CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

MASTER THESIS

FROM THE ECONOMICS OF VALUE CREATION TO THE PROCESS OF MEASURING VALUE

The case of Novo Nordisk S/A

Student: Rafael Acre Pacheco

M.Sc. Finance and Strategic Management

December 7th 2015

Supervisor: Peter Sehested

Number of pages and characters: 80 pages/ 179.923 characters

Abstract

The objective of this thesis is to estimate the intrinsic value of Novo Nordisk's stock as of April 30th 2015, by applying the fundamental analysis and the enterprise discounted free cash flow model. The main findings from the fundamental analysis show that the markets where Novo Nordisk operates are expected to grow, especially in volume, as the global population grows, ages, and urbanizes. Contrarily, revenue growth in value will be constrained by changes in the regulatory environment, and increasing competition, especially from generics. Based on this scenario, the drivers of Novo Nordisk's organic revenue growth will be based on market penetration, rather than on a favorable price development. Despite the challenges in the external environment, Novo Nordisk grew organically +10 percent on average in the last five years. This is a result of the company's strong business focus on few therapeutic areas, which are supported by an integrated approach to business strategy. Additionally, Novo Nordisk also presented the best underlying operating performance from 2010 to 2014, with ROIC above 28 percent in all years analyzed. None of its competitors managed to achieve that mark. Based on the enterprise discounted free cash model proposed by Koller et al. (2010), Novo Nordisk's intrinsic value was estimated at 367,49 DKK per share as of April 30th 2015. This value is 3 percent lower than the value of Novo Nordisk's stocks traded in the market at that day, which was at 378,70 DKK per share. The sensitivity analysis showed that the observed value is very sensitive to even small changes in revenue growth and WACC. Moreover, the multiples analysis also supports the findings above. In conclusion, Novo Nordisk's stock is assessed as an investment where the underlying risk fairly reflects earnings potential.

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Abbreviations

ADA - American Diabetes Association
BMI - Body Mass Index
BRICS - Brazil, Russia, India, China, and South Africa
CAGR - Compound Annual Growth Rate
CAPM - Capital Asset Pricing Model
DCF - Discounted Cash Flow
EEA - European Environment Agency
EMA - European Medicines Agency
EMEA - Europe, Middle East, and Africa
EU - European Union
FCF - Free Cash Flow
FDA - Food and Drug Administration
FIFO - First-in, First-out
GAAP - Generally Accepted Accounting Principles
GDP - Gross Domestic Product
GLP-1 - Glucagon-like Peptide-1
IDF - International Diabetes Federation
IFRS - International Financial Reporting Standards
LIFO - Last-in, First-out
LLY - Eli Lilly and Company
M&A - Merger and Acquisition
MRK - Merck
NIH - National Heart, Lung, and Blood Institute
NCDs - Non-communicable Diseases
NOPLAT - Net Operating Profits Less Adjusted Taxes
NVO - Novo Nordisk S/A
OTC - Over The Counter
PhRMA - Pharmaceutical Research and Manufacturers of America
PBMs - Pharmacy Benefit Managers
PESTEL - Political, Economic, Socio-cultural, Technological, Environmental, and Legal
PPP - Purchasing Power Parity
PPACA - Patient Protection and Affordable Care Act
RBV - Resource Base View
R&D - Research and Development
ROIC - Return On Invested Capital
RONIC - Return On New Invested Capital
S&P's - Standard & Poor's
SNY - Sanofi
SWOT - Strengths, Weaknesses, Opportunities, and Threats
WACC - Weighted Average Cost of Capital
WFH - World Federation of Haemophilia
WHO - World Health Organization

1 Introduction

Novo Nordisk, NVO, is a pharmaceutical company created in 1989 from a merger between two Danish companies, Nordisk Insulin Laboratorium and Novo Terapeutisk Laboratorium, founded in 1923 and 1925 respectively. Both companies were focused on the development of diabetes medicines. Nowadays, with products marketed in 180 countries, NVO is the leader in the global diabetes market. It also has a strong presence in haemophilia and growth hormone markets.

Its main competitors are Eli Lilly, LLY, and Sanofi, SNY. Both companies have a long tradition in the diabetes market. In 1920, a partnership between LLY and researchers Frederick Bating and Charles Best from the University of Toronto resulted in the development of a method to isolate and purify insulin for the treatment of diabetes. Three years later, LLY introduced the world's first commercially available insulin product, Iletin. SNY and NVO followed suit, starting the commercialization of their own insulin later that year, the Insulin Hoechst and Insulin Leo respectively.

The diabetes market has achieved important milestones since the beginning of the development and commercialization of insulin in 1923. In 1973 NVO launched Monocomponent insulin, the purest insulin available on the market. In 1982 LLY introduced Humulin, the first artificial human insulin, developed through the use of recombinant DNA technology. In 1998 NVO developed Pandin, a new drug that stimulates insulin secretion by the pancreas in the presence of glucose in the blood.

In 2013 the European Medicines Agency, EMA, approved the commercialization of NVO's new long-acting insulin, Tresiba. Tresiba is a new-generation insulin that endures in the body for more than 42 hours. It is seen as targeting SNY's Lantus, the best-selling long-acting insulin in the world and the company's most profitable medicine. Tresiba will also compete with SNY's own new-generation insulin product Toujeo, which was given the green light by the Food and Drug Administration, FDA, in the USA in January 2015 and by EMA, in April 2015. In April 2015 NVO also resubmitted Tresiba for the FDA's approval. NVO expects to start commercializing Tresiba by the beginning of 2016 in the US market.

NVO has experienced significant growth in the last couple of decades. The expansion of the company's portfolio of products, associated with the growth of the global diabetes pandemic, and the aging population have created new strengths and opportunities for the company to sustain revenue growth and high return on invested capital, ROIC. However, NVO also faces a challenging future.

Technological developments, the pressure from generic manufacturers and the spending cuts by national healthcare policies will challenge NVO's ability to sustain double-digit returns in the future. Actually, these challenges will impact the performance of the entire pharmaceutical

industry in the coming decades. Consequently, it become interesting to investigate whether NVO is a stock that is worth investing in.

1.1 Problem Statement

The aim of the thesis is to answer the following question: **'What is the intrinsic value of Novo Nordisk's stock as of April 30th 2015 based on the enterprise discounted cash flow valuation?'**

The research question is complemented with four objectives to structure the presentation of the research:

1) What is the macroeconomic environment outlook in which NVO operates? Are NVO's markets expected to grow? What are NVO's core resources and capabilities? What are NVO's competitive strengths and weaknesses? What strategic advantages has NVO developed, or does it plan to develop, in reaction to business opportunities and threats?
2) What is NVO's current financial situation compared to its competitors? Based on NVO's macroeconomic environment and strategy analysis, what risks and rewards do NVO's operating performance expose?
3) How does NVO's business strategy and financial performance influence its cash flow prospects?
4) What is a reasonable intrinsic value for NVO's stock based on the enterprise discounted cash flow valuation?

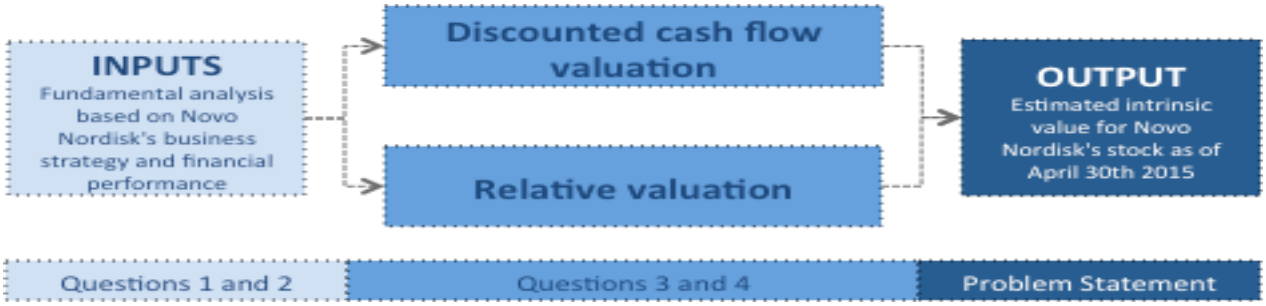
1.2 Methodology

Answers to the questions above require analysis of qualitative information about the company's business plans and quantitative information about its financial position and performance (Subramanyam and Wild, 2009). Therefore, a thorough valuation of NVO's securities based on a fundamental analysis is conducted.

A fundamental analysis comprises the determination of the intrinsic value of a company's securities by an extensive strategy and financial analysis of key value-drivers, such as cash flows, risk, growth, and the company's competitive position (Lev and Thiagarajan, 1993).

The information produced in the fundamental analysis will provide the inputs for the enterprise discounted cash flow, DCF, valuation applied to determine the intrinsic value of NVO's stock as of April 30th 2015. Answering complementary questions 1 and 2 above generates the inputs. These inputs are processed in questions 3 and 4 through the DCF valuation. Additionally, in order to complement the DCF analysis, a relative valuation is also undertaken. Finally, the valuation will provide the ultimate output, which is the answer to the problem statement above. Figure 1 schematizes how the valuation process will work.

Figure 1 The valuation process



For valuation purposes, the research takes the perspective of an active investor. Active investors buy investments and constantly oversee their activity in order to exploit profitable conditions (Ye, 2012). An active investor's strategy with fundamental analysis is to buy stocks when its intrinsic value exceeds its market value, or sell stocks when its intrinsic value is below its market value (Subramanyam et al., 2009). As a result, an investor perspective mainly consists of optimizing investment decisions.

1.2.1 Research Philosophy and Approach

This empirical research is based on positivistic and interpretivistic philosophies, as it uses both quantitative and qualitative techniques (Brown, 2006). Additionally, this research takes a deductive approach, as it is based upon theory supported by the strategy and financial analysis of NVO.

1.2.2 Research Strategy

A holistic case study is selected for this valuation analysis. According to Robson (2002, p.178), a case study is "a strategy for doing research which involves an empirical investigation of a particular phenomenon within its real life context using multiple sources of evidence". Yin (2009) defines a holistic case study as a study that is focused on a single unit of analysis.

