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Valuation of Novo Nordisk B A/S as of March 31st 2017

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Name: Firat Emin Kücükavci
CPR:

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Abstract

This paper is a detailed analysis of Novo Nordisk A/S in order to determine a fair value of the share price and evaluate whether it was over or undervalued on 31st of March 2017 following a period with significant price decrease.

In order to value Novo Nordisk A/S a strategic and financial analysis was conducted. The findings in these analyses followed to a forecast of Novo Nordisk's free cash flow within a forecast horizon of eight years. Finally, previous sections findings were used as input to the valuation model followed by a sensitivity analysis of the share price in relation to the four most important drivers of the model, namely the long term growth rate, the weighted average cost of capital, the EBITDA margin and the revenue growth in the budget period.

The strategic analysis indicated that increased global political pressure and changed legislation for abbreviated licensure pathways for biosimilars has caused increased threat from new entrants and increased rivalry between existing players. In addition, consolidations between the private benefit managers, who negotiate prices for private insurance companies, have lead to notably bargaining power to the American buyers. Furthermore, the strategic analysis suggests a high potential of the pipeline and product portfolio of Novo Nordisk with several market leading products, such as Victoza®, Norditropin® and NovoRapid®, and future blockbusters, including Tresiba®, Xultophy®, Fiasp® and Semaglutide®. The financial analysis of the statements over the last five years indicated that Novo Nordisk is highly competitive and superior to Eli Lilly and Sanofi in generating return on invested capital, particularly due to its competitive advantage in cost management.

The valuation of Novo Nordisk is based on two approaches. The main model is the discounted cash flow (DCF) model. This model is supported by a multiple valuation approach, where EV/EBIT and EV/EBITDA ratios are considered to provide better estimates than any other multiple. The DCF model valued the share price to DKK 299.5. The multiple valuations provided a valuation range from DKK 277.2 and DKK 376.2. The calculated DCF price is within the range of the share price calculated with the multiples, indicating the DCF valuation to be reasonable.

On basis of the analysis, the fair share price of Novo Nordisk B A/S as of March 31st 2017 is DKK 299.5, which implies a premium of 25% to the actual close price at the same date. This indicates, that the market has mispriced and undervalued the stock.

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1 Introduction

1.1 Introduction

Novo Nordisk is a Danish multinational pharmaceutical company primarily known for its market leadership in the diabetes cares segment. Novo Nordisk B A/S is listed on OMX Copenhagen 20, the Danish stock exchange for the 20 most liquid assets. In the last couple of months the Novo Nordisk B share has experienced some high blows on the stock market.

Novo Nordisk's stock price decreased more than 40% over a relatively short period of time in 2016 due to the management's reduction in growth forecasts for 2016. If you take into account that Novo Nordisk is the largest company on OMX Copenhagen 20, then 40% becomes even more dramatic. I therefore wonder why the market can react so dramatic on a growth reduction of "only" 2% percentage point.

The 31st March 2017, the share trades at DKK 239.5, which is 54.4% lower than the maximum price (DKK 369.8) the share traded at on 1st of August 2016. This means the company has lost more than half of its market capitalization in only nine months. It is therefore motivating to understand the valuation drivers and to answer what the fair value of the stock should be on 31st March 2017.

The thesis consists of 8 sections. Section one is the introduction section, covering the problem, methodology and delimitations of the thesis. Section two involves a presentation of Novo Nordisk, the markets and diseases. Sections three-five includes an analysis of the macro and industry environment as well as an analysis of Novo Nordisk's pipeline and current product portfolio. Section six covers a financial analysis of Novo Nordisk's performance in comparison to its main peers. Section 7 involves the valuation of Novo Nordisk and includes the budget, cost of capital, valuation and a sensitivity analysis of the key assumptions. Finally, section eight presents the conclusion.

1.2 Problem Statement

Following the significant price volatility in the common stock of Novo Nordisk B A/S, the main purpose of the thesis is to estimate the fair value of the stock as of March 31st 2017, based on a strategic and financial analysis of Novo Nordisk A/S. The problem statement is covered by the following main research question, along with a set of sub questions.

1.2.1 Research Question

"*What is the fair value of the Novo Nordisk B A/S common stock as of March 31st 2017, and how is the markets expectation of Novo Nordisk relative to the calculated fair price of March 31st 2017?*"

1.2.2 Sub Questions

To understand the drivers behind the research question, five sub-questions are defined. These questions will be addressed in different sections of the thesis and will provide basis for answering the main research question. The questions are as:

1. What macro environmental factors affect the business of Novo Nordisk A/S, and how is the future expectation on the operating environment?

2. How competitive and attractive are the markets Novo Nordisk A/S operates in, and how is it expected to impact future earnings of Novo Nordisk A/S?

3. How is the future potential of the pipeline and product portfolio of Novo Nordisk A/S compared to key peers?

4. How profitable is the business of Novo Nordisk A/S compared to key peers?

5. How sensitive is the valuation to changes in key assumptions?

1.3 Methodology

To answer the problem statement the inductive approach is applied, i.e. data and relevant theories are applied to illuminate the problem statement.

Following Plenborg's (2002) note about valuation of companies, where Radiometer Medical is used as a case, the paper is divided in three main parts, (i) a strategic, (ii) a financial, (iii) and a valuation part.

1.3.1 Strategic Analysis

The strategic part is initiated with a macro environment analysis. The macro analysis helps to understand the current and future operating environment of a company. The primary aim of the macro analysis is to detect macro factors that may have an impact on Novo Nordisk' future cash flow potential and risk (Petersen & Plenborg, 2012). The macro analysis is built on the PEST model. The acronym is Political, Economic, Social, Technological influences that are usually beyond the firm's control but must be considered as a source of opportunities and threats (Clegg, Carter, Kornberger, & Schweitzer, 2011). The Political influence includes political as well as legal factors. However, due to the high importance of the legal environment in the pharmaceutical industry it is deemed to be more optimal to analyze the legal environment separate from the political environment. As a result, the macro analysis is presented as a SLEPT model (Social, Legal, Economic, Political, Technology) (Smith & Awopetu).

The second step in the strategic analysis is a detailed industry analysis. In December 2016 Novo Nordisk committed to limit future price increases to no more than single-digit numbers, consequently the future attractiveness of the markets Novo Nordisk operates in become highly important. There are different drivers that affect the attractiveness of an industry, but it is generally accepted that competition is one of the most important parameters (Petersen & Plenborg, 2012). To understand the competition and the attractiveness of the markets Novo Nordisk operates in, Porter's five forces model is applied. The five forces determine the attractiveness of an industry based on five forces that define the rules of competition within a market. The five forces include, the threat of new entrants, the threat of substitute products, bargaining power of suppliers, bargaining power of customers, and the rivalry between existing competitors (Clegg, Carter, Kornberger, & Schweitzer, 2011).

One problem with the five forces is that it does not tell anything about the specific company of interest. Therefore, the industry analysis of five forces is followed with a pipeline and product portfolio analysis. The aim of the analysis is to understand

the earnings potential of current and future products. The analysis is built on the drug product life cycle model. According to an article by Christina Ciot (2015) there are three distinctive stages in the life cycle of a drug, including (1) the research and development stage, (2) the period of time between its launch and the loss of exclusivity (patent expiry date), and (3) the period after the loss of exclusivity, when generic or biosimilar drugs can enter the market (Ciot, 2015). The drug product life cycle model is deemed to provide good illumination on the strengths and weaknesses of the pipeline and current product portfolio, and accordingly the future cash flows.

1.3.2 Financial Analysis

The financial analysis is about analyzing the profitability of Novo Nordisk. Profitability is an important signal of economic strength and historical profitability therefore provides an important element in defining the future expectations for a company (Petersen & Plenborg, 2012, s. 93). The structure of the profitability analysis will follow the Du Pont approach, where profitability, measured as return on equity, will be decomposed in operating and financing, and each decomposed driver analyzed separately (Petersen & Plenborg, 2012, s. 120). In the section, the historical drivers of Novo Nordisk are compared with the two key peers, Eli Lilly and Sanofi, which are picked based on their similarity to Novo Nordisk in relation to their portfolio selection and activity in regions as Novo Nordisk. The analyzed period covers the past five years and enables the observation of the most current development figures.

1.3.3 Valuation

There are several different valuation approaches. In general, the approaches can be classified into four groups, including the present value approaches, the relative valuation approach, the liquidation approach and the real option approach. The four approaches address valuation from different perspectives (Petersen & Plenborg, 2012, s. 210). The liquidation and the real option approaches will not be applied in this thesis. The liquidation approach is opted out as it is believed that the value of the business is higher going concern than if all assets were liquidated. The real option approach is opted out, as it is believed to be too complex and challenging to provide reliable estimates. In the thesis the present value approach and the relative valuation approach will be applied, respectively as the primary and the secondary approaches.

Within the present value approaches the discounted cash flow model (DCF) is selected as the optimal model to value the stock of Novo Nordisk. When deciding on the main valuation model, different models, such as the economic value added

model (EVA) and the discounted divided model (DDM), was considered. However, due to some pitfalls of these models, the DCF was deemed to be most appropriate to use. The DDM model is based on dividends paid by the company, and since dividends are a result of firm policy and not directly related to firm performance, it is argued that a valuation based on this model might be insufficient. The EVA model on the other side is a value-based model that gives the same answer as the DCF model, however, as the EVA model is an all accounting based concept the periodic EVA values might have some accounting distortions. Consequently, and supported by the fact that the DCF works best for companies that manage a stable capital structure, which is the case for Novo Nordisk, the DCF model is chosen as the primary model. The choice of the DCF model is also supported by the technical note of Plenborg (2002) wherein he valuate the stock of Radiometer Medical using the DCF model and by Bogdan & Villiger (2010), who suggest the discounted cash flow model to be the optimal approach to valuate life science companies.

The present value model will be supported by a relative valuation approach where the value of the stock of Novo Nordisk will be estimated using the market price of comparable companies. The aim of having the market multiples as a second valuation is to gain an overview of how the market, on average, value stocks within the pharmaceutical industry, and to be able to evaluate the markets and our assumptions in order to increase the validity of our valuation.

1.4 Data

The empirical part of the paper is based on secondary data sources only. The secondary sources are information collected by others than the investigator. The sources in this paper compromises among others, financial statements, annual reports, investor presentations, textbooks, academic articles, websites as well as financial databases, such as the Bloomberg Terminal.

Sources such as financial statements and annual reports are deemed to be highly reliable, although companies might have a bias towards themselves in their own annual reports. To understand and reduce the biases the company specific reports were compared with competitor reports. The used textbooks and academic articles are all very reliable and raise no causes of concern, as only publicly acknowledged publications were used. Regarding websites, the selection was relied on known organizations and websites with acknowledged authors. The Bloomberg Terminal database is both independent and widely used as a supplier of data, and the reliability of the source is therefore assumed to be very high.

1.5 Delimitations

A company valuation is highly dependent on, and sensitive to, information about drivers behind the used model. Therefore, it has been necessary to set a cut-of date. The cut-off date used in this paper is the 31st of March 2017, and as such, no information originated after this date will be used.

The primary market is defined, as the pharmaceutical industry of biological drug developer and manufacturer, and other pharmaceutical industries will only briefly be touched if deemed necessary.

The Hormone Replacement Therapy will only briefly be analyzed in the strategic analysis, as the medication related to the disease only represents 3% of total sales, the patent is expired and there is no other product on the disease in the pipeline, all together indicating reduced focus from the view of management.

The financial analysis covers the period from 2012 to 2016, and financial performance before that period will not be covered. The chosen period of analysis is assessed to enable the observation of the most current development figures.

The general theoretical models are assumed to be known and will only briefly be explained.

2 Presentation

2.1 Novo Nordisk

Novo Nordisk is a Danish pharmaceutical company headquartered in Bagsværd, Denmark. The company develops, produces and markets pharmaceutical products primarily in diabetes care. Novo Nordisk is the worlds leading diabetes producer of human insulins, insulin analogues, injection devices and glucagon-like peptide-1, and educational materials (Novo Nordisk AR, 2016).

Novo Nordisk is established in 1989 through a merger of two Danish companies, Novo and Nordisk, whom at the time of the merger were respectively the second and third largest global insulin makers. The two companies each dates back to the 1920s. Novo Nordisk has thus more than 90 years of innovation and leadership in diabetes care, including some pioneering inventions such as the first company to produce human insulins (1982) and the first company to develop a refillable injector (1983) (Novonordisk.com/History). In addition to diabetes care medication and devices Novo Nordisk is active in the obesity, haemophilia, growth disorders and hormone replacement therapy areas.

Novo Nordisk is a global company that employs about 42.000 people in 77 countries, with Denmark and the US the two countries with the highest number of employees. In addition, Novo Nordisk has its research and development facilities spread on three continents and its 16 production sites in eight countries on five different continents, but the production of the active pharmaceutical ingredients are kept in Denmark (Novonordisk.com/AboutNovo).

2.2 Capital Structure

Novo Nordisk has a share capital of DKK 500.000.000. The share capital is divided into *A* share capital and *B* share capital, where each A share of DKK 0.2 carries 200 votes whereas each B share of DKK 0.2 carries one vote. The B shares are listed on Nasdaq Copenhagen and on the New York Stock Exchange as American Depository Receipts. There are currently 2,530 million outstanding shares (excluding treasury shares). The *A* shares are not listed, and are all owned by Novo A/S, a Danish public limited liability company fully owned by the Novo Nordisk Fonden. The A shares held by Novo A/S represent 21.5% of the capital and 73.25% of the total number of votes. In addition, Novo A/S holds 6.55% of the total B share capital. Accumulated, the majority shareholder Novo A/S holds 28.05% of the total share capital and controls 75.48% of the total number of votes (Novonordisk.com/Shareholder).

2.3 Key Markets

Novo Nordisk is a global company that markets its product to 165 countries. The primary markets are United States, China, Japan and major countries in Europe. The company consolidates its sales regions into two commercial units covering the entire world, namely the US and International Operations (IO) (Novo Nordisk AR, 2016, s. 36). Figure 1 illustrates the revenue contribution from the US and International Operations.

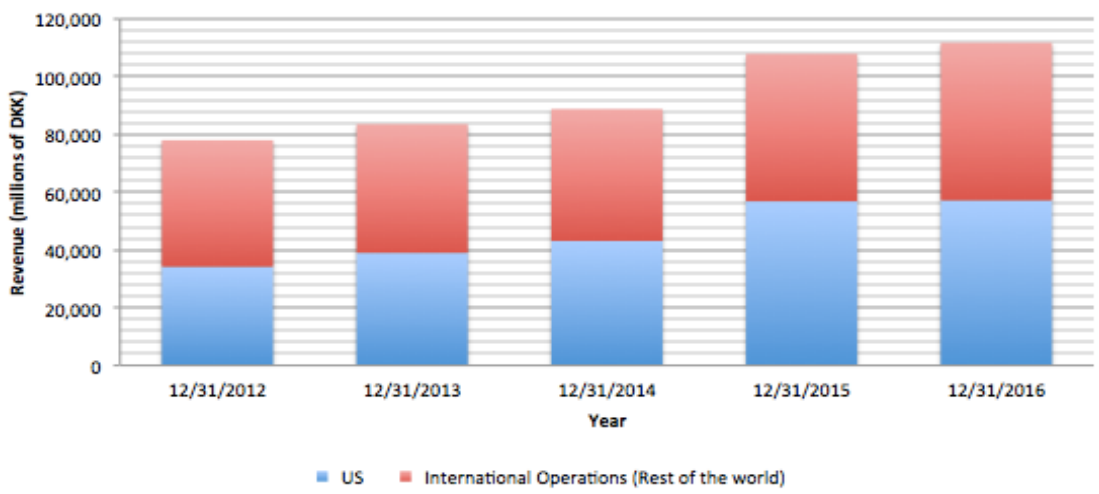

Figure 1: Historical revenue from US and rest of the world
Source: Own creation, based on Novo Nordisk annual reports 2012-2016

In the last five years the group revenues is increased from DKK 78.026 millions in 2012 to DKK 111.780 millions in 2016, reflecting a compounded annual growth rate of 7.5%. Also, the figure shows that the fraction of sales from the US has increased from 43.9% in 2012 to 51.2% in 2016, emphasizing the importance of the US market for Novo Nordisk' historical revenue growth.

International operation is responsible for half of Novo Nordisk's total revenue. Covering 95% of the world population the unit is clustered into four regions; region Europe, region China, region Pacific and all other countries. Region Pacific includes Canada, Japan, South Korea, Australia and New Zealand. Except for US, Novo Nordisk does not report detailed sales on the individual countries but do so on regional level, see figure 2 for regional sales in the latest fiscal year.

Figure 2 illustrates that the US is the largest market with of 51% of the total revenue. The European region is the second largest market with 19% of the total group sales. The accumulated sales in EU and the US make 70% of the total group sales. The next largest market is region China with 9% share of the total group sales, followed by region pacific with an 8% share.

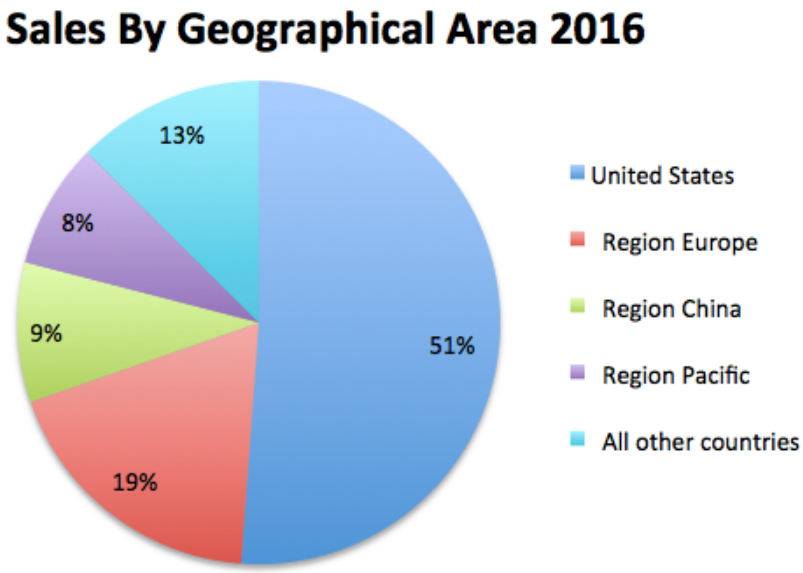

Figure 2: Novo Nordisk FY 2016 sales by geographical regions
Source: Own creation, based on (Novo Nordisk AR, 2016)

2.3 Disease areas

Novo Nordisk operates in two business segments: diabetes care and biopharmaceuticals. Diabetes care is the largest of the segments, and represents about 80% of the total sales, see figure 3.

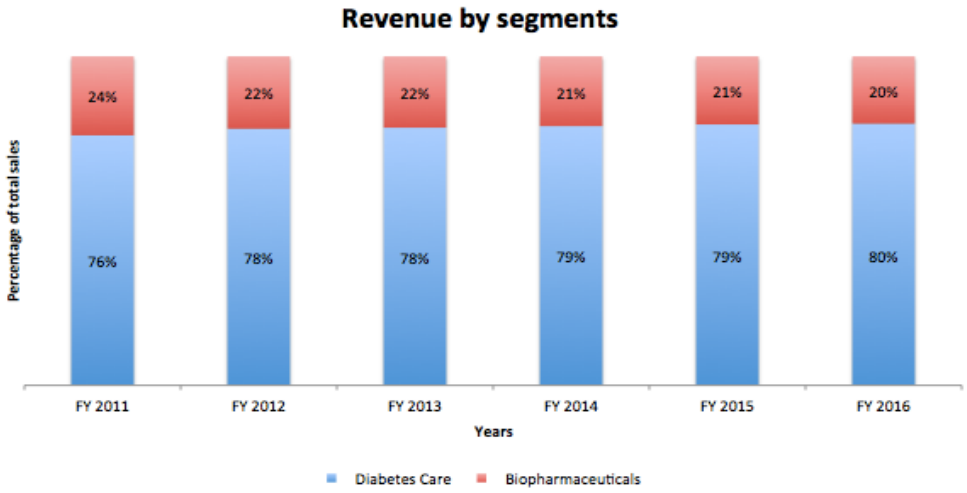

Figure 3: Historical revenue by segments.
Source: Own creation, based on Novo Nordisk Annual Reports 2011-2016

In the diabetes care segment Novo Nordisk research, develop, produce and market products related to insulin, glucagon-like peptide-1, oral anti-diabetic drugs, and obesity, and in the biopharmaceutical segment they research, develop, produce and market products for haemophilia, growth hormone disorders and hormone

replacement therapy (Novo Nordisk AR, 2016). The insulin and glucagon-like peptide-1 segments is the cornerstone of Novo Nordisk as they represent 80% of sales. See appendix 1 for historical sales development on each sub segment.

All of the diseases Novo Nordisk work on are either inherited or lifestyle diseases, and common for all of the medications related to the diseases is that they are all based on proteins, they are all prescription based, and they are all related to chronic diseases. In the following the most important diseases will be elaborated.

2.3.1 Diabetes

Diabetes is a chronic disease categorized in two main types. *Diabetes type 1* is characterized by the body's inability to produce *insulin*[1]. Diabetes type 1 occurs suddenly and typically affects adolescents and comprises about 10% of the diabetic population (IDF, 2015). *Diabetes Type 2* is characterized by the body's inability to produce enough insulin or to properly use the insulin it makes. Diabetes type 2 comprises about 90% of the diabetic population (IDF, 2015).

Diabetes type 2 is caused by interplay of genetic and environmental factors, including unhealthy diet, physical inactivity and excess weight, and is as such in contrast to diabetes type 1 developing over time (IDF, 2015). While diabetes type 1 patients must inject insulin on a daily basis, the treatment of diabetes type 2 patients depends on the degree of the functionality of beta cells[2], see figure 4.

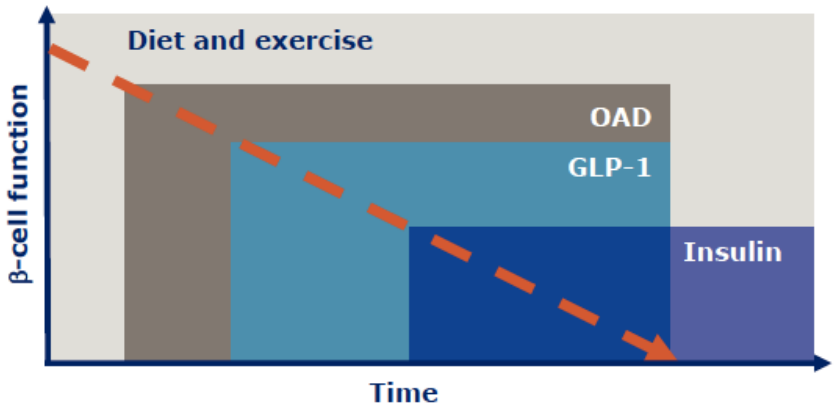

Figure 4: Progression of type 2 diabetes and treatment intensification.
Source: (Novo Nordisk Investor Presentation Q1, 2017)

Figure 4 illustrates that, as the functionality of beta cells decrease, the treatment of diabetes type 2 intensifies, starting from oral antidiabetic (OAD) medication to

[1] *Insulin* is a hormone produced in the pancreas, which allows the body to use glucose in the blood
[2] *Beta cells* has the task of activating the production of insulin in the body

glucagon-like peptide-1 (GLP-1)[3] injections and finally to insulin treatment once the beta cells fully lose their ability to produce insulin. Novo Nordisk operates in all of the above diabetes segments though has the primary focus on the GLP-1 and insulin segments, in which they are positioned as global market leaders (Novo Nordisk Investor Presentation Q1, 2017). The insulin market is subdivided in three segments, namely fast-acting insulin, premix insulin and long-acting insulin. In each category Novo Nordisk has a number of different generation of products available. Currently, Novo Nordisk offers human insulins, modern insulins and new-generation insulins to the three insulin segments.

The insulin and GLP-1 segment accounts for 80% of total group sales of Novo Nordisk and 93% of the sales in the diabetes care segment, see figure 5. The rest of the revenue in the diabetes care segment is from obesity and oral antidiabetic products. The revenue from the latter is less than 5% and has decreased every year since 2010, and furthermore it is not expected to make a key revenue driver for the future.

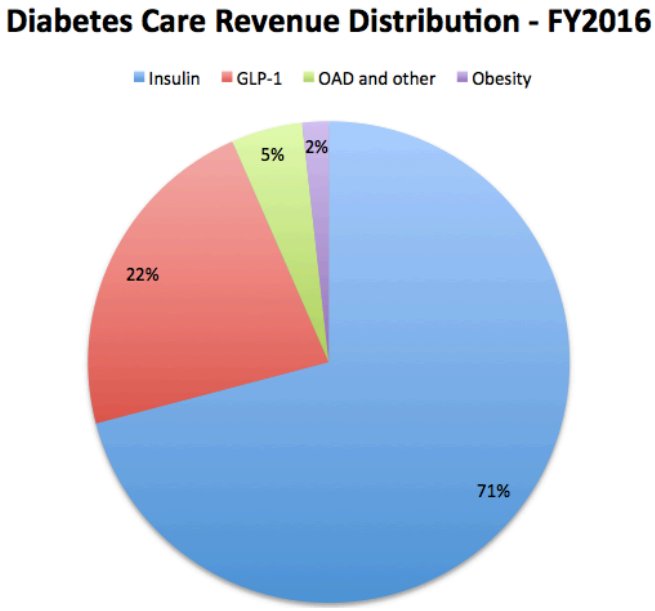

Figure 5: Diabetes Care Revenue Distribution FY 2016.
Source: Own Creation based on (Novo Nordisk AR, 2016)

2.3.2 Obesity

Obesity is a condition where excessive body fat accumulation is at a level that may cause significant health complications, such as type 2 diabetes, high cholesterol and certain types of cancers, to name a few. Obesity is usually measured with the

[3] *Glucagon* is a hormone produced in the pancreas, whose function is to activate the liver to release stored insulin when there is a glucose deficit in the blood stream

body mass index method (BMI)[4], where a BMI greater than 25 is considered as overweigh and a BMI equal to or greater than 30 considered as obesity (Who.int/Obesity, 2016). Obesity is mainly caused by long-term unhealthy diet consumption and lack of physical activity, and may also to some degree be influenced by environmental, psychological and genetic factors (Obesityaction.org/Obesity).

The global obesity population counts more than 600m people, however the market for anti-obesity medication (AOM) is relatively new, and only 4% of the obesity population is treated with prescription based medication (Novo Nordisk Investor Presentation Q1, 2017). Novo Nordisk entered the obesity market in 2015 with Saxenda®, which currently represent 1.5% of total group sales and 5% of the sales in diabetes care.

2.3.3 Haemophilia

Haemophilia is primarily an inherited disorder that prevents the blood from clotting due to the body's inability to make blood clots, also known as factors (Nhlbi.nih.gov, 2013). There are 13 factors needed for the blood to clot properly, and without treatment, uncontrolled internal bleeding can cause significant health complications (Haemophiliacare.co.uk, 2016). There are many different types of bleeding disorders but the two main types are, haemophilia A that occurs due a deficiency of clotting factor VIII, and haemophilia B that occurs due to the lack of clotting factor IX. There is an estimated 493.000 people worldwide living with haemophilia, of which approximately 350.000 are haemophilia A patients, and 70,000 are haemophilia B patients. Other haemophilia types are more rare (Novo Nordisk AR, 2016).

Novo Nordisk's sales from the haemophilia segment is primarily driven of NovoSeven® in the Factor VII segment. Novo Nordisk has currently limited presence in the haemophilia A segment and no presence in the haemophilia B segment. The haemophilia segment of Novo Nordisk represent about 9% of group sales, and is the largest segment within biopharmaceuticals, with 46% of revenues, see appendix 1 and figure 6.

[4] *BMI* is an index of weight-for-height, and is defined as a person's weight in kilograms divided by the square of his height in meters.

