	9 400	10 200	32	- 259	- 267	293,8	-	-
Juno Therapeutics	19	1 200	1 900	79	- 241	- 246	15,2	-	-
Galapagos	64	1 900	3 000	137	63	60	13,9	30,2	50,0
Bluebird Bio	62	1 900	2 500	6	- 254	- 264	316,7	-	-
Median	**63**	**1 900**	**2 750**	**56**	**- 248**	**- 255**	**154,5**	**-**	**-**
Average	**71**	**3 600**	**4 400**	**64**	**- 173**	**- 179**	**159,9**	**7,5**	**12,5**

EV/Sales (Median) ->	4 943
EV/Sales (Average) ->	5 116
EV/EBITDA (Median) ->	- 2 590
EV/EBITDA (Average) ->	- 1 953
P/E (Median) ->	-
P/E (Average) ->	- 46

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Genmab A/S	159	9 000	9 600	258	166	168	34,9	54,2	57,1
Seagen	53	6 900	7 500	418	- 125	- 140	16,5	-	-
Jazz Pharmaceuticals	109	8 100	6 500	1 500	708	397	5,4	11,4	16,4
Ionis Pharmaceuticals	48	5 700	5 800	373	- 10	- 60			
H. Lundbeck A/S	40	7 900	7 900	2 200	349	172	3,6	22,6	45,9
Median	**53**	**7 900**	**7 500**	**418**	**166**	**168**	**11,0**	**17,0**	**31,2**
Average	**82**	**7 520**	**7 460**	**950**	**218**	**107**	**15,1**	**22,1**	**29,9**

EV/Sales (Median) ->	351
EV/Sales (Average) ->	483
EV/EBITDA (Median) ->	- 4 413
EV/EBITDA (Average) ->	- 5 717
P/E (Median) ->	- 114
P/E (Average) ->	- 109

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Kite (target)	140	9 400	10 200	32	- 259	- 267	293,8	-	-
Juno Therapeutics	19	1 200	1 900	79	- 241	- 246	15,2	-	-
Galapagos	64	1 900	3 000	137	63	60	13,9	30,2	50,0
Bluebird Bio	62	1 900	2 500	6	- 254	- 264	316,7	-	-
Genmab A/S	159	9 000	9 600	258	166	168	34,9	54,2	57,1
Seagen	53	6 900	7 500	418	- 125	- 140	16,5	-	-
Jazz Pharmaceuticals	109	8 100	6 500	1 500	708	397			
Ionis Pharmaceuticals	48	5 700	5 800	373	- 10	- 60	15,3	-	-
H. Lundbeck A/S	40	7 900	7 900	2 200	349	172	3,6	22,6	45,9
Median	**62**	**6 900**	**6 500**	**258**	**- 10**	**- 60**	**15,9**	**-**	**-**
Average	**77**	**5 778**	**6 100**	**556**	**44**	**- 20**	**88,7**	**13,4**	**19,1**

EV/Sales (Median) ->	509
EV/Sales (Average) ->	2 839
EV/EBITDA (Median) ->	-
EV/EBITDA (Average) ->	- 3 465
P/E (Median) ->	-
P/E (Average) ->	- 70

DCF

Valuation Date:	2017-01-01
Share Price on Valuation Date:	$140,0
Diluted Shares Outstanding	73

Operating Data

			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Revenue	$17,3	$22,2	$55,0	$136,4	$338,2	$838,6	$2 079,8
Revenue Growth Rate (%)			*148,0%*	*148,0%*	*148,0%*	*148,0%*	*148,0%*
EBITDA	($104,0)	($273,2)	($469,7)	($258,3)	($198,8)	$437,2	$959,4
EBITDA Margin (%)							
EBIT	($104,0)	($273,2)	($472,0)	($264,0)	($213,0)	$402,0	$872,0
EBIT Margin (%)							
Depreciation & Amortization	$4,6	$10,6	$2,3	$5,7	$14,2	$35,2	$87,4
D&A as a % of revenue			*4,2%*	*4,2%*	*4,2%*	*4,2%*	*4,2%*