This thesis defines NVO S/A as our single unit of analysis, because the main point of interest is to find the intrinsic value of the entire business. As a result, the holistic case study strategy fits the objective of this thesis, as it strengthens the ability to gain in-depth knowledge of the company being evaluated.

1.2.3 Sources

Secondary data is the primary source of information for this study. It comprises data from the Bloomberg Terminal, Business Insight: Essentials, ORBIS, Statista database, Bisnode MarketProfile, OMX NewsClient, articles from academic journals and newspapers, press releases, and the Internet.

The information gathered also includes perspectives from other analysts, industry experts, as well as NVO itself. As certain information about NVO is inaccessible, it was sometimes necessary to make a number of specific estimations and assumptions. I will specify when this was the case.

Finally, any publicly available material including NVO's annual reports from the period of January 1st 2010 to April 30th 2015 is used for this analysis. I assume that all information given by NVO is truthful, and that their accounts provide a clear and true picture of the company's historical financial situation.[1]

1.3 Limitations

The valuation process entails certain limitations. The first one relates to biases. According to Damodaran (2006), valuation is a subjective process, which is inherently biased. Biases are created when estimations and assumptions are based on our own perceptions of the prospects of a company. Thus, throughout the valuation process, I will try to confront my biases when making input choices and also try to open up the valuation process to more objective points of views about Novo Nordisk's future.

Valuation also entails uncertainty. Damodaran (2006) highlights that any attempt at forecasting the value of assets entails uncertainty. The author classifies uncertainty in three groups: estimation, firm-specific, and macroeconomic uncertainties. Estimation uncertainty occurs when wrong assessments are made when converting raw information into inputs for the valuation model. Firm-specific uncertainty is related to the possible mismatch between our expectations about the company's performance and the real world. Finally, macroeconomic uncertainty is related to the difficulties of predicting the changes in the macroeconomic environment and their impact on the company's prospects. The advantage of breaking uncertainty down is that it gives us an idea about what we can manage during the valuation process (Damodaran, 2006).

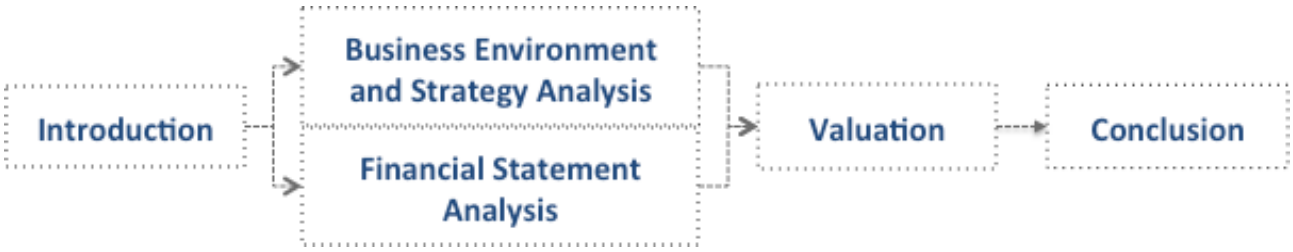
Although the analysis of NVO's strategic business areas is based on facts and events affecting the industry up until April 30 2015, given the endless flow of information into the financial markets, a valuation of a firm conducted today may be completely obsolete tomorrow. According to Damodaran (2006), even the best-constructed model is susceptible to these uncertainties. In general, healthy responses to uncertainty are open about its existence and offer information on its magnitude to those using the valuation (Damodaran, 2006).

1.4 Thesis Structure

The structure of the valuation process for this thesis is presented in Figure 2. Note that while Figure 1 shows how the information flows in the valuation process, Figure 2 shows how the information is organized in this thesis. More detailed descriptions of each stage of the process follow subsequently.

[1] Novo Nordisk's financial statements are audited by PricewaterhouseCoopers, PwC, which has approved the company's annual reports from 2009 to 2014 without any accounting remarks.

Figure 2 Thesis structure



1.4.1 Business Environment and Strategy Analysis

This section of the thesis will begin with a macroeconomic analysis of the pharmaceutical industry. The analysis is carried out by applying the PESTEL model. This model provides a structured overview of the political, economic, social, technological, and legal factors that NVO is affected by.

Next, an analysis of the diabetes and biopharmaceutical markets is provided. This analysis consists of examining past and expected future overviews of NVO's market share and growth and also an identification of NVO's main competitors in those markets.

Not all competitors are presented – they were chosen based on their background in the two strategic business areas. More emphasis is placed on the diabetes market, as it is the area where NVO differentiates itself and excels the most.

After an analysis of the diabetes and biopharmaceutical markets, a presentation of NVO's strategic business areas is provided, where the emphasis is on how NVO's products differ from other products in the market. In this analysis, the focus is on NVO's core products, as the turnover of complementary products (i.e. pens and needles) relies on the number of units sold of the core products. The products are categorized in two main strategic business areas: diabetes and biopharmaceutics.

Following the analysis of the macroeconomic environment and the strategic business areas, an analysis based on Porter's Five Forces framework is undertaken in order to identify the various market forces that affect the revenue growth of diabetes and biopharmaceutical business areas. This framework will provide important inputs to the estimation of future gross margins as well as individual product viability.

NVO's specific internal resources and skills are also analysed, including their durability and value, in order to assess whether the company will be able to continue to provide products that will enable it to maintain a high gross margin and continue to capture additional market share. Finally, the business environment and strategy analysis for NVO is summarized in a SWOT analysis.

1.4.2 Financial Statement Analysis

This section will focus on examining NVO's ROIC and organic revenue growth through a thorough analysis of the company's historical financial performance during the last five years, 2010-2014.

The reasons for selecting this period is based on the intense changes in the regulatory and legal environments after 2010, which will substantially dictate the industry's profitability in the median- and long- term.[2]

Next, an analysis of the accounting adjustments necessary to prepare NVO's financial statements for financial performance analysis is provided. Subsequently, a thorough analysis of NVO's ROIC and organic growth is undertaken.

1.4.3 Valuation

Based on the business environment and strategy analysis and the historical financial performance analysis, a valuation of the company's stock is undertaken. The purpose of this section is to find the intrinsic value of NVO's stock as of April 30th 2015 based on the enterprise DCF valuation.

Next, in order to analyse the consistency of the valuation process, a sensitivity analysis was conducted. This is based on the most critical factors assessed in the business environment and strategy analysis section, which present the value drivers that either affect NVO's profitability the most or involve the greatest uncertainty.

Finally, a relative valuation is also undertaken in order to complement the valuation analysis. The enterprise DCF and relative valuations are considered the most common methods of company valuation in the market, due to their simplicity and reliability (Koller at al., 2010).

[2] More information about the political and legal environments for the pharmaceutical industry is provided in section 2.1.1.

2 Business Environment and Strategy Analysis

The main objective of the business environment and strategy analysis is to discover the key value drivers that influence NVO's organic revenue growth. NVO's business strategy is analysed by examining the external and internal environments in which the company operates. Also, an analysis of how consistently NVO's business strategy develops and sustains competitive advantage is conducted.

Business strategy can mean a broad range of things. Numerous schools of thought have tried to give a clear definition of what strategy is, such as the strategic positioning school (Porter, 1980), the action school (Mintzberg, 1990), the resource-based view, RBV (Barney, 1991), the process school (Pettigrew, 1997), the dynamic capabilities school (Teece et al., 1997), and the practice school (Jarzabkowski, 2005). However, in the attempt to provide a framework of the way business strategy is created and implemented by companies, these perspectives are not necessarily competing, but rather complementary to each other.

According to Porter (1996), business strategy is the means by which an organization achieves its goals. Strategy is then seen as the underlying guide for companies' development of competitive advantages, and consequently, profitability. However, Mintzberg (1978) points out that the organizational concept of strategy reflects the coherence of organizational activities.

As a result, strategy should be the unifying theme that provides coherence and direction to the actions and decisions an organization pursues. It involves consistency in the way companies manage their organizational activities in response to changes in the external and internal environments (Mantere, 2013).

2.1 Macroeconomic Analysis

Pharmaceutical companies operate in changing and at times adverse business environments. To understand the causes and predict the consequences of the changes that take place in the macroeconomic environment, a comprehension of the broader business issues is required as well as the elements in the business environment that bring about such changes (Grant, 2010). If a company intends to survive, it needs to respond and adapt to the changes in its macroeconomic environment.

Therefore, the purpose of this section is to identify the macroeconomic factors that impact the industry's value drivers by addressing the following question: What is the macroeconomic environment outlook in which NVO operates? The PESTEL model will be employed to facilitate the analysis. The model is a framework used by professionals to analyse and monitor the external factors that impact an industry.

The PESTEL model involves the examination of the industry's political, economic, socio-cultural, technological, environmental, and legal factors. It has two primary functions: firstly, it allows the identification of the environment in which NVO operates; and secondly, it enables the prediction

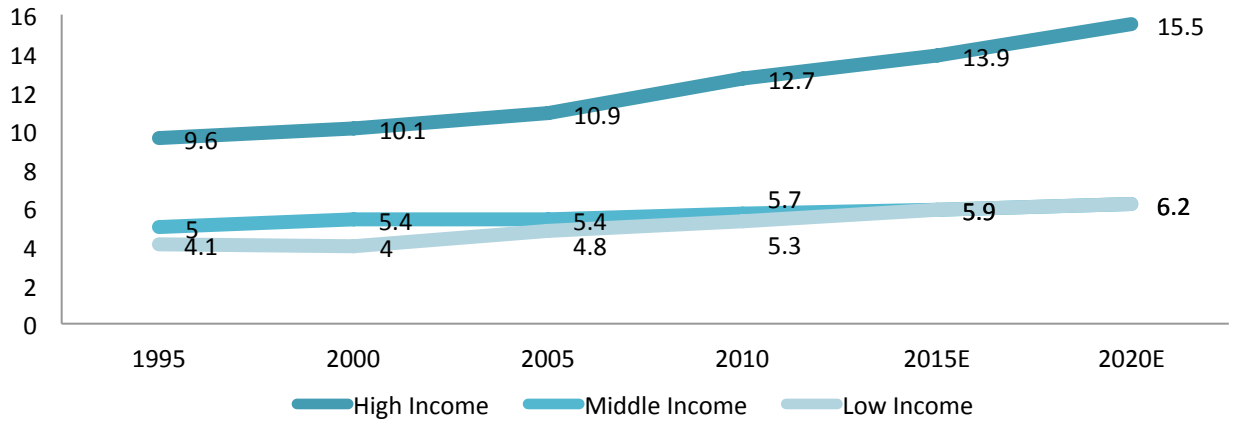
of situations that the company might encounter in the future. The macroeconomic factors analysed in this section will be relevant for the forecast analysis in section 4.