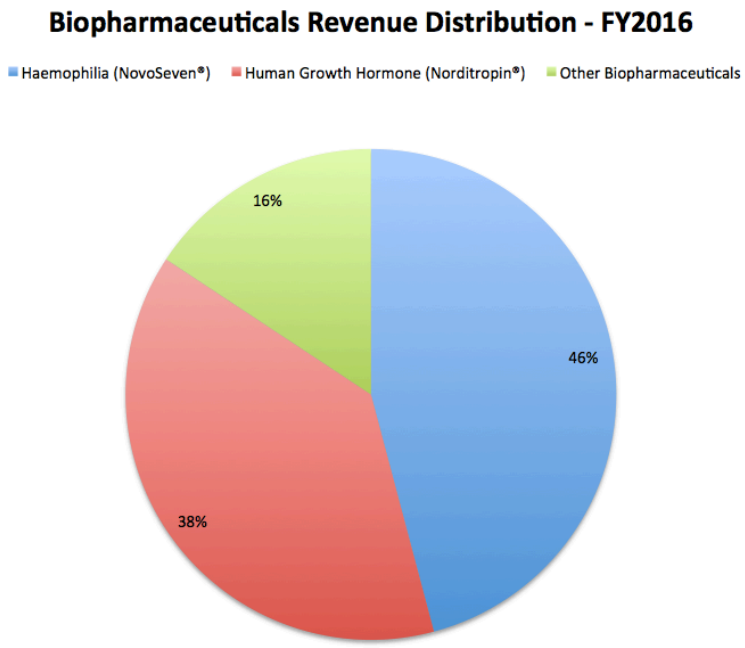

Figure 6: Biopharmaceuticals Revenue Distribution for fiscal year 2016.
Source: Own creation, based on (Novo Nordisk AR, 2016)

2.3.4 Growth Hormone Deficiency

Growth hormone deficiency is a condition where the body does not produce enough *growth hormone*. Growth hormone is a protein responsible of stimulating body growth and contributes to keep muscles, tissues and bones healthy. Growth hormone deficiency can be inherited or acquired, commonly due to illness or accidents that affect the brain (Novonordisk.com/Growthhormonetherapy, 2015). The most common treatment for growth hormone deficiency is human growth hormone (HGH) injections into the body. In the HGH segment Novo Nordisk is global market leader with the blockbuster Norditropin® (Novo Nordisk AR, 2016). The HGH sales represents 8% of Novo Nordisk's group sales and accounts for 38% of the sales in the biopharmaceutical segment, see appendix 1 and figure 6.

3 Macro Environment

For valuation of a company, it is essential to understand macro factors that might impact the company's development and performance. For this purpose the SLEPT analysis is used. This analysis is about analyzing the social, legal, economic, political, and technological factors that on a macro level can affect the future operation and earnings of a company. In the following each of the macro environmental factors will be analyzed.

3.1 Social Environment

As explained earlier, Novo Nordisk predominantly produces medication for inherited (diabetes type 1, haemophilia & growth disorders) and lifestyle diseases (diabetes type 2 & obesity). In this section, the sociocultural and demographic factors, which are expected to impact the market potential of the segments related to Novo Nordisk, will be analyzed

3.1.1 Increasing world population

The world population today is about 7.5 billion, and according to the United Nations Department of Economic and Social Affairs' latest report it is projected to increase to 8.5 billion by 2030, 9.2 billion by 2040 and 9.7 billion by 2050 (Un.org/Worldprojection, 2015), see figure 7. Population growth rates are expected to decline gradually. The numbers in figure 7 indicates that until 2030 the world population will increase 0.97% annually, and then 0.75% and 0.60%, respectively for the periods 2030-2040 and 2040-2050. Assuming that the amount of people with inherited diseases as a minimum follows the development in the world population, it will be expected that the global population growth rates will have positive effect on revenues of Novo Nordisk.

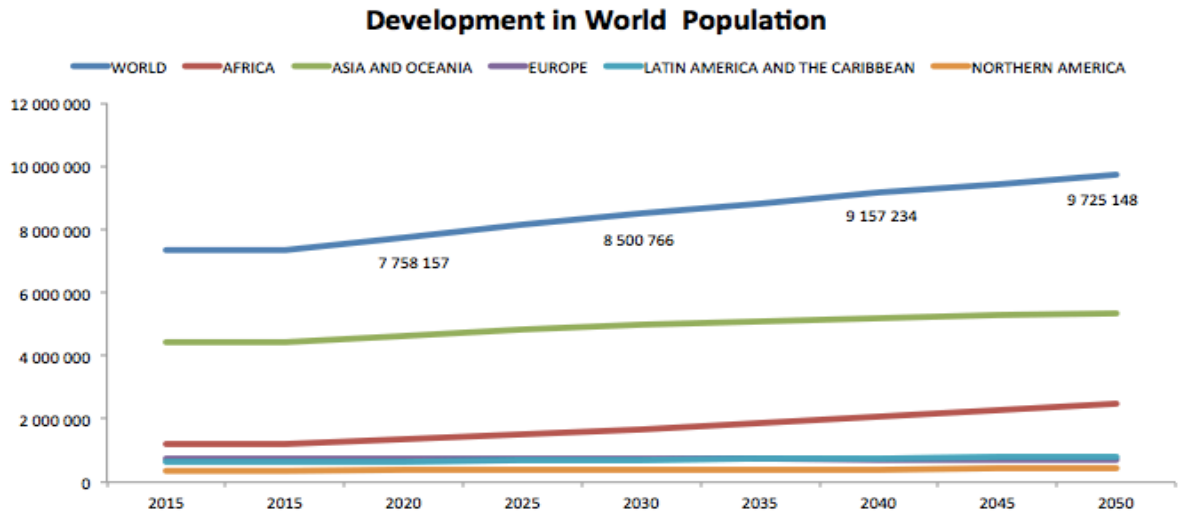

Figure 7: Population development at global and regional level.
Source: Own creation, based on data from United Nations Department of Economics and Social Affairs.

3.1.2 Ageing global population

In the same report United Nations suggest that the proportion of older people (60 or above) will more than double by 2050. The most significant increase is expected to happen in Europe, where 34% of the population is projected to be 60 years or above by 2050 compared to the current level of 20%, followed by Latin America, Caribbean, and Asia, where the proportion is expected to increase from current 11-12% to more than 25% (Un.org/Worldprojection, 2015). Given that type 2 diabetes develops over time and often is diagnosed at a later age, the increased global age population, especially in Europe that accounts for the second largest market for Novo Nordisk, is expected to present a positive driver on future revenues.

3.1.3 Increasing urbanization

Currently, an estimated 55 percent of the world's population lives in urban areas and by 2050 the urban population is expected to represent 66% of the global population, with most significant increases in the developing part of the world. Currently, the most urban regions include North America (82%), Latin America (80%) and Europe (73%), while the least urbanized regions include Africa (40%) and Asia (48%) (UN DESA, 2014).

3.1.4 Increasing obesity levels

Urbanization brings with it lifestyle changes such as unhealthy diet consumption and reduced physical activities due to changing modes of transpiration and increasing sedentary nature of many forms of work (Who.int/Obesity, 2016)

The increased urbanization and lifestyle changes have caused a significant increase in the level of obesity. According to an analysis from WHO 1.9 million adults are either overweight or obese, of which about 600m is clinical obese (Who.int/Obesity, 2016). The increase in global obesity rates is substantial and widespread in both the developed and developing part of the world. In the last 3 decades no country in the world has managed to decrease the obesity growth rates, supporting the fact that obesity will continue to increase, though significantly more in in the low –and middle income countries as income levels rise (Who.int/Obesity, 2016).

United states accounts for 13% of the world obesity population and is by far the country with most obese people, followed by China and India who accumulated represent 15% of the obesity population (Murray & Ng, 2017). In United States 36.5% of the adult population has obesity, representing 80 million people (Novo Nordisk AR, 2016, s. 35), and the share is expected to increase to 50% by 2030 and even pas 60% in some states (Trust for America's Health, 2012). In Europe, obesity rates are also projected to increase by 2030, though with significant growth differences between countries, with the most significant increases expected to happen in Ireland, Greece, Spain, Sweden, Austria and the Czech Republic (Breda, 2015).

The increase in obesity in the United States and in the world supports Novo Nordisk's future revenues in the diabetes segment and increases the probability of their success in the obesity segment.

3.1.5 Increasing diabetes population

Diabetes is one of the largest global health emergencies of the 21st century. The number of people diagnosed with diabetes has increased over the last 50 years, and continue to increase every year. The World Health Organization (WHO) reports that diabetes is currently the 8th leading cause to death and projects it to be the 5th leading cause to death in 2030 (Who.int/Healthstatistics). According to the International Diabetes Federation (IDF) 415 million adults live with diabetes and additional 318 million adults live with impaired glucose tolerance, which puts them at high risk of developing the disease in the future (IDF, 2015, s. 12). The number of diabetes patients is expected to increase from 415m to 642 million by 2040, indicating a constant annual growth rate of 1.8% which is significantly higher than the global population growth rate for the same period, see table 1 below.

(m people)	2015	2040
North America and Caribbean	44	61
Europe	60	71
Middle East and North Africa	35	72
South and Central America	30	49
Africa	14	34
Western Pacific	153	215
South East Asia	78	140
Total	415	642

Table 1: Estimated number of people with diabetes worldwide and per region in2015 and 2040. Source: Own creation, based on data from (IDF, 2015)

The most significant increase is to come from diabetes type 2, which is the most prevalent form of diabetes and comprises about 90% of the diabetes population. The ageing global population, economical development and increased urbanization are major trends that have substantial impact on the diabetes growth rate. There is especially a significant relationship between urbanization and diabetes type 2. Currently, 2/3 of the diabetes population live in urban areas but this ratio is expected to increase to 3/4 by 2040 (IDF, 2015). Type 1 diabetes is the less common type of diabetes and according to IDF it is increasing by approximately 3% each year globally.

There is yet serious challenges and unmet needs in the treatment of diabetes, as only about half of the people estimated to have diabetes are diagnosed, and only half of those diagnosed receive professional care, of which only half reach their treatment targets, a scenario known as the rule of halves (IDF, 2015). This challenge further supports future revenue potential for Novo Nordisk.

3.2 Legal Environment

In the following section the most important factors in the legal environment related to the pharmaceutical industry will be analyzed.

3.2.1 Intellectual Property Protection

Research and development of new drugs is the foundation of the existence of pharmaceutical companies. Research and development is both time consuming and expensive, and unlike many other industries there is a significant relationship between research and development activities and future earnings in the pharmaceutical industry (Lehman, 2003). Consequently, pharmaceutical companies

rely highly on intellectual property protection mechanisms in order to protect and receive a return on their investment.

Patent rights are limited in duration and according to the World Intellectual Property Organization (WIPO)[5], whose member countries among others include United States, the European Union, China and Japan, the global standard is 20 years from the date of filling the application (Wipo.int/Patents). However, different from other industries, the culture in the pharmaceutical research industry emphasizes very early disclosure of inventions, usually long before a product is ready to be placed on the market (Lehman, 2003), and this gives pharmaceutical manufacturers shorter periods of patent exclusivity than the legislative 20 years.

In addition to the lengthy time period between patent filling and the final development of a drug, the patent term is further reduced by the time regulatory offices use to evaluate a market authorization application. For this reason, many sovereign states permit a patent applicant to apply for an extension of the patent term to compensate for the inability to market inventions due to safety and efficacy regulations. The time periods permitted for such an extension is however not equal to the time lost in ability to market. In United States patents can be extended for the time spent by the FDA on the regulatory review period after the issuance of the patent while in the European Union, patents can be extended with the period that goes from the filling of the patent application to receipt of the first marketing authorization approval. However, in both markets the maximum patent term extension is 5 years. Similar to the US and the EU, Japan permits a maximum extension of 5 years. In China and India, both future growth markets, the legislations do not permit for patent term expansions (Hojberg.com).

However, once a patent term is extended, the exclusivity right of use do not follow. This permits generic and biosimilar competitors to use the product for test and development of alternatives while the patent is still on and to market the alternative the moment the patent of the branded-drug expires (Murphy, 2015).

3.2.2 Introduction of biosimilars

In 2010, the US government changed the patient protection and affordable care act, creating a shorter licensure pathway for biological products that are categorized to be biosimilars with a biological product previously approved by the FDA (Felix, Gupta, Cohen, & Riggs, 2014). The first biosimilars was though not

[5] *WIPO* is a specialized United Nations Agency that serves as the secretariat for administration of most of the global intellectual property treaties

approved until late 2015[6]. At present, the market is still relatively new and the FDA has approved only five biosimilars. Therefore, the effect of biosimilars and their prospect in the US market is yet unknown. However, the European market, which has allowed for Biosimilars since 2006, and to this date approved 20 biosimilars, shows a significant development in biosimilars sales and negative price impact on both the reference branded-drug and the related disease segment (IMS Health, 2016). The introduction of biosimilars in the US is therefore anticipated to increase competition and reduce prices on biological products.

In addition, the regulatory authorities in the EU and the US have recently finalized overarching guidelines as well as specific guidelines to insulin biosimilars for the regulatory approval of biosimilars making the licensure pathway more accessible and more attractive for biosimilars producers (Heinemann, Khatami, McKinnon, & Home, 2015). Accordingly, it is expected that several more insulin biosimilars will make their way to both markets in the near future.

3.2.3 Public funding of healthcare plans – rest of the world

The complicated world of drug pricing gives many challenges for governments to keep costs balanced. In an increasing number of countries policies and price control mechanisms are implemented to keep price gauging in check. The external reference-pricing (ERP) tool[7] is widely implemented across European countries to control for drug prices and ensure that a given country can negotiate or set the price of a medicine using the price(s) in one or several countries as benchmark or reference (European Comission, 2015). The external reference pricing mechanism is currently implemented in most countries in EU, including Switzerland, Iceland and Norway (European Comission, 2015). Worldwide, non-EU countries, such as Brazil, Jordan, Japan, South Africa, Canada and Turkey, do also apply the ERP and often EU member states as reference countries (Rémuzat, Urbinati, Mzoughi, El Hammi, Belgaied, & Toumi, 2015).

In addition to the ERP policy a few European countries use additional mechanisms to further control drug prices, including mechanisms such as, the international non-proprietary name prescribing, tendering, distribution margin, and headline price cut mechanisms. While the extent of the use of the mechanisms vary across countries the aims are to increase the prescription of generic or biosimilar products to brand products through prescription on active ingredients rather than brand name, to lower prices through tendering, to indirectly cut prices through

[6] A biosimilar by Novartis for a drug unrelated to any of Novo Nordisk's product segments
[7] Also called the international price comparison / benchmarking tool

limitations on distributor margins, and directly impose transparent reduction to a medicine's list price (Deloitte, 2013).

These different mechanisms put direct limits on increases to the list price and strengthen the negotiation power of governments to pharmaceutical industries.

3.2.4 Public funding of healthcare plans – United States

Similar to other developing countries, United States spends a significant part of the federal budget on healthcare programs. Medicare and Medicaid are different government-run programs to support people who are 65 or older and people with low-income, respectively. By law, Medicaid is offered a mandatory discount, as drug makers are required to sell drugs to Medicaid at the lowest price anyone is able to negotiate. In addition Medicaid must by law cover all drugs approved by the Food and Drug Administration regardless of their price or efficiency (Time.com/Healthcare, 2016). However, pharmaceutical companies' largest customer is Medicare who spent USD 632 billion in 2015, representing 15% of the total federal budget (Cubanski & Neuman, 2016).

Medicare is divided in four parts through Part A to Part D. While most parts of Medicare are allowed to purchase drugs, most governmental prescription drugs are covered by Medicare part D (Lee, Gluck, & Curfman, 2016). The government-run programmes were initiated in 1965 but the Medicare Part D was not introduced until the Medicare Modernization Act (MMA) of 2003 was enacted, and the act include a "noninterference" clause that prohibit direct negotiations between the government and pharmaceutical companies on drug prices and prevent the government from intervening or developing its own formulary or pricing structure (Lee, Gluck, & Curfman, 2016). In addition, Medicare Part D is required to provide two drugs in each drug class, but must on the other hand include substantially all drugs in six protected disease classes, including antiretroviral, antidepressant, antipsychotic, immunosuppressant, anticancer and anticonvulsant drugs (Shepherd, 2017).

The legislation prohibits the government to directly negotiate price reductions with drug manufacturers or intervene in formulary status for Medicare Part D. Instead, the legislation gives the private insurers the ability to negotiate formulary status for Medicare Part D and the ability to exclude drugs in the formulary for drugs unrelated to the six protected drug classes. As none of Novo Nordisk's disease areas are within the protected drug classes they face high competition for formulary status.

3.3 Economic Environment

3.3.1 Financial Risk

Novo Nordisk operates in a large number of countries. The group sales are reported in Danish Krone, and since less than 1% of the total sales is from Denmark, the total earnings are very sensitive to financial currency risk. The majority of Novo Nordisk's sales are in USD, EUR, CNY, JPY and GBP (Novo Nordisk AR, 2016). In figure 8 the currency fluctuations against the DKK are presented. To make the figures more presentable, the CNYDKK and the JPYDKK is multiplied with a factor 10 and a factor 100, respectively.

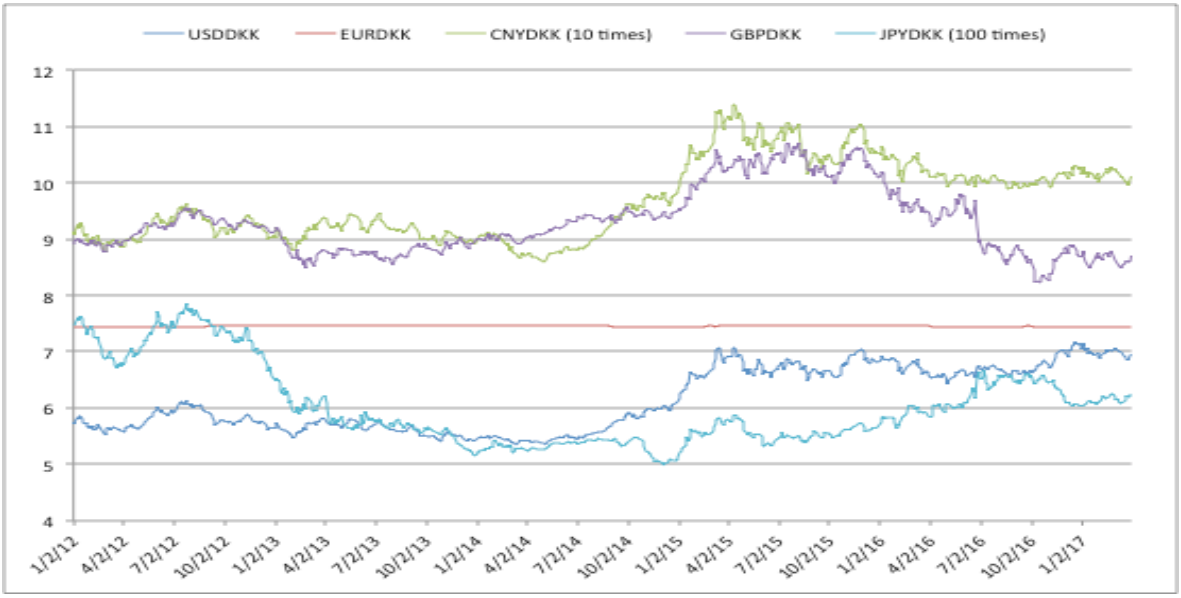

Figure 8: Historical foreign exchange rates against the DKK. The CNYDKK and JPYDKK are presented with factor 10 and factor 100, respectively. Source: Own creation based on exchange rates from Denmark's National Bank (Nationalbanken.dk/Exchangerates, 2017)

As illustrated in the figure the risk towards the EUR is considered low due to Denmark's exchange-rate policy. For the remainder of the major currencies there is a significant volatility and thus foreign exchange risk. For these currencies Novo Nordisk use currency hedging through foreign exchange forwards and foreign exchange options to minimize currency risk up to 24 months forward (Novo Nordisk AR, 2016, s. 83). The currency risk can affect results in both directions and is unpredictable. For 2017 Novo Nordisk estimates that a 5% appreciation or depreciation will have following impact on the operating profit: DKK 2.100m from USD, DKK 320m from CNY, DKK 200m from JPY and DKK 90m from GBP (Novo Nordisk AR, 2016, s. 83). In addition, Novo Nordisk continually assesses the financial contracts and the hedges effectiveness, and hence the key takeaway from the currency risk is that the company has a proper setup to mitigate currency risk.

3.3.2 Economic Development

Businesses are usually affected by national and global economic factors and business cycles, which indicates how organizations, consumers and other stakeholders behave and perform in the market. The pharmaceutical industry is however less sensitive to economic trends as people continue to become ill and still need treatment, irrespective of global economic trends (Behner, Vallerien, Ehrhardt, & Rollmann, 2009).

Figure 9 shows the historical GDP growth rates of the world and the major markets Novo Nordisk operates in. The variation around the financial crisis and the slower GDP growth is clear, especially in China where the growth rate has continued to decrease.

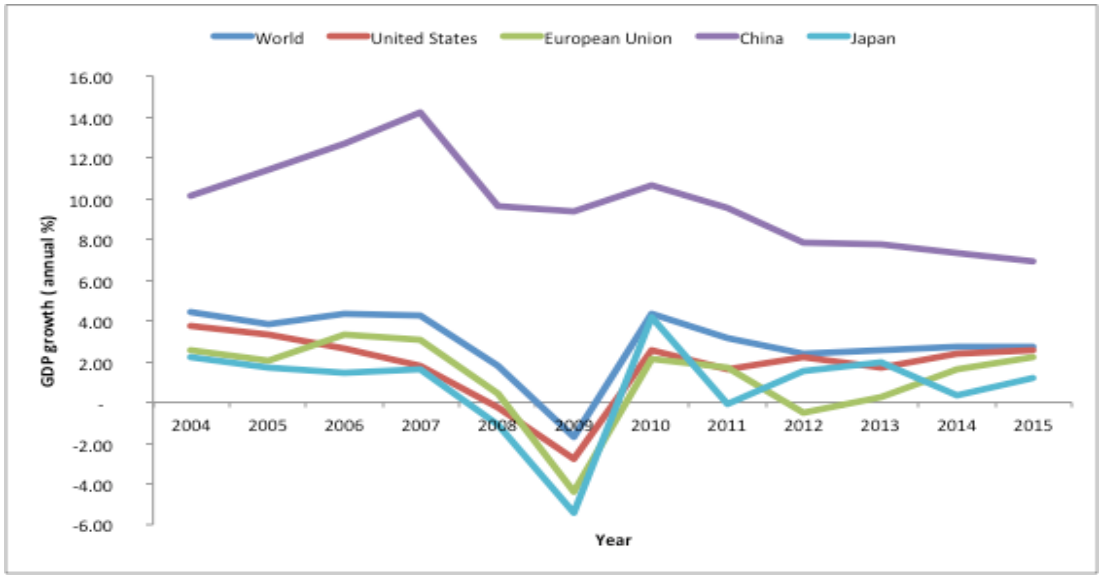

Figure 9: Historical GDP Growth rates of the world, the US, the EU, China and Japan. Source: Own creation, based on data from The World Bank.

Compared to figure 10, with health expenditure per capita and total health expenditure as % of GDP, it is noticed that in most markets the health expenditure per capital has increased despite the lower GDP growth rates, and if looking at the total health expenditure as % of GDP it is obvious that the percentage is relatively stable with slightly increases in most markets despite the high variations and decrease in GDP growth rates.

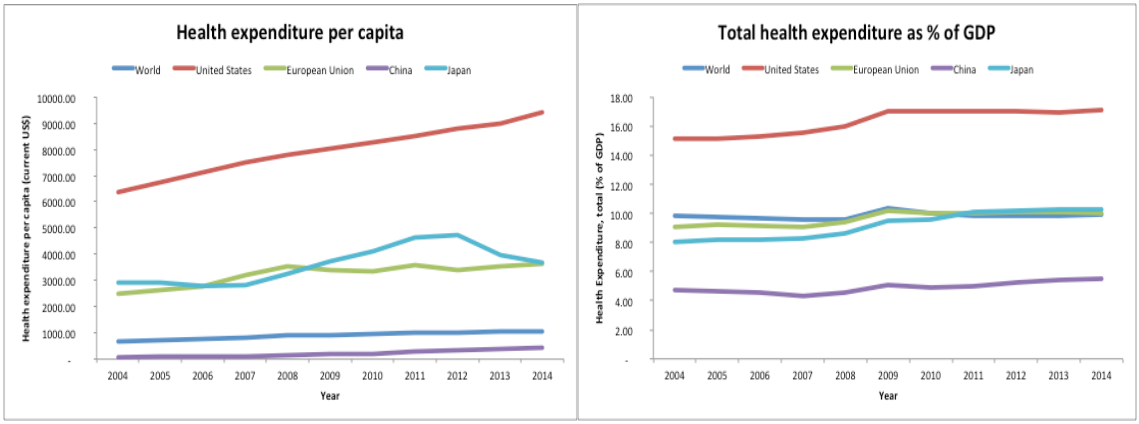

Figure 10: Historical Health expenditure per capita and Total health expenditure as a % of GDP. Source: Own Creation, based on data from The World Bank

This finding supports that the pharmaceutical industry is independent of economic trends, and imply the sector to be a defensive sector. If we further compare the historical GDP growth rates with Novo Nordisk's historical growth rates, as illustrated in appendix 1, no relationship is noticed. In particular, Novo Nordisk has managed higher growth rates than the global GDP growth rate in all of the years five years. This indicates that future forecasts of Novo Nordisk should depend more on the development of individual disease/product markets and market shares rather than the general economic development. In addition, the independence of business cycle should indeed benefit the valuation as it eliminates a significant risk factor many other industries would face.

3.4 Political Environment

3.4.1 Global political pressure

In most developed countries, healthcare expenses represent the largest part of government budgets, see figure 10 above, and consequently it is assumed that economic downturns and low economic growth have indirect impact on government policies and government budget allocation decisions.

Increasing healthcare expenses combined with lower GDP growth rates in many major markets reduce government's ability and willingness to pay for healthcare. In addition, governments increasingly put political pressure on pharmaceutical industries and implement mechanisms to reduce prices on pharmaceutical products. As such governments in Region Europe have implemented austerity measures, the US has introduced biosimilars, and countries in Region China and Pacific has introduced government mandated price cuts (Novo Nordisk AR, 2016, s. 66). It is expected that governments will continue to intensify control of healthcare budgets, leading to further cost regulations to drive down drug prices, increase biosimilar competition, and increase demands for proof of value.

Consequently, in the mentioned regions with high political pressure, future growth is most likely to come from volume growths rather than price increases.

3.4.2 The US political environment

Drug companies charge extremely high prices around the world but no country has it in the political agenda as often as in the United States. This is no surprise as the United States has the highest drug prices in the world. As explained in section 3.2.4 this is partly due to the fact that the regulations in the US allows pharmaceutical companies to charge the list price they want by prohibiting the government to directly intervene in negotiations with pharmaceutical companies contrary other major markets where governments to some extent control price increases through different initiatives.

In the recent months the lack of mechanisms to control the increasing drug prices has once again gained high political importance. The pharmaceutical industry in the country has come under fire for what is called price gauging. It started as an important political agenda during the presidential election in 2016 and has to some surprise continued post the election of President Donald Trump. The president has at several occasions expressed his criticism of the high prices and the negotiation power pharmaceutical companies posses. He has even called for legislation changes to allow for import of "cheaper" drugs and to force drug companies to negotiate directly with government on prices in Medicare (Usnews.com, 2017). However, if we take into account the strong pharmaceutical lobbies in the US (Bloomberg.com/Pharma, 2017) and President Donald Trump's failure to yet implement any of his initial ideas there is a high possibility that no changes will be made. Nevertheless, it is a fact that several key politicians from both the Republicans and the Democrats have warned pharmaceutical companies of their high prices and therefore it might be expected that the political pressure on pharmaceutical companies will continue but exactly what legislation changes it might imply and when it will be due is still unknown. This fact is also acknowledged by the management of Novo Nordisk, which expects healthcare reforms in the US but not in the short term. Even though no healthcare reforms are expected for the time being, the high political risk and the public attention towards the high prices has caused some pharmaceutical companies to limit their future price increases. Novo Nordisk is one of the companies who following public criticism of their high price increases on their insulin products announced to limit all future list price increases to no more than single-digit numbers annually (Fiercepharma.com/Novo, 2016).