Balance Sheet And Other Financial Information

			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Cash	$392,8	$114,6	284,1	704,6	1 747,4	4 333,5	10 747,2
Accounts Receivable			-	-	-	-	-
Inventories			-	-	-	-	-
Prepaid Expenses	$16,4	$13,0	32,2	79,8	197,9	490,8	1 217,1
Accounts Payable	$8,0	$10,7	$14,1	$18,7	$24,7	$32,8	$43,4
Accrued Expenses	$11,8	$29,5	73,7	184,4	461,3	1 153,9	2 886,2
Debt			0,0	0,0	0,0	0,0	0,0
Gross PP&E (increases annually be capex)	$30,1	$44,4	65,5	96,6	142,5	210,1	310,0
Cash Growth (%)			*148,0%*	*148,0%*	*148,0%*	*148,0%*	*148,0%*
Accounts Receivable Growth (%)							
Inventories Growth (%)							
Prepaid Expenses Growth (%)			*148,0%*	*148,0%*	*148,0%*	*148,0%*	*148,0%*
Accounts Payable Growth (%)			*32,4%*	*32,4%*	*32,4%*	*32,4%*	*32,4%*
Accrued Expenses Growth (%)			*150,1%*	*150,1%*	*150,1%*	*150,1%*	*150,1%*
Capital Expenditures Growth (%)			*47,5%*	*47,5%*	*47,5%*	*47,5%*	*47,5%*

Free Cash Flow Buildup

$mm			Annual Forecast (projected)				
	2015A	2016A	2017P	2018P	2019P	2020P	2021P
Period			1	2	3	4	5
Total Revenues			$55,0	$136,4	$338,2	$838,6	$2 079,8
EBITDA			(469,7)	(258,3)	(198,8)	437,2	959,4
EBIT			(472,0)	(264,0)	(213,0)	402,0	872,0
Tax rate			**35,0%**	**35,0%**	**35,0%**	**35,0%**	**35,0%**
EBIAT			**($306,8)**	**($171,6)**	**($138,5)**	**$261,3**	**$566,8**
Depreciation & Amortization			2,3	5,7	14,2	35,2	87,4
Accounts receivable			0,0	0,0	0,0	0,0	0,0
Inventories			0,0	0,0	0,0	0,0	0,0
Prepaid expenses			(19,2)	(47,6)	(118,1)	(292,9)	(726,3)
Accounts payable			3,5	4,6	6,1	8,0	10,6
Accrued expenses			44,3	110,7	276,9	692,6	1 732,3
Capital expenditures			(21,1)	(31,1)	(45,9)	(67,7)	(99,8)
Unlevered free cash flows			**($297,1)**	**($129,3)**	**($5,3)**	**$636,6**	**$1 570,9**
Discount Rate *(WACC)*			*10,8%*	*10,8%*	*10,8%*	*10,8%*	*10,8%*
Present value of free cash flows			($268,1)	($105,3)	($3,9)	$422,4	$940,7
Sum of present values of FCFs	**$985,7**						

Terminal Value

Growth in perpetuity method:	
Long term growth rate	10,0%
WACC	10,8%
Free cash flow (t+1)	1 728,0
Terminal Value	215 997,2
Present Value of Terminal Value	**$129 344,9**

Enterprise Value to Equity Value		**Difference (%)**
Enterprise Value	$130 330,6	995%
Less: Net debt	(114,6)	
Equity Value	**$130 445,2**	
Diluted Shares Outstanding	73,0	
Equity Value Per Share	**$1 786,92**	893%

Bioverativ

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Bioverativ (target)	64	10 800	11 200	1 200	462	356	9,0	23,4	31,5
Spark Therapeutics	51	1 400	1 900	12	- 238	- 253	116,7	-	-
Chugai Pharmaceutical	9	25 800	28 000	4 700	860	644	5,5	30,0	43,5
Shire	155	66 000	47 000	15 200	4 700	4 300	4,3	14,0	10,9
Median	**58**	**18 300**	**19 600**	**2 950**	**661**	**500**	**7,2**	**18,7**	**21,2**
Average	**70**	**26 000**	**22 025**	**5 278**	**1 446**	**1 262**	**33,9**	**16,9**	**21,5**

EV/Sales (Median) ->	8 694
EV/Sales (Average) ->	40 649
EV/EBITDA (Median) ->	8 644
EV/EBITDA (Average) ->	7 787
P/E (Median) ->	43
P/E (Average) ->	44