2.1.1 Political and Legal Analysis

As recently as the mid-1980s, pharmaceutical manufacturers in many markets around the world retained monopoly power over their innovative products. Supported by patents and low government controls on the prices of medicines, these companies were not only able to recover their research and development, R&D, costs, but were also rewarded with superior profit margins on invested capital (Oehlricha and Daemmrich, 2013).

In the past two decades, however, governments, particularly in high-income markets, have focused on pharmaceutical companies in their efforts to control rising healthcare expenditures. As shown in Figure 3, the growth of healthcare expenditure in high-income countries is the highest in the world, with an increase of almost 45% in the past two decades.

Figure 3 Total healthcare expenditure as % of GDP



Source: World Bank, 2012

High-income markets, such as the European and American markets, are the most important markets for the pharmaceutical industry, representing almost 65% of total sales worldwide (EvaluatePharma, 2015). Government monitoring in these regions, however, has resulted in expensive fines for pharmaceutical companies during the past decade.

According to a study carried out by PublicCitizen (2012), an American non-profit organization focused on monitoring abusive practices of pharmaceutical companies in the US, the industry has spent approximately 30 billion USD to resolve 226 violation charges in the last fifteen years, such as off-label marketing and overcharging of taxpayer-funded health programmes.[3]

EMA and FDA are the regulatory authorities that control the industry in the EU and the US respectively. They are responsible for controlling the safety of medicines as well as approving their

[3] See http://www.citizen.org/hrg2073, accessed 06-06-2015.

commercialization. For instance, EMA recently introduced a new, three-pronged approach to the management of medicines' adverse reactions[4], while FDA is developing a system called Sentinel[5] to oversee the safety of all medicines on the US market.

Interaction between regulators around the world has also increased recently. Particularly EMA and FDA have collaborated with each other in the analysis of the safety of new products.[6] This interaction has two distinctive outcomes for pharmaceutical companies: it can speed up the approval process of medicines by regulators; or it can increase the likelihood of rejections, as rejection of a product by one regulator could influence the approval by others.

Obtaining the approval for commercialization of a new medicine is a long and arduous process. This is one of the biggest issues the industry currently faces, as profitable branded-medicines are losing their patents faster than new medicines are being patented.

Patents create a temporary competitive advantage for the companies' owners, as it prohibits competitors from replicating the medicine during its lifetime. Actually, the nature of patents drives pharmaceutical companies to constantly pursue the development of new medicines. Thus, patents are an essential value driver for estimating the future performance of any pharmaceutical company.

The unbalanced replacement of patent-expired medicines with new-patented medicines is increasingly eroding the profitability of the industry as price per medicine declines dramatically upon the introduction of generic competition.[7] According to Figure 4, the spending on generics, especially in high-income markets, is expected to put at risk 215 billion USD in sales of branded medicines worldwide over the next five years.

Based on Figure 4, this tendency is expected stabilize by 2020. However, as the US faces growing political pressure to lower prescription drug prices and relax the restrictions on generic product production, there is an expectation that generic products will absorb more sales from branded-medicines in the long-term.

In 2010, the American government introduced the Patient Protection and Affordable Care Act, PPACA[8], which aims to improve access to healthcare by covering another 30 million citizens. In order to absorb the increase in healthcare expenditure from the PPACA, the American government has tried to reduce expenses on medicines. It is estimated that these provisions will

[4] See http://www.adrreports.eu/en/ and http://www.idf.org/monitoring-medicines-safety-improves-across-eu-european-medicines-agency-report, accessed 20-06-2015.
[5] See http://www.fda.gov/Safety/FDAsSentinelInitiative/ucm2007250.htm, accessed 20-06-2015.
[6] See http://www.ema.europa.eu/ema/index.jsp?curl=pages/news_and_events/news/2015/07/news_detail_002367.jsp&mid=WC0b01ac058004d5c1, accessed 24-07-2015
[7] See http://www.health.harvard.edu/newsletter_article/Tracking-down-generic-alternatives-to-brand-name-drugs, accessed 01-09-2015.
[8] See http://www.dol.gov/ebsa/healthreform/, accessed 23-06-2015.

reduce the industry's revenues from branded medicines by 112 billion USD over the next decade in the US (Statista, 2014).

Figure 4 World sales at risk from patent expiration (2006-2020)

Source: EvaluatePharma, 2015

The healthcare reforms in the PPACA, however, go beyond those primary aims. Since 2013, the US government has begun funding public hospitals based on the quality of the care rather than the quantity of the services supplied.[9] These changes inevitably expose medicines to greater scrutiny as healthcare providers can start applying the same criteria to the therapies they prescribe.

The industry has shown some warning signs that these interventions could slow or hamper the development of new life-saving medicines. In order to provide incentives for innovation, there are discussions in the regulatory community concerning the development of a common pharmaceutical market, which would harmonize inspections globally. However, due to the heterogeneity of national healthcare systems, a single global drug approval process remains elusive for the foreseeable future.

The changes in the political and legal environments around the world over the past two decades expose a complex dynamic between the regulatory environment and pharmaceutical innovation. There are declarations that regulators are jeopardizing innovation. If true, it is more likely that pharmaceutical companies will need to adapt, rather than fight against them.

Globally, governments are becoming more concerned about their healthcare expenditures, regulators are becoming more proactive, and patients more demanding. All these agents will increasingly require more of the pharmaceutical industry. They will stress more transparency in the way the companies conduct clinical trials, form partnerships with customers and providers, develop contracting strategies, define pricing agreements and marketing, and, importantly, how they handle patients' safety.

[9] See http://www.medscape.com/viewarticle/768352_4, accessed 23-06-2015.

In conclusion, it is clear that governments, especially in high-income markets, are looking for better medicines, clinically and economically, that allow greater efficiency in the way healthcare resources are consumed and patients are treated. It is also clear that the price of medicines is no longer only influenced by competitive market forces, but also by national interventions (Oehlricha and Daemmrich, 2013). However, there is still no clear consensus about how the industry will adapt to the tougher regulatory and legal environments in the long-term. Table 1 summarizes the key political and legal factors explored in this section.

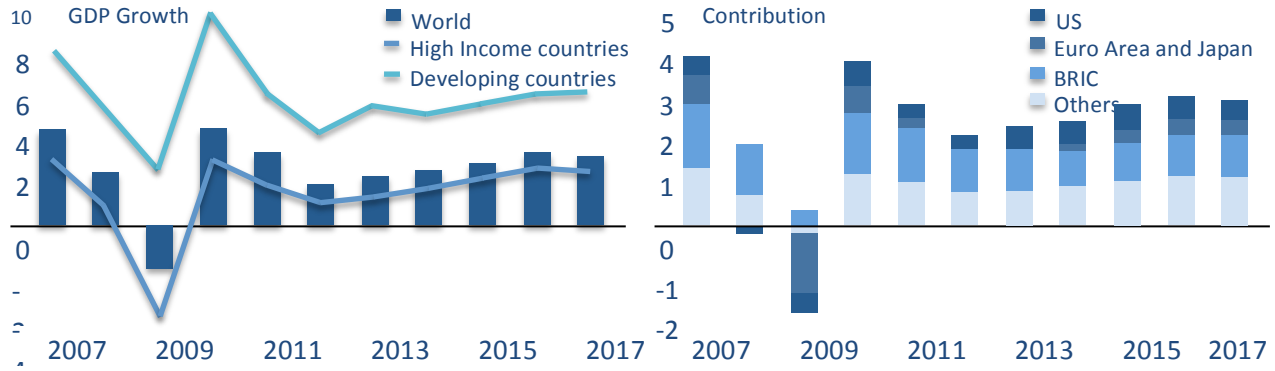
Table 1 Summary of the political and legal analysis

Political Landscape	Overview
Current Strengths	Patents employed as differentiation strategy
Current Challenges	Adapt to the new healthcare policies; get products in the pipeline approved by FDA and EMA in time to replace patent-expired medicines; generic competition
Future Prospects	Global harmonization of inspections/policies for new drugs
Future Risks	Tougher healthcare policy reforms; patent expiration; increasing generic competition

2.1.2 Economic Analysis

The global economic recovery from the financial crisis in 2008 has been uneven around the world. According to Figure 5, high-income countries, such as the UK and US, are recovering faster than the EU and Japan. Middle-income economies, like Brazil, Russia, India, China, and South Africa, the BRICS, is seeing less intense growth than in the past, mainly due to a structural slowdown (World Bank, 2015). Low-income countries, predominantly in Africa, are managing to continue growing at a strong pace.

Figure 5 GDP growth actual/projected and contribution to global growth by region



Source: World Bank, 2015

According to the World Bank report on the prospects of the global economy (2015), the asynchronous monetary policies in the major economies, the decreasing commodity prices, and the weak global trade have been the main factors contributing to the current weak global economic recovery. Additionally, poor economic recovery increases instability in the financial markets, especially when it comes to foreign exchange rates.

Globalized industries, such as pharmaceutics, which sell products in numerous countries, see their operations and financial conditions adversely affected by fluctuations in currency exchange rates. The factors listed above are expected to persist, with financial conditions projected to tighten progressively worldwide (World Bank, 2015).