3.5 Technological Environment

3.5.1 Technological development - the key to maintaining competitive

In the pharmaceutical industry the technological aspect is of high importance. Usually the time for technological obsolescence is equal the term of the patents, and companies must continually innovate newer technologies to provide new and better products to maintain competitive. Hence, the research and development (R&D) activities become one of the most significant competitive parameter in the industry, which is supported by the high R&D spending in the industry. Studying the reformulated statements of Novo Nordisk, Eli Lilly and Sanofi the importance of R&D is clear, as they over the five years in average have spent between 13%-24% of their sales on R&D. Therefore, it is legit to conclude that future earnings of established companies is in their ability to innovate new and improved products to survive and maintain a market position or improve existing market positions.

3.5.2 Increased M&A activity for technological assets

Since 2013 the number of mergers and acquisitions in the pharmaceutical industry has increased significantly. The most interesting trend is the shift in the development stage of the assets when the deals are announced. Independent of therapy area, increasingly more assets are acquired at earlier stages of the development phase, i.e. the proportion of deals for preclinical assets is increasing while the proportion of deals for approved assets has dropped (Vitez & Harrison, 2016). This support the importance of technological development for future R&D pipelines to keep up with competitors.

Until recently, Novo Nordisk only focused on in-house research and development, unlike its competitors Eli Lilly and Sanofi, but following increased competition Novo Nordisk has changed its strategy to follow the global pharmaceutical trend and supplement the internal research and development activities with in-license and acquisitions (Novo Nordisk AGM, 2017, s. 7). Novo Nordisk is the leading player in the diabetes segment and it can therefore not be easy to find attractive external innovations in this area, consequently the new M&A strategy is more likely to support the biopharmaceutical segment. With the new strategy of adding high potential bolt-on acquisitions to the research and development pipeline, Novo Nordisk has removed one of the disadvantages it had to its competitors, as its previous policy limited it to acquire any external technologies of high quality. The new strategy is expected to increase the potential of the R&D pipeline in the biopharmaceutical segment. However, this will also bring higher costs, as M&A deals in the pharmaceutical industry are fairly overpriced.

3.5.3 Increased industry focus on digital health

The external improvement in the technological area including big data and artificial intelligence has increased the bar for innovation and it is no longer enough to have superior data from clinical trials as payers are increasingly demanding real-world data to assess the actual outcome of the "product" they agree to pay for (Novo Nordisk AR, 2016, s. 32). For this purpose Novo Nordisk has partnered with IBM Watson Health, who is specialized in collection and analysis of big data in the healthcare sector. The collaboration involves development of systems to collect real-time data from patients using Novo Nordisk devices and analyze the data to get new insight that can lead to improved solutions for diabetes management (Novonordisk.com/Pressrelease, 2015). In addition to improve the future R&D pipeline, the collaboration is intended to improve Novo Nordisk's negotiation position with payers.

Given the increased digitalization in the healthcare sector, a digitalization step by Novo Nordisk is an important step for the future. Novo Nordisk is though not the only pharmaceutical company to partner with a software developer or to make use of artificial intelligence. Several players in the overall pharmaceutical industry has already partnered with tech companies (Meddeviceonline.com, 2015), including Sanofi who has partnered with Alphabet's (owner of Google) life science firm Verily in a diabetes joint venture with the aim to combine devices with services (CNBC.com/Healthcare, 2016).

Furthermore, following a trend with increased use of smartphone applications to make life more convenient, Novo Nordisk has announced a partnership with Glooko to develop an electronic health platform to people with diabetes. Glooko is a leading remote patient monitoring platform for diabetes that syncs with most popular diabetes devices and major fitness and activity trackers (Glooko.com/Pressrelease, 2017). The purpose of the collaboration is to develop platforms to deliver personalized services to assist patients with diabetes in areas including treatment adherence and blood glucose management (Digitalcommerce360.com, 2017).

The digitalization within the pharmaceutical industry is indeed very important, and the industry is likely to go through significant digital transformations. However, due to the scope of the thesis the technological disruption will not be covered further. The key point to take from the above analysis is, that digital health is a hot topic and Novo Nordisk is with its recent collaborations with IBM Watson Health and Glooko in a good position going forward. However, as the digital health strategy is relatively new the outcome and impact on future earnings is yet unknown.

4 Industry Analysis

In this section Porter's five forces model is applied to understand the competition and attractiveness in the segments Novo Nordisk operates in. As it was explained in section 2, Novo Nordisk operates in different segment. It is believed that most of the factors affecting one segment will also affect all other segments. Therefore, in the Porter's five forces model the threats and bargaining power analysis will be on pharmaceutical industry level while the rivalry between existing competitors will look at the different segments Novo Nordisk operates in.

4.1 Threat of new Entrants

The threat of new entrants affects the competitive environment for existing companies and influence the ability of existing companies to achieve profitability. A high threat of entrants means new players are likely to be attracted to the profits and can enter the industry with ease. New players entering the market can threaten or decrease the market share and profitability of established companies in the industry and may result in changes to product quality or price levels. A high threat can make the industry more competitive and decrease profit potential for established companies. A low threat, on the other hand, makes an industry less competitive and increases profit potential for established firms as barriers to entry deter new entrants (Strategiccfo.com/Entrants, 2013). The level of entry and exit barriers in an industry determines the threat of entrants. In the following the most significant barriers in the pharmaceutical industry will be analyzed in order to understand the potential threat of new entrants.

4.1.1 Economies of Scale: Important

Pharmaceutical companies are global companies that sell large amounts of drugs throughout the year, and given the high initial capital requirements one must sell large amounts to break even. It indicates the importance of economies of scale as a barrier for new entrants, as it may be difficult for new players to attempt to produce the same amounts as established pharmaceuticals. Established pharmaceutical companies like Novo Nordisk have already large and well established infrastructures and distribution networks, and better marginal economies that can take new entrants long time to achieve (Investopedia.com/Entrybarriers, 2015).

4.1.2 Capital Requirements: High

The pharmaceutical industry requires heavy investments in manufacturing facilities, commercial operations and research and development facilities. The high capital requirements represent both entrance and exit barriers, as it might be very hard to leave the industry after significant investments, especially with fixed assets, which can be challenging to sell without taking on heavy losses. The manufacturing costs could be outsourced to reduce the initial investment but then the potential entrant will face higher marginal costs compared to established companies and consequently compete on worse conditions. The most significant cost is though the research and development part of the value chain as there is a large liquidity demand for this activity before any products are ready for marketing approval. On average, it can take 10 to 13 years for a new drug to complete the journey from initial discovery to approval (Bogdan & Villiger, 2010). Including the costs of drug failures, the average cost to research and develop a successful drug is estimated to be USD 2.6 billion. In the process thousands and sometimes millions of compounds can be screened and assessed in the early R&D process, and only a few of those will ultimately go to a clinical testing of which less than 12% will ultimately receive approval (Phrma, 2015).

This indicates that a potential entrant needs significant capital for the manufacturing and commercial operations, and substantial amounts of liquidity to the research and development process, as negative cash flows might be expected in the 10 to 13 years the journey from idea to market place take. All together the high capital requirement make threat from new entrants low.

4.1.3 Regulatory processes: Complex and Expensive

Given high initial manufacturing and research & development costs, most countries have implemented regulatory barriers on the pharmaceutical industry, which makes it difficult for new entrants to enter the marketplace. Pharmaceutical companies that want to enter a marketplace must be granted a special market authorization by the related institution. In the United States the Food and Drug Administration (FDA) and in Europe the European Medicines Agency (EMA) is responsible for the authorization. The processes typical take long time, are expensive and require many documents and there is no guarantee of any approval. Estimates suggest that the average suggested time for a decision by the FDA is 17 months. Moreover about 93% of applications are not approved the first time and of those 66% are not approved the second time either (Investopedia.com/Entrybarriers, 2015). The longer time it takes the regulatory offices to approve a product, the more costly it becomes for the sponsor, and in

addition it gives the established pharmaceutical company opportunity to apply for a special market exclusivity right or in another strategic way create a longer temporary monopoly. Though, the latter situation is only possible if the new entrant enters the market with a copy product, a generic or biosimilar.

4.1.4 Intellectual Property Mechanisms: High Protection

Intellectual property rights prohibit anyone to commercially make, use, distribute or sell a product or formulary that is patented. Patents therefore function as very tight regulatory barriers for new entrants. As discussed in section 3.2.1 most countries, including the United States, the European Union, China and Japan operates with patent lengths of 20 years from the date of filling, while US and EU patents in addition can be extended for some of the time lost during the regulatory approval. Furthermore, in the US legislation gives pharmaceutical companies the opportunity to apply for a time limited market exclusivity right, which depending on the time of application can go beyond the formulary expiration date. Established companies often use the initial patent, market exclusivity rights and other different life cycle strategies to defend and extend their patents, which make it very difficult for a new entrant to get market authorization for a generic or biosimilar product (Investopedia.com/Entrybarriers, 2015)

4.1.5 New legislative pathway for Biosimilars

Once a patent expires generics or biosimilars[8] can enter the market. In the pharmaceutical industry one distinguish small-molecule drugs from biological drugs. All Novo Nordisk products are biological drugs. Given the complexity of the chemical structure and analytical characterization, biological drugs are very difficult to manufacture identical copies of and consequently very few generics are available for biological drugs. As discussed in section 3.2.2, to change the lack of generics in the biological drug segments, legislation in major markets has changed to give abbreviated licensure pathway for biosimilars once patents expire.

In November 2016 the FDA approved the very first biosimilar insulin in United States, Basaglar (insulin glargine), sponsored by Eli Lilly, and which is biologically similar to Sanofi's basal insulin Lantus (insulin glargine). The legislation that allows the FDA to approve biosimilars is relatively new in United States. In the EU, the European Medicines Agency's (EMA) pathway for biosimilars was already introduced in 2006, indicating that it might be easier to introduce a biosimilar in the EU than in the US, which is supported by the fact that the biosimilar insulin

[8] *Biosimilars* are drugs that are highly similar to the reference product. They are identical in the active ingredients but can differ in the inactive ingredients, contrary to *generics* that are completely identical versions of the reference products.

glargine from Eli Lilly was approved and launched in the EU already in 2015 (under the brand name Abasaglar), more than a year before it was approved and launched in United States. Basaglar/Abasaglar is the first biosimilar insulin product to be launched in the world. The insulin biosimilar segment is still relatively new, and there is little evidence available to assess exactly how it will impact the diabetes care market going forward. However, lessons can be taken from the European Union where 20 biosimilars in other pharmaceutical segment than diabetes care has been introduced. An analysis from IMS Health shows that in the last 10 years, the introduction of biosimilars has increased competition, which has affected not just the price of the direct comparable product but also has had an affect on the price of the whole product class. In addition, it has had similar impact on the total therapy area price as it has on the biosimilar/reference product price. (IMS Health, 2016). The statistics of IMS are majorly based on four therapeutic areas, where human growth disorders is one of them. In Europe, biosimilars have been in the market for human growth hormone from 2007 through 2011 and had a significant impact on the market. The price statistics shows that in the period, across the Europe, in average the prices in the biosimilar accessible market, i.e. the market that use the same molecule (Somatropin), where Novo also offers Norditropin, has experienced a price per treatment of -19% while the whole therapeutic area, human growth hormone decreased 13%. We can therefore assess that the introduction of biosimilars will have a negative impact on prices and future earnings due to increased competition from both established players in the segments and other pharmaceutical companies, which aim to extend their product portfolio.

Thus, the legislation change is expected to increase competition and lower prices in the pharmaceutical industry (Diatribe.org/Biosimilar, 2016). Prior to the legislative change, biosimilars were not allowed. Therefore the abbreviated licensure pathway for biosimilars means established pharmaceutical companies within the biological drug segments face higher threat from new entrants as patents for major products expires.

4.1.6 Summary of Threat of New Entrants

The entry barriers overall are high. There are high capital requirements, including significant cost advantage to established companies due to economies of scale. There are high legal barriers with long and complex regulatory approval processes and effective patent protection mechanisms. The barriers are effective for new entrants that are originally are not pharmaceutical companies. However, the barriers are relatively lower to already existing pharmaceutical companies that want to expand their product portfolio. The changed legislation in the US and the EU for abbreviated licensure pathway for biosimilars further eases the barriers for

existing pharmaceutical firms to enter new segments with copy products. This last point constitutes a significant threat for established companies like Novo Nordisk. Consequently, I assess the threat to be low from new entrants outside the pharmaceutical industry but medium to high from new entrants within the pharmaceutical industry, suggesting high future profit rates though at lower growth rates than historical levels.

4.2 Threat of Substitutes

Threat of substitutes is defined as the availability of alternative products that consumers can purchase instead of the products offered by the established companies in the industry. The potential risk of substitution affects the competitive environment in the industry and limits established companies' potential returns, because consumers can choose to purchase the substitute instead of the product of the industry. (Strategiccfo.com/Substitutes, 2013).

As described in section 2.4 diabetes type 1, growth hormone disorder and haemophilia are chronic inherited diseases that can only be treated with drug injections. Therefore, there is no other alternative for these diseases than medicine. For obesity and diabetes type 2, a healthy lifestyle can help but once the patient reaches clinical obesity or the beta cells become nonfunctional, also here there are no alternatives to medicine. As such, the threat from substitutes is assessed to be low.

4.3 Bargaining Power of Suppliers

In the pharmaceutical industry, the most significant suppliers are suppliers of raw materials for the production, and human resources for operations and development of expertise and knowledge.

The most significant raw materials Novo Nordisk use represents energy, water, chemicals, starches, and sugar. It is all common and readily available raw materials with relatively low price volatility. However, a few specific raw materials are less available, and for such raw materials, it is Novo Nordisk's policy to develop close and long-term relationships with the suppliers (Wikinvest.com/Rawmaterials). In overall, the negotiation power of raw material supplier is low.

Human resources are very essential for the pharmaceutical industry, as knowhow and continually knowledge creation is the pharmaceutical companies fundament of future existence. In contrary to raw materials, knowledge is a scarce resource

and therefore there is a higher competition between pharmaceutical companies to recruit the most talented employees. To attract talented people pharmaceutical companies offer several employee benefits, such as personal development opportunities, work-life balance, maternity leave, prestige, etc. This development in general makes the pharmaceutical industry a very attractive place for employees. Meeting the employee demands is not a problem for Novo Nordisk either and is ranked as the 73rd best company to work for by Fortune due to its culture that is "different in a good way", an environment that is "friendly" and "honest", and a management that focus on physical and emotional well being of employees (Fortune.com/100, 2017). Novo Nordisk is the only of its competitors in the diabetes market to be on the "100 best companies to work for in 2017" list by Fortune. But, according to Glassdoor, Novo Nordisk's workplace (3.6) (Glasdoor.com/Nordisk, 2017) is rated behind Eli Lilly (4.0) (Glasdoor.com/Lilly, 2017)and better than Sanofi (3.5) (Glasdoor.com/Sanofi, 2017). Based on the two different providers of workplace rating it is deemed that all competitors in the industry have high workplace environments. Therefore, it is deemed that for the industry and specifically for Novo Nordisk, human resources have a low negotiation power.

4.4 Bargaining Power of Buyers

The pharmaceutical industry is very complex because the end user of a product is rarely the buyer and nor the decision maker on what brand to buy. Prescription based drugs for chronic diseases are expensive and therefore in most cases the patients receive either a full or partial subsidy from a government program or a private insurance company, and in addition the patient is limited to only use drugs approved by the payer institutions. It is assessed that the user has no negotiation power at all, because he/she has to choose the brand the doctor prescribes and what the government or insurance company is willing to cover. The negotiation power of buyers against pharmaceutical companies is therefore with either governments or private insurance companies. Reading through the latest annual report of Novo Nordisk we see that the significant buyers to negotiate with are private benefit managers in the United States and national governments in the rest of the world. (Novo Nordisk AR, 2016) Therefore, in the following the negotiation power of the most significant buyers will be analyzed.

4.4.1 Bargaining power of buyers in rest of the world: Medium Power

The legal analysis in section 3.2.3 explains the regulations and price control mechanisms across major markets outside the US. According to data from the World Bank in average 75% of all healthcare expenditures in Europe are publicly funded, while the percentage in East Asia & Pacific is 66% and 60% in Middle East

and North Africa (Data.worldbank.org, 2014). Thus the largest and most significant buyers in major markets outside United States are national governments. While the majority of the governments admit the importance of the healthcare service, their willingness and ability to pay high prices is subject to increasing political pressures, for example in China and Region Pacific where government-mandated price cuts have been introduced (Novo Nordisk AR, 2016).

In region Europe, which accounts for 48% of the sales in the non-US related sales, the government implemented austerity measures presents a risk to the revenue pharmaceutical manufacturers can generate. Governments typically buy in larger quantities and this strengthens the negotiation power they have by law. However, the external reference pricing policy and most of the other additional policies analyzed in section 3.2.3 are most applicable on generics or biosimilars. Given the lack of generics and the very few available biosimilars in human growth hormone and diabetes it is assessed that the governments currently have medium bargaining power to pharmaceutical manufacturers. This is because pharmaceutical manufacturers of biologics can deny selling a product in a market or remove it immediately after the patent is due in case the governments negotiate too hard (European Comission, 2015). Consequently, the governments are repeatedly facing the challenge of balancing patient access to the most effective medicines with affordability and rising costs. However, governments have the obligation to make recommendation lists to guide physicians on what to prescribe, and they do have the power to remove or lower the financial support to drugs, which would force pharmaceutical manufacturers to remove one or more drugs from a specific market. Therefore, the pharmaceutical manufacturers cannot set the price they want and has to price their products according to the regulations and the availability of alternatives.

Hence, the negotiation power of European governments as well as Chinese and Japanese is assessed to be of medium to high power which in future years might further increase with implementation of additional policies and entrance of more biosimilar products due to patent expirations of large brands. In conclusion, the future growth in Europe and other major markets outside the US will not come from price but rather volume and market share increases and introduction of new and better products through intensive research and development activities.

4.4.2 Bargaining power of public buyers in United States: Low Power

According to the World Bank about 50% of the health expenditure in US is publicly funded, all the while about 40% is funded by insurance companies and 10% by the patient themselves (Data.worldbank.org, 2014). The government is therefore the largest customer in the states, where there are two government-funded programmes, the Medicaid and the Medicare.

For Medicaid, pharmaceutical companies are required to sell their prices at by anyone lowest negotiated price and the legislation do not allow the government to exclude any drugs that are approved by the FDA. Therefore, in relation to the Medicaid programme the government has no negotiation power and pharmaceutical companies can without any limitation get their products on the formulary status of Medicaid.

For Medicare, the legislation prohibits the government to negotiate directly with drug companies but allow them to do it through private insurers. The Medicare part D plan gives private insurers the ability to negotiate formulary status for Medicare part D and allow them to provide only two drugs in each drug class, giving them a significant negotiation power over drug manufacturers. The ability to exclude drugs from the formulary list, which the plan gives to private insurer, cause intensive price competition between manufactures for formulary status.

It mean, that the government has no negotiation power as such but has given some of the power it should have to private insurers. Therefore will pharmaceutical companies including Novo Nordisk face high negotiation power from private insurers due to their power of offering preferable formulary status in the part related to Medicare part D but low negotiation power from private insurer in relation to the Medicaid formulary lists. However, neither do the private insurers possess the negotiation power as they give the power to a third party company, namely the private benefit managers, who negotiate for them and decide what drugs to put in the formularies.

4.4.3 Bargaining power of private buyers in United States: High Power

Figure 11 shows the significance of rebates Novo Nordisk has given in the last couple of years. It is very clear from the development of the gross sales and net sales that over the years the two graphs move away from each other, indicating increased rebates given to customers. More interesting is that 95% of all rebates given relates to the US, of which 50% is paid to pharmacy benefit managers, see appendix 2

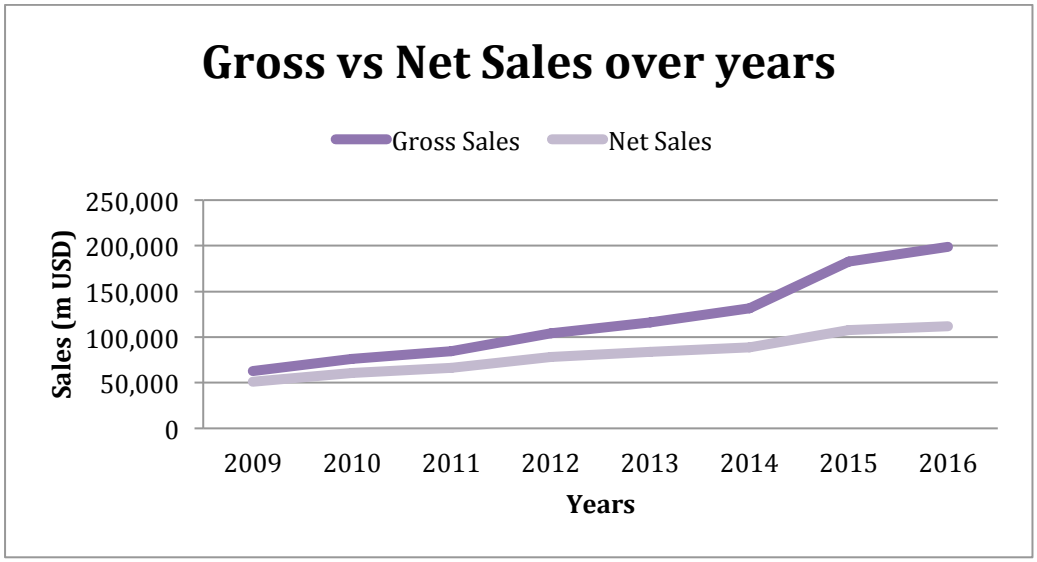

Figure 11: Historical gross sales and net sales of Novo Nordisk. Source: Own creation, based on Novo Nordisk Annual Reports

The most important customers in USA include government payers, private payers and private benefit managers (PBMs). In the annual reports of Novo Nordisk it is noticed that in addition to the PBMs, significant rebates are given to Medicare and Medicaid and other managed healthcare plans (Novo Nordisk AR, 2016).

In the US healthcare, plan sponsors, among others private health insurers and self-funded employers, often outsource the administration of prescription drug benefits to pharmacy benefit managers, which makes the prescription drug paradigm very complex. Pharmacy benefit managers are third-party organizations that serve as the middlemen between plan sponsors, pharmacies and manufacturers. Their functions are to negotiate discounts and rebates with drug manufacturers, to process and pay prescription drug claims, and to develop and maintain drug formularies[9]. This means, PBMs have high bargaining power to pharmaceutical manufacturers that want access to the American market. In recent years this negotiation power has increased as the PBM marketplace has become remarkably more consolidated (Frier Levitt, LCC, 2017).

[9] The list of financially supported drugs approved for prescription

2011	Medco	EXPRESS SCRIPTS	Prime Therapeutics	SXC Health Solutions	Catalyst Health Solutions	OptumRx	CVS Caremark
2013	EXPRESS SCRIPTS		Prime Therapeutics	Catamaran Corporation		OptumRx	CVS Caremark
2015	EXPRESS SCRIPTS		Prime Therapeutics	OptumRx			CVS Caremark

Figure 12: Consolidation in the PBM Market.
Source: own creation based on (Frier Levitt, LCC, 2017) and Novo Nordisk Annual reports 2015-2016.

Through several mergers and acquisitions, the PBM industry has transformed from a marketplace with several large PBMs to a marketplace with only four PBMs, see figure 12. The industry consolidation among PBMs means that today 90% of the market for prescription drugs is controlled by only four PBMs, namely Express Scripts, CVS Caremark, OptumRx and Prime Therapeutics, see figure 13.

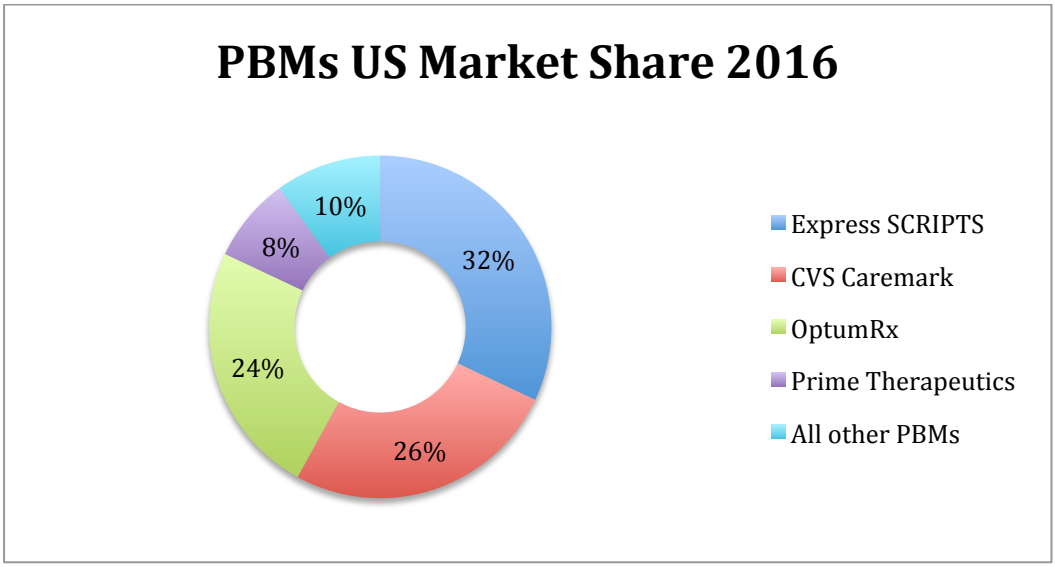

Figure 13: Pharmacy Benefit Manger 2016 market shares in the US.
Source: Own Creation, based on (Novo Nordisk AR, 2016).

Given the high power the PBMs possess and recognizing the further profit they can make from controlling specialty drugs, all of the major PBMs have acquired or launched their own pharmacies, which further strengthen their negotiation position with pharmaceutical manufactures. They are therefore expected to continue to put pressure on net prices of pharmaceutical companies.

The introduction of biosimilars gives additional power to PBMs against branded-drug manufacturers. Several PBMs have already welcomed biosimilars and highlighted the important role they will play going into the future, which suggest that PBMs future negotiation power is not going to become smaller and that the combination of PBMs power and introduction of biosimilars will put high pressure on prices and make it harder for pharmaceutical manufacturers to get their products into the formulary lists as was the case for Novo Nordisk's bestseller Victoza®, that several time has been left out of Express Scripts formulary, apparently due to Novo Nordisk's reluctance to reduce its price (Bloomberg.com/Victoza, 2016). Similarly, for Lantus and Toujeo (Diabetesdaily.com/CVS, 2017) of Sanofi who were left out of the 2017 formulary of CVS Health to make space for a biosimilar.

Based on the above analysis, the bargaining power of buyers on the pharmaceutical market is characterized as very strong due to consolidations in the market and the increasing pressure the public programmes insurers and private insurers put through PBMs on pharmaceutical manufacturers to lower prices. The power of the PBMs are so high that they can directly dictate which products that can be sold or not in the market, and hence directly impact the share price of a listed company with a negative announcement.