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Jazz Pharmaceuticals	135	9 000	8 100	1 600	684	488	5,6	13,2	16,6
Neurocrine Biosciences	78	6 700	6 900	162	- 121	- 143	41,4	-	-
Seagen	54	7 300	7 700	482	- 172	- 126	15,1	-	-
Genmab A/S	17	9 200	10 000	376	237	176			
H. Lundbeck A/S	49	9 500	10 100	2 700	701	417	3,5	13,6	24,2
Median	**54**	**9 000**	**8 100**	**482**	**237**	**176**	**10,4**	**6,6**	**8,3**
Average	**67**	**8 340**	**8 560**	**1 064**	**266**	**162**	**16,4**	**6,7**	**10,2**

EV/Sales (Median) ->	12 462
EV/Sales (Average) ->	19 694
EV/EBITDA (Median) ->	3 039
EV/EBITDA (Average) ->	3 085
P/E (Median) ->	17
P/E (Average) ->	21

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Bioverativ (target)	64	10 800	11 200	1 200	462	356	9,0	23,4	31,5
Spark Therapeutics	51	1 400	1 900	12	- 238	- 253	116,7	-	-
Chugai Pharmaceutical	9	25 800	28 000	4 700	860	644	5,5	30,0	43,5
Shire	155	66 000	47 000	15 200	4 700	4 300	4,3	14,0	10,9
Jazz Pharmaceuticals	135	9 000	8 100	1 600	684	488	5,6	13,2	16,6
Neurocrine Biosciences	78	6 700	6 900	162	- 121	- 143	41,4	-	-
Seagen	54	7 300	7 700	482	- 172	- 126	15,1	-	-
Genmab A/S	17	9 200	10 000	376	237	176			
H. Lundbeck A/S	49	9 500	10 100	2 700	701	417	3,5	13,6	24,2
Median	**54**	**9 200**	**10 000**	**1 200**	**462**	**356**	**7,3**	**13,4**	**13,8**
Average	**68**	**16 189**	**14 544**	**2 937**	**790**	**651**	**25,1**	**11,8**	**15,8**

EV/Sales (Median) ->	8 775
EV/Sales (Average) ->	30 172
EV/EBITDA (Median) ->	6 170
EV/EBITDA (Average) ->	5 436
P/E (Median) ->	28
P/E (Average) ->	32

DCF

Valuation Date:	2018-01-01
Share Price on Valuation Date:	$64,0
Diluted Shares Outstanding	175

Operating Data

			Annual Forecast (projected)				
	2016A	2017A	2018P	2019P	2020P	2021P	2022P
Revenue	$887,4	$1 168,5	$1 285,4	$1 413,9	$1 555,3	$1 710,8	$1 881,9
Revenue Growth Rate (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
EBITDA	$325,7	$490,4	$510,2	$561,3	$617,4	$679,2	$747,1
EBITDA Margin (%)			*39,7%*	*39,7%*	*39,7%*	*39,7%*	*39,7%*
EBIT	$292,4	$447,2	$462,4	$509,0	$559,9	$615,9	$677,5
EBIT Margin (%)			*36,0%*	*36,0%*	*36,0%*	*36,0%*	*36,0%*
Depreciation & Amortization	$53,4	$14,5	$42,5	$46,7	$51,3	$56,5	$62,1
D&A as a % of revenue			*3,3%*	*3,3%*	*3,3%*	*3,3%*	*3,3%*

Balance Sheet And Other Financial Information

			Annual Forecast (projected)				
	2016A	2017A	2018P	2019P	2020P	2021P	2022P
Cash		$436,5	480,2	528,2	581,0	639,1	703,0
Accounts Receivable	$ 149,4	$189,4	208,3	229,2	252,1	277,3	305,0
Inventories	$302,0	$40,6	44,7	49,1	54,0	59,4	65,4
Prepaid Expenses			-	-	-	-	-
Accounts Payable	$12,7	$26,1	$28,7	$31,6	$34,7	$38,2	$42,0
Accrued Expenses	$89,3	$233,5	256,9	282,5	310,8	341,9	376,1
Debt			0,0	0,0	0,0	0,0	0,0
Gross PP&E (increases annually be capex)	$28,4	$24,0	26,4	29,0	31,9	35,1	38,7
Cash Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accounts Receivable Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Inventories Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Prepaid Expenses Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accounts Payable Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Accrued Expenses Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*
Capital Expenditures Growth (%)			*10,0%*	*10,0%*	*10,0%*	*10,0%*	*10,0%*