However, according to Figure 6, the global pharmaceutical market has performed better than the global economy. It grew on average 4.1% per year in the past decade, and it is forecast to grow on average 4.8% for the next five years.[10] However, market growth is gradually moving from high-income markets to other markets. For instance, the market for prescription medicines increased on average 22.6% in the BRICS during the last five years (EvaluatePharma, 2015). In the same period, low-income markets increased by 7.2% on average (EvaluatePharma, 2015). If this pattern continues, the global pharmaceutical market for human medicines could be worth nearly 1 trillion USD by 2020 (EvaluatePharma, 2015).

Figure 6 World sales of medicines from 2006 to 2020

Source: EvaluatePharma, 2015

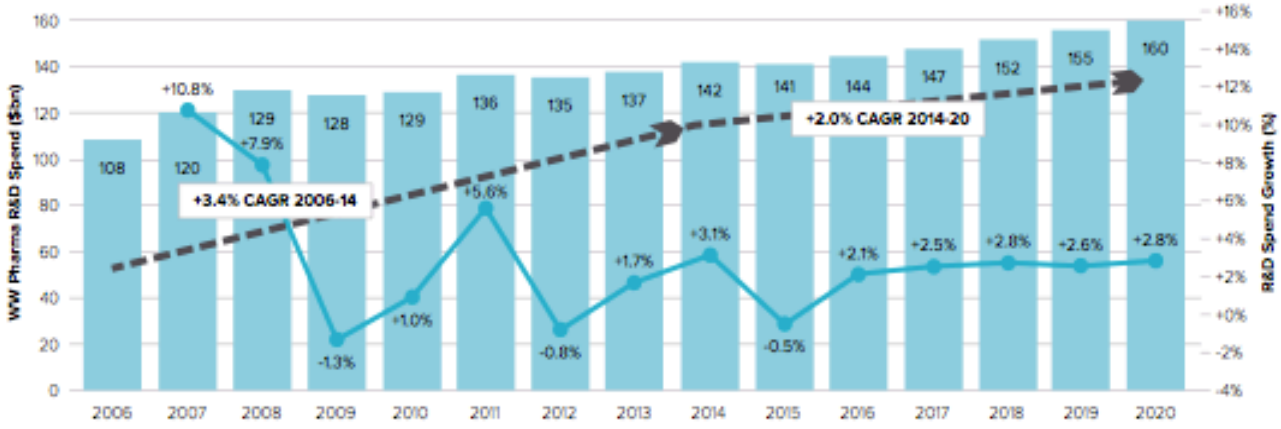
The pharmaceutical industry has been a great contributor to the global economy by employing hundreds of thousands of high skilled workers.[11] Globally, the industry creates almost 20 million jobs (Ostwald et al., 2015). This is partially a by-product of its intense R&D activities. The industry spends more than any other industry on R&D activities and it continues to invest massively in the development of new medicines.

According to Figure 7, it is expected that the industry will spend on average 150 billion USD on R&D per year until 2020. Due to the very high research costs associated with the early stage of the development of a new drug, pharmaceutical companies tend to focus on few therapy fields. According to the IMS Health (2015), the top therapy areas that have seen a worldwide increase in

[10] See Appendix 1 for more information about historical economic developments of the pharmaceutical industry.
[11] See http://www.efpia.eu/topics/industry-economy, accessed 24-07-2015.

total expenditure are: oncology, anti-diabetics, asthma/COPO, autoimmune diseases, lipid regulators, HIV antivirus, antipsychotics, and vaccines.

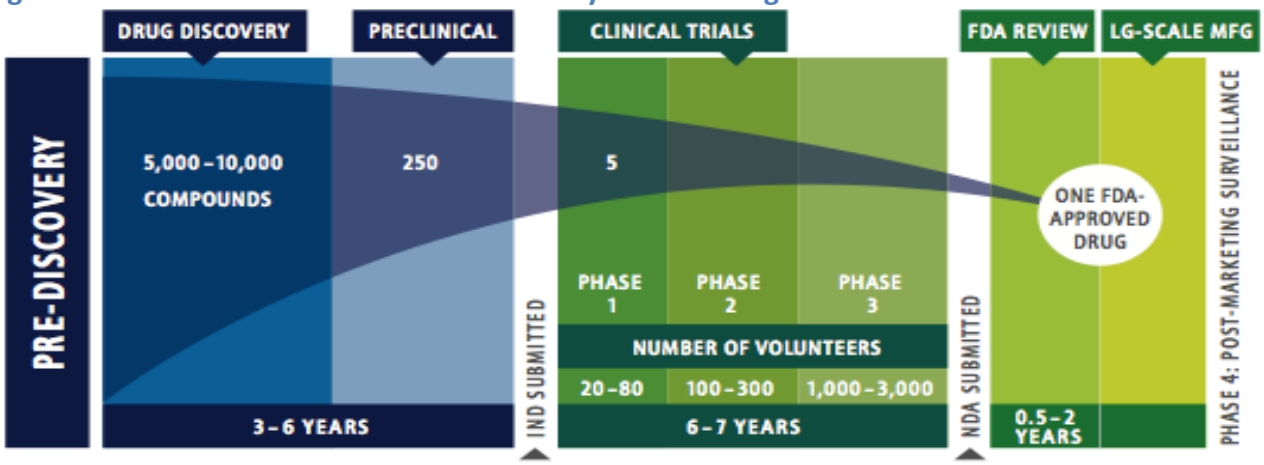
Figure 7 Worldwide total pharmaceutical R&D expenditure (2006-2020)



Source: EvaluatePharma, 2015

R&D activities come at a high price and risk. According to a study carried out by PwC (2012), it takes on average 3.5 billion USD to get a new medicine to market. According to Figure 8, from discovery to marketing, the R&D lifecycle encompass a long and risky road. It shows that normally only one in 5,000 compounds developed, or 0.02% of these compounds, ends up being commercialized.

Figure 8 Pharmaceutical R&D – from discovery to marketing



Source: PhRMA, 2014

Competition from generics is also forcing the industry to fill product pipelines faster than its R&D departments' capacity to create new medicines. Nowadays, companies are reacting with cuts to R&D and sales expenses, and are finding growth through mergers and acquisitions, M&A, and economies of scale. The largest pharmaceutical companies are moving toward a model that recognizes their core strength as distribution while innovation is purchased from outside the company (Ostwald et al., 2015).

M&As have played a key role in shaping the industry (Fisher, 2015). Companies unable to maintain an attractive pipeline are generally the first to pursue M&As. In the past two decades, there has been a substantial increase in mergers between global pharmaceutical players. Recently, however, global pharmaceutical companies have shifted their focus to acquiring small biopharmaceuticals. These kinds of companies are capturing the attention of some leading pharmaceutical companies due to their low-cost R&D activities, especially in the early stages of the product lifecycle.

Economy of scale is another important factor for the pharmaceutical industry. As any other industry, supply and demand dictates profitability. In the US, which has one of the most expensive healthcare systems in the world, the average spending on healthcare is close to 9,000 USD per capita per year. In other countries though, it can be less than 100 USD per capita per year (WHO, 2015). On the one hand, it shows the substantial disparities of healthcare systems around the world. On the other hand, it also shows why the US market is so important to the pharmaceutical industry's profitability. However, as pointed out above, supplying the demand for medicines in the US and in most other high-income markets is becoming increasingly challenging.

In conclusion, in the near future, pharmaceutical companies will need to address both the economic and clinical value of medicines all across the product lifecycle (PwC, 2012). It means that they will have to be able to distinguish between the specific characteristics of a medicine and measure the specific economic value of each feature in order to develop competitive advantages. In order to remain competitive, pharmaceutical companies will need to improve their R&D productivity and change their commercialization strategy from volume to value (PwC, 2012). Table 2 summarizes the key factors examined in this section.

Table 2 Summary of the economic analysis

Economic Landscape	Overview
Current Strengths	Competitive advantage by specialization in strategic therapy areas; M&As strategy
Current Challenges	Increased competition, especially from biotechnology companies; control of cost and duration of R&D - declining research productivity
Future Prospects	More M&As
Future Risks	Global economic instability may put more pressure on manufacturers because of tightening financial conditions

2.1.3 Social Analysis

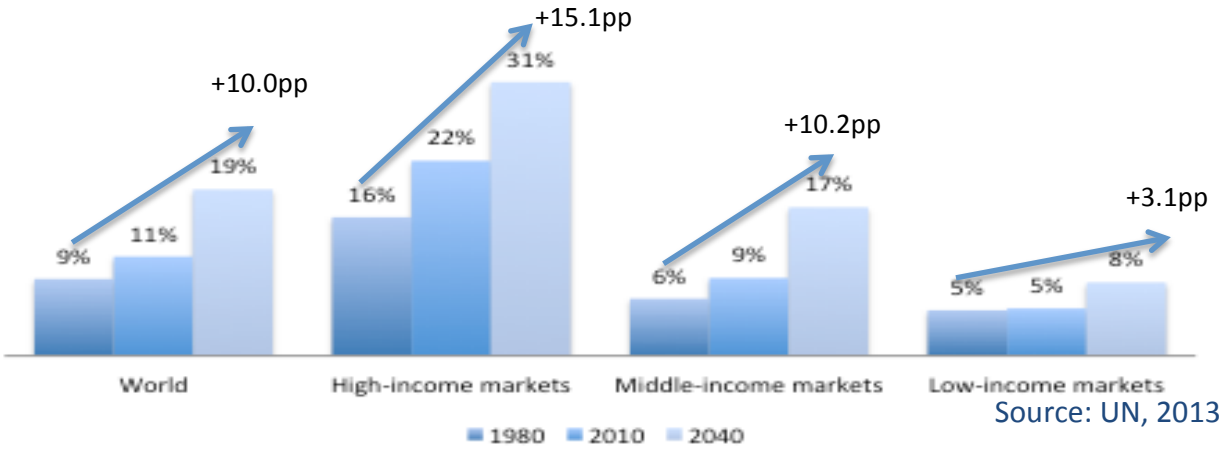
There are more people in the world than ever before. In the last two decades 2 billion people were born, and by 2020, there will be almost 8 billion people on the planet (UN, 2013). From this total, it is expected that almost 70% will be living in cities, more than 30% will be overweight or obese, and around 20% will be above 60 years old (WHO, 2015).