4.4.4 Summary of bargaining power of Buyers

In United States pharmaceutical companies can set the list price they want, and then they can negotiate with insurance companies, private benefit managers and distributors for rebates. In China, Japan and most countries in region Europe several price control mechanisms, among others the external reference pricing and government-mandated price cuts, are actively used and therefore, pharmaceutical companies cannot set the list price they want. However, the lack of generics and the low availability of biosimilars give the pharmaceutical manufacturers the ability to remove their products from the market if the governments are too tough in their negotiations. This indicates a medium to high economic power of governments of major countries outside the United States, and a low economic power of the government in the United States. Though in the states, the significant negotiation power is given to private benefit managers that negotiate contracts for private insurance companies. The latest consolidations in the PBM sector have given high economic power to the PBMs and consequently possess very high negotiation power to pharmaceutical companies.

4.5 Rivalry among Existing Competitors

Novo Nordisk operates in different segments and can be described as a strong competitor within four different industries. In the following analysis of the rivalry between existing competitors, the segmentation will be applied to analyze the rivalry.

4.5.1 Diabetes Care

Novo Nordisk is the global market leader in the diabetes care segment, having a market share of 27% of the total world sale. The overall diabetes care segment is assessed to be very consolidated the three largest companies – Novo Nordisk, Eli Lilly and Sanofi – represents close to 65% of the global diabetes care sales. In the last ten years, the diabetes care market has in average increased 15.2% every year, and add to that that the widely expected increase in global diabetes population from the current 415 million, the overall market is very attractive for established as well as new players.

As described earlier, the diabetes market is divided in Insulin, GLP-1 and OAD. Figure 14 below illustrates the distribution of diabetes patients and the market value within the three treatment classes. From the figure, it is noticed that the insulin and the GLP-1 segments are the most attractive treatment classes as they offer better market value relative to their population size.

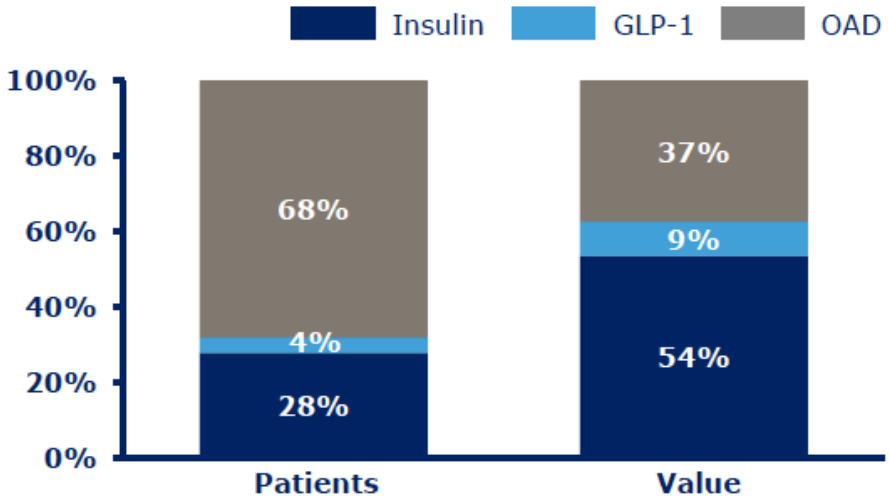

Figure 14: Distribution of patients and value across treatment classes, Source: (Novo Nordisk Investor Presentation Q1, 2017)

To better understand the rivalry in the diabetes care segment the market will be segmented into GLP-1, fast-acting, long-acting and premix insulins.

4.5.1.1 GLP-1

GLP-1 analog is a hormone that lowers blood glucose in patients with type 2 diabetes. The segment accounts for 10% of the value of the global diabetes market and represent 4% of the global diabetes patients. On a regional perspective the GLP-1 volume market split is concentrated around North America and region Europe, which respectively represent 47% and 39% of the global volumes. Measured in value it is the fastest growing segment in diabetes care. In the last five years the global GLP-1 market in average increased 36.3% every year, and given technological advances and increased education about diabetes the segment is expected to grow further.

In the GLP-1 segment, Novo Nordisk is the market leader with 58% of market share due to its blockbuster Victoza® (liraglutide). Victoza® is in competition with Trulicity®(dulaglutide) from Eli Lilly, as well as Byetta®(exenatide) and Bydureon®(exenatide) from AstraZeneca. In addition, Victoza have a market share of 54% in North America and 64% in region EU, indicating that they are dominating at a global level as well as in the two most important regions.

The GLP-1 market is relatively new, with the first product launched in 2005. Novo Nordisk entered in 2010 with Victoza® and has experienced significant success. In 2012 Bydureon® was launched and in 2015 Trulicity®. The market is currently described as an oligopoly. The segment is expected to grow significantly in upcoming years with increased competition between the three main players, Novo Nordisk, Eli Lilly and AstraZeneca, with the later two gaining some market share from Novo Nordisk. However, Novo Nordisk is expected to maintain its position as market leader due to its soon to be launched GLP-1 product, Semaglutide®, which is superior to all existing products in the market, see section on pipeline and product portfolio.

4.5.1.2 Insulin

In the overall insulin market, Novo Nordisk is the market leader with 44% market share. The market is characterized as an oligopoly with 3 large players. In addition to Novo Nordisk, Sanofi and Eli Lilly is present in the industry with market shares of 35% and 19%, respectively (Novo Nordisk Investor Presentation Q1, 2017), see figure 15.

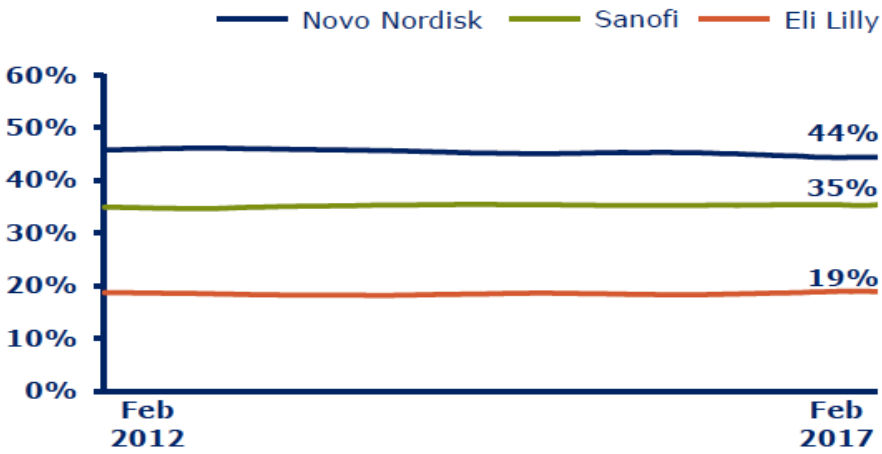

Figure 15: Global modern and new insulin volume market shares.
Source: (Novo Nordisk Investor Presentation Q1, 2017)

In the last five years the overall insulin segment grow 19.8% annually, see figure 16. The insulin segment is very attractive as the market historically has provided high profits and is expected to continue to grow at high rates, supported by global macro trends, including the high growth rates in diabetes population. The introduction of biosimilars and the strengthened power of PBMs have further intensified the rivalry between current competitors and have increased the possibility of entrance from new players. Consequently, the growth in the insulin segment is no longer expected to come from price increases but from volume. As discussed in the macro analysis, Novo Nordisk has confirmed this challenge and announced a limit on future price increases to no more than single-digit numbers.

As explained earlier, the insulin market is comprised of three segments, namely fast-acting insulin, long-acting insulin, and premix insulin. The fast acting and the long acting insulin segments are due to their size and their significant growth rates more competitive and more attractive going forward, see figure 16.

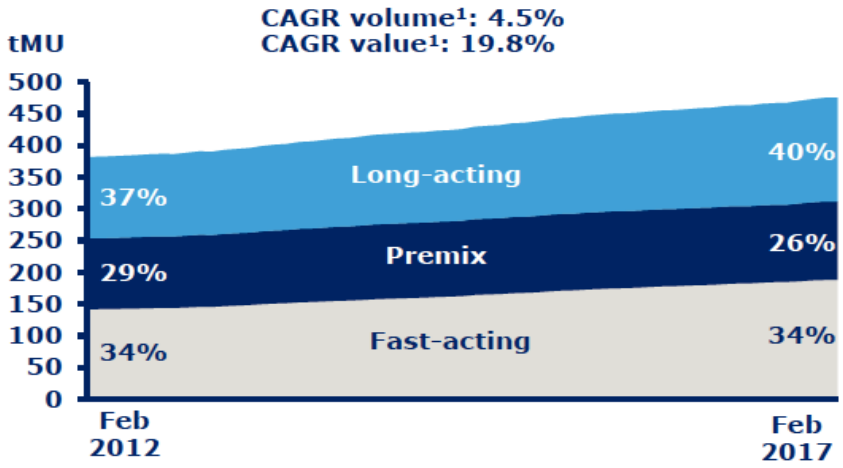

Figure 16: Global insulin volume market by segment
Source: (Novo Nordisk Investor Presentation Q1, 2017)

4.5.1.2.1 Fast acting insulin

The fast-acting insulin segment represents 34% of the global insulin volume and is growing at a constant rate. The fast acting segment is the insulin sub segment Novo Nordisk has the largest market share in. Novo Nordisk is the market leader with NovoRapid®[10] (Aspart) and has a market share of 41%. NovoRapid is followed by strong competition from Eli Lilly's Humalog® (Lispro), Sanofi's Apidra® (Glulisine) and MannKind Corporation's Afrezza®. NovoRapid® is all competitors but Afrezza® superior. Afrezza® is though only launched in the US and faces challenges to get into the formulary of private insurance companies. Given the success of NovoRapid®, price has become an important factor for competitors to compete with Novo Nordisk. In United States, according to GoodRx, Humalog, Apidra and Afrezza are respectively $216, $138 and $225 cheaper than NovoRapid® (Goodrx.com, 2017). The success of NovoRapid® is not going to continue forever as the insulin has patent expiration this year, while both Humalog® and Apidra® face patent expirations in 2018. This suggest two important points, (1) future market competition depends highly on the current R&D pipeline of the players, and (2) the introduction of biosimilars. It is already known that Sanofi is developing a biosimilar version of Eli Lilly's Humalog® (Diatribe.org/Biosimilar, 2016) as such supporting the increased competition going forward.

4.5.1.2.2 Long-acting insulin

The long-acting insulin segment is the largest in terms of volume and also the highest growing insulin sub segment. In addition, it is the segment with highest competition among existing players. Currently, five brands are competing for the long-acting insulin customers. These include Basaglar® from Eli Lilly, Lantus® and Toujeo® from Sanofi, Levemir® and Tresiba® from Novo Nordisk. Basaglar® is a biosimilar, that similar to Lantus® and Toujeo® is based on insulin glargine. Insulin glargine was until 3 years ago patented by Sanofi but as the patent has expired the competition in the segment has also increased and prices has decreased because Lantus® was by far the most popular insulin in the segment, and the product that has been in the market the longest time. After the launch of Basaglar the original brands have been forced to decrease their prices to be considered into the PBMs formulary lists. Among other Lantus® decreased its price from $385 to $266, a level that is lower than Basaglar®, which is traded at $323 (Goodrx.com, 2017), supporting increased price competition going forward. In addition, it is known that Mylan/Biocon and Merck/Samsung Bioepis are working on their own biosimilar insulin glargine products. With the potential of these new entrants into the

[10] Named NovoLog® in the US

attractive long-acting insulin segment, competition in this segment is expected to intensify more than the other insulin sub segments (Diatribe.com, 2016).

Of the products currently competing in the market, Basaglar®, Lantus® and Levemir® all are modern insulins, while Toujeo® and Tresiba® are the only new-generation insulins. Tresiba® is currently all other products superior but future market penetration depends on Novo Nordisk ability to convince the payers of its superiority and the price strategy.

4.5.1.2.3 Pre-mix Insulin

The premix insulin is the smallest of all the insulin sub-segment and the one segment that grows slowest. In average, over the last five years the segment has grown 1.9% a year, measured in volume (Novo Nordisk Investor Presentation Q1, 2017). Because the pre-mix insulins are combinations of long –and fast acting insulins the market is not expected to grow as quick as the two other markets, supported from figure 16 where the total market share of premix insulins to total insulin segment has decreased in the last five years, suggesting the segment to be less attractive compared to the two other insulin sub segments.

In the pre-mix insulin segment Novo Nordisk operates successfully with its modern insulin NovoMix® and has a leading market share of close to 35% measured in volume. The other products in the market is Humalog® and Humulin® both from Eli Lilly. Similar to the other modern insulins, the NovoMix® has patent expiration in 2017. The future market landscape is likely to be based on Sanofi's LixiLan, which is produced in collaboration with Zealand Pharma A/S, and Novo Nordisk new generation pre-mix Xultophy®, which is already approved in the EU and in the US. LixiLan is a combination of Sanofi's GLP-1 and the insulin Lantus®, while Xultophy® is a combination of Victoza® and the new generation insulin Tresiba®.

4.5.1.3 Obesity

The global obesity population counts more than 600million people, however only 4% of those are treated with prescription based anti-obesity medication (AOM) (Novo Nordisk Investor Presentation Q1, 2017). The segment is very new and growth is challenged by the fact that obesity is not yet widely recognized as a chronic disease. Currently, the market for prescription based AOM consist of four major players, including Saxenda® from Novo Nordisk, Qsymia® from Vivus, Belviq® initially from Eisai and Arena, and Contrave® initially from Orexigen and Takeda. The market challenges are supported from disappoint sales from Belviq® and

Contrave® which has seen partners Arena and Takeda to leave Belviq® (Fiercepharma.com/Marketing, 2017) and Contrave® (Fiercepharma.com/Contrave, 2016) respectively. The market challenges are confirmed by Novo Nordisk, who believes obesity awareness and understanding is where diabetes type 2 was 20 years ago and consequently expect it to take many years to get at a desired level (Novo Nordisk AR, 2016). Based on the above, the AOM segment is assessed to be less attractive than any other of the segments Novo Nordisk operates in and the market is expected to grow marginally in the coming years. However, the intensity of competition is assessed to be high, as the four large players in the market have to compete intensively for the relatively low AOM size.

4.5.2 Biopharmaceuticals

4.5.2.1 Haemophilia

There are many different types of bleeding disorders but the two main types are, haemophilia A and haemophilia B. There is an estimated 493.000 people worldwide living with haemophilia, of which approximately 350.000 are haemophilia A patients, and 70,000 are haemophilia B patients. Other haemophilia types are more rare (Novo Nordisk AR, 2016). Because it is an inherited disease, the growth in size is very limited. In the overall haemophilia market Novo Nordisk has a market share of about 18%, which makes them the second largest in the segment measured on value (Novo Nordisk Investor Presentation Q1, 2017, s. 24).

The high market position of Novo Nordisk is primarily due to NovoSeven® who has 95% of the market share in the Factor VIIa segment. The Factor VIIa segment is relatively small in size because there on a global level are only a small number of patients with clotting factor VIIa deficiency (Novo Nordisk Investor Presentation Q1, 2017, s. 93). Consequently, the competition as well as attractiveness in the segment is deemed to be relatively low.

In term of market size and market potential, the haemophilia A (Factor VIII) segment is the largest and most attractive. The market is though very competitive with brands such as Recombinate®/Advate® (Baxter), Kogenate®/Helixate® (Bayer), Xyntha®/Refacto® (Wyeth Pharmaceuticals), Eloctate® (Biogen) and NovoEight® (Novo Nordisk) sharing the global market. The strongest player is Baxter who dominates the segment with 50% of the global market share, while Novo Nordisk is the competitor with lowest market share. Novo Nordisk is the newest player and neither have any first mover advantage or a product offering better than competitors, which force them to compete on price in the already very competitive market. Currently, most products in the market are short acting drugs. Looking forward patient convenience is important as products are expected to

move from short to long acting. The future market is expected to consist of five players, including Baxter, Bayer, Biogen, Wyeth and Novo Nordisk.

The second largest market is the haemophilia B segment (Factor IX). The market consists of four players, Biogen, CSL Behring, Wyeth Pharmaceuticals and Baxter. Benefix® of CSL Behring and Alprolix® of Biogen are the two market leaders and together represents close to 90% of the market. The segment is very consolidated and is due to its size and growth potential less attractive than the haemophilia A segment. Equivalent to the haemophilia A segment, products in the haemophilia B segment are either short or long acting, where all but Rixubis® (Baxter) are long acting, which is reflected in Baxter having the significantly smallest market share in the segment. Baxter is therefore considered to not be able to compete with the other players. Novo Nordisk is yet not in the haemophilia B segment but expect to enter with its long-acting recombinant Rebinyn® (N9-GP).

4.5.2.2 Growth Disorders

The growth hormone is the segment with highest biosimilar penetration. The market is highly competitive. The market players include Novo Nordisk, Pfizer, Sandoz, Eli Lilly, Merck Kgaa and Roche. Novo Nordisk is the market leader with 30% market share measured in volume, with the next largest competitor Pfizer having 20% market share (Novo Nordisk Investor Presentation Q1, 2017). The market is facing increased risk of competition as both small and large competitors attempt to market products that are biosimilars. All biosimilars are based on Somatropin, which offer similar results as Novo Nordisk's blockbuster Norditropin®. The market accounts for high growth opportunity, making competition even more cutthroat. The global human growth hormone market has grown 4.5% annually in the last five years, and the market is expected to grow at a similar rate until 2019 (Technavio.com, 2014). Despite high competition from biosimilars, Novo Nordisk has managed to keep its high market share, which is primarily due to Norditropin® being the only product that can be stored at room temperature. This fact indicates that the competition in the market is not on product efficiency but on product differentiation through patient convenience (Norditropin.com).

5 Pipeline and Product Portfolio

To understand the current and future market potential, the industry attractiveness from above will be followed wit a pipeline and product portfolio analysis. The aim of this section is to evaluate the revenue potential of each product.

According to a report from Roche (Roche, 2013), the process of research and development of a new treatment can take about 12 years. The process is divided in laboratory research, pre-clinical studies, clinical studies and regulatory approval. The clinical study and regulatory approval is often merged to one and represent a pharmaceutical companies pipeline. The clinical study is further divided in three phases, and every drug has to go successfully through each phase before it can go for regulatory approval (Roche, 2013). According to the US Food & Drug Administration, (Fda.gov/Drugdevelopment, 2016), approximately 70% of the drugs in phase 1 make it to phase 2, of which 33% make it to phase 3, and approximately 25-30% of these make it to the approval stage. This means that only 6-7% of all drugs that enters the clinical stage go to the approval stage. As of March 2017, Novo Nordisk has 17 products in its R&D Pipeline, 11 in phase I, 3 in phase II, and 3 in phase III. In addition 3 products have been filed for regulatory review in at least one major market (Novonordisk.com/R&D Pipeline, 2017).

To understand the potential of the products the drug life cycle model will be applied. According to an article by Christina Ciot (2015) there are three distinctive stages in the life cycle of a new drug, including (1) the research and development stage, (2) the period of time between its launch and the loss of exclusivity (patent expiry date), and (3) the period after the loss of exclusivity, when generic or biosimilar drugs can enter the market (Ciot, 2015). Given the long time horizon of clinical studies and the high uncertainty of a product going from phase 1 to successful approval, only products in phase III and products that that are filled for review will be considered in the following analysis. In appendix 4, all products in the research and development pipeline are illustrated along with the current marketable product portfolio.

For the potential of the product portfolio the second stage is of high importance. The second stage of the drug life cycle model contains the introduction, growth, maturity and decline stages. The introduction stage is about launch of the product and creation of a demand, the growth stage is about maximizing the market share, the maturity stage is about maintenance of the market share, and finally, decline stage is about minimisation of expenses (Ciot, 2015).

5.1 Drug Product Lifecycle – Diabetes Care

The drug product lifecycle for the diabetes care segment is presented in figure 17 below. Spread over all sub segments Novo Nordisk has at least a product in each of the stages. In the decline stage Novo Nordisk has three products, Actrapid®, Insultard® and Mixtard®. These are all human insulins whose patens have expired for long time ago. The human insulins are offered at discounts and only to least developed and low-income countries as well as to selected humanitarian relief organizations (Novo Nordisk AR, 2016, s. 99).

	Development				Market	
Segment	**Phase III**	**Filed**	**Introduction**	**Growth**	**Maturity**	**Decline**
GLP-1	Oral Semaglutide®	Semaglutide®			Victoza®	
Fast-acting Insulin		Fiasp®			NovoRapid®/NovoLog®	Actrapid® (Human Insulin)
Long-acting Insulin				Tresiba®	Levemir®	Insultard® (Human Insulin)
Premix Insulin			Xultophy® Ryzodeg®		NovoMix®	Mixtard® (Human Insulin)
Obesity			Saxenda®			

Figure 17: Drug Product Life Cycle of diabetes care segment. Source: Own creation, based on data from (Novonordisk.com/R&D Pipeline, 2017) and (Novo Nordisk AR, 2016)

On overall, the product lifecycle seems promising. In all of the diabetes segments a mature product is available, and for all the segments a product is available in the pipeline or the introduction/growth stage to support the future growth of the product in the maturity stage. In the following, the potential of the products in the different sub segments will be analyzed.

5.1.1 GLP-1

Victoza®, assessed to be in the maturity stage, is the market leader in the GLP-1 segment and competes with Bydureon® and Trulicity®. Victoza® has patent protection until 2023 (Novo Nordisk Investor Presentation Q1, 2017). Victoza® offers once a day injection, so both Bydureon® and Trulicity who offers once a week injections are superior to Victoza®. This is also acknowledged by the market, where Trulicity has shown strong performance since its launch and gained significant market shares (Pmlive.com, 2017). Bydureon® on the other side has lacked in the competition with Victoza® because it contrary to Victoza® until 2014 was injected with traditional needles. However, in 2014 the Bydureon® pen was approved (Astrazeneca.com, 2014) and launched and therefore a higher

competition from Bydureon® on Victoza® can now also be expected. Consequently, Victoza® is expected to slightly lose some of its global market share to Trulicity® and Bydureon®, which both are superior to Victoza®.

Semaglutide®, is the successor of Victoza®. It is a once weekly GLP-1 and is proved to be all competing products superior (Fiercepharma.com/Semaglutide, 2017). Novo Nordisk filed regulatory approval for Semaglutide in the US and in the EU and is expected to be in the final process of the approval. Semaglutide® is therefore expected to support the GLP-1 growth in the very short term (Novonordisk.com/New releases, 2016).

Oral Semaglutide®, is one of the most groundbreaking products in the pipeline. It is the first ever GLP-1 in the form of a pill. The oral Semaglutide® is currently in phase III of the clinical studies and results are expected to come in 2018 (Novonordisk.com/Announcement, 2015). If the oral GLP-1 successfully goes through the phase III studies, Novo Nordisk will be disrupting the segment and drastically increase their market share within the GLP-1 segment. In addition, the technology would increase the possibility to make similar advancements in the insulin segment.

5.1.2 Fast-acting insulin

NovoRapid® has patent expiration in 2017 and is assessed to be in the maturity stage. NovoRapid® is the market leader in the fast-acting insulin segment and compete with Humalog®, Apidra®, and Afrezza®. NovoRapid® is Humalog® and Apidra® superior both in terms of onset (the length of time before insulin reaches the bloodstream and begins to lower blood sugar) and in terms of duration (how long insulin continues to work) (Webmd.com/Diabetesguide). Afrezza® is only launched in the US and is so far not covered by most Medicare and insurance plans, which puts challenges to its competitiveness to NovoRapid®. However, Afrezza® is inhaled rather than injected and has a much faster absorption rate than any other competitor. Therefore, it will become a very strong competitor to NovoRapid® once MannKind Corporation solve their problems to get into the formulary status of payer.

Fiasp®, is the next generation fast acting insulin of Novo Nordisk. It is already approved and launched in some European countries, and is resubmitted to the FDA, with a decision expected towards the end of 2017 (Diatribe.com / Fiasp, 2017). Fiasp® is the first-ever next-generation fast-acting insulin to launch globally and its global progress is so far very positive. Fiasp® is better than NovoLog® in many areas and proved to absorb faster than Afrezza® (Diatribe.com / Fiasp, 2017). Thus,

it is believed that the new-generation insulin Fiasp® will support Novo Nordisk to increase sales and the market penetration within the fast-acting insulin segment.

5.1.3 Long Acting

Levemir® is Novo Nordisk's modern insulin in the long-acting segment. It has patent protection to 2018 in the EU and 2019 in the US, and is assessed to be in the maturity stage. Levemir® is in intense competition with products based on insulin glargine. Insulin glargine products are all superior to Levemir®, both in terms of efficiency and price, explaining the low market share of Levemir of 19% (Novo Nordisk Investor Presentation Q1, 2017, s. 42). Going forward the sales growth of Levemir® is expected to decline.

Tresiba® is Novo Nordisk's new-generation insulin in the long-acting segment, and has patent protection to 2028 in EU and 2029 in the US. Tresiba® started to launch in 2016 and is expected to continue its global launch in 2017 and 2018. It is assessed to be in the growth stage in the product life cycle model. Tresiba® is a 42-hour long insulin, which compared to the alternative 20-24 hours, is much more flexible and convenient for patients. However, given the high competition and aggressive price strategies the future market penetration of Tresiba® depends on Novo Nordisk's price strategy and the ability to convince the payers of the superiority of Tresiba®. Nevertheless, it is believed that Tresiba® will help Novo Nordisk to increase its market share in the long-acting segment.

5.1.4 Premix

NovoMix® is Novo Nordisk's modern insulin in the premix segment. NovoMix® is the blockbuster in the segment but has patent expiration in 2017 and going forward decreasing growth rates are expected from NovoMix®.

Xultophy® is the successor of NovoMix®. Xultophy® is already launched in Europe (Novonordisk.com / Xultophy launch, 2015) in 2015 and is expected to launch in US during 2017 (Novo Nordisk Investor Presentation Q1, 2017). Similar to all other current pre-mix insulins in the market, Xultophy® is also based on longa-acting insulin combinations. Going forward, Xultophy® is expected to compete with LixiLan® of Sanofi, and because Tresiba® is superior to all other long-acting insulins in the market, Xultophy® is assessed to be superior to LixiLan®. Therefore, I expect Xultophy® to help Novo Nordisk increase the market share in the pre-mix segment, which is supported by the fact that LixiLan® is only recently approved in the EU and yet to be approved in the US (Euroinvestor.com, 2017).

Ryzodeg® is Novo Nordisk's second new-generation insulin in the premix segment. Ryzodeg® is globally approved and waits for the launch to start. Ryzodeg® is the first ever combination of fast-acting insulin with an ultra-long duration, and as such Novo Nordisk expect it to have a blockbuster potential in the future and support Novo Nordisk's market penetration in the premix segment (Thepharmaletter.com/Ryzodeg, 2014).

5.1.5 Obesity

Saxenda® is assessed to be in the introduction stage of the product life cycle as it is still the primary objective to create a market demand for anti-obesity medication. Saxenda® has a stronger value proposition than competitors, which is reflected in the market share on prescription uptake of which Saxenda® accounts for 17% of the market based on volume and 49% based on value (Novo Nordisk Investor Presentation Q1, 2017, s. 86). The superiority of Saxenda® is also supported by studies that show the effectiveness of Saxenda to be more superior to Belviq® and Contrave®, but behind Qsymia®. Because of its leadership and product offering that is superior to most alternatives Novo Nordisk is expected to continue to gain market shares in the segment, though with little impact on total group revenues.

5.2 Drug Product Lifecycle – Biopharmaceuticals

The drug product lifecycle for the key biopharmaceuticals is presented in figure 18 below. It is noticed that Novo Nordisk has a product in phase 3 of clinical stage for both of the biopharmaceutical segments. In addition, several products are ready to be launched or about to launch in the haemophilia segment, indicating a promising product lifecycle for the segment.

	Development				Market	
Segment	**Phase III**	**Filed**	**Introduction**	**Growth**	**Maturity**	**Decline**
Haemophilia	N8-GP	N9-GP (Rebinyn ®)	NovoEight® NovoThirteen®		NovoSeven®	
Growth Disorders	Somapacitan®				Norditropin®	

Figure 18: Drug Product Life Cycle of the biopharmaceutical segment
Source: Own creation, based on data from (Novonordisk.com/R&D Pipeline, 2017) and (Novo Nordisk AR, 2016)

5.2.1 Haemophilia

NovoSeven® is assessed to be in the maturity stage of the product lifecycle. Given its superiority to competing products, NovoSeven® is expected to continue to deliver positive results.