Free Cash Flow Buildup

$mm			Annual Forecast (projected)				
	2016A	2017A	2018P	2019P	2020P	2021P	2022P
Period			1	2	3	4	5
Total Revenues			$1 285,4	$1 413,9	$1 555,3	$1 710,8	$1 881,9
EBITDA			510,2	561,3	617,4	679,2	747,1
EBIT			462,4	509,0	559,9	615,9	677,5
Tax rate			**21,0%**	**21,0%**	**21,0%**	**21,0%**	**21,0%**
EBIAT			**$365,3**	**$402,1**	**$442,3**	**$486,6**	**$535,2**
Depreciation & Amortization			42,5	46,7	51,3	56,5	62,1
Accounts receivable			(18,9)	(20,8)	(22,9)	(25,2)	(27,7)
Inventories			(4,1)	(4,5)	(4,9)	(5,4)	(5,9)
Prepaid expenses			0,0	0,0	0,0	0,0	0,0
Accounts payable			2,6	2,9	3,2	3,5	3,8
Accrued expenses			23,4	25,7	28,3	31,1	34,2
Capital expenditures			(2,4)	(2,6)	(2,9)	(3,2)	(3,5)
Unlevered free cash flows			**$408,3**	**$449,4**	**$494,3**	**$543,8**	**$598,1**
Discount Rate *(WACC)*			*8,0%*	*8,0%*	*8,0%*	*8,0%*	*8,0%*
Present value of free cash flows			$378,0	$385,2	$392,3	$399,5	$406,9
Sum of present values of FCFs	**$1 961,9**						

Terminal Value

Growth in perpetuity method:	
Long term growth rate	5,0%
WACC	8,0%
Free cash flow (t+1)	628,0
Terminal Value	20 865,0
Present Value of Terminal Value	**$14 193,8**

Enterprise Value to Equity Value		**Difference (%)**
Enterprise Value	$16 155,7	39%
Less: Net debt	(436,5)	
Equity Value	**$16 592,2**	
Diluted Shares Outstanding	175,0	
Equity Value Per Share	**$94,81**	-47%

Cubist Pharmaceuticals

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Cubist (target)	76	7 500	7 300	1 200	204	29	6,3	36,8	251,7
Astellas Pharma	12	22 800	26 100	10 700	2 300	881	2,1	9,9	29,6
Teva	36	45 200	34 000	20 300	4 100	1 300	2,2	11,0	26,2
Actavis	164	34 700	28 500	6 900	1 600	- 563	5,0	21,7	-
Median	**56**	**28 750**	**27 300**	**8 800**	**1 950**	**455**	**3,6**	**16,4**	**27,9**
Average	**72**	**27 550**	**23 975**	**9 775**	**2 051**	**412**	**3,9**	**19,8**	**76,9**

EV/Sales (Median) ->	4 353
EV/Sales (Average) ->	4 691
EV/EBITDA (Median) ->	3 337
EV/EBITDA (Average) ->	4 049
P/E (Median) ->	8
P/E (Average) ->	23

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Incyte	51	7 500	7 500	355	13	- 83	21,1	576,9	-
Taro Pharmaceutical industries	87	4 700	4 400	737	410	267	6,4	11,5	16,5
Jazz Pharmaceuticals	127	7 700	7 400	872	427	216	8,8	18,0	34,3
Biomarin	70	9 300	9 700	549	- 114	- 176	16,9	-	-
Median	**79**	**7 600**	**7 450**	**643**	**212**	**67**	**12,9**	**14,7**	**8,2**
Average	**84**	**7 300**	**7 250**	**628**	**184**	**56**	**13,3**	**151,6**	**12,7**

EV/Sales (Median) ->	15 462
EV/Sales (Average) ->	15 982
EV/EBITDA (Median) ->	3 009
EV/EBITDA (Average) ->	30 927
P/E (Median) ->	2
P/E (Average) ->	4