As the global population increases, ages, and becomes more urbanized and sedentary, the demand for pharmaceutical products will rise accordingly. Age and obesity, for instance, are both associated with a higher prevalence of non-communicable diseases, such as diabetes, heart issues

and cancer (WHO, 2011). According to the UN (2013), 85% of deaths worldwide are associated with non-communicable diseases. This statistic turns them into the leading cause of mortality around the world.

The proportion of the world's population aged 60 or over is increasing rapidly. In 2050, they are expected to represent almost 35% of the world population (UN, 2013). However, according to Figure 9, this growth is projected to be uneven between countries. In high-income markets, for instance, the ageing process started some decades ago, while in middle-income markets it is just taking off. In low-income markets, the ageing population growth has been modest.

Figure 9 Speed of population ageing, 1980-2040



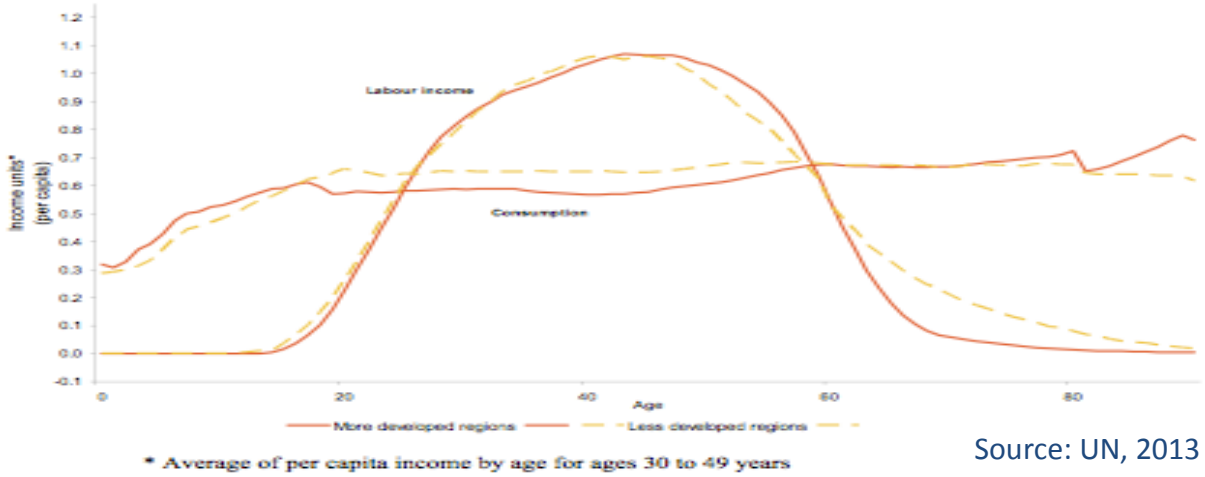
Source: UN, 2013

The global average life expectancy is currently around 71 years, representing an increase of 7 years since 1990 (WHO, 2015). Actually, the number of people reaching 60 years or above is increasing faster than the number of births. The current growth rate of the older population above 60 years is at almost 2% worldwide, while the global population growth is at 1.2% (UN, 2013).

With human life expectancy stretching into very old ages, lifetime cost of healthcare also rises. This is because the demand for healthcare is higher among the older population than the younger population. According to Figure 10, the beginning and the end of the human life span are periods where people consume more than they are able to produce, on average (UN, 2013).

The disparity between consumption and income, especially after the productive period, indicates that older people tend to be more exposed to poverty than the rest of the population. Consequently, governments will see an increase in their responsibility to satisfy the needs of the older population, such as pensions and healthcare services, while enabling them to live longer and healthier (UN, 2013). This scenario indicates that the cost of healthcare services offered by public healthcare systems is expected to increase.

Figure 10 Population economic life cycle



Source: UN, 2013

On the one hand, the pharmaceutical industry benefits from ageing populations and a relative rise in chronic diseases. On the other hand, as presented in section 2.1.2, in high-income countries, governments and private healthcare providers are becoming more hesitant to pay a premium for new and innovative therapies (Taylor et al., 2014). This can create barriers to the industry's growth. One alternative companies have found to boost profitability and curb this scenario is to expand to low- and middle-income markets.

These markets, however, face challenging social issues. For instance, access to care is usually insufficient and disproportionately distributed among their citizens. Thus, pharmaceutical companies will need to adapt their resources to tackle the alleviation of the financial burden of care in these markets (Beran, 2015).

In order to succeed in those markets, pharmaceutical companies will need to delve into these markets' political, geographical, religious, social, and structural differences. Moreover, their ethnic differences, diet habits, and local environments may require the development of medicines that tackle particular diseases from which they suffer. However, customization is costly and consumers' purchasing power in these markets tends to be lower than in the high-income markets, which can usually afford more expensive therapies (WHO, 2014).

In conclusion, the barriers above make low- and middle-income markets more difficult to serve, although it is not unachievable. The number of consumers that can afford more expensive treatments is forecast to rise from 1.7 billion to 3.6 billion by 2025 in these markets (World Bank, 2015). These new consumers are classified as those with annual incomes between 6,000 and 30,000 USD (PPP). This rise, however, is expected to be concentrated in middle-income markets, particularly in China, Brazil, India, Indonesia, and Mexico (WHO, 2015). Table 3 summarizes the key factors discussed in this section.

Table 3 Summary of the social analysis

Social Landscape	Overview
Current Strengths	The capability of the industry's structure and resources to explore new markets
Current Challenges	Increased consumer expectations/demands in high-income countries; more transparent proof of medicines' efficacy/safety/advantages
Future Prospects	Ageing population growth; increase of chronic health conditions worldwide, specially non-communicable diseases
Future Risks	Ageing population will increase the pressure on governments over healthcare expenditures due to the patient's economic life cycle. Consequently, governments will push the price of medicines down by tougher regulation, as a way of reducing healthcare costs

2.1.4 Technological Analysis

Technology plays a key role in the pharmaceutical industry's innovation. For instance, recent developments in gene-sequencing technologies have contributed to decreasing costs of gene-sequencing tests from 95 million USD per test in 2000 to just 1,000 USD in 2012.[12] This shows that access to better and cheaper tools to diagnose and treat patients is becoming a mainstream medical practice.

The speed of recent developments in the technological field has also imposed some challenges. As was explored above, the pharmaceutical industry is currently experiencing its deepest R&D crisis. Additionally, the proliferation of biopharmaceuticals is intensifying competition.[13] In order to make their R&D activities more competitive, traditional pharmaceutical companies either have to collaborate with a wide range of organisations, including hospitals, academic institutions, technology vendors, healthcare screening, physiotherapy, exercise facilities, and the like, or become fully diversified businesses capable of delivering such services themselves (PwC, 2012).

As presented in section 2.1.2, another important component to create competitive advantages in a period of intense competition, low R&D productivity, and fast technological developments, is shifting the commercialization strategy from volume to value (PwC, 2012). With the processing capabilities of computers doubling in terms of performance and capacity almost every two years, big developments in data processing and management have become less costly and time consuming. These new technologies may enable the pharmaceutical industry to collect large amounts of data to prove the worth of its products. 'Big data' can be used to attest the efficacy and safety of their products, as well as their contribution to savings in total healthcare costs.

Nowadays, with easier access to information, governments, regulators, and patients are increasingly focusing on medicines' cost, efficacy, and safety (PwC, 2012). Especially after the financial crisis, the industry's stakeholders are getting more cautious towards accepting new and expensive therapies without evidence of its efficacy. In order to supply this new demand, the

[12] See http://www.genome.gov/sequencingcosts/, accessed 24-06-2015.

[13] As presented in section 2.1.1, biopharmaceutical companies' advantage over traditional large pharmaceutical companies relies on their low-cost, highly productive R&D activities.

pharmaceutical industry will need to develop not just better medicines, but also more efficient information management processes (Deloitte, 2014).

There is a growing discussion about the synergies of healthcare systems in the national and international environments.[14] Healthcare providers, such as hospitals, clinics, and research institutions, produce mountains of data on a regular basis. If aggregated strategically, this data can be used to build a detailed portrait of a patient's health and, when combined with other patient data streams, can create substantial knowledge about entire disease states and patient populations.

Additionally, technological advancements are also starting to change the way healthcare practitioners and patients interact. It is expected that over the next years there will be an increase in the number of virtual doctor-patient contacts.[15] Through wearable devices, like augmented wear and nanoparticle pills, that can be used to monitor a broad range of physiologies, information about patients' health can be combined from multiple devices in real time to create a comprehensive view of the patient's illnesses.[16] Instead of the old-fashioned reactive approach, where patients go to the doctor when they feel ill, this new approach takes a preventative strategy by focusing on improving health awareness and self-management.

Numerous healthcare providers in the mature and growth markets alike are building the required infrastructure to develop the environment for sophisticated data sharing and processing (PwC, 2012). Improving data sharing can also support scientists in collaborating and making better sense of what they are researching. By strengthening the scientific base of their R&D activities, pharmaceutical companies can improve quality in the early stage of the development of new medicines, benefiting all stakeholders.

All these changes may also allow the pharmaceutical industry to be more participative in connecting healthcare systems, collecting evidence of a medicine's effectiveness, measuring how patients feel, and developing customized diagnostics for new therapies. Additionally, increasing the effectiveness of data processing and management may benefit the entire industry supply chain. By overseeing the provision of health management services for patients with specific diseases, pharmaceutical manufacturers can more accurately produce and distribute medicines based on demand.