NovoEight® is launched in Europe (2014) and the US (2015), and the global launch activities are ongoing. The product is not superior to any competing products and is currently the Haemophilia A product with least market share. NovoEight® is a short-drug and do not offer much growth potential in a market with products that going forward will move from short to long-acting drugs.

N8-GP is a promising long-acting haemophilia A drug of Novo Nordisk. It is currently in phase III of clinical studies and expected to increase Novo Nordisk market share in the segment once it is approved. However, any submission is not expected before 2018 (Novo Nordisk Investor Presentation Q1, 2017, s. 94). With N8-GP, I believe Novo Nordisk can gain market share in haemophilia A from 2019 and gradually reach 10-15% going forward. In the long-acting segment, Novo Nordisk will though be in high competition with Biogen who is expected to launch its own long-acting injection already in 2017 (Fiercebiotech.com/Biogen, 2016).

Rebinyn® is Novo Nordisk's first long-acting injection for the haemophilia B segment. Rebinyn® has just recently received approval in the US but is yet to receive an approval in the EU (Novonordisk.com/Rebinyn, 2017). Novo Nordisk expect to launch Rebinyn® in the US in 2018. Rebinyn® is a once weekly injection

similar to CSL's version. However, Alprolix® from Biogen is once every ten days. Given the head start of CSLs and competitive advantage of Biogen, Rebinyn® is expected to face tough competition but still expected to gain a market share of 10-15% in the long term.

5.2.2 Growth Hormone

Norditropin® is the blockbuster in the segment as it is all other products superior due to the fact of being the only product to be stored at room temperature. However, the Norditropin® formulary has patent expiration in 2017, suggesting decreasing sales growth going forward.

Somapacitan® is expected to be the successor of Norditropin, and is currently in phase III of clinical stage. Somapacitan® is likely to increase future sales and market shares of Novo Nordisk as it is a once weekly injection versus the current once daily injections (Novonordisk.com/R&D Pipeline, 2017). However, also Pfizer has a similar product in phase 3 clinical studies (Fool.com/Pfizer, 2015). The two players are expected to launch their once weekly products at the same time and therefore to continue to remain as the leading players.

Based on Novo Nordisk's superior product to the competitors, its patent on the room temperature technology, and the promising pipeline drug in Somapacitan®, I expect Novo Nordisk to increase its market share in the long term to 35%.

6 Financial Analysis

6.1 Reformulation of Statements

In this section the consolidated income statement and balance sheet of Novo Nordisk A/S will be reformulated. The aim is to separate operating activities from financing activities with the purpose of understanding the drivers behind the value creation in Novo Nordisk. For the later analysis, the statements of Eli Lilly and Sanofi are also reformulated similar to Novo Nordisk. In the following the reformulation of the income statement and the balance sheet of Novo Nordisk as well as discussions behind the role of key accounting items will be presented.

See Appendix 5 for the reformulated statements of Novo Nordisk and appendix 6-7 for the benchmark and trend analysis of the statements. See Appendix 8-9 for reformulated statements of Eli Lilly and Sanofi, respectively.

6.1.1 Reformulation of the Income Statement

Investors consider operating profit as the primary source of value creation. To get a better knowledge of the sources of value creation in the firm, the accounting items in the consolidated income statement is reformulated such that it illustrates the development in earnings before interest, taxes and depreciation (EBITDA), earnings before interest and depreciation EBIT), net operating profit after tax (NOPAT) and net earnings (Petersen & Plenborg, 2012).

In the consolidated income statement Novo Nordisk reports depreciation and amortisation in the function to which they belong. To illustrate the operating costs exclusive of depreciation and amortisation and to measure the development in earnings before interest, taxes, depreciation and amortisation the first step in the reformulation of the income statement is to deduct depreciation and amortisation from each of the operating expenses, including cost of goods sold, sales, distribution & administrative costs, research & development costs, and other operating expenses.

In addition, the reported other operating income for 2015 include profit received from the partly divestment of NNIT A/S. In the notes to the annual report of 2015 Novo Nordisk writes that NNIT A/S is seen as a financial investment and the earnings will be reported as financial income. Therefore, it is assessed to exclude the divestment profit from net operating income in 2015.

Novo Nordisk reports corporate tax as a single item in the income statement, which makes it necessary to isolate the tax on operations from the tax on financial items in the reformulated income statement. In four of the five previous years, Novo Nordisk has net financial expenses, which means a tax shield has been received for those years. The tax shield is calculated as the multiplication of the marginal tax rate in Denmark and net financial expenses. The marginal tax rate is used rather than the effective tax rate due to the fact that bulk of the net financial expenses are related to financial instruments Novo Nordisk use to reduce the currency risk of the Danish Kroner against some of the key currencies, which indicates that the foreign exchange and derivative related gains and losses are associated with the headquarters in Denmark and therefore should be taxed through the tax rate in Denmark.

Adding the reported tax and the tax shield to earnings before interest and taxes, the net operating profit after tax is measured. The reformulated income statement shows that during the five years historical period the NOPAT has increased 69.4% or that Novo Nordisk has delivered a compounded annual growth rate of 11.12% during the last five years.

6.1.2 Reformulation of the Balance Sheet

The purpose of reformulating the balance sheet is to be able to compare it with the reformulated income statement and to understand the development in the invested capital. Invested capital is the combined investment in Novo Nordisk's operating activities, which is equal to the difference between the operating assets and operating liabilities (Petersen & Plenborg, 2012). The consolidated individual accounts are reformulated following the approach of Petersen & Plenborg (2012).

In reformulating the balance sheet, intangible assets, property, plant & equipment as well as deferred income taxes are classified as non-current operating assets as they are directly related to the operating business. Similarly, inventories, trade receivables tax receivables, and other receivables and prepayments are classified as current operating assets.

Novo Nordisk reports provisions in a single accounting line. In note 3.6 in the annual report 2016, the provisions are separated into provisions for sales rebates, provisions for product returns, provisions for legal disputes and other provisions. Provisions for sales rebates include rebates and discounts granted to government agencies, wholesalers, retail pharmacies, managed care and other customers. Provisions for sales rebates is directly related to the normal operating business and will therefore be treated as operating liability and classified accordingly in the reformulated balance sheet. Provisions for product returns, provisions for legal

disputes and other provisions are mostly classified as non-current liabilities and therefore likely to be interest bearing. In addition the present value of these provisions are adjusted yearly and changes recognized as net financial expenses (Novo Nordisk AR, 2016, s. 79). Consequently, provisions for product returns, provisions for legal disputes and other provisions will be classified as interest-bearing debt under a single line called other provisions.

The accounting item other liabilities consists of employee costs payable, accruals, sales rebates payable, VAT and duties payable, payables regarding clinical trials, amount owed to associated company and other payables, which include royalty payments and deferred income. As discussed in the reformulation of income statement, earnings from associated companies will be treated as financial activity. Therefore, will amount owed to associated company also be treated as a financial liability and classified as interest-bearing debt. The remainder of other liabilities is classified as capital invested in operations. Amount owed to associated company is only recognized for 2015 and 2016. Therefore, for the years 2012-2014 the whole accounting item other liabilities will be treated as an operating liability.

In addition to provisions and other liabilities, trade payables, deferred tax income liabilities and tax payables are classified as non-interest-bearing debt, and therefore part of operating liability that will reduce the investment needed to finance operations. In the period of five years the invested capital increases in all years except for 2016 where it decreases slightly. Over the period, invested capital increases 12.3%; see trend analysis in appendix 7.

To create consistency in the reformulated statements, Investments in associated company is classified as interest-bearing assets. Likewise, cash and cash equivalents are treated as an interest-bearing asset. One could argue to use some of the cash as part of operating activity, however Novo Nordisk do not provide details in the consolidated financial statements on any separation between operating cash and excess cash, consequently cash at bank will be treated as financial item. This idea is supported by the fact that in the last five years cash at bank has in average accounted for about 50% of invested capital and that Novo Nordisk receives interest income from the cash at bank.

In addition to other provisions, and amount owed to associated company, derivative financial instruments, retirement benefit obligations and long-term as well as short-term debt is classified as interest bearing assets as they all are either measured at fair value or are interest-bearing according to Petersen & Plenborg (2012). It is noteworthy to note that Novo Nordisk has not issued long-term debt in the period from 2012 to 2016.

Subtracting Interest-bearing assets from interest-bearing debt net-interest-bearing debt (NIBD) is measured. Given the high level of interest bearing assets, particularly due to high fraction of excess cash, and the low debt level NIBD of Novo Nordisk is negative for all years.

6.2 Profitability Analysis

Profitability analysis is the key in financial analysis. Historical profitability and drivers are important elements in defining the future expectations of a company. The analysis will follow the structure of DuPont to analyze the development in the drivers behind the return on equity (ROE) of Novo Nordisk and benchmark with competitors Eli Lilly and Sanofi.

Similar to the reformulation of statements, the DuPont approach split the return on equity in operating and financing. Return on equity is defined as (Petersen & Plenborg, 2012):

$$ROE = ROIC + (ROIC - NBC) \times \frac{NIBD}{BVE}$$

Where, ROIC is return on invested capital, NBC is net borrowing cost, NIBD is net interest-bearing debt and BVE is book value of equity. All calculations will be based on the reformulated statements in appendix 5, 8 & 9, respectively for Novo Nordisk Eli Lilly and Sanofi. In addition, to lower any potential outlier in the data, the average levels will be used for balance sheet items. The detailed DuPont analysis of the three companies is found in appendix 10-13.

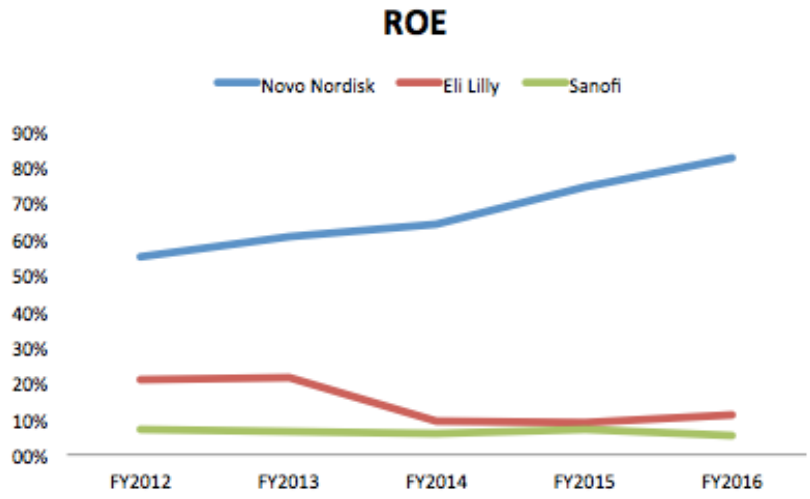

Figure 19: Return on equity on Novo, Eli and Sanofi.
Source: Own creation, baed on reformulated statements

Figure 19 illustrates the return on equity for the three companies. It is noticed that Novo Nordisk is superior to both competitors in generating return with the shareholders money. In addition Novo Nordisk is the only company who manage to increase the profitability in the period. In the period from 2012 to 2016 Novo Nordisk improves the return on equity from 54.9% to 82.2%, indicating an increase of 49.8% over the period or an average increase of 8.4% a year.

In the same period Eli Lilly has reduced the profitability of equity from 20.8% in 2012 to 11.3% in 2016, indicating a decrease of 45.8%. Sanofi on the other hand has a relatively stable yet decreasing return on equity.

To understand the development in the return on equity the operating and financing drivers will be analyzed in the following.

6.2.1 Evaluation of Operating

The first part of the profitability analysis will examine the effect of operating on the profitability. In the following the return on invested capital will be analyzed as a function of profit margin and turnover rate of invested capital.

6.2.1.1 Return on Invested Capital

Return on Invested Capital (ROIC) is the overall profitability measure of the company's operations and it expresses the return on the net operating assets as a percentage. ROIC is calculated as NOPAT divided by invested capital (Petersen & Plenborg, 2012).

ROIC (after tax)	FY2012	FY2013	FY2014	FY2015	FY2016
Novo Nordisk	87,4%	86,6%	89,3%	120,0%	125,0%
Eli Lilly	22,5%	26,7%	11,7%	8,9%	9,4%
Sanofi	6,8%	6,4%	5,9%	6,8%	6,6%

Table 2: Historical Return on invested capital for Novo Nordisk, Eli Lilly and Sanofi
Source: Own Creation, based on reformulated statements

The Novo Nordisk business generates significant returns. In the last fiscal year they generated a return of 125% for each DKK invested in the operations. The ROIC benchmark in table 2 shows a significant difference across the three firms, with Novo Nordisk being significantly superior to both competitors in all years.

In the five years period of analysis, Novo Nordisk has managed to improve their ROIC with 43% or 7.4% in average a year. It can be noticed that only Novo Nordisk

has managed to increase its ROIC while Eli Lilly has cut its profitability as much as 58.2%, with Sanofi having a relatively stable yet decreasing ROIC.

To explain Novo's superior ROIC, further decomposing of the ROIC is necessary.

6.2.1.1.1 Profit Margin

In the latest fiscal year, Novo Nordisk had a profit margin, measured as net operating profit after tax to net sales, of 34.4 percentage, which is a 10 basis point improvement to the year before and 530 basis points improvement to 2012, corresponding to an improvement of 18.2% over the period or 3.4% in average a year. It suggests that Novo Nordisk has been superior in managing their cost base, especially when comparing the profit margins with peers, see table 3.

NOPAT Margin	FY2012	FY2013	FY2014	FY2015	FY2016
Novo Nordisk	29,1%	29,2%	30,2%	34,3%	34,4%
Eli Lilly	13,4%	15,0%	7,9%	7,1%	8,0%
Sanofi	13,1%	12,7%	12,1%	12,5%	11,9%

Table 3: Historical Net Operating Profit After Tax margins for Novo Nordisk, Eli Lilly and Sanofi
Source: Own creation, based on reformulated statements

For the profit margins, the same pattern as the ROIC is noticed. Novo Nordisk is the only firm to increase margins in the period of analysis with Eli Lilly once again being the company with the largest decrease in margins (-40.1%). The profit margins therefore seem to be an explanation of Eli Lilly's significant decrease in ROIC.

6.2.1.1.2 Turnover Rate of Invested Capital

The turnover rate of invested capital expresses the company's ability to utilize invested capital. It is calculated as net revenue to invested capital (Petersen & Plenborg, 2012). The turnover ratio of Novo Nordisk has in the five years period increased from 3.01 to 3.64, which is an increase of 20.9%. The turnover ratio of 3.64 indicates that Novo Nordisk tie up capital in less than 100 days. This is an extraordinary result for a company in the pharma industry, which is characterized by relatively low turnover rates due to their heavy investments in fixed assets (Petersen & Plenborg, 2012).

Turnover Rate of Invested Capital	FY2012	FY2013	FY2014	FY2015	FY2016
Novo Nordisk	3,01	2,97	2,96	3,50	3,64
Eli Lilly	1,68	1,78	1,47	1,25	1,17
Sanofi	0,52	0,51	0,49	0,54	0,56

Table 4: Historical Turnover Rate of Invested Capital for Novo Nordisk, Eli Lilly and Sanofi
Source: Own creation, based on reformulated statements

The high turnover ratio suggest Novo Nordisk has a tight cost control through the value chain, and the benchmark in table 4 support Novo's superiority in utilizing their invested capital compared to Eli Lilly and Sanofi.

The turnover ratio of Eli Lilly has decreased 30.2% in the five years period and indicating that the significant decrease in their ROIC is also supported from their decreasing ability to utilize invested capital. For Sanofi the turnover ratio are relatively stable over the period. However, Sanofi's turnover ratio is noticed to be significantly lower than Novo Nordisk and Eli Lilly, indicating that they have inferior ability to utilize their invested capital and considered as the primary explanation for their significantly lower ROIC level.

6.2.2 Evaluation of Financing

The second part of the profitability analysis will examine the effect of financing on the profitability. In the following the financial gearing and the net borrowing cost will be analyzed.

6.2.2.1 Financial Leverage

Financial leverage is defined as net interest-bearing debt divided by book value of equity. In the period of analysis the financial leverage of Novo Nordisk is negative for all years, indicating higher interest-bearing assets than interest-bearing debt.

Financial Leverage	FY2012	FY2013	FY2014	FY2015	FY2016
Novo Nordisk	-33,5%	-32,3%	-27,6%	-29,2%	-33,4%
Eli Lilly	-4,9%	-20,0%	-19,2%	6,2%	26,3%
Sanofi	21,9%	15,0%	15,0%	12,5%	7,0%

Table 5: Historical Financial Leverage of Novo Nordisk, Eli Lilly and Sanofi.
Source: Own creation, based on reformulated statements

In the last five years, Novo Nordisk has operated without any long-term debt and with significant amount of cash at bank. In the reformulated balance sheet it is noticed that cash at bank constantly represent 70% to 80% of interest-bearing assets. This partly explain the relatively stable financial leverage in table 5, where the financial leverage has only changed – 0.1%, gone from – 33.5% in 2012 to – 33.4% in 2016.

The benchmark analysis suggests that, everything else being equal, Novo Nordisk has lower financial risk than the competitors. Table 5 shows that Eli Lilly has operated with negative financial leverage in the first three years of the analysis but has then increased the financial leverage significantly. In the latest fiscal year they operate with a financial leverage of 26.3%, primarily explained by an increase of long-term debt of 51.6% from 2012 to 2016. Sanofi on the other hand operates with positive but decreasing financial leverage. In the reformulated balance sheet of Sanofi, it is noticed that similar to Eli Lilly, Sanofi has significantly increased its portion of long-term debt in the period but the impact on financial leverage has been offset by the relatively higher increase in assets held for sale.

6.2.2.2 Net Borrowing Cost

Net borrowing cost (NBC) is defined as net financial expenses after tax divided by net interest-bearing debt (Petersen & Plenborg, 2012). The net borrowing cost of Novo Nordisk is negative in four out of five years and presents a very high variation range from +5.8% to -35.8%. Given the relatively stable negative financial leverage one would assume more stability on the net borrowing costs. However the NBC is highly affected by gains and losses of the derivative financial instruments Novo Nordisk, as well as Eli Lilly and Sanofi, use for hedging purposes. Therefore, the NBC is assessed to not give a true picture of the borrowing rate.

NBC	FY2012	FY2013	FY2014	FY2015	FY2016
Novo Nordisk	-9,5%	5,8%	-2,6%	-35,8%	-3,2%
Eli Lilly	-13,1%	-1,5%	-1,1%	9,1%	2,4%
Sanofi	6,3%	6,8%	5,8%	6,0%	26,1%

Table 6: Historical Net Borrowing Cost of Novo Nordisk, Eli Lilly and Sanofi. Note: A negative sign indicates a net borrowing gain. Source: Own creation, based on reformulated statements

As shown in table 6, the NBC of Eli Lilly varieties heavily in the five years period. Though it follow a close pattern to its financial leverage by having a negative NBC the first three years followed by two years of positive NBC. Sanofi on the other hand, has a relatively stable NBC in the first four years but in 2016 the NBC shows

a high increase primary due to impairment losses on financial assets related to equity ownership in a public healthcare company (Sanofi AR, 2016, s. 321).

6.2.3 Summary of Profitability Analysis

Based on the return on invested capital Novo Nordisk is highly competitive as they show superior profitability levels compared to competitors. The difference is caused by Novo Nordisk's ability to better manage costs and to improve them over time contrary to competitors.

The combination of a turnover ratio notably higher than the industry and a high profit margin substantially higher than all competitors is believed be a competitive advantage caused by Novo Nordisk's strategic focus on protein related diseases alone, contrary to competitors that have diversified portfolios.

Based on the financial leverage, Novo Nordisk has a lower financial risk compared to both competitors, and the relatively stable and negative level of the financial leverage support a fixed capital structure with zero long-term debt going forward.

7 Valuation

Following the technical note of Plenborg (2002) wherein he analyze Radiometer Medical as a case, the discounted cash flow to the firm model is applied as the primary model in this thesis. This present value approach will be supported by a relative valuation approach where the value will be estimated by the market price of comparable companies.

The discounted cash flow model to the firm is defined as:

$$EV_0 = \sum_{t=1}^{n} \frac{FCFF_t}{(1+WACC)^t} + \frac{FCFF_{n+1}}{WACC - g} \cdot \frac{1}{(1+WACC)^n}$$

Where EV_0 is the present value of the enterprise value, $FCFF_t$ is the free cash flow in period t, $FCFF_{n+1}$ is the free cash flow in the terminal period, g is the constant growth rate in the terminal period and WACC is the discount factor (Petersen & Plenborg, 2012). That is, the value of the company is equal to the future cash flows generated by the assets discounted to present value with the discount factor that takes into account the time value of money and the risk associated with future cash flows (Petersen & Plenborg, 2012).

The discounted cash flow model implies that only the free cash flows to the firm and WACC affect the market value of the firm. In the following sub sections the budget and the discount rate will be estimated, followed by a DCF-model valuation of Novo Nordisk and a multiple comparison. Finally, the chapter will test the valuation result using sensitivity analysis, where the stock price reaction to change of key input variables is analyzed.

7.1 Budget

The most significant factor in determining the budget length is the expiration of current patents and expected completion of high potential products in the research and development pipeline. For Novo Nordisk most of the patents for current blockbusters, including NovoMix®, NovoRapid®, Norditropin® and Levemir®, expire in the period between 2017 and 2019. Most new-generation versions to the products with close patent expirations are already approved and about to launch but higher groundbreaking products, like the oral semaglutide, is not expected to complete the last clinical phase before 2019-2020. To include the potential of the products in the last clinical phase of the R&D pipeline, a budget length of 8 years is

chosen in order to give a precise estimate of the long-term valuation of Novo Nordisk.

The budgeting is based on financial value drivers, which will form the basis for the pro forma income statement, balance sheet and free cash flow calculations. The eight financial drivers include:

(1) Revenue Growth
(2) EBITDA Margin
(3) D&A / Intangible & Tangible Assets
(4) Tax Rate
(5) Net Borrowing Cost
(6) Intangible & Tangible Assets / Revenue
(7) Net Working Capital / Revenue
(8) Net Interest-bearing Debt / Invested Capital

Figure 20: Financial value drivers for pro-forma statements. Source: Own creation based on (Petersen & Plenborg, 2012)

In the following the key financial drivers will be analyzed. In appendix 14, the historical and projected financial value drivers are presented.

7.1.1 Revenue Growth Forecast

As explained in the earlier analysis the diabetes and the biopharmaceutical markets are segmented in different underlying product groups. In the following section the growth forecast in the individual segments will be elaborated based on the strategic and financial analysis above.

For all future products in stage 3 of clinical trial a risk adjustment is applied. All individual segment growth rates are illustrated in figure 21 below.

7.1.1.1 Diabetes and Care

In the GLP-1 segment Victoza® is the blockbuster. In the last fiscal year the growth rate reduced to a level of 11.2%. Victoza® is expected to have a similar growth rate the next two years due to an intense competition with competitor products which are superior to Victoza®. From 2019 Semaglutide®, which is all current GLP-1 products in the market superior, is expected to be fully launched and therefore improve growth rates. The GLP-1 growth is further expected to increase when the oral semaglutide passes the last clinical phase. I believe it is highly likely to pass as Novo Nordisk has already started to invest in production facilities

(Novonordisk.com/Pressrelease2, 2015). I expect the oral semaglutide to be launched from 2021 and support the growth in the GLP-1 segment.

Insulin is the market with highest competition. The entrance of the first biosimilar in the US and the consolidation of PBMs will have a negative impact on prices going forward. Therefore, the growth rates in the insulin segment are not expected to follow historical high level. In the last five years Novo Nordisk had an average growth rate of 10% in the insulin segment but only 0.4% growth in the last fiscal year. Therefore, it is expected that growth in the insulin segment will be modest in the first two years of the forecast where Novo Nordisk will adjust its strategy to the changed market environment and continue the global launch of its new-generation insulins, Fiasp®, Xultophy®, and Ryzodeg® which will take over the blockbusters NovoRapid® and NovoMix® which has patent expirations in 2017. The low growth in the first two years of the budget period is partly expected to be offset by the further global launches of Tresiba®, which has shown superior performance to the current modern insulin Levemir® and all other long-acting insulins in the market. From 2019 the growth is forecasted to increase as Novo Nordisk is expected to have fully adjusted to changed market environments and fully launched all new-generation insulins. In addition to the modern insulins and new-generation insulins, Novo Nordisk has annual sales DKK 10-11 billion from human insulin. These sales are historically at a stable level, and they are predicted to continue this way for all of the future years.

As discussed in the strategic analysis the revenue from OAD is decreasing and this segment is not expected to be a value driver. In addition, the obesity market is highly challenged, as obesity is yet not accepted as a chronic disease. Therefore, the other diabetes care and obesity accounting segment is not expected to grow higher than the historical three years average, which include and put higher emphasis to the introduction of Saxenda® in 2015.

	Forecasts							
	2017	2018	2019	2020	2021	2022	2023	2024
Revenue growth y/y	5,2%	5,6%	7,2%	8,1%	8,7%	9,2%	9,1%	9,1%
Insulin growth y/y	3,5%	4,0%	5,5%	6,0%	6,3%	6,3%	6,3%	6,3%
GLP-1 growth y/y	11,2%	10,0%	14,0%	18,0%	19,0%	22,0%	22,0%	22,0%
Other diabetes care and obesity growth y/y	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%
Haemophilia growth y/y	4,3%	4,7%	5,0%	5,2%	5,6%	4,7%	4,7%	4,7%
Human growth hormone growth y/y	11,8%	11,0%	9,0%	9,0%	10,8%	11,0%	11,0%	11,0%
Other biopharmaceuticals growth y/y	-12,0%	-2,0%	1,0%	0,0%	2,0%	3,0%	1,0%	0,0%

Figure 21: Forecasted segment growth rates.
Source: Own creation based on strategic and financial analysis.

7.1.1.2 Biopharmaceuticals

The biopharmaceutical diseases are all mainly inherited, and therefore the forecast of future revenue growths take into account the long-run growth of the global population growth rate analyzed in the strategic analysis.

The historical average in haemophilia is 4.3%, which largely only include sales from NovoSeven®. Due to increased competition to NovoSeven®, and NovoEight® being the only other active product, though with limited success, the growth in 2017 is forecasted similar to 2016. In addition, the recently approved Rebinyn® is soon expected to be launched and forecasted to improve sales from the haemophilia B segment starting from 2018, while the long-acting N8-GP to haemophilia A patients is expected to increase growth from the haemophilia A segment from 2020.

The human growth hormone market is the most competitive market due to large and increasing amount of available biosimilars. The global human growth hormone market has grown 4.5% annually in the last five years, and the market is expected to grow at a similar rate in the next few years. Novo Nordisk has experienced great success with Norditropin® which is all other products superior. However, Norditropin® has patent expiration in 2017 and therefore further increased competition and lower sales growth is expected already from 2018. From 2020, Novo Nordisk is forecasted to increase sales in the segment with Somapacitan®, which is in the last stage of the clinical trial, and is superior to currently all existing products.

Other biopharmaceutical predominantly consist of hormone replacement therapy-related products. Novo Nordisk has a limited focus on this segment. In average the segment has grown 9% over the years, however future growth is expected to decrease significantly due to the introduction of a generic version of Novo Nordisk's Vagifem® and the lack of successors in the pipeline.

7.1.2 Other Financial Drivers

In the following, the key financial drivers for the valuation will be discussed.