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Cubist (target)	76	7 500	7 300	1 200	204	29	6,3	36,8	251,7
Astellas Pharma	12	22 800	26 100	10 700	2 300	881	2,1	9,9	29,6
Teva	36	45 200	34 000	20 300	4 100	1 300	2,2	11,0	26,2
Actavis	164	34 700	28 500	6 900	1 600	- 563	5,0	21,7	-
Incyte	51	7 500	7 500	355	13	- 83	21,1	576,9	-
Taro Pharmaceutical industries	87	4 700	4 400	737	410	267	6,4	11,5	16,5
Jazz Pharmaceuticals	127	7 700	7 400	872	427	216	8,8	18,0	34,3
Biomarin	70	9 300	9 700	549	- 114	- 176	16,9	-	-
Median	**73**	**8 500**	**8 600**	**1 036**	**419**	**123**	**6,3**	**14,7**	**21,3**
Average	**78**	**17 425**	**15 613**	**5 202**	**1 118**	**234**	**8,6**	**85,7**	**44,8**

EV/Sales (Median) ->	7 576
EV/Sales (Average) ->	10 337
EV/EBITDA (Median) ->	3 009
EV/EBITDA (Average) ->	17 488
P/E (Median) ->	6
P/E (Average) ->	14

DCF

Valuation Date:	2014-01-01
Share Price on Valuation Date:	$76,0
Diluted Shares Outstanding	96

Operating Data

			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Revenue	$849,4	$971,2	$1 078,0	$1 196,6	$1 328,2	$1 474,3	$1 636,5
Revenue Growth Rate (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
EBITDA	$270,4	$69,6	$343,2	$380,5	$422,4	$468,8	$520,4
EBITDA Margin (%)			*31,8%*	*31,8%*	*31,8%*	*31,8%*	*31,8%*
EBIT	$237,1	$26,4	$300,9	$333,9	$370,6	$411,3	$456,6
EBIT Margin (%)			*27,9%*	*27,9%*	*27,9%*	*27,9%*	*27,9%*
Depreciation & Amortization	$63,5	$78,0	$83,8	$93,3	$103,6	$115,0	$127,6
D&A as a % of revenue			*7,8%*	*7,8%*	*7,8%*	*7,8%*	*7,8%*

Balance Sheet And Other Financial Information

			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Cash	$104,0	$91,1	101,1	112,2	124,5	138,2	153,4
Accounts Receivable	$93,5	$123,2	136,7	151,7	168,4	187,0	207,5
Inventories	$41,9	$57,7	64,0	71,0	78,9	87,5	97,2
Prepaid Expenses	$31,2	$58,3	64,7	71,8	79,7	88,5	98,2
Accounts Payable	$45,6	$31,9	$35,4	$39,3	$43,6	$48,4	$53,7
Accrued Expenses	$163,6	$245,1	272,0	302,0	335,2	372,0	413,0
Debt	$367,8	$817,8	817,8	817,8	817,8	817,8	817,8
Gross PP&E (increases annually be capex)	$230,0	$255,5	283,6	314,8	349,4	387,9	430,5
Cash Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Accounts Receivable Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Inventories Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Prepaid Expenses Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Accounts Payable Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Accrued Expenses Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Capital Expenditures Growth (%)			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*

Free Cash Flow Buildup

$mm			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Period			1	2	3	4	5
Total Revenues			$1 078,0	$1 196,6	$1 328,2	$1 474,3	$1 636,5
EBITDA			343,2	380,5	422,4	468,8	520,4
EBIT			300,9	333,9	370,6	411,3	456,6
Tax rate			**35,0%**	**35,0%**	**35,0%**	**35,0%**	**35,0%**
EBIAT			**$195,6**	**$217,0**	**$240,9**	**$267,4**	**$296,8**
Depreciation & Amortization			83,8	93,3	103,6	115,0	127,6
Accounts receivable			(13,5)	(15,0)	(16,7)	(18,5)	(20,6)
Inventories			(6,3)	(7,0)	(7,8)	(8,7)	(9,6)
Prepaid expenses			(6,4)	(7,1)	(7,9)	(8,8)	(9,7)
Accounts payable			3,5	3,9	4,3	4,8	5,3
Accrued expenses			27,0	29,9	33,2	36,9	40,9
Capital expenditures			(28,1)	(31,2)	(34,6)	(38,4)	(42,7)
Unlevered free cash flows			**$255,4**	**$283,8**	**$315,0**	**$349,6**	**$388,1**
Discount Rate *(WACC)*			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Present value of free cash flows			$230,1	$230,3	$230,3	$230,3	$230,3
Sum of present values of FCFs	**$1 151,4**						