As a result, technological advancements are leading to changes that go beyond R&D activities. They are supporting the industry in enhancing its ability to produce medicines and develop treatments that deliver measurable improvements in safety, efficacy, and ease of compliance and

[14] See, http://universalhealthcoverageday.org/un-resolution/, accessed 27-06-2015.
[15] See http://mobihealthnews.com/22215/five-reasons-virtual-doctor-visits-might-be-better-than-in-person-ones/, accessed 27-06-2015.
[16] See http://www.forbes.com/sites/robertglatter/2014/11/20/wearable-technology-and-digital-healthcare-strategies-should-shift-focus-to-chronic-medical-illness/, accessed 24-06-2015.

at the same time, reduce costs. Therefore, in order to build competitive advantage, managing information is becoming as important as managing medicines. Table 4 summarizes the key factors analysed in this section.

Table 4 Summary of the technological analysis

Technological Landscape	Overview
Current Strengths	In-house R&D activities
Current Challenges	Biotechnology competition
Future Prospects	Commercialization based on management of outcomes; R&D synergies with external agents; development of integrated healthcare data processing and management processes
Future Risks	Adapt rapidly to potential big changes in the technological environment

2.1.5 Environmental Analysis

The industry's environmental impact is considered relatively low when compared with some other industries, such as chemistry and food (EEA, 2010). However, when considering the whole lifecycle of a medicine, which consists of production, consumption, and disposal, environmental issues can increase substantially (EEA, 2010).

According to the European Environment Agency (2010), EEA, studies confirm that medicines pose environmental risks. Although not precise, wastewater can be considered one of the biggest issues associated with the environmental impact of medicines' lifecycle.

Overall, the pharmaceutical industry requires consistent high-quality water for medicine production.[17] However, fresh water is becoming scarce. Today, approximately 700 million people in the world live in areas with scarce fresh water resources.[18] The number is likely to increase as the global population is on the rise (UN, 2013).

The UN (2014) predicts that in ten years' time, 1.8 billion people will be living in places where water is very limited or polluted, while 5 billion will be living in areas with some sort of moderate water shortage or pollution. This means that almost 80% of the world population will live in areas with water issues by 2025 (UN, 2014).

Many pharmaceutical manufacturing centres are in areas that will become more susceptible to severe weather events.[19] China, India, most of the countries in Africa, and some countries in South America are among the regions that will be affected most severely by water shortage by 2025 (UN, 2014). Countries in the high-income market will also be impacted. For instance, some states in the US are particularly at risk of water shortage even earlier than 2025.[20]

[17] See http://apps.who.int/prequal/info_general/documents/TRS970/TRS_970_Annex2.pdf, accessed 27-07-2015.
[18] See, http://www.un.org/waterforlifedecade/scarcity.shtml, accessed 27-07-2015.
[19] See http://www.pwc.de/de/gesundheitswesen-und-pharma/assets/pharma_2020_sc_final.pdf, accessed 27-07-2015.
[20] See, http://www.un.org/waterforlifedecade/scarcity.shtml, accessed 27-07-2015.

In order to curb this issue, many countries around the world are tightening their environmental regulations, following the international trend to curb water pollution and carbon emissions. Additionally, growing public concerns about fresh water shortage will likely lead to tax rises based on water consumption (PwC, 2012).

As a result, the pharmaceutical industry will likely be required to invest in eco-friendly production processes and equipment in order to reduce its environmental footprint. If the predictions of a tougher climate materialize in the future, environmental issues may force the reallocation of pharmaceutical manufacturing facilities to safer areas. However, reallocating a manufacturing facility to a new place can be a risky and costly decision. Table 5 summarizes the key environmental factors analysed in this section.

Table 5 Summary of the environmental analysis

Environmental Landscape	Overview
Current Strengths	The industry's environmental footprint is relatively low
Current Challenges	Tougher environmental regulation leads to more expenditure on environmental compliance
Future Prospects	More investments in eco-friendly processes and equipment
Future Risks	Worsening weather conditions require costly decisions, such as moving manufacturing facilities to safer regions

2.2 Understanding the Diabetes and Biopharmaceutics industries

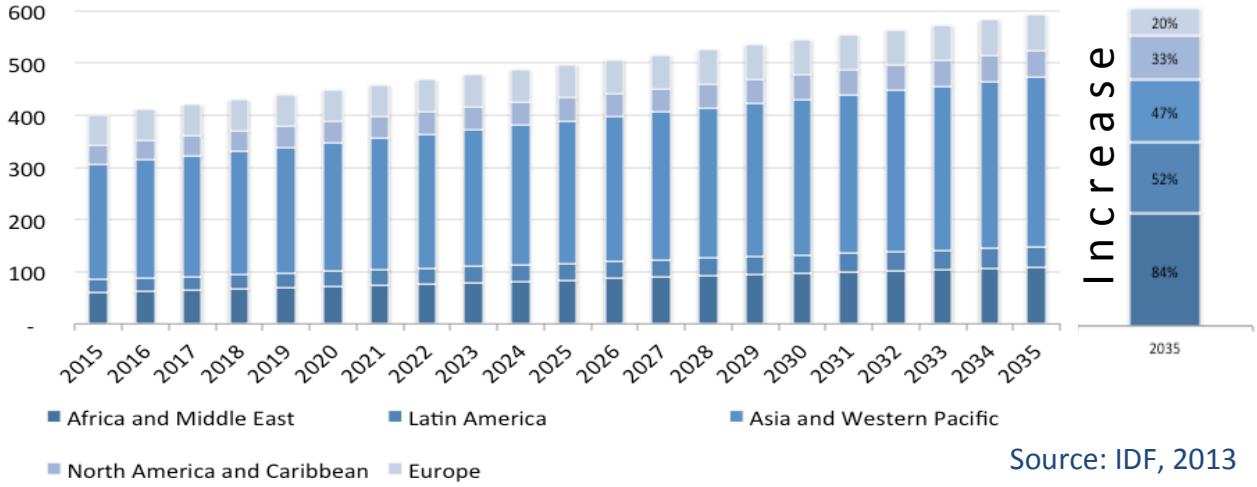
The aim of this section is to answer the following question: Are diabetes and biopharmaceutical markets expected to grow? The analysis delves into the diabetes and biopharmaceutical markets in order to understand characteristics such as size, structure, trends, segmentation, and competition that drive growth and business profitability in the diabetes and biopharmaceutical markets.

2.2.1 Diabetes Market

Currently, there are almost 390 million people living with diabetes worldwide (WHO, 2015). Over the next twenty years, it is expected that the number of diabetic people will reach around 600 million (IDF, 2013).

According to Figure 11, the Asian and Western Pacific regions are where more than half of the global diabetes population will be concentrated (IDF, 2013). According to the IDF's report (2013) about the global diabetes pandemic, Africa and Latin America will see the incidence of the disease rise 84% and 52% respectively, affecting almost 150 million people in the next fifteen years. Europe and North America will experience double-digit increases in the number of diabetes cases. However, they will be much lower than in the rest of the world.

Figure 11 Expected number of people with diabetes 2015-2035 (in millions)



Source: IDF, 2013

According to some studies, only half of the global diabetes population is diagnosed (IDF, 2013). In some parts of Asia and Africa the scenario is even worse, with less than 30% of the diabetic patients being acknowledged (Statista, 2015). In contrast, the rate of identified cases in Europe and the North and South Americas is increasing, with 70% of diabetes cases being diagnosed on average (Statista, 2015).

Even among the group of people diagnosed with the disease, only half of them generally undergo some kind of treatment (IDF, 2013). Therefore, only one quarter of the diabetes population worldwide are actually diagnosed and undergoing treatment. That leaves around 290 million diabetic people completely uncovered by any diabetes treatment. Most of them are concentrated in low- and middle-income markets.

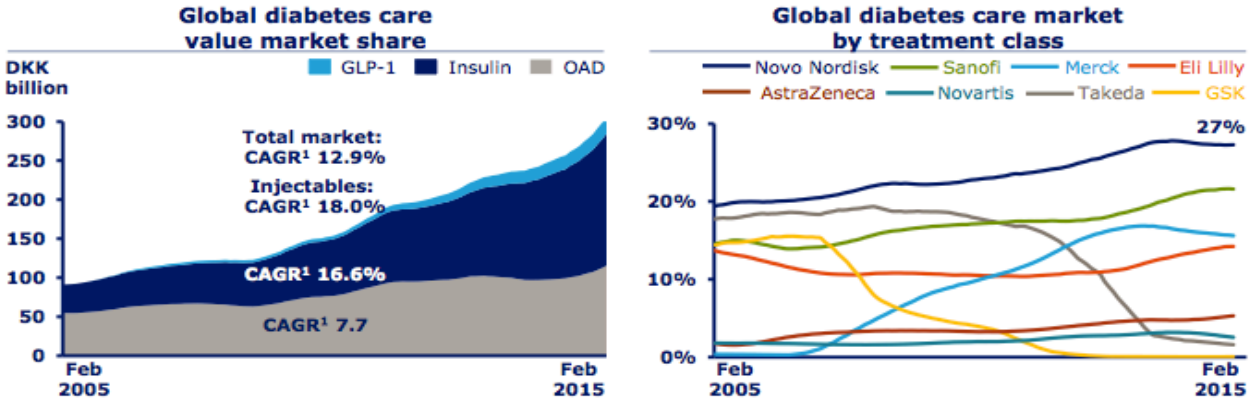
In these markets, the diabetes population is projected to increase considerably, especially among the population aged 20-59 years (IDF, 2013). Generally, the risk of developing diabetes greatly increases with age. However, in those markets more people will start living with diabetes during their productive years. This is due to the rapid urbanization and economic development in these markets, which contribute to a more sedentary lifestyle (WHO, 2015).

One of the major risks of a sedentary lifestyle is obesity, which significantly increases the prevalence of diabetes (NVO, 2015). It is expected that the global health expenditures due to diabetes will reach 630 billion USD per year by 2035 (EvaluatePharma, 2015). From this amount, almost 470 billion USD will be concentrated just in North America and Europe. Despite the growing prevalence of the disease in Africa, Asia, and South America, it is projected that their spending will account for less than 20% of the global health expenditure on diabetes by 2035 (EvaluatePharma, 2015).