EBITDA margin was in the last two years 46.4% and 46.2%. The five-years historical average is 43.5%. Novo Nordisk has recently changed its R&D strategy and will going forward include acquired research and development projects into the pipeline. The changed strategy is expected to, all other things equal, to increase

the administration costs as well as the cost of sales. With the change in strategy Novo Nordisk is expected to reduce some of the competitive cost advantage it had relative to its peers due to its previous strategic focus on organic growth on protein based products only. In addition, Novo Nordisk has a high number of product launches and therefore higher administration and marketing costs in the next 3 years. The EBITDA margin is forecasted to decrease gradually in the first five years of the forecast period, and then projected to stabilize at a level of 40%.

Depreciation and amortisation is estimated as a percentage of tangible & intangible assets. The ratio is relatively stable around 12% during the historical period and it is projected to follow the same pattern in the future.

The tax rate is set equal to the statutory tax rate of 22% in Denmark.

Intangible & tangible assets are estimated as a percentage of revenues. Historically the ratio has varied very closely around 27%. However, the post is expected to increase due to possible acquisitions of intangible assets through M&A activities. The intangible & tangible assets is projected to be constant at 30% to the revenues.

Net working capital as a percentage of revenue, is forecasted to stay at the same level as the historical median, indicating that future growth in invested capital will come from investment in non-current assets.

Net interest bearing debt to invested capital is projected at a constant rate equal to the historical average.

	Forecasts							
Financial Value Drivers	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
(1) Revenue Growth	*5,2%*	*5,6%*	*7,2%*	*8,1%*	*8,7%*	*9,2%*	*9,1%*	*9,1%*
(2) EBITDA Margin	*45,1%*	*43,9%*	*42,8%*	*41,6%*	*40,0%*	*40,0%*	*40,0%*	*40,0%*
(3) D&A / Intangible & Tangible Assets	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%
(4) Tax Rate	*22,0%*	*22,0%*	*22,0%*	*22,0%*	*22,0%*	*22,0%*	*22,0%*	*22,0%*
(5) Net Borrowing Cost	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%
(6) Intangible & Tangible Assets / Revenue	*30,0%*	*30,0%*	*30,0%*	*30,0%*	*30,0%*	*30,0%*	*30,0%*	*30,0%*
(7) Net Working Capital / Revenue	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%
(8) Net Interest-bearing Debt / Invested Capital	*-43,2%*	*-43,2%*	*-43,2%*	*-43,2%*	*-43,2%*	*-43,2%*	*-43,2%*	*-43,2%*

Figure 22: Forecasted financial drivers.
Source: Own creation, based on the strategic and financial analysis

All projected financial drivers are illustrated in figure 22.

In addition, appendix 15 shows the pro-forma income statement, pro forma balance sheet and the pro forma free cash flow calculation.

7.1.3 Terminal growth

In general there are three ways to estimate the terminal value. One is to assume liquidation in the terminal year and estimate the market value of assets at that point. The other two approaches assume going concern after the budget period. The first approach is to apply multiples on earnings, revenues or book value to estimate the terminal value and the other approach is to assume that cash flows of the firm will grow at a constant rate forever (Damodaran, Estimating Terminal Value). It is assumed that Novo Nordisk will continue its operations after the budget period, and the constant growth approach will be applied to estimate the terminal value of the company.

A growth rate higher than the market economy and a growth rate that is negative are assessed to be unrealistic, as it will imply that the company at some point either make up the entire economy or disappear, respectively. Based on the fact that the pharmaceutical industry is a defensive industry, it is assessed that the terminal growth rate equal to the global GDP growth rate is a realistic estimate. The projected global growth rate of 2.8% to 2030 (Oecd.org/GDP, 2014) is thus implied as the terminal growth. See appendix 3 for the calculations.

7.2 The Discount Rate

The next step towards the valuation of Novo Nordisk is to estimate the weighted average cost of capital (WACC). The WACC is used to discount future free cash flows back to their present value, and is hence one of the most important parameters in the valuation (Penman, 2013). The WACC is calculated as the weighted average of after-tax cost of debt (tax shield is included) and cost of equity:

$$WACC = \frac{D}{V} \cdot r_D \cdot (1 - t) + \frac{E}{V} \cdot r_E$$

In the equation, D is the market value of the debt, E is the market value of equity, V is the enterprise value, t is the tax rate, r_D is cost of debt and r_E is the cost of equity (Penman, 2013). In the following subsections, all the parameters of the WACC will be estimated followed by the estimation of the weighted average cost of capital of Novo Nordisk.

7.2.1 Cost of equity

To estimate the cost of equity the Capital Asset Pricing Model (CAPM) will be used. The CAPM describes the relationship between risk and expected return, and it is the most applied measure to determine the investors' required rate of return (Penman, 2013).

The general CAPM is given as:

$$r_i = r_f + \beta(r_m - r_f)$$

Where r_i is the cost of equity, r_f is the risk free interest rate, r_m is the market portfolio return and β is the systematic risk coefficient. CAPM indicates that the return equity owners require depends on the covariance between the individual stock and the market return, i.e. the systematic risk β. The β-coefficient has a value of 1 for the market portfolio. Individual stocks with β lower than 1 are less volatile to market fluctuations while individual stocks with β higher than 1 are more sensitive to market changes relative to the market portfolio (Penman, 2013). In the following, all the parameters of the CAPM will be estimated followed by the estimation of Novo Nordisk investors' required rate of return.

7.2.1.1 Estimation of the risk-free rate

The risk-free rate tells how much an investor can expect to earn without taking any risk. According to Petersen & Plenborg (2012), the yield curve from a

government bond is often used as a proxy for the risk-free rate. As the cash flow of Novo Nordisk is reported in Danish Krone, the Danish 10-year government bond is applied to avoid issues related to inflation as well as illiquidity (Petersen & Plenborg, 2012).

The yield on the Danish 10-year government bond on June 6, 2017 is 0.535% (Bloomberg Terminal). The observed yield is assessed to be very low compared to the historical averages of 2.11% and 3.43%, respectively for 10 and 20 years. The current low rate is due to the economic situation in Europe and in Denmark, where the latter is acknowledged to be a safe harbor for bond investors due to its highest possible credit ratings (Nationalbanken.dk, 2017). Consequently, the observed quote is assessed to not be a good proxy for future value of the risk free rate. To avoid such problems Ernst & Young (2015) suggest some alternative approaches, where I have assessed the use of the average yield as a proxy for the risk free rate to be the most optimal. Based on historical daily yields from Bloomberg Terminal, the 20 years average of the Danish 10-year government bond is estimated to 3.43%. It is assessed that 3.43% is a realistic proxy for the future risk free rate.

7.2.1.2 Estimation of the beta coefficient

The beta coefficient represents the additional required return from investors, based on the systematic risk of the underlying stock relative to the market portfolio. It will therefore be calculated as a linear regression of the historical excess return of Novo Nordisk to the excess return of the market return.

The fundamental question is what index to use as a proxy for the market. Because Novo Nordisk is in the OMX Copenhagen 20 index it would be an obvious choice to use. However, this can cause biased results as Novo Nordisk has a significant weight within the index. Another alternative is the MSCI World Healthcare Index where Novo Nordisk has a relatively little weight. In the following the beta will be calculated with each of the two indexes as a proxy for the market return.

In both cases five years historical weekly data is used. The returns are based on excess returns, i.e. the risk free rate, estimated in the previous section, is subtracted from the absolute weekly returns for Novo Nordisk and both of the indexes. The summary output of the linear regressions is available in appendix 16.

The linear regression with the OMX Copenhagen 20 index as a proxy for the market portfolio gives a beta estimate of 1.35 with a standard error of 0.0453. The linear regression with the MSCI World Healthcare index gives a beta estimate of 0.98 with a standard error of 0.1143.

The first beta estimate of 1.35 indicates that Novo Nordisk has a larger systematic risk relative to the market, while the second beta estimate of 0.98 indicates that Novo Nordisk' excess return is closely related to the market index. The differences in the two beta estimates are assessed to be due to Novo Nordisk's relative weight in the two indices.

An alternative approach to measure the beta is estimating beta from industry comparable firms. In his latest update from January 2017 Professor Damodaran calculate the pharmaceutical industry beta to 1.02 (Damodaran, Betas by Sector (US), 2017), which is close to the beta estimating using the MSCI World Healthcare index above. In addition to the reported industry beta, for comparison purposes I have collected several reported beta estimates from different providers, see table 7.

Provider	Beta
Bloomberg	1,40
Reuters	1,48
Financial Times	1,48
InFinancials	1,40
Yahoo	0,55
Google	0,70
Average	1,17

Table 7: Novo Nordisk beta estimate from different providers.
Source: Own creation based on data collected from different sources

The different providers differ in their estimation by their use of market index, frequency of measurement and measurement period. The estimated beta coefficients from the different providers range from 0.55 to 1.48, with an average of 1.17.

It is assessed that an average of the above estimated beta coefficients provides the highest quality of beta estimate. The average beta estimate of the weekly regression from OMX C20 (1.35), the weekly regression from MSCI World Healthcare (0.98), industry beta of Damodaran (1.02) and the average beta estimate of different financial data providers (1.17) gives a combined beta estimate of combined 1.13.

7.2.1.3 Estimation of the market risk premium

The market risk premium is the difference between market returns and returns from risk-free investments, i.e. it expresses the compensation investors want for taking risk. The calculation of the risk premium is typically based on two approaches, the ex-post approach or the ex-ante approach (Petersen & Plenborg, 2012). Professor Damodaran follow the ex-post approach and monthly updates the implied risk premium based on the S&P 500 Index, where he suggests a rate of 4.49% as of June 1 2017 (Damodaran, Implied ERP, 2017). KPMG follows a similar approach for 10 European countries and suggest an average market risk premium of 6% (KPMG, 2016). Based on the stated figures, I believe 5.2% is a reasonable estimate for the market portfolio return.

7.2.1.4 Estimation of the cost of equity

Using the estimated values of the risk free rate (3.43%), the beta coefficient (1.13) and the market risk premium (5.2%), in the CAPM, the cost of equity is estimated to be 9.36%:

$$r_i = 3.43\% + 1.13 \cdot 5.2\% = 9.36\%$$

7.2.2 Cost of Debt

The cost of debt is the rate at which a company can borrow at in the market. The cost of debt reflects both the default risk of the company and the level of interest rates in the market. As the profitability analysis illustrated, Novo Nordisk has operated without any long-term debt in the last five years and consequently has not reported details on interest rate levels on any outstanding debt.

In this situation, the credit assessment approach is assessed to be the most optimal approach to evaluate the creditor' return requirement. In this approach the cost of debt is equal to the sum of the interest free rate and the default premium (Koller, Goedhart, & Wessels, 2010). According to Bloomberg, the S&P rating assigned to Novo Nordisk is AA-, which according to Petersen & Plenborg (2010) imply a very strong capacity to meet financial commitments. According to data from professor Damodaran, see appendix 17, the default premium for companies credit rated AA is 0.65%. Given the previously estimated risk free rate of 3.43%, the before tax cost of debt of Novo Nordisk bondholders is estimated as 4.08%:

$$Cost\ of\ debt_{pre-tax} = 0.65\% + 3.43\% = 4.08\%$$

To include the tax shield received from debt financing, the cost of debt after tax will be calculated. It is expected that the highest fraction of debt will be in local

currency. Therefore, in the calculation of the cost of debt after tax, the statutory tax rate of 22% in Denmark will be applied. The cost of debt post tax is calculated as 3.18%:

$$Cost\ of\ debt_{after-tax} = 4.08\% \cdot (1 - 22\%) = 3.18\%$$

7.2.3 Capital Structure

The weighted cost of capital is used to discount future free cash flows back to their present value, and therefore, the capital structure applied must be the target structure in the future. In the last five years, Novo Nordisk has operated with equity financing only. This would suggest a cost of capital to be equal to the cost of equity.

However, as explained earlier, the company has recently changed their research and development strategy to include mergers and acquisitions in the future product pipeline, making fully equity financing unrealistic taking the high demand of acquisitions in the pharmaceutical industry into account. This advocates that Novo Nordisk will be forced to increase its debt to capital ratio in the long term. The future capital structure is difficult to estimate, however, it is assessed to be realistic that Novo Nordisk in the long term maintain a capital structure equal to the average pharmaceutical industry. Professor Damodaran estimates the average debt to capital ratio for US pharmaceutical companies to be 12.64% (Damodaran, Cost of Capital by Sector (US) , 2017) and for EU pharmaceuticals to 18.48% (Damodaran, Cost of Capital by Sector (EU), 2017). For Novo Nordisk, the average debt to capital ratio of 15.55% is assessed to be more representative of the future capital structure.

7.2.4 Weighted Average Cost of Capital

At this point the cost of debt after tax (3.18%), the cost of equity (9.36%) and the target capital structure (15.55%) is estimated. Based on these inputs, the weighted average cost of capital of Novo Nordisk is estimated to be 8.40%:

$$WACC = 0.1848 \cdot 0.0318 + (1 - 0.1555) \cdot 0.0936 = 0.0840$$

7.3 Present Value Valuation

Based on the pro forma statements, the weighted average cost of capital of 8.4% and the terminal growth rate of 2.8%, the share price of Novo Nordisk is calculated using the DCF model. The snapshot of the valuation is illustrated in figure 23 below, see appendix 18 for a larger version of the figure.

		Budget Period								
(m DKK)		2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	Terminal
Number of Forecast Period		1	2	3	4	5	6	7	8	
Free Cash Flow to the Firm (FCFF)		29.346	36.850	37.737	39.144	40.320	43.813	47.844	52.210	958.434
Discount Factor		*0,9225*	*0,8510*	*0,7851*	*0,7242*	*0,6681*	*0,6163*	*0,5686*	*0,5245*	0,5245
Present Value of FCFF		27.072	31.360	29.627	28.349	26.939	27.004	27.204	27.386	502.722
Present Value of FCFF in Budget Period	224.940									
Present Value of FCFF in Terminal Period	502.722									
Estimated Enterprise Value	727.662									
Net Interest-bearing Debt	- 15.062									
Estimated Market Value of Equity	**742.724**									
Shares outstanding (m)	2.530									
Implied Share Price (DKK) 31 December 2016	293,57 DKK									
Factor adjustment to valuation date	1,0201									
Implied Share Price (DKK) 31 March 2017	299,46 DKK									

Figure 23: DCF Valuation of Novo Nordisk as of 31st March 2017

The discounted cash flow model used is based on free cash flow to the firm. Therefore, the net interest-bearing debt is deducted from the enterprise value to arrive at the market value of the equity. The implied share price is based on 2.530m outstanding class B shares. Because the annual report is based on the balance date of 31 December 2016, the implied share price is adjusted forward to the 31st of March 2017.

The calculated share price using the discounted cash flow model is DKK 299.5 on 31st March 2017, which implies a premium of 25% to the close price (DKK 239.5) on the same date. This indicates that the market has undervalued the stock.

7.4 Sensitivity Analysis

The valuation is based on several key assumptions on the future. In the following the key assumptions behind the valuation, including the weighted cost of capital, the terminal growth rate, the EBITDA margin and the revenue growth rate in the budget period, will be investigated to determine how sensitive the calculated share price of Novo Nordisk is to these forecast assumptions.

In figure 24, the sensitivity analysis of the WACC and the long-term growth rate is presented. In the base case the discount factor is 8.4% and the long-term growth rate is 2.8%. The analysis proves that the share price is highly sensitive to changes in the WACC, where a change of +/– 0.5 percentage-point and +/–1.0 percentage-point in the discount rate cause a price volatility of DKK 54.4 and DKK 112.0 respectively. An interesting observation is related to the share price if it was assumed that Novo Nordisk in the long term would continue with a capital structure without any long-term debt. In that case the weighted cost of average would equal the cost of equity of 9.4% and imply a share price of DKK 253.5. This finding implies that everything else being equal, Novo Nordisk shareholders would indeed gain from a capital structure similar to the average pharmaceutical industry.

Sensitivity Analysis

Implied LT Growth Rate	WACC 6,90%	7,40%	7,90%	8,40%	8,90%	9,40%	9,90%
1,3%	324,8 DKK	297,4 DKK	274,2 DKK	254,3 DKK	237,1 DKK	222,0 DKK	208,7 DKK
1,8%	347,8 DKK	316,0 DKK	289,5 DKK	267,1 DKK	247,8 DKK	231,1 DKK	216,5 DKK
2,3%	375,8 DKK	338,4 DKK	307,6 DKK	281,9 DKK	260,2 DKK	241,5 DKK	225,4 DKK
2,8%	410,7 DKK	365,5 DKK	329,2 DKK	299,5 DKK	274,6 DKK	253,5 DKK	235,5 DKK
3,3%	455,2 DKK	399,3 DKK	355,6 DKK	320,4 DKK	291,6 DKK	267,5 DKK	247,1 DKK
3,8%	514,2 DKK	442,5 DKK	388,3 DKK	345,9 DKK	311,9 DKK	284,0 DKK	260,7 DKK

Figure 24: Sensitivity analysis of changes in WACC and Long-term growth rate on the share price as of on 31st March 2017

The impact of the long-term growth rate is similarly of high importance, however at a slightly lower volatility in the share price compared to the WACC, as holding all other variables constant the share price volatility is DKK 38.47 and DKK 91.62, respectively for a change of +/– 0.5 percentage-point and +/– 1.0 percentage-point in the long term growth rate.

In figure 25, the sensitivity of the EBITDA margin and the revenue growth rate in the budget period is presented. The sensitivity analysis reveals that the calculated share price is sensitive to changes in the EBITDA margin and the revenue growth

in the budget period as well. However, the volatility seems to be lower than for the WACC and long-term growth rate.

Sensitivity Analysis

Revenue Growth in budget \ EBITDA Margin	-2%	-1,50%	-1,00%	-0,50%	0,00%	0,50%	1,00%	1,50%	2%
-2,0%	250,1 DKK	254,9 DKK	259,7 DKK	264,4 DKK	269,2 DKK	274,0 DKK	278,8 DKK	283,6 DKK	288,4 DKK
-1,5%	256,7 DKK	261,7 DKK	266,6 DKK	271,6 DKK	276,5 DKK	281,5 DKK	286,4 DKK	291,3 DKK	296,3 DKK
-1,0%	263,6 DKK	268,7 DKK	273,8 DKK	278,9 DKK	284,0 DKK	289,1 DKK	294,1 DKK	299,2 DKK	304,3 DKK
-0,5%	270,7 DKK	275,9 DKK	281,1 DKK	286,4 DKK	291,6 DKK	296,9 DKK	302,1 DKK	307,3 DKK	312,6 DKK
0,0%	277,9 DKK	283,3 DKK	288,7 DKK	294,1 DKK	299,5 DKK	304,9 DKK	310,3 DKK	315,6 DKK	321,0 DKK
0,5%	285,3 DKK	290,9 DKK	296,4 DKK	302,0 DKK	307,5 DKK	313,1 DKK	318,6 DKK	324,2 DKK	329,7 DKK
1,0%	292,9 DKK	298,6 DKK	304,3 DKK	310,1 DKK	315,8 DKK	321,5 DKK	327,2 DKK	332,9 DKK	338,6 DKK
1,5%	300,7 DKK	306,6 DKK	312,5 DKK	318,4 DKK	324,3 DKK	330,1 DKK	336,0 DKK	341,9 DKK	347,8 DKK
2,0%	308,7 DKK	314,8 DKK	320,8 DKK	326,9 DKK	332,9 DKK	339,0 DKK	345,1 DKK	351,1 DKK	357,2 DKK

Figure 25: Sensitivity analysis of changes in EBITDA Margin and Revenue Growth in Budget period on the e share price as of on 31 March 2017

Furthermore, as one would expect from the fundamental analysis, the sensitivity is higher from the revenue growth rate than for the EBITDA margin. In the case of the EBITDA margin a change of +/– 2.0 percentage-point gives a price volatile of DKK 43.1, while a revenue growth change of +/– 2.0 percentage-point gives a price volatility of 63.7 DKK.

From the sensitivity analysis we see that the share price estimate based on the present value approach is indeed sensitive to changes in key value drivers. Therefore, in the following a relative valuation will be applied to get further insight into the value of Novo Nordisk based on the markets valuation of peers and the industry.

7.5 Relative valuation

Earlier in the thesis Eli Lilly and Sanofi is described as the closest companies to Novo Nordisk's business operations. In the relative analysis it is though believed that a multiple average based on the two companies alone is of low quality. Therefore, the peer group will include seven comparable companies, of which all have some market share in the total diabetes care segment (Novo Nordisk Investor Presentation Q1, 2017, s. 26)

There are several multiples available to value a company. For the relative valuation of Novo Nordisk three different multiples will be applied, including Price/Sales, EV/EBIT and EV/EBITDA. Table 8 presents the peer group companies, their respective multiple and the average multiple of the peer group.

	Company	Price / Sales 2017e	EV / EBIT 2017e	EV / EBITDA 2017e
1	SANOFI	3,0x	15,0x	10,7x
2	ELI LILLY & CO	3,9x	16,6x	14,4x
3	MERCK & CO. INC.	4,4x	13,6x	12,0x
4	ASTRAZENECA PLC	3,9x	22,5x	13,8x
5	NOVARTIS AG-REG	4,4x	20,7x	16,6x
6	TAKEDA PHARMACEUTICAL CO LTD	2,6x	29,7x	13,9x
7	GLAXOSMITHKLINE PLC	2,7x	14,4x	9,7x
	Average	**3,6x**	**19,0x**	**13,0x**

Table 8: Peer group companies to Novo Nordisk, and related multiples for price/sales, EV/EBIT, and EV/EBITDA. Source: Own creation with forward estimates based on Bloomberg Terminal analyst consensus.

The multiples are based on the share price on 31st of March 2017 and one-year forward estimates of Sales, EBIT and EBITDA, based on analyst consensus from Bloomberg. In appendix 19, the calculations of the multiples and the related share price of Novo Nordisk is presented.

Based on the average of the multiples in table 8, the estimated share price of Novo Nordisk ends up in the range from DKK 167,06 to DKK 376,16, see table 9.

	Price / Sales	EV / EBIT	EV / EBITDA
Share price 31 March 2017	167,06 DKK	376,16 DKK	277,18 DKK

Table 9: Estimated share price of Novo Nordisk based on peer group multiples

The share price calculated through the peer group EV/EBIT gives a price of DKK 376.16 and it is the only multiple that gives a higher share price than calculated in the DCF model. Interestingly, the peer group price/sales multiple gives the lowest

share price, indicating the importance of sales growth within the industry for the total value of the company. Lastly, the peer group EV/EBITDA gives a share price of DKK 277.18 as of 31st of March 2017.

The results of the peer multiples do not suggest the same valuation result as our DCF model, indeed there are even high differences in between the different approaches. The high difference between the multiples is due to the different perspectives on value they have. The price/sales, which is good for a general impression of the market value of sales driven companies, ignores the costs. In the financial analysis it was discovered that Novo Nordisk has a superior cost management to its peer and therefore the valuation based on peer price/sales multiple is considered to be insufficient to provide a realistic value of Novo Nordisk. Both the EV/EBIT and the EV/EBITDA multiples take the costs into account and hence provide more realistic estimates than the price to sales multiple. The large difference between the valuation using the EV/EBIT and EV/EBITDA multiple is due to the different sizes of depreciation and amortisation the pharmaceutical companies have, primarily due to their different strategies to improve their R&D pipeline and future sales growth.

The primary valuation model in this thesis is the DCF approach, while the multiple analyses is conducted to support the evaluation of the DCF calculations. DCF valuations have an internal view on the company while multiple valuations take a market view (Koller, Goedhart, & Wessels, 2010). Taking this into consideration, it is clear that the two types of approaches rely on different assumptions and different inputs, which explain the difference in calculated share prices. The DCF method requires a thorough understanding of the market, the company and the future expectations for both. As such the DCF is all compassing, but since markets are complex, different key factors will be identified and emphasized by different analyses (Koller, Goedhart, & Wessels, 2010). The DCF model is very forward looking, and is looking at all future free cash flows, even though it only makes direct inferences about a limited number of these into the future. Thus the model is based on a long-term horizon, and might consider, and weigh, the distant future more than the general market does. Therefore, it is believed that the DCF model is a better estimation and provides a more reliable estimate of the fair value of Novo Nordisk.

In addition, the calculated share price of DKK 299.46 using the discounted cash flow model is within the range of 277.18 and DKK 376.16, which the peer group EV/EBIT and EV/EBITDA multiples gives, indicating the present value valuation to be reasonable.

8 Conclusion

The object of this paper has been to determine the fair value of Novo Nordisk B A/S stock as of 31st March 2017 and evaluate it against the markets valuation of the stock. In order to answer the question, 5 sub questions, that will provide basis for answer ring the research question, were conducted.

Projected increasing world population, aging global population and urbanization are expected to create basis for future revenues. In addition, increased obesity levels, especially in the United States who accounts for 13% of the global obesity population, and increased diabetes population along with technological advances are positive indicators for future revenue growth in the markets Novo Nordisk operates in. Furthermore, it is legit to conclude that future earnings of established companies depends on their ability to innovate new and improved products to survive and maintain market positions. This supports a future market environment with increased mergers and acquisition deals of assets at earlier stages of the development phase, which explains Novo Nordisk's decision to include M&A into their future R&D strategy. However, higher health expenditures than economic growth has increased the political pressure on the pharmaceutical industry and resulted in different price control mechanisms in Europe and many other major markets outside the United States. In United States the presidential election in 2016 has brought high political debates and criticism of pharmaceutical prices, which has resulted Novo Nordisk to commit to limit all future price increases to no more than single-digit numbers. Consequently, future growth in the pharmaceutical industry is more likely to come from volume growth rather than price increases.

Novo Nordisk operates in some very attractive markets, which has delivered very high historical growth rates and were effectively protected by strong entrance barriers. However due to external changes to the entrance barriers and significant strengthening of buyers economic power the competition has increased. Changed legislation in the US and the EU for abbreviated licensure pathway for biosimilars and recently updated regulatory guidelines specifically for insulins has made it easier and more attractive for companies to enter with "copy" products. Consequently, the launch of the first insulin biosimilar, Basaglar, in the US at the end of 2016 has had significant impact on the industry. In addition, consolidations within the Private Benefit Managers (PBMs) industry in the US, has increased the power of US buyers, and forced branded-drug pharmaceuticals to decrease list prices and give higher rebates to PBMs in order to come into their formulary.
The industries Novo Nordisk operates in are still highly attractive due to the growth potential they possess but changed industry forces suggest higher competition and higher price pressure going forward. Consequently, Novo

Nordisk is expected to continue its future growth but double-digit growth rates are no longer expected.

Novo Nordisk has a very promising pipeline and product portfolio. Novo Nordisk has some market leader products in their portfolio. In the GLP-1 segment Victoza®, in the insulin segments, NovoRapid® and NovoMix®, in the obesity segment Saxenda®, in the Haemophilia segment NovoSeven® and in the Human Growth Hormone segment Norditropin®. Most of the blockbusters offer superior qualities to their peers. However, all of the products mentioned face increased competition from cheaper as well as better alternatives. Therefore, future growth is expected to come from successors of the blockbusters. In the GLP-1 segment, Semaglutide® is filled for approval and will support Novo's market leadership as it is all existing products superior. In the insulin segment, Tresiba® has already started its launch strategy in 2016. Tresiba® has significant higher value proposition than all competing products in the segment due to its 42 hours active insulin compared to the alternative 20-24 hours. The success of Tresiba® is one of the most important revenue drivers for Novo Nordisk going forward. Similarly, Xultophy® and Ryzodeg®, who are based on Tresiba® and therefore all other alternatives superior, are expected to support the market leadership in the premix insulin segment. Fiasp®, the successor of NovoRapid®, which is already approved in the EU and expected to approve in US by the end of 2017, is another expected blockbuster in the fast-acting insulin segment as studies has confirmed its superiority to other current alternatives in the market. For biopharmaceuticals, Rebinyn®, who recently received approval in the EU, is to help Novo Nordisk enter the haemophilia B segment and support future growth in the greater haemophilia segment.