Terminal Value

Growth in perpetuity method:	
Long term growth rate	5,0%
WACC	11,0%
Free cash flow (t+1)	407,5
Terminal Value	6 791,5
Present Value of Terminal Value	**$4 030,4**

Enterprise Value to Equity Value		**Difference (%)**
Enterprise Value	$5 181,8	-38%
Less: Net debt	726,8	
Equity Value	**$4 455,0**	
Diluted Shares Outstanding	96,1	
Equity Value Per Share	**$46,38**	-55%

Questcor Pharmaceuticals

Relative valuation

Scenario 1

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Questcor (target)	68	4 300	3 600	799	461	293	5,4	9,3	12,3
Arena Pharmaceuticals	59	1 200	1 300	81	- 4	- 19	14,7	-	-
Astra Zeneca	23	76 800	74 000	25 800	8 300	2 600	3,0	9,3	28,5
Novartis	58	208 700	194 600	52 700	15 400	9 200	4,0	13,6	21,2
Median	59	40 550	38 800	13 300	4 381	1 447	4,7	9,3	16,7
Average	52	72 750	68 375	19 845	6 039	3 019	6,8	8,0	15,5

EV/Sales (Median) ->	3 732
EV/Sales (Average) ->	5 405
EV/EBITDA (Median) ->	4 283
EV/EBITDA (Average) ->	3 703
P/E (Median) ->	93
P/E (Average) ->	86

Scenario 2

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Incyte	51	7 500	7 500	355	13	- 83	21,1	576,9	-
Taro Pharmaceutical Industrie	87	4 700	4 400	737	410	267	6,4	11,5	16,5
Jazz Pharmaceuticals	127	7 700	7 400	872	427	216	8,8	18,0	34,3
Biomarin	70	9 300	9 700	549	- 114	- 176	16,9	-	-
Median	79	7 600	7 450	643	212	67	12,9	14,7	8,2
Average	84	7 300	7 250	628	184	56	13,3	151,6	12,7

EV/Sales (Median) ->	10 295
EV/Sales (Average) ->	10 642
EV/EBITDA (Median) ->	6 799
EV/EBITDA (Average) ->	69 890
P/E (Median) ->	46
P/E (Average) ->	70

Scenario 3

	Market Data			Financial Data			Valuation		
	Price	EV	Market Cap	Sales	EBITDA	Earnings	EV/Sales	EV/EBITDA	P/E
Company Name	($/share)	($Million)	($Million)	($Million)	($Million)	($Million)	x	x	x
Questcor (target)	68	4 300	3 600	799	461	293	5,4	9,3	12,3
Arena Pharmaceuticals	59	1 200	1 300	81	- 4	- 19	14,7	-	-
Astra Zeneca	23	76 800	74 000	25 800	8 300	2 600	3,0	9,3	28,5
Novartis	58	208 700	194 600	52 700	15 400	9 200	4,0	13,6	21,2
Incyte	51	7 500	7 500	355	13	- 83	21,1	576,9	-
Taro Pharmaceutical Industrie	87	4 700	4 400	737	410	267	6,4	11,5	16,5
Jazz Pharmaceuticals	127	7 700	7 400	872	427	216	8,8	18,0	34,3
Biomarin	70	9 300	9 700	549	- 114	- 176	16,9	-	-
Median	64	7 600	7 450	768	419	242	7,6	10,4	14,4
Average	68	40 025	37 813	10 237	3 112	1 537	10,0	79,8	14,1

EV/Sales (Median) ->	6 075
EV/Sales (Average) ->	8 023
EV/EBITDA (Median) ->	4 792
EV/EBITDA (Average) ->	36 797
P/E (Median) ->	80
P/E (Average) ->	78