Overall, the demand for diabetes treatments is on the rise. The global revenue of diabetes products grew 155% over the past six years, from 27.1 billion USD in 2008 to 63.6 billion USD in 2014 (EvaluatePharma, 2015). Additionally, according to Figure 12, the global diabetes market

grew, on average, almost 13% annually in the last ten years. Figure 12 also shows that of this global market for diabetes, insulin accounts for 55%, oral anti-diabetes products for 38%, and GLP-1 products for 7% (NVO, 2014).

Figure 12 Global diabetes market share per treatment and manufacturers 2005-2015



Source: Novo Nordisk, 2015

According to Figure 12 and Table 6, NVO is the leading manufacturer of diabetes medicines worldwide, capturing 30% of the global diabetes market in 2014. Besides NVO, the main global manufacturers of diabetes products are SNY, LLY and Merck, MRK. These four players combined represented almost 80% of the global diabetes market in 2014.

Table 6 Top ten global manufacturers of diabetes medicines by sales 2014-2020

Rank	Company	WW Sales (USD m)		CAGR[21] 2014-20	WW Market Share		Rank Change 2014-20
		2014	2020		2014	2020	
1	Novo Nordisk	12,488	17,980	+6%	30.0%	29.7%	+0
2	Sanofi	9,571	8,617	-2%	23.0%	14.3%	+0
3	Merck & Co	6,032	8,044	+5%	14.5%	13.3%	+0
4	Elli Lilly	4,196	7,646	+11%	10.1%	12.6%	+0
5	AstraZeneca	1,792	4,152	+15%	4.3%	6.9%	+0
6	Boehringer Ingelheim	756	3,346	+28%	1.8%	5.5%	+2
7	Johnson & Johnson	586	2,167	+24%	1.4%	3.6%	+4
8	Novartis	1,304	1,564	+3%	3.1%	2.6%	-2
9	Takeda	913	945	+1%	2.2%	1.6%	-2
10	Merck KGaA	502	587	+3%	1.2%	1.0%	+2
	Total top ten	38,140	55,048	+6%	91.6%	91.1%	
	Other	3,477	5,413	+8%	8.4%	8.9%	
	Total Industry	41,617	60,461	+6%	100.0%	100.0%	

Source: EvaluatePharma, 2015

[21] Compound Annual Growth Rate.

It is expected, however, that the four leading manufacturers of diabetes products will represent 70% of the global market by 2020 (EvaluatePharma, 2015). According to table 6, this decrease is due to the 308% growth over the next six years of AstraZeneca, Boehringer Ingelheim, and Johnson & Johnson. These three companies will increase their market share from 6% in 2014 to 16% by 2020. Additionally, according to Table 7, the drop is also related to the decrease in SNY's Lantus sales, as its patent will expire in 2015.[22]

Table 7 Top five diabetes medicines by global sales 2014-2020

Rank	Product	Company	Pharmaco-logical Class	WW Sales (m USD)		CAGR 2014-20	WW Market Share	
				2014	2020		2014	2020
1	Januvia/Janumet	Merck & Co	Oral anti-diabetes	6,358	7,525	+3%	15.3%	12.4%
2	Lantus	Sanofi	Insulin	8,428	4,935	-9%	20.3%	8.2%
3	NovoRapid	Novo Nordisk	Insulin	3,109	3,848	+4%	7.5%	6.4%
4	Victoza	Novo Nordisk	GLP-1	2,393	3,486	+6%	5.7%	5.8%
5	Humalog	Eli Lilly	Insulin	2,785	2,908	+1%	6.7%	4.8%

Source: EvaluatePharma, 2015

Back to Table 6, it shows that the market share for NVO in 2020 is projected to decrease 0,3%. This means that the company will not only be unable to capture SNY's Lantus market share, but it may face tougher market conditions in the future. By 2020, NVO will lose the patent for NovoMix, NovoRapid, and Levemir in the American and European markets. This could explain NVO's projected decrease in market share. However, generic competition in the insulin market is almost non-existent at the moment.[23] Consequently, the patent losses of the whole of NVO's modern insulin category should not be the main reasons for NVO's decrease in market share.

According to my analysis, since 1923 competition in this market has always been among branded-insulin. In the short-term, NVO's decrease in market share will come from new-branded medicines, especially from new products launched by NVO's big competitors.[24]

Although competition is projected to intensify, NVO will be able to sustain its leadership in the diabetes market leading up to 2020. This shows that the company has a strong portfolio of products capable of supporting a tougher level of competition in the market. An analysis of NVO's top three competitors is presented below.[25]

[22] See http://www.fiercepharma.com/special-reports/top-10-patent-expirations-2015, accessed 01-08-2015. This assumes that SNY will not object to the expiration and attempt to get an extension of the patent.
[23] See http://www.psmag.com/health-and-behavior/why-is-there-no-generic-insulin, accessed 01-08-2015.
[24] This topic will be discussed in more detail in section 2.4.3 Threat of substitutes.
[25] A detailed analysis of NVO's portfolio of products in the diabetes segment is provided in section 2.3.

2.2.1.1 Sanofi

With more than ninety years of experience in the diabetes market, this French international pharmaceutical company is the second biggest manufacturer of diabetes medicines worldwide, with 23% of the global market share in 2014 (EvaluatePharma, 2015).

The company is present in over 100 countries. 60% of SNY's total revenue is concentrated in the US and Europe (SNY, 2014). Nowadays, SNY has the leadership position in the North American insulin market, with 42% in February 2015 (NVO, 2015).[26]

SNY has a very competitive portfolio of diabetes products. The company has strong R&D capabilities to maintain an attractive product pipeline. It has also been involved in some strategic alliances that have helped it to roll out new products.[27]

SNY has recently launched new diabetes medicines that have the potential to become blockbusters, such as Toujeo and Afressa.[28] The company's product mix consists of insulin and GLP-1. Table 8 presents SNY's portfolio of products for diabetes.

Table 8 Overview of SNY's portfolio of products for diabetes care

Categories	Products
Insulin	Lantus® (insulin glargine), Toujeo® (insulin glargine), Apidra® (insulin glulisine), Amaryl®/Amarel® (Insulin glimepiride), and Afrezza® (inhalable insulin)
GLP-1	Lyxumia® (lixisenatide)
Devices	Lantus® SoloSTAR® and Apidra® SoloSTAR® injection pens; ClikSTAR® and JuniorSTAR®, a reusable pen for Lantus® and Apidra®; and AllSTAR® injection pen developed especially for people with diabetes in emerging markets

Source: Sanofi, 2015

SNY's Lantus is a long-acting insulin and currently the leader in sales of human insulin globally. With Lantus patent expiration approaching, SNY developed Toujeo, a long-acting insulin and a potential Lantus replacement. Toujeo was launched in the beginning of 2015 in the US and Europe. SNY also has the only rapid-acting inhaled human insulin available in the market, Afrezza. In spite of some skepticism surrounding Afrezza's efficacy and side effects holding back its market kick off, it still has the potential to become a future blockbuster for SNY.

2.2.1.2 Eli Lilly

With almost a century of experience in the diabetes market, this American company was the first pharmaceutical company in the world to develop a method to isolate and purify insulin for the treatment of diabetes (LLY, 2015). The company was also the first to develop human insulin

[26] See Appendix 2 for more information about the insulin market share by regions 2010-2015.
[27] See http://en.sanofi.com/Images/38264_20150203_Afrezza_en.pdf, accessed 01-08-2015.
[28] See http://www.ajmc.com/journals/evidence-based-diabetes-management/2015/may-2015/toujeo-and-afrezza-new-and-improved-insulins-limited-by--fda-labeling-constraints, accessed 01-08-2015.

through recombinant DNA technology. It represented 10.1% of the global market share in 2014 (EvaluatePharma, 2015).

The diabetes category represented almost 25% of LLY's total revenue in 2014 (LLY, 2014). Its main markets are the US and Japan, which represent around 70% of its total revenue of diabetes medicines (LLY, 2014). The company has been under intense public scrutiny during the last years. Allegations of off-label promotions in 2009[29] and bribery schemes in China in 2013[30] have harmed the company's image.

In order to boost its image and pipeline, LLY has developed strategic alliances with other pharmaceutical companies. In 2011 the company collaborated with Boehringer Ingelheim to develop diabetes compounds including oral diabetes agents and insulin, such as Adasria.[31] In 2012 the company opened a research facility in China in order to study the development of potential diabetes medicines tailored for the Chinese population (LLY, 2012).

At the end of 2013, the company announced an investment of 700 million USD to enhance its global manufacturing capability, especially in China, in order to respond to the growing demand for diabetes medicines worldwide (LLY, 2013). The company's product mix for diabetes focuses on insulin and oral anti-diabetes agents. Table 9 shows LLY's product mix for diabetes care.

Table 9 Overview of LLY's portfolio of products for diabetes care

Categories	Products
Insulin	Humulin®, Humalog®, Humalog Mix 75/25TM® and Humalog Mix 50/50TM®, Trulicity®, Adasria®
Oral anti-diabetes agents	Trajenta®, Jentadueto®, Jardiance®, Glyxambi®

Source: LLY, 2015

In order to rebalance the patent loss of its most profitable diabetes medicine, Humalog, LLY has launched a series of oral anti-diabetes agents for the treatment of type-2 diabetes, such as Jardiance and Glyxambi in 2014 and 2015, respectively.

The company has also launched a new insulin product, Trulicity, for the treatment of type-2 diabetes in the US and Europe in 2014 and is waiting for a lawsuit process to finalize in the US to release its biosimilar Basaglar (Abasaglar in other markets).

Basaglar is a generic version of SNY's Lantus. It is expected to be introduced in the European market later in 2015. It will become the first generic insulin ever created and will potentially pose a great threat to Lantus and NVO's modern insulin category.

[29] See http://www.justice.gov/archive/opa/pr/2009/January/09-civ-038.html, accessed 12-07-2015.
[30] See http://www.wsj.com/articles/SB10001424127887323665504579028370607960690, accessed 12-07-2015.
[31] See https://www.boehringer-ingelheim.com/news/news_releases/press_releases/2014/29_october_2014_diabetes.html, accessed 12-07-2015.