For the long-term revenue drivers N8-GP in haemophilia A, Somapacitan® in growth hormone and oral Semaglutide® in GLP-1 segments are the most interesting and high potential products in the current pipeline. All of the products are superior to all currently available products in the market. Especially, the oral Semaglutide® is expected to be disruptive for the future market once approved.

In the profitability analysis Novo Nordisk showed to be highly competitive and superior to Eli Lilly and Sanofi in generating return on equity as well as return on invested capital. The high performance is caused by Novo Nordisk significantly superior profit margins to peers and extraordinary turnover ratio of 3.64, which is both better than peers but also considerably higher than the industry, which is characterized by relatively low turnover rates due to heavy investments. The combination of the high profit margin and turnover ratio results in a competitive

advantage Novo Nordisk has in managing cost, and is believed to support profits going forward.

The valuation of Novo Nordisk is based on a discounted cash flow model. In order to investigate the reliability of the valuation result, a sensitivity regarding the weighted average cost of capital, long-term growth rate, EBITDA margin and revenue growth rate within the budget period was conduced. The analysis suggested sensitivity to all four assumptions though at different degrees. The highest sensitivity is related to the WACC followed by the long-term growth rate and the revenue growth in the budget period. The EBITDA margin showed to provide the least sensitivity. The analysis proves that a change of +/– 1.0 percentage-point in the discount rate cause a share price volatility of DKK 112.0, which still indicates a higher share price valuation than the actual close price at 31st of March 2017.

Based on the strategic analysis along with the financial analysis, the fair value of Novo Nordisk B A/S as of March 31st 2017 is calculated to DKK 299.5, which implies a premium of 25% to the actual close price of DKK 239.5 on the same date. This indicates that the market undervalued the share price of Novo Nordisk B A/S, in other words the market seems to have more pessimistic assumptions about the future than the assumptions applied in our DCF valuation.

The calculated share price of DKK 299.5 falls within the range of DKK 277.18 and DKK 376.16 which the peer group 1-year forward EV/EBIT and EV/EBITDA multiples give, indicating the DCF valuation of DKK 299.5 to be reasonable.

Appendix

Appendix 1: Historical Sales Development by Product Segments

In Millions of DKK	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Total Sales	78.026	83.572	88.806	107.927	111.780
Diabetes Care	60.887	65.456	69.980	85.590	88.949
Insulin	46.123	49.022	52.493	62.833	63.059
GLP-1	9.495	11.633	13.426	18.027	20.046
Obesity	-	-	-	460	1.577
Other diabetes care	5.269	4.801	4.061	4.270	4.267
Biopharmaceuticals	17.139	18.116	18.826	22.337	22.831
Haemophilia	8.933	9.256	9.142	10.064	10.472
Human Growth Hormone	5.698	6.114	6.506	7.820	8.770
Other Biopharmaceuticals	2.508	2.746	3.178	4.453	3.589

In % as of total sales	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Diabetes Care	78,0%	78,3%	78,8%	79,3%	79,6%
Insulin	59,1%	58,7%	59,1%	58,2%	56,4%
GLP-1	12,2%	13,9%	15,1%	16,7%	17,9%
Obesity	0,0%	0,0%	0,0%	0,4%	1,4%
Other diabetes care	6,8%	5,7%	4,6%	4,0%	3,8%
Biopharmaceuticals	22,0%	21,7%	21,2%	20,7%	20,4%
Haemophilia	11,4%	11,1%	10,3%	9,3%	9,4%
Human Growth Hormone	7,3%	7,3%	7,3%	7,2%	7,8%
Other Biopharmaceuticals	3,2%	3,3%	3,6%	4,1%	3,2%

Growth rates y/y	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Total Sales	17,6%	7,1%	6,3%	21,5%	3,6%
Diabetes Care	20,7%	7,5%	6,9%	22,3%	3,9%
Modern Insulins (Insulin Analogues)	21,1%	9,6%	8,9%	20,8%	-5,3%
GLP-1 (Victoza)	58,5%	22,5%	15,4%	34,3%	11,2%
Human Insulins	4,8%	-3,8%	-5,3%	9,1%	-1,3%
New Generation Insulin				118,5%	210,1%
Other diabetes and obesity care	7,9%	-8,9%	-15,4%	16,5%	23,6%
Obesity (Saxenda®)					242,8%
Biopharmaceuticals	7,7%	5,7%	3,9%	18,6%	2,2%
Haemophilia (NovoSeven®)	7,0%	3,6%	-1,2%	10,1%	4,1%
Human Growth Hormone (Norditropin®)	12,9%	7,3%	6,4%	20,2%	12,1%
Other Biopharmaceuticals	-0,8%	9,5%	15,7%	40,1%	-19,4%

Source: Own creation, based on Novo Nordisk annual reports 2012-2016

Appendix 2: Historical Gross Sales and Rebates Given

(m DKK)

	2011	2012	2013	2014	2015	2016
Gross Sales	84.368	103.948	115.906	131.841	182.779	198.924
US Managed Care and Medicare	5.075	7.519	9.959	17.522	33.235	40.874
US Wholesaler charge-backs	5.894	4.390	5.481	12.858	22.030	25.416
US Medicaid rebates	2.551	8.196	10.126	5.578	9.838	10.862
Other US discounts and sales returns	3.825	2.620	2.978	2.972	4.685	5.147
Non-US rebates, discounts and sales returns	695	3.197	3.790	4.105	5.064	4.845
Total gross-to-net sales adjustments	18.040	25.922	32.334	43.035	74.852	87.144
Net sales	66.346	78.026	83.572	88.806	107.927	111.780

Growth Y/Y

	2011	2012	2013	2014	2015	2016
Gross Sales	11,3%	23,2%	11,5%	13,7%	38,6%	8,8%
US Managed Care and Medicare	23,1%	48,2%	32,5%	75,9%	89,7%	23,0%
US Wholesaler charge-backs	18,0%	-25,5%	24,9%	134,6%	71,3%	15,4%
US Medicaid rebates	2,3%	221,3%	23,5%	-44,9%	76,4%	10,4%
Other US discounts and sales returns	32,8%	-31,5%	13,7%	-0,2%	57,6%	9,9%
Non-US rebates, discounts and sales returns	28,0%	360,0%	18,5%	8,3%	23,4%	-4,3%
Total gross-to-net sales adjustments	20,0%	43,7%	24,7%	33,1%	73,9%	16,4%
Net sales	9,2%	17,6%	7,1%	6,3%	21,5%	3,6%

Appendix 3: GDP Growth rate of major markets & Terminal Growth

Location	INDICATOR	SUBJECT	MEASURE	FREQUENCY	TIME	GDP Value USD	2017-2030 Growth
JPN	GDPLTFORECAST	TOT	MLN_USD	A	2015	4.153.567	
JPN	GDPLTFORECAST	TOT	MLN_USD	A	2017	4.207.533	
JPN	GDPLTFORECAST	TOT	MLN_USD	A	2030	4.878.613	1,0%
USA	GDPLTFORECAST	TOT	MLN_USD	A	2015	15.423.341	
USA	GDPLTFORECAST	TOT	MLN_USD	A	2017	16.401.209	
USA	GDPLTFORECAST	TOT	MLN_USD	A	2030	22.482.236	2,1%
CHN	GDPLTFORECAST	TOT	MLN_USD	A	2015	13.325.589	
CHN	GDPLTFORECAST	TOT	MLN_USD	A	2017	15.099.104	
CHN	GDPLTFORECAST	TOT	MLN_USD	A	2030	26.307.248	3,8%
WLD	GDPLTFORECAST	TOT	MLN_USD	A	2015	68.077.321	
WLD	GDPLTFORECAST	TOT	MLN_USD	A	2017	73.424.803	
WLD	GDPLTFORECAST	TOT	MLN_USD	A	2030	111.074.203	2,8%
EA15	GDPLTFORECAST	TOT	MLN_USD	A	2015	10.182.211	
EA15	GDPLTFORECAST	TOT	MLN_USD	A	2017	10.611.402	
EA15	GDPLTFORECAST	TOT	MLN_USD	A	2030	13.571.050	1,7%

The World GDP Forecast of 2.8% is used for the terminal growth.

World GDP Rate (USD)	2017	73.424.803
	2024	92.645.670
	2030	111.074.203
World GDP growth (%)	2017-2024	2,95%
	2017-2030	2,80%
	2024-2030	1,22%
Terminal Growth		**2,80%**

Appendix 4: Pipeline and Product Portfolio

Segment	Development				Market			
	Phase I	Phase II	Phase III	Filed	Introduction	Growth	Maturity	Decline
Diabetes	LAI287 (NN1436) PI406 (NN1406) PYY 1562 (NN9748)	Anti-IL 21 GLP-1 T1D (NN9828)	Oral Semaglutide®	Semaglutide® Fiasp®		Tresiba®	Victoza® NovoRapid®/NovoLog® Levemir® NovoMix®	Actrapid® (Human Insulin) Insultard® (Human Insulin) Mixtard® (Human Insulin)
Obesity and Other	AM833 (NN9838) GS305 (NN9030) PYY 1562 (NN9747) GG-co-agonist 1177 (NN9277) FGF21 Obesity (NN9499) Tri-agonist 1706 (NN9423)	Semaglutide Obesity (NN9536) Semaglutide NASH (9931)			Xultophy® Ryzodeg® Saxenda®			
Haemophilia	Concizumab (NN7415) Subcutaneous N8-GP (NN7170)		N8-GP	N9-GP (Rebinyn ®)	NovoEight® NovoThirteen®		NovoSeven®	
Growth Disorders			Somapacitan®				Norditropin®	

Appendix 5: Reformulated Statements of Novo Nordisk

Novo Nordisk - Reformulated Income Statement

DKK million	2012	2013	2014	2015	2016
Net Sales	78.026	83.572	88.806	107.927	111.780
Cost of goods sold	11.475	12.059	12.316	14.053	15.045
Gross Profit	66.551	71.513	76.490	93.874	96.735
Sales, distribution & adm. costs	24.707	26.751	26.613	32.051	32.217
Research and development costs	10.434	11.267	12.846	12.936	13.643
Other operating income, net	757	797	896	1.140	750
EBITDA	**32.167**	**34.292**	**37.927**	**50.027**	**51.625**
Depreciation and amortisation	2.693	2.799	3.435	2.959	3.193
EBIT	**29.474**	**31.493**	**34.492**	**47.068**	**48.432**
Reported Income Tax	*6.379*	*7.355*	*7.615*	*8.623*	*9.873*
Tax shield, net financial expenses	*416*	*- 262*	*97*	*1.401*	*139*
Tax on EBIT	6.795	7.094	7.712	10.024	10.012
NOPAT	**22.679**	**24.400**	**26.780**	**37.044**	**38.420**
Net Financial Expenses before Tax	*1.663*	*- 1.046*	*396*	*5.961*	*634*
Tax on net financial expenses	*416*	*- 262*	*97*	*1.401*	*139*
Net Financial Expenses after tax	1.247	- 785	299	4.560	495
Net Income	**21.432**	**25.184**	**26.481**	**32.484**	**37.925**

Corporation tax, marginal	*25,0%*	*25,0%*	*24,5%*	*23,5%*	*22,0%*
Net financial expenses	*1.663*	*- 1.046*	*396*	*5.961*	*634*
Tax shield, net financial expenses	*416*	*- 262*	*97*	*1.401*	*139*
Net Financial Expenses after tax	*1.247*	*- 785*	*299*	*4.560*	*495*

Novo Nordisk - Free Cash Flow

	2012	2013	2014	2015	2016
NOPAT	22.679	24.400	26.780	37.044	38.420
+ Depreciation and amortisation	2.693	2.799	3.435	2.959	3.193
Net Working Capital	1.609	1.746	577	- 3.243	- 5.369
- Change in NWC	1.436	137	- 1.169	- 3.820	- 2.126
- Net Investments (fixed assets)	3.307	3.262	4.452	6.148	8.383
Free Cash Flow to the Firm (FCFF)	**20.629**	**23.800**	**26.932**	**37.675**	**35.356**
Net new financial obligation	- 1.304	650	3.291	- 5.899	641
Net Financial Expenses after Tax	1.247	- 785	299	4.560	495
Free Cash Flow to equity holders (FCFE)	20.686	23.934	23.342	39.014	34.220

Novo Nordisk - Reformulated Balance Sheet

DKK million	2012	2013	2014	2015	2016
Intangible Assets	*1.495*	*1.615*	*1.378*	*2.158*	*2.714*
Property, plant and equipment	*21.539*	*21.882*	*23.136*	*25.545*	*30.179*
Intangible and Tangible Assets	23.034	23.497	24.514	27.703	32.893
Deferred income tax assets	2.244	4.231	5.399	6.806	2.683
Total non-current assets	25.278	27.728	29.913	34.509	35.576
Inventories	9.543	9.552	11.357	12.758	14.341
Trade receivables	9.639	10.907	13.041	15.485	20.234
Tax receivables	1.240	3.155	3.210	3.871	1.552
Other receivables and prepayments	2.705	2.454	2.750	2.257	2.411
Total current assets	23.127	26.068	30.358	34.371	38.538
Trade Payables	3.859	4.092	4.950	4.927	6.011
Tax payables	593	2.222	2.771	3.777	3.976
Deferred Income tax liabilities	732	672	7	6	13
Total tax liabilities	1.325	2.894	2.778	3.783	3.989
Provisions for sales rebates	7.352	7.950	11.002	16.508	19.971
Other liabilities	8.982	9.386	11.051	12.396	13.936
Total non-interest-bearing debt	21.518	24.322	29.781	37.614	43.907
Invested Capital (Net Operating Assets)	**26.887**	**29.474**	**30.490**	**31.266**	**30.207**
Share Capital	560	550	530	520	510
Retained Earnings	39.001	41.137	41.277	46.816	46.111
Treasury Stock	- 17	- 21	- 11	- 10	- 9
Other Reserve	1.088	903	- 1.502	- 357	- 1.343
Total Equity	**40.632**	**42.569**	**40.294**	**46.969**	**45.269**
Other provisions	2.211	2.543	2.629	3.316	3.860
Amount owed to associated company	-	-	-	259	245
Retirement benefit obligations	760	688	1.031	1.186	1.451
Derivative financial instruments	48	-	2.607	1.382	2.578
Long term Debt	-	-	-	-	-
Short term Debt	500	215	720	1.073	229
Interest-bearing debt	**3.519**	**3.446**	**6.987**	**7.216**	**8.363**
Other financial assets	228	551	856	1.339	1.388
Derivative financial instruments	931	1.521	30	304	529
Investment in associated company	-	-	-	811	809
Marketable securities	4.552	3.741	1.509	3.542	2.009
Cash at bank	11.553	10.728	14.396	16.923	18.690
Interest-bearing assets	**17.264**	**16.541**	**16.791**	**22.919**	**23.425**
Net-interest-bearing debt (NIBD)	**- 13.745**	**- 13.095**	**- 9.804**	**- 15.703**	**- 15.062**
Invested Capital	**26.887**	**29.474**	**30.490**	**31.266**	**30.207**
Control	-	-	-	-	-

Appendix 6: Benchmark analysis of Novo Nordisk

Novo Nordisk - Benchmark Analysis of Income Statement

DKK million	2012	2013	2014	2015	2016
Net Sales	100,0%	100,0%	100,0%	100,0%	100,0%
Cost of goods sold	14,7%	14,4%	13,9%	13,0%	13,5%
Gross Profit	85,3%	85,6%	86,1%	87,0%	86,5%
Sales, distribution & adm. costs	31,7%	32,0%	30,0%	29,7%	28,8%
Research and development costs	13,4%	13,5%	14,5%	12,0%	12,2%
Other operating income, net	1,0%	1,0%	1,0%	1,1%	0,7%
EBITDA	41,2%	41,0%	42,7%	46,4%	46,2%
Depreciation and amortisation	3,5%	3,3%	3,9%	2,7%	2,9%
EBIT	37,8%	37,7%	38,8%	43,6%	43,3%
Tax on EBIT	8,7%	8,5%	8,7%	9,3%	9,0%
NOPAT	29,1%	29,2%	30,2%	34,3%	34,4%
Net Financial Expenses after tax	1,6%	-0,9%	0,3%	4,2%	0,4%
Net Income	27,5%	30,1%	29,8%	30,1%	33,9%

Novo Nordisk - Benchmark Analysis of Balance Sheet

DKK million	2012	2013	2014	2015	2016
Intangible Assets	3,1%	3,0%	2,3%	3,1%	3,7%
Property, plant and equipment	44,5%	40,7%	38,4%	37,1%	40,7%
Intangible and Tangible Assets	47,6%	43,7%	40,7%	40,2%	44,4%
Deferred income tax assets	4,6%	7,9%	9,0%	9,9%	3,6%
Total non-current assets					
Inventories	19,7%	17,8%	18,8%	18,5%	19,3%
Trade receivables	19,9%	20,3%	21,6%	22,5%	27,3%
Tax receivables	2,6%	5,9%	5,3%	5,6%	2,1%
Other receivables and prepayments	5,6%	4,6%	4,6%	3,3%	3,3%
Total current assets					
Trade Payables	17,9%	16,8%	16,6%	13,1%	13,7%
Tax payables	2,8%	9,1%	9,3%	10,0%	9,1%
Deferred Income tax liabilities	3,4%	2,8%	0,0%	0,0%	0,0%
Total tax liabilities	6,2%	11,9%	9,3%	10,1%	9,1%
Provisions for sales rebates	34,2%	32,7%	36,9%	43,9%	45,5%
Other liabilities	41,7%	38,6%	37,1%	33,0%	31,7%
Total non-interest-bearing debt					
Invested Capital (Net Operating Assets)					
Total Equity					
Other provisions	62,8%	73,8%	37,6%	46,0%	46,2%
Amount owed to associated compan	0,0%	0,0%	0,0%	3,6%	2,9%
Retirement benefit obligations	21,6%	20,0%	14,8%	16,4%	17,4%
Derivative financial instruments	1,4%	0,0%	37,3%	19,2%	30,8%
Long term Debt	0,0%	0,0%	0,0%	0,0%	0,0%
Short term Debt	14,2%	6,2%	10,3%	14,9%	2,7%
Interest-bearing debt					
Other financial assets	1,3%	3,3%	5,1%	5,8%	5,9%
Derivative financial instruments	5,4%	9,2%	0,2%	1,3%	2,3%
Investment in associated company	0,0%	0,0%	0,0%	3,5%	3,5%
Marketable securities	26,4%	22,6%	9,0%	15,5%	8,6%
Cash at bank	66,9%	64,9%	85,7%	73,8%	79,8%
Interest-bearing assets					
Net-interest-bearing debt (NIBD)					
Invested Capital					

Appendix 7: Trend Analysis of Novo Nordisk

Novo Nordisk - Trend Analysis of Income Statement

DKK million	2012	2013	2014	2015	2016
Net Sales	100,00	107,11	113,82	138,32	143,26
Cost of goods sold	100,0	105,1	107,3	122,5	131,1
Gross Profit	100,0	107,5	114,9	141,1	145,4
Sales, distribution & adm. costs	100,0	108,3	107,7	129,7	130,4
Research and development costs	100,0	108,0	123,1	124,0	130,8
Other operating income, net	100,0	105,3	118,4	150,6	99,1
EBITDA	100,0	106,6	117,9	155,5	160,5
Depreciation and amortisation	100,0	103,9	127,6	109,9	118,6
EBIT	100,0	106,9	117,0	159,7	164,3
Tax on EBIT	100,0	104,4	113,5	147,5	147,4
NOPAT	100,0	107,6	118,1	163,3	169,4
Tax on net financial expenses	100,0	-62,9	24,0	365,6	39,6
Net Income	100,0	117,5	123,6	151,6	177,0

Novo Nordisk - Trend Analysis of Balance Sheet

DKK million	2012	2013	2014	2015	2016
Intangible Assets	100,0	108,0	92,2	144,3	181,5
Property, plant and equipment	100,0	101,6	107,4	118,6	140,1
Intangible and Tangible Assets	100,0	102,0	106,4	120,3	142,8
Deferred income tax assets	100,0	188,5	240,6	303,3	119,6
Total non-current assets	100,0	109,7	118,3	136,5	140,7
Inventories	100,0	100,1	119,0	133,7	150,3
Trade receivables	100,0	113,2	135,3	160,6	209,9
Tax receivables	100,0	254,4	258,9	312,2	125,2
Other receivables and prepayments	100,0	90,7	101,7	83,4	89,1
Total current assets	100,0	112,7	131,3	148,6	166,6
Trade Payables	100,0	106,0	128,3	127,7	155,8
Tax payables	100,0	374,7	467,3	636,9	670,5
Deferred Income tax liabilities	100,0	91,8	1,0	0,8	1,8
Total tax liabilities	100,0	218,4	209,7	285,5	301,1
Provisions for sales rebates	100,0	108,1	149,6	224,5	271,6
Other liabilities	100,0	104,5	123,0	138,0	155,2
Total non-interest-bearing debt	100,0	113,0	138,4	174,8	204,0
Invested Capital (Net Operating Ass	**100,0**	**109,6**	**113,4**	**116,3**	**112,3**
Share Capital	100,0	98,2	94,6	92,9	91,1
Retained Earnings	100,0	105,5	105,8	120,0	118,2
Treasury Stock	100,0	123,5	64,7	58,8	52,9
Other Reserve	100,0	83,0	-138,1	-32,8	-123,4
Total Equity	100,0	104,8	99,2	115,6	111,4
Other provisions	100,0	115,0	118,9	150,0	174,6
Amount owed to associated company					
Retirement benefit obligations	100,0	90,5	135,7	156,1	190,9
Derivative financial instruments	100,0	0,0	5431,3	2879,2	5370,8
Long term Debt					
Short term Debt	100,0	43,0	144,0	214,6	45,8
Interest-bearing debt	100,0	97,9	198,6	205,1	237,7
Other financial assets	100,0	241,7	375,4	587,3	608,8
Derivative financial instruments	100,0	163,4	3,2	32,7	56,8
Investment in associated company					
Marketable securities	100,0	82,2	33,2	77,8	44,1
Cash at bank	100,0	92,9	124,6	146,5	161,8
Interest-bearing assets	100,0	95,8	97,3	132,8	135,7
Net-interest-bearing debt (NIBD)	**100,0**	**95,3**	**71,3**	**114,2**	**109,6**
Invested Capital	**100,0**	**109,6**	**113,4**	**116,3**	**112,3**

Appendix 8: Reformulated Statements of Eli Lilly

Eli Lilly - Reformulated Income Statement

USD million	2012	2013	2014	2015	2016
Net Sales	22.603	23.113	19.616	19.959	21.222
Cost of goods sold	4.797	4.908	4.933	5.037	5.655
Gross Profit	**17.807**	**18.205**	**14.683**	**14.922**	**15.567**
Sales, distribution & adm. costs	7.514	7.126	6.621	6.533	6.452
Research and development costs	5.278	5.531	4.734	4.796	5.244
Acquired In-Process R&D costs	-	57	200	535	30
Other operating income, net	674	519	341	101	- 85
EBITDA	**5.689**	**6.010**	**3.469**	**3.158**	**3.757**
Depreciation and amortisation	1.317	1.330	1.295	1.349	1.400
EBIT	**4.372**	**4.680**	**2.174**	**1.808**	**2.357**
Reported Corporate Tax	1.320	1.205	610	382	636
Tax Shield, net financial expenses	18	8	6	10	14
Tax on EBIT	1.337	1.213	615	392	651
NOPAT	**3.035**	**3.467**	**1.559**	**1.417**	**1.706**
Net Financial Expenses before Tax	73	40	28	74	77
Tax on net financial expenses	18	8	6	10	14
Net Financial Expenses after tax	55	32	22	64	62
Net Income	**2.980**	**3.435**	**1.536**	**1.353**	**1.644**

Corporate tax, effective	*24,4%*	*20,5%*	*20,3%*	*13,7%*	*18,9%*
Net financial expenses	*73*	*40*	*28*	*74*	*77*
Tax shield, net financial expenses	*18*	*8*	*6*	*10*	*14*
Net Financial Expenses after tax	*55*	*32*	*22*	*64*	*62*

Eli Lilly - Reformulated Balance Sheet

USD million	2012	2013	2014	2015	2016
Intangible Assets	*4.753*	*4.331*	*4.642*	*9.075*	*8.331*
Property, plant and equipment	*7.760*	*7.976*	*7.964*	*8.054*	*8.253*
Intangible and Tangible Assets	12.513	12.307	12.606	17.128	16.583
Sundry	2.534	2.213	1.799	2.221	1.914
Total non-current assets	15.047	14.519	14.405	19.349	18.497
Inventories	2.644	2.929	2.740	3.446	3.562
Trade receivables	3.336	3.434	3.235	3.513	4.029
Other receivables and prepayments	1.374	1.344	1.127	1.163	1.472
Total current assets	7.354	7.707	7.101	8.122	9.063
Trade Payables	1.188	1.119	1.128	1.338	1.349
Tax payables	144	254	94	359	119
Deferred Income Tax Liability (Short-Term)	1.048	793	-	-	-
Deferred Income Tax Liability (Long-Term)	1.334	1.079	999	869	689
Total tax liabilities	2.526	2.126	1.092	1.228	808
Other current liabilities	1.482	1.467	1.289	1.506	1.445
Provisions and other liabilities	4.516	4.270	4.541	5.020	6.136
Total non-interest-bearing debt	9.712	8.983	8.051	9.092	9.738
Invested Capital (Net Operating Assets)	**12.689**	**13.244**	**13.455**	**18.378**	**17.822**
Equity attributable to equity holders of Eli Lilly	14.765	17.631	15.373	14.571	14.008
Equity attributable to non-controlling interests	9	9	15	19	73
Total Equity	**14.774**	**17.641**	**15.388**	**14.590**	**14.081**
Other Liabilities	1.369	1.863	2.284	1.747	2.228
Retirement benefit obligations	3.012	1.549	2.563	2.160	2.454
Long term Debt	5.519	4.200	5.333	7.972	8.368
Short term Debt	12	1.013	2.689	6	1.937
Interest-bearing debt	**9.913**	**8.625**	**12.869**	**11.886**	**14.987**
Derivative financial instruments	6.313	7.625	9.975	3.647	5.208
Marketable securities (short)	1.666	1.567	955	785	1.457
Cash at bank	4.019	3.830	3.872	3.666	4.582
Interest-bearing assets	**11.998**	**13.022**	**14.802**	**8.098**	**11.246**
Net-interest-bearing debt (NIBD)	**- 2.085**	**- 4.397**	**- 1.933**	**3.788**	**3.741**
Invested Capital	**12.689**	**13.244**	**13.455**	**18.378**	**17.822**
Control	-	-	-	-	-

Appendix 9: Reformulated Statements of Sanofi

Sanofi - Reformulated Income Statement

Eur million	2012	2013	2014	2015	2016
Net Sales	35.957	33.306	31.999	34.861	34.708
Cost of goods sold	11.098	10.991	10.230	10.919	10.702
Gross Profit	**24.859**	**22.315**	**21.769**	**23.942**	**24.006**
Sales, distribution & adm. costs	8.929	8.603	8.425	9.382	9.486
Research and development costs	4.905	4.770	4.667	5.082	5.172
Other operating income, net	148	450	144	- 208	- 127
Share of profit from associates after tax	393	35	- 52	- 22	134
Tax on profit from associates	75	6	- 11	- 3	31
Operating profit before special items	**11.641**	**9.433**	**8.758**	**9.245**	**9.386**
Special items, net income	- 1.141	- 300	- 404	- 795	- 879
EBITDA	**10.500**	**9.133**	**8.354**	**8.450**	**8.507**
Depreciation and amortisation	4.492	4.055	3.206	3.328	2.833
EBIT	**6.008**	**5.078**	**5.148**	**5.122**	**5.674**
Reported Corporate Tax	1.109	763	1.214	709	1.326
Tax on profit from associates	75	6	- 11	- 3	31
Tax Shield, net financial expenses	126	83	87	51	200
Tax on EBIT	1.311	852	1.290	757	1.558
NOPAT	**4.698**	**4.226**	**3.858**	**4.365**	**4.117**
Net Financial Expenses before Tax	658	503	406	381	856
Tax on net financial expenses	126	83	87	51	200
Net Financial Expenses after tax	532	420	319	330	656
Net Income	**4.166**	**3.806**	**3.539**	**4.035**	**3.461**