DCF

Valuation Date:	2014-01-01
Share Price on Valuation Date:	$68,0
Diluted Shares Outstanding	53

Operating Data

			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Revenue	$509,3	$798,9	$998,7	$1 248,3	$1 560,4	$1 950,5	$2 438,1
Revenue Growth Rate (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
EBITDA	$297,7	$454,0	$573,9	$717,8	$897,2	$1 121,5	$1 401,9
EBITDA Margin (%)			*57,5%*	*57,5%*	*57,5%*	*57,5%*	*57,5%*
EBIT	$296,5	$439,8	$562,1	$702,8	$878,5	$1 098,1	$1 372,7
EBIT Margin (%)			*56,3%*	*56,3%*	*56,3%*	*56,3%*	*56,3%*
Depreciation & Amortization	$1,2	$14,2	$11,7	$15,0	$18,7	$23,4	$29,3
D&A as a % of revenue			*1,2%*	*1,2%*	*1,2%*	*1,2%*	*1,2%*

Select Balance Sheet And Financial information

			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Cash	$80,6	$175,8	219,8	274,8	343,4	429,3	536,6
Accounts Receivable	$61,4	$87,1	108,8	136,0	170,1	212,6	265,7
Inventories	$9,9	$16,4	20,5	25,6	32,0	40,0	50,0
Prepaid Expenses	$4,9	$7,1	8,9	11,1	13,9	17,4	21,7
Accounts Payable	$13,1	$14,3	$17,9	$22,3	$27,9	$34,9	$43,6
Accrued Expenses	$16,5	$21,3	26,6	33,3	41,6	52,0	65,0
Debt	$0,0	$15,7	15,7	15,7	15,7	15,7	15,7
Gross PP&E (increases annually be capex)	$2,1	$31,7	39,7	49,6	62,0	77,5	96,8
Cash Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Accounts Receivable Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Inventories Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Prepaid Expenses Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Accounts Payable Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Accrued Expenses Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*
Capital Expenditures Growth (%)			*25,0%*	*25,0%*	*25,0%*	*25,0%*	*25,0%*

Free Cash Flow Buildup

$mm			Annual Forecast (projected)				
	2012A	2013A	2014P	2015P	2016P	2017P	2018P
Period			1	2	3	4	5
Total Revenues			$998,7	$1 248,3	$1 560,4	$1 950,5	$2 438,1
EBITDA			573,9	717,8	897,2	1 121,5	1 401,9
EBIT			562,1	702,8	878,5	1 098,1	1 372,7
Tax rate			**35,0%**	**35,0%**	**35,0%**	**35,0%**	**35,0%**
EBIAT			**$365,4**	**$456,8**	**$571,0**	**$713,8**	**$892,2**
Depreciation & Amortization			11,7	15,0	18,7	23,4	29,3
Accounts receivable			(21,8)	(27,2)	(34,0)	(42,5)	(53,1)
Inventories			(4,1)	(5,1)	(6,4)	(8,0)	(10,0)
Prepaid expenses			(1,8)	(2,2)	(2,8)	(3,5)	(4,3)
Accounts payable			3,6	4,5	5,6	7,0	8,7
Accrued expenses			5,3	6,7	8,3	10,4	13,0
Capital expenditures			(7,9)	(9,9)	(12,4)	(15,5)	(19,4)
Unlevered free cash flows			**$350,5**	**$438,5**	**$548,1**	**$685,1**	**$856,4**
Discount Rate *(WACC)*			*11,0%*	*11,0%*	*11,0%*	*11,0%*	*11,0%*
Present value of free cash flows			$315,7	$355,9	$400,8	$451,3	$508,2
Sum of present values of FCFs	**$2 031,9**						

Terminal Value

Growth in perpetuity method:	
Long term growth rate	5,0%
WACC	11,0%
Free cash flow (t+1)	899,2
Terminal Value	14 986,6
Present Value of Terminal Value	**$8 893,8**

Enterprise Value to Equity Value		**Difference (%)**
Enterprise Value	$10 925,6	95%
Less: Net debt	(160,2)	
Equity Value	**$11 085,8**	
Diluted Shares Outstanding	52,9	
Equity Value Per Share	**$209,40**	143%