Corporate tax, effective	*19,2%*	*16,6%*	*21,5%*	*13,5%*	*23,4%*
Share of profit after tax, associates	*393*	*35*	*- 52*	*- 22*	*134*
Tax on profit from associates	*75*	*6*	*- 11*	*- 3*	*31*
Share of profit before tax, associates	*468*	*41*	*- 63*	*- 25*	*165*
Net financial expenses	*658*	*503*	*406*	*381*	*856*
Tax shield, net financial expenses	*126*	*83*	*87*	*51*	*200*
Net Financial Expenses after tax	*532*	*420*	*319*	*330*	*656*

Sanofi - Reformulated Balance Sheet

Eur million	2012	2013	2014	2015	2016
Intangible Assets	*58.265*	*52.529*	*53.740*	*51.583*	*51.166*
Property, plant and equipment	*10.578*	*10.182*	*10.396*	*9.943*	*10.019*
Intangible and Tangible Assets	68.843	62.711	64.136	61.526	61.185
Investment in affiliates	487	448	2.384	2.676	2.890
Deferred income tax assets	4.379	4.144	4.860	4.714	4.669
Total non-current assets	73.709	67.303	71.380	68.916	68.744
Inventories	6.379	6.352	6.562	6.516	6.892
Trade receivables	7.507	6.831	7.149	7.386	7.311
Tax receivables	1.575	1.556	1.391	1.006	1.034
Other receivables and prepayments	1.475	1.407	1.477	1.432	1.814
Total current assets	16.936	16.146	16.579	16.340	17.051
Trade Payables	3.190	3.003	3.651	3.817	4.297
Tax payables	2.844	2.791	2.860	2.964	3.101
Deferred Income tax liabilities	5.932	5.060	4.105	2.895	2.292
Total tax liabilities	8.776	7.851	6.965	5.859	5.393
Provisions and other liabilities	10.631	8.993	10.605	13.491	14.170
Total non-interest-bearing debt	22.597	19.847	21.221	23.167	23.860
Invested Capital (Net Operating Assets)	**68.048**	**63.602**	**66.738**	**62.089**	**61.935**
Invested Capital (Net Operating Assets)	**68.048**	**63.602**	**66.738**	**62.089**	**61.935**
Equity attributable to equity holders of Sanofi	57.332	56.904	56.120	58.049	57.554
Equity attributable to non-controlling interests	134	129	148	161	170
Total Equity	**57.466**	**57.033**	**56.268**	**58.210**	**57.724**
Retirement benefit obligations	5.773	4.568	4.873	4.308	4.377
Derivative financial instruments	- 122	- 102	95	47	122
Long term Debt	10.843	10.527	13.308	13.129	16.824
Short term Debt	3.852	4.182	1.627	3.460	1.765
Interest-bearing debt	**20.346**	**19.175**	**19.903**	**20.944**	**23.088**
Other financial assets	101	14	10	5.752	6.421
Derivative financial instruments	651	562	428	218	210
Marketable securities	2.575	3.714	1.645	1.934	1.942
Cash at bank	6.437	8.316	7.350	9.161	10.304
Interest-bearing assets	**9.764**	**12.606**	**9.433**	**17.065**	**18.877**
Net-interest-bearing debt (NIBD)	**10.582**	**6.569**	**10.470**	**3.879**	**4.211**
Invested Capital	**68.048**	**63.602**	**66.738**	**62.089**	**61.935**
Control	-	-	-	-	-

Appendix 10: Du Pont Comparison between Novo Nordisk, Eli Lilly and Sanofi

ROIC (after tax)	FY2012	FY2013	FY2014	FY2015	FY2016	5 yr CAGR	5 yr PERIOD %
Novo Nordisk	87,4%	86,6%	89,3%	120,0%	125,0%	7,4%	43,0%
Eli Lilly	22,5%	26,7%	11,7%	8,9%	9,4%	-16,0%	-58,2%
Sanofi	6,8%	6,4%	5,9%	6,8%	6,6%	-0,4%	-1,9%

NOPAT Margin	FY2012	FY2013	FY2014	FY2015	FY2016		
Novo Nordisk	29,1%	29,2%	30,2%	34,3%	34,4%	3,4%	18,2%
Eli Lilly	13,4%	15,0%	7,9%	7,1%	8,0%	-9,7%	-40,1%
Sanofi	13,1%	12,7%	12,1%	12,5%	11,9%	-1,9%	-9,2%

Turnover Rate of Invested Capital	FY2012	FY2013	FY2014	FY2015	FY2016		
Novo Nordisk	3,01	2,97	2,96	3,50	3,64	3,9%	20,9%
Eli Lilly	1,68	1,78	1,47	1,25	1,17	-6,9%	-30,2%
Sanofi	0,52	0,51	0,49	0,54	0,56	1,6%	8,0%

Financial Leverage	FY2012	FY2013	FY2014	FY2015	FY2016		
Novo Nordisk	-33,5%	-32,3%	-27,6%	-29,2%	-33,4%	-0,1%	-0,5%
Eli Lilly	-4,9%	-20,0%	-19,2%	6,2%	26,3%	-240,0%	-637,9%
Sanofi	21,9%	15,0%	15,0%	12,5%	7,0%	-20,5%	-68,2%

NBC	FY2012	FY2013	FY2014	FY2015	FY2016		
Novo Nordisk	-9,5%	5,8%	-2,6%	-35,8%	-3,2%	-19,5%	-66,3%
Eli Lilly	-13,1%	-1,5%	-1,1%	9,1%	2,4%	-171,3%	-118,4%
Sanofi	6,3%	6,8%	5,8%	6,0%	26,1%	33,0%	315,6%

ROE	FY2012	FY2013	FY2014	FY2015	FY2016		
Novo Nordisk	54,9%	60,5%	63,9%	74,5%	82,2%	8,4%	49,8%
Eli Lilly	20,8%	21,1%	9,2%	8,9%	11,3%	-11,5%	-45,8%
Sanofi	6,9%	6,4%	5,9%	6,9%	5,3%	-5,1%	-23,2%

Appendix 11: Du Pont Analysis of Novo Nordisk

Novo Nordisk - Du Pont Analysis

DKK million	FY2012	FY2013	FY2014	FY2015	FY2016	CAGR	5 Year Growth
Revenue	78.026	83.572	88.806	107.927	111.780	7,5%	43,3%
EBIT	29.474	31.493	34.492	47.068	48.432	10,4%	64,3%
NOPAT	22.679	24.400	26.780	37.044	38.420	11,1%	69,4%
Net Financial Expense after tax	1.247	- 785	299	4.560	495	-16,9%	-60,4%
Net Income	21.432	25.184	26.481	32.484	37.925	12,1%	77,0%
INVESTED CAPITAL, average	25.947	28.181	29.982	30.878	30.737	3,4%	18,5%
NIBD, average	- 13.093	- 13.420	- 11.450	- 12.754	- 15.383	3,3%	17,5%
BVE, average	39.040	41.601	41.432	43.632	46.119	3,4%	18,1%
ROE (Net Income / BVE)	55%	61%	64%	74%	82%	8,4%	49,8%
ROE (ROIC + (ROIC-NBC) x NIBD/BVE	55%	61%	64%	74%	82%	8,4%	49,8%
Operating Activity							
ROIC (after tax)	87,4%	86,6%	89,3%	120,0%	125,0%	7,4%	43,0%
NOPAT margin	29,1%	29,2%	30,2%	34,3%	34,4%	3,4%	18,2%
Turnover rate of invested capital	3,01	2,97	2,96	3,50	3,64	3,9%	20,9%
Financial Activity							
NBC	-9,5%	5,8%	-2,6%	-35,8%	-3,2%	-19,5%	-66,3%
Financial Leverage	-33,5%	-32,3%	-27,6%	-29,2%	-33,4%	-0,1%	-0,5%

Appendix 12: Du Pont Analysis of Eli Lilly

Eli Lilly - Du Pont Analysis

USD million	FY2012	FY2013	FY2014	FY2015	FY2016	CAGR	5 Year Growth
Revenue	22.603	23.113	19.616	19.959	21.222	-1,3%	-6,1%
EBIT	4.372	4.680	2.174	1.808	2.357	-11,6%	-46,1%
NOPAT	3.035	3.467	1.559	1.417	1.706	-10,9%	-43,8%
Net Financial Expense after tax	91	49	33	84	91	0,1%	0,4%
Net Income	2.944	3.419	1.525	1.332	1.615	-11,3%	-45,1%
INVESTED CAPITAL, average	13.464	12.967	13.350	15.917	18.100	6,1%	34,4%
NIBD, average	- 691	- 3.241	- 3.165	928	3.765	-240,4%	-644,8%
BVE, average	14.155	16.207	16.514	14.989	14.335	0,3%	1,3%
ROE (Net Income / BVE)	21%	21%	9%	9%	11%	-11,5%	-45,8%
ROE (ROIC + (ROIC-NBC) x NIBD/BVE	21%	21%	9%	9%	11%	-11,5%	-45,8%
Operating Activity							
ROIC (after tax)	22,5%	26,7%	11,7%	8,9%	9,4%	-16,0%	-58,2%
NOPAT margin	13,4%	15,0%	7,9%	7,1%	8,0%	-9,7%	-40,1%
Turnover rate of invested capital	1,68	1,78	1,47	1,25	1,17	-6,9%	-30,2%
Financial Activity							
NBC	-13,1%	-1,5%	-1,1%	9,1%	2,4%	-171,3%	-118,4%
Financial Leverage	-4,9%	-20,0%	-19,2%	6,2%	26,3%	-240,0%	-637,9%

Appendix 13: Du Pont Analysis of Sanofi

Sanofi - Du Pont Analysis

EUR million	FY2012	FY2013	FY2014	FY2015	FY2016	CAGR	5 Year Growth
Revenue	35.957	33.306	31.999	34.861	34.708	-0,7%	-3,5%
EBIT	6.008	5.078	5.148	5.122	5.674	-1,1%	-5,6%
NOPAT	4.698	4.226	3.858	4.365	4.117	-2,6%	-12,4%
Net Financial Expense after tax	784	586	493	432	1.056	6,1%	34,7%
Net Income	3.913	3.639	3.364	3.932	3.060	-4,8%	-21,8%
INVESTED CAPITAL, average	69.412	65.825	65.170	64.414	62.012	-2,2%	-10,7%
NIBD, average	12.484	8.576	8.520	7.175	4.045	-20,2%	-67,6%
BVE, average	56.928	57.250	56.651	57.239	57.967	0,4%	1,8%
ROE (Net Income / BVE)	7%	6%	6%	7%	5%	-5,1%	-23,2%
ROE (ROIC + (ROIC-NBC) x NIBD/BVE	7%	6%	6%	7%	5%	-5,1%	-23,2%
Operating Activity							
ROIC (after tax)	6,8%	6,4%	5,9%	6,8%	6,6%	-0,4%	-1,9%
NOPAT margin	13,1%	12,7%	12,1%	12,5%	11,9%	-1,9%	-9,2%
Turnover rate of invested capital	0,52	0,51	0,49	0,54	0,56	1,6%	8,0%
Financial Activity							
NBC	6,3%	6,8%	5,8%	6,0%	26,1%	33,0%	315,6%
Financial Leverage	21,9%	15,0%	15,0%	12,5%	7,0%	-20,5%	-68,2%

Appendix 14: Historical & Projected Financial Value Drivers of Novo Nordisk

Financial Value Drivers Assumption

	Historical					Rates		Forecasts					
	2012	2013	2014	2015	2016	5-years average	3-years average	2017	2018	2019	2020	2021	2022	2023	2024
Revenue growth y/y	*17,6%*	7,1%	6,3%	21,5%	3,6%			5,2%	5,6%	7,2%	8,1%	8,7%	9,2%	9,1%	9,1%
Insulin growth y/y	*16,6%*	6,3%	7,1%	19,7%	0,4%	*10,0%*	*9,0%*	3,5%	4,0%	5,5%	6,0%	6,3%	6,3%	6,3%	6,3%
GLP-1 growth y/y	*58,5%*	22,5%	15,4%	34,3%	11,2%	*28,4%*	*20,3%*	11,2%	10,0%	14,0%	18,0%	19,0%	22,0%	22,0%	22,0%
Other diabetes care and obesity growth y/y	*7,9%*	-8,9%	-15,4%	16,5%	23,6%	*4,7%*	*8,2%*	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%	8,2%
Haemophilia growth y/y	*7,0%*	3,6%	-1,2%	10,1%	4,1%	*4,7%*	*4,3%*	4,3%	4,7%	5,0%	5,2%	5,6%	4,7%	4,7%	4,7%
Human growth hormone growth y/y	*12,9%*	7,3%	6,4%	20,2%	12,1%	*11,8%*	*12,9%*	11,8%	11,0%	9,0%	9,0%	10,8%	11,0%	11,0%	11,0%
Other biopharmaceuticals growth y/y	*-0,8%*	9,5%	15,7%	40,1%	-19,4%	*9,0%*	*12,1%*	-12,0%	-2,0%	1,0%	0,0%	2,0%	3,0%	1,0%	0,0%

	Historical					Rates		Forecasts					
Financial Value Drivers	2012	2013	2014	2015	2016	5-years average	3-years average	2017	2018	2019	2020	2021	2022	2023	2024
(1) Revenue Growth	17,6%	7,1%	6,3%	21,5%	3,6%	11%	10%	5,2%	5,6%	7,2%	8,1%	8,7%	9,2%	9,1%	9,1%
(2) EBITDA Margin	41,2%	41,0%	42,7%	46,4%	46,2%	*43,5%*	*45,1%*	45,1%	43,9%	42,8%	41,6%	40,0%	40,0%	40,0%	40,0%
(3) D&A / Intangible & Tangible Assets	11,8%	12,0%	14,3%	11,3%	10,5%	*12,0%*	*12,1%*	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%	12,0%
(4) Tax Rate	25,0%	25,0%	24,5%	23,5%	22,0%	*24,0%*	*23,3%*	22,0%	22,0%	22,0%	22,0%	22,0%	22,0%	22,0%	22,0%
(5) Net Borrowing Cost	-9,5%	5,8%	-2,6%	-35,8%	-3,2%	*-9,1%*	*-13,9%*	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%	-5,0%
(6) Intangible & Tangible Assets / Revenue	29%	28%	27%	24%	27%	*27,1%*	*26,1%*	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%
(7) Net Working Capital / Revenue	2,1%	2,1%	0,6%	-3,0%	-4,8%	*-0,6%*	*-2,4%*	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%
(8) Net Interest-bearing Debt / Invested Capital	-50%	-48%	-38%	-41%	-50%	*-45,5%*	*-43,2%*	-43,2%	-43,2%	-43,2%	-43,2%	-43,2%	-43,2%	-43,2%	-43,2%

Appendix 15: Pro-forma Statements and Free Cash Flow of Novo Nordisk

Pro Forma Income Statement

DKK million	2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E
Net Sales	111.780	117.583	124.185	133.070	143.869	156.396	170.777	186.355	203.286
EBITDA	**51.625**	**53.008**	**54.556**	**56.929**	**59.895**	**62.558**	**68.311**	**74.542**	**81.315**
Depreciation and amortisation	3.193	4.233	4.471	4.791	5.179	5.630	6.148	6.709	7.318
EBIT	**48.432**	**48.775**	**50.086**	**52.139**	**54.716**	**56.928**	**62.163**	**67.833**	**73.996**
Reported Income Tax	9.873	10.731	11.019	11.471	12.037	12.524	13.676	14.923	16.279
Tax shield, net financial expenses	*139*	*184*	*194*	*208*	*225*	*244*	*267*	*291*	*317*
Tax on EBIT	10.012	10.914	11.213	11.678	12.262	12.768	13.942	15.214	16.597
NOPAT	**38.420**	**37.861**	**38.873**	**40.461**	**42.454**	**44.160**	**48.220**	**52.619**	**57.400**
Net Financial Expenses before Tax	634	834	881	944	1.021	1.110	1.212	1.322	1.443
Tax on net financial expenses	139	184	194	208	225	244	267	291	317
Net Financial Expenses after tax	495	651	687	737	796	866	945	1.031	1.125
Net Income	**37.925**	**37.210**	**38.186**	**39.724**	**41.657**	**43.294**	**47.275**	**51.588**	**56.274**

Pro Forma Balance Sheet

DKK million	2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E
Intangible and Tangible Assets	32.893	35.275	37.256	39.921	43.161	46.919	51.233	55.907	60.986
Deferred income tax assets	2683	2.822	2.981	3.194	3.453	3.754	4.099	4.473	4.879
Total non-current assets	35.576	38.097	40.236	43.115	46.614	50.673	55.332	60.380	65.865
Net working capital	- 5.369	764	807	865	935	1.016	1.110	1.211	1.321
Invested Capital (Net Operating Assets	**30.207**	**38.861**	**41.043**	**43.979**	**47.549**	**51.689**	**56.442**	**61.590**	**67.186**
Total Equity	**45.269**	**55.641**	**58.765**	**62.969**	**68.080**	**74.008**	**80.813**	**88.185**	**96.196**
Net-interest-bearing debt (NIBD)	**- 15.062**	**- 16.780**	**- 17.722**	**- 18.990**	**- 20.531**	**- 22.319**	**- 24.371**	**- 26.594**	**- 29.010**
Invested Capital	**30.207**	**38.861**	**41.043**	**43.979**	**47.549**	**51.689**	**56.442**	**61.590**	**67.186**
Control	-	-	-	-	-	-	-	-	-

Pro Forma Free Cash Flow

	2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2022E
NOPAT	38.420	37.861	38.873	40.461	42.454	44.160	48.220	52.619	57.400
+ Depreciation and amortisation	3.193	4.233	4.471	4.791	5.179	5.630	6.148	6.709	7.318
Net Working Capital	- 5.369	764	807	865	935	1.016	1.110	1.211	1.321
- Change in NWC	- 2.126	6.133	43	58	70	81	93	101	110
- Net Investments (fixed assets)	8.383	6.615	6.451	7.456	8.419	9.388	10.462	11.382	12.398
Free Cash Flow to the Firm (FCFF)	**35.356**	**29.346**	**36.850**	**37.737**	**39.144**	**40.320**	**43.813**	**47.844**	**52.210**
Net new financial obligation	641	- 1.718	- 942	- 1.268	- 1.541	- 1.788	- 2.052	- 2.223	- 2.416
Net Financial Expenses after Tax	495	651	687	737	796	866	945	1.031	1.125
Free Cash Flow to equity holders (FCFE	34.220	30.413	37.104	38.269	39.888	41.242	44.920	49.036	53.501
Dividens	34.220	30.413	37.104	38.269	39.888	41.242	44.920	49.036	53.501
Cash Surplus	-	-	-	-	-	-	-	-	-

Appendix 16: Regressions for beta estimations

Excess Return of Novo Nordisk and Excess Return of OMX Copenhagen 20 Index:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,8799
R Square	0,774224
Adjusted R	0,773355
Standard Ei	0,016535
Observatio	262

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0,243757	0,243757	891,5832	5,34E-86
Residual	260	0,071083	0,000273		
Total	261	0,31484			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,005495	0,001291	4,257998	2,88E-05	0,002954	0,008037	0,002954	0,008037
X Variable 1	1,353761	0,045338	29,85939	5,34E-86	1,264485	1,443037	1,264485	1,443037

Excess Return of Novo Nordisk and Excess Return of MSCI World Healthcare Index:

Regression Statistics	
Multiple R	0,470708
R Square	0,221566
Adjusted R	0,218572
Standard Ei	0,030702
Observatio	262

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0,069758	0,069758	74,00398	7,49E-16
Residual	260	0,245082	0,000943		
Total	261	0,31484			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	-0,0001	0,00282	-0,0357	0,971548	-0,00565	0,005453	-0,00565	0,005453
X Variable 1	0,983305	0,114304	8,602556	7,49E-16	0,758226	1,208384	0,758226	1,208384

Appendix 17: Default risk for different credit ratings (Damodaran)

Rating is	Spread is
A	1,00%
A-	1,10%
A+	0,85%
AA	0,65%
AAA	0,50%
B	5,00%
B-	5,25%
B+	3,75%
BB	3,35%
BB+	3,00%
BBB	1,60%
C	12,00%
CC	10,00%
CCC	8,00%
D	15,00%

Discounted Free Cash Flow

WACC	**8,40%**
LT Growth rate	**2,80%**

EBITDA Margin change in budget	**0,00%**
Revene growth change in budget	**0,00%**

(m DKK)		Budget Period 2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	Terminal
Number of Forecast Period		1	2	3	4	5	6	7	8	
Free Cash Flow to the Firm (FCFF)		29.346	36.850	37.737	39.144	40.320	43.813	47.844	52.210	958.434
Discount Factor		*0,9225*	*0,8510*	*0,7851*	*0,7242*	*0,6681*	*0,6163*	*0,5686*	*0,5245*	0,5245
Present Value of FCFF		27.072	31.360	29.627	28.349	26.939	27.004	27.204	27.386	502.722
Present Value of FCFF in Budget Period	224.940									
Present Value of FCFF in Terminal Period	502.722									
Estimated Enterprise Value	727.662									
Net Interest-bearing Debt	- 15.062									
Estimated Market Value of Equity	**742.724**									
Shares outstanding (m)	2.530									
Implied Share Price (DKK) 31 December 2016	**293,57 DKK**									
Factor adjustment to valuation date	1,0201									
Implied Share Price (DKK) 31 March 2017	**299,46 DKK**									

Relative Valuation

	Company	Price / Sales		Price / Earning		EV / EBIT		EV / EBITDA	
		2016	2017e	2016	2017e	2016	2017e	2016	2017e
	Novo Nordisk A/S	6,4x	6,1x	18,7x	18,0x	14,2x	13,8x	13,3x	12,9x
1	SANOFI	3,3x	3,0x	25,7x	15,0x	15,7x	15,0x	10,9x	10,7x
2	ELI LILLY & CO	3,9x	3,9x	25,1x	18,6x	22,7x	16,6x	16,7x	14,4x
3	MERCK & CO. INC.	4,5x	4,4x	20,8x	16,2x	17,3x	13,6x	11,9x	12,0x
4	ASTRAZENECA PLC	3,9x	3,9x	25,7x	18,0x	24,5x	22,5x	15,5x	13,8x
5	NOVARTIS AG-REG	4,0x	4,4x	30,7x	16,6x	26,4x	20,7x	15,3x	16,6x
6	TAKEDA PHARMACEUTICAL CO LTD	2,6x	2,6x	38,6x	27,1x	26,5x	29,7x	12,7x	13,9x
7	GLAXOSMITHKLINE PLC	2,9x	2,7x	49,6x	15,1x	13,3x	14,4x	11,0x	9,7x
	Average (All 7 peers)	**3,6x**	**3,6x**	**30,9x**	**18,1x**	**20,9x**	**19,0x**	**13,4x**	**13,0x**
	Average (Sanofi + Lilly only)	**3,6x**	**3,5x**	**25,4x**	**16,8x**	**19,2x**	**15,8x**	**13,8x**	**12,6x**

Novo Nordisk relevant item (m DKK)	Sales:	111.780	Earnings:	37.925	EBIT:	48.432	EBITDA:	51.625
Enterprise Value (m DKK)		399.274		685.888		917.887		672.390
NIBD (m DKK)		- 15.062		- 15.062		- 15.062		- 15.062
Market Value of Equity (m DKK)		414.336		700.950		932.949		687.452
Shares Outstanding (# million)		2.530		2.530		2.530		2.530
Share price 31 December 2016		**163,77 DKK**		**277,06 DKK**		**368,75 DKK**		**271,72 DKK**
Share price 31 March 2017		**167,06 DKK**		**282,62 DKK**		**376,16 DKK**		**277,18 DKK**

Appendix 20: Threat from copy products

Threat from generics: Not Existing

Generic drugs are bioequivalent copies of brand-name drugs, i.e. they are chemically and structurally equivalent to the original drug, and can function as a direct substitute to the original drug. Generic drugs come into the market at, in average, a price discount of 80%-85% to the branded-drugs. According to the FDA 80% of all prescription drugs in the US are generics (Fda.gov/Generics, 2016). However, generic drugs traditionally only applies to small molecule based drugs and not for biological drugs, which are very difficult to create identical copies of due to the greater complexity of their chemical structure and analytical characterization. It is therefore assessed that at the time being, generic drugs do not make any threat for established pharmaceuticals producing biological drugs like Novo Nordisk.

Threat from biosimilars: Increasing

For biological drugs to some extent the only substitute is biosimilars, which are drugs that are highly similar to the reference product in terms of safety, purity, and potency, but have allowable minor differences in clinically inactive components. Since biosimilar drugs are not completely identical to the reference drug they, contrary to generic drugs, need their own prescription (Diatribe.org/Legaltroubles). In November 2016, the FDA approved the first ever insulin biosimilar. The biosimilar, Basaglar that is developed and marketed by Eli Lilly and Boehringer Ingelheim (Lilly/BI) is similar to Sanofi's basal insulin Lantus (insulin glargine). It was launched in the US in December 2016 but has been in the EU market since 2015 (under the brand name Abasaglar). The product is priced at a 15-20% discount relative to Lantus. The insulin biosimilar segment is still relatively new, and there is little evidence available to assess exactly how it will impact the diabetes care market going forward. However, lessons can be taken from the European Union where 20 biosimilars in other pharmaceutical segment than diabetes care has been introduced. An analysis from IMS Health shows that in the last 10 years, the introduction of biosimilars has increased competition, which has affected not just the price of the direct comparable product but also has had an affect on the price of the whole product class. In addition, it has had similar impact on the total therapy area price as it has on the biosimilar/reference product price. (IMS Health, 2016). The statistics of IMS are majorly based on four therapeutic areas, where human growth disorders is one of them. In Europe, biosimilars have been in the market for human growth hormone from 2007 through 2011 and had a significant impact on the market. The price statistics shows that in the period, across the Europe, in average the prices in the biosimilar accessible market, that is

the market that use the same molecule (Somatropin), where Novo also offers Norditropin, has experienced a price per treatment of -19% while the whole therapeutic area, human growth hormone decreased 13%. We can therefore assess that the introduction of biosimilars will have a negative impact on prices and future earnings due to increased competition from both established players in the segments and other pharmaceutical companies, which aim to extend their product portfolio. However, all biosimilars are copies of older versions of off-patented drugs. This indicates that biosimilars only compete on price and not on quality, as original drug manufacturer whose patent expires usually update their drugs to better versions. Though, it is expected that biosimilar indirectly also put a price pressure on the new generation drugs since too high prices for newer versions can make buyers price sensitive enough to go with older versions in their formulary list, which was exactly the case when CVS, just a month after Basaglar was launched, decided not to include Sanofi's bestseller modern insulin Lantus and new generation basal insulin Toujeo in it s 2017 formulary and instead put Basaglar in the formulary (Diabetesdaily.com, 2016).

Appendix 21: Switching cost of diabetes patients

Switching costs for patients: Low

The switching costs from the perspective of a diabetic patient are extremely high because it takes time and many visits to the doctor to establish a stable insulin regime. The process is time consuming and often causes several hassles and hypoglycemia attacks until the optimal product and dosage is found. Therefore, once it has been achieved, patients has no desire to repeat the process all over again. The consequence of high switching costs creates a strong brand loyalty, which extends beyond the expiration of patents (Seekingalpha.com, 2016). However, the brand loyalty is limited to patients that pay for drugs out of their own pocket. For patients that rely on private insurance or government subsidies, the switching costs are low as patients are forced to switch to whatever product that is on the formulary lists (Diatribe.org/Biosimilar, 2016). Because a high fraction of patients receive subsidies or have private insurances that cover the prescription medicine, the switching costs is assessed to be low in average.

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