2.2.1.3 Merck

MRK is an American pharmaceutical company present in more than 140 countries. MRK had a market share in the diabetes market of 14.5% in 2014 (EvaluatePharma, 2015). The company is the most active of its peers in terms of using M&A and R&D partnerships to expand its activities and pipeline.

The biggest transaction made by the company in the last years was the acquisition of Schering-Plough, completed in 2009.[32] In 2013, MRK and Pfizer entered into a collaboration agreement for the development and commercialization of an oral sodium glucose inhibitor for the treatment of type-2 diabetes.[33]

MRK's product mix for diabetes focuses only on oral anti-diabetes agents. It is currently the leading manufacturer of oral anti-diabetes medicines worldwide (EvaluatePharma, 2015). The company commercializes three main diabetes medicines: Janumet, Janumet XR, and Januvia (MRK, 2015). Table 10 summarizes the key factors examined throughout section 2.2.1.

Table 10 Summary of the key factors in the diabetes market

Fact	Current scenario	Future scenario
Global diabetes population	390 million people in 2015	600 million by 2035, with growth concentrated in low- and middle-income markets
Global expenditure on diabetes	540 billion USD in 2015	630 billion USD per year by 2035, with 80% concentrated in North America and Europe
Global revenue of diabetes products	Grew 155% in six years, from 27.1 billion USD in 2008 to 41.6 billion USD in 2014	Forecast to reach 61 billion USD by 2020 (CAGR of 6%)
Market share of main global manufacturers	Novo Nordisk (30%); Sanofi (23%); Merck (14.5%); Eli Lilly (10.1%) in 2014	Novo Nordisk (29.7%); Sanofi (14.3%); Merck (13.3%); Eli Lilly (12.6%) by 2020

2.2.2 Biopharmaceutical Market

The biopharmaceutical market encompasses many large and small biopharmaceutical companies. Due to its size the analysis will concentrate on two fields, haemophilia and growth hormone, since these are the business areas NVO operates in.

2.2.2.1 Haemophilia

According to the World Federation of Haemophilia (2015), WFH, there were around 100,000 people living with haemophilia in 2000. Today, it is expected that almost 400,000 people currently live with the disease. This represents an increase of 300% in fifteen years, or a CAGR of 6% per

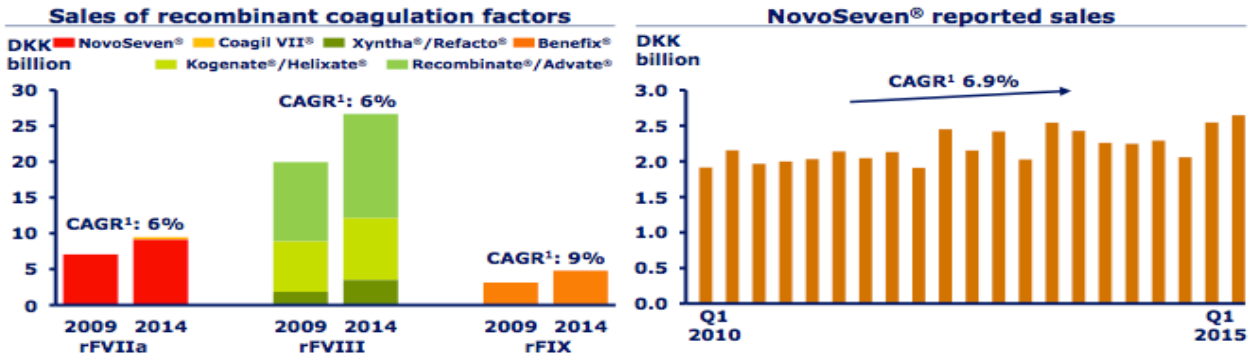
[32] See http://www.msd-uk.com/about/our-history/Merger.xhtml, accessed 13-07-2015.
[33] See http://press.pfizer.com/press-release/merck-co-inc-and-pfizer-enter-worldwide-collaboration-agreement-develop-and-commercial, accessed 13-07-2015.

year (WFH, 2015). Additionally, the global market for haemophilia medicines is estimated to be 8.5 billion USD in 2015 and has grown by more than 5% annually in recent years (NVO, 2015).

Of those 400,000 cases of haemophilia worldwide only about 180,000 are actually diagnosed (WFH, 2015). According to the World Federation of Haemophilia (WFH 2015), the US is the country with the highest number of incidences of haemophilia in the world, with 31,000 cases diagnosed in 2013. Following the US, the UK, Brazil, and India also have high incidences of the disease. These four countries combined represented almost 35% of the world population with haemophilia in 2013 (WFH, 2015).

The main medicines based on recombinant DNA technology available in the market are: NovoSeven, NovoThirteen, and NovoEight from NVO; Bayer's Kogenate; ReFacto and Xyntha from Pfizer; and Advate and Feiba from Baxter. Figure 13 shows a more detailed overview of the market for haemophilia in the last five years.

Figure 13 NovoSeven's sales performance and competition 2010-2015



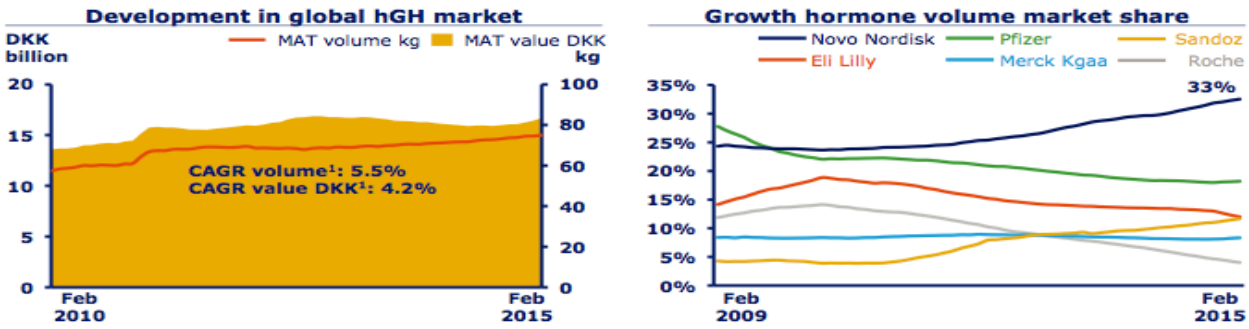
Source: Novo Nordisk, 2015

NVO has a leading position in the haemophilia market. Even with NovoSeven no longer under patent protection since 2011, the medicine was still the most prescribed medicine for the treatment of haemophilia worldwide in 2014, representing almost 25% of the global market (NVO, 2014).

2.2.2.2 Growth Hormone

The growth hormone category is much larger and more profitable for NVO than the hormone replacement category. Accordingly, this analysis will focus on the growth hormone category. It is expected that approximately 2 million people live with some sort of growth hormone disorder worldwide (NVO, 2014). The global market for treatments focusing on growth hormone deficiency is expected to increase from 1.26 billion USD in 2014 to approximately 1.88 billion USD by 2024 (GlobalData, 2015).

Figure 14 Growth Hormone market developments 2010-2015



Source: Novo Nordisk, 2015

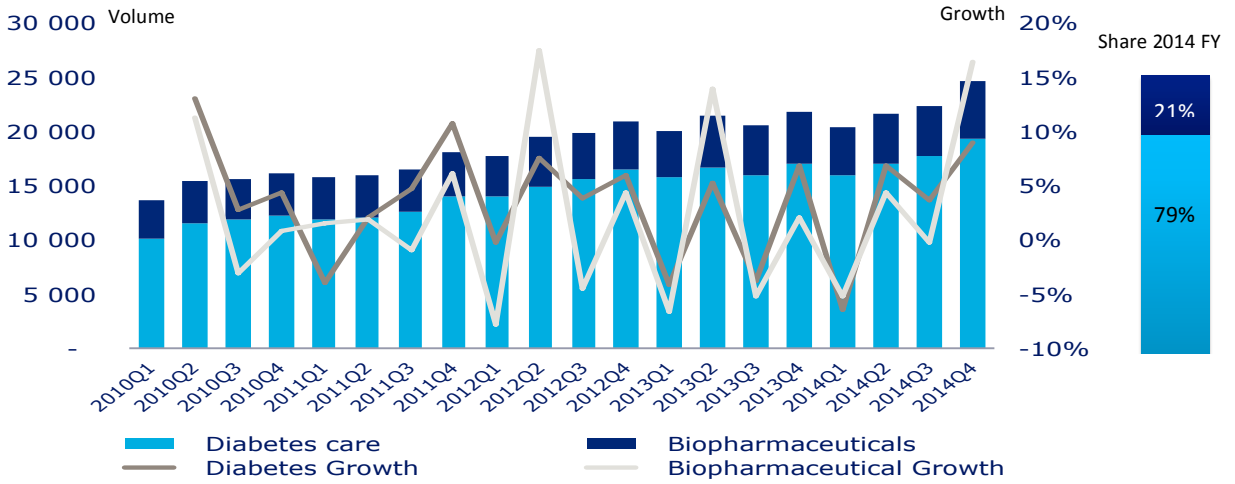
According to Figure 14, NVO is the leader in the growth hormone market, with 33% of market share. However, it is expected that the sales for NVO's Norditropin will remain stable until 2017, when its patent expires, and then it will start gradually decreasing.

A decline in Norditropin's sales is also related to the development of long-acting growth hormone medicines expected by 2017. These new medicines come mainly from biobetters[34], which are forecasted to reach around 1.2 billion USD in sales by 2025 (GlobalData, 2015).

2.3 Understanding NVO's Business Areas

This section will provide an overview of the diseases that NVO's products tackle, as well as the products' target objectives. The goal is to provide insights of the growth potential of NVO's products in their respective markets. This section bases its analysis on events that have occurred in the last five years, 2010-2014.[35]

Figure 15 NVO's sales by business area



Source: Novo Nordisk, 2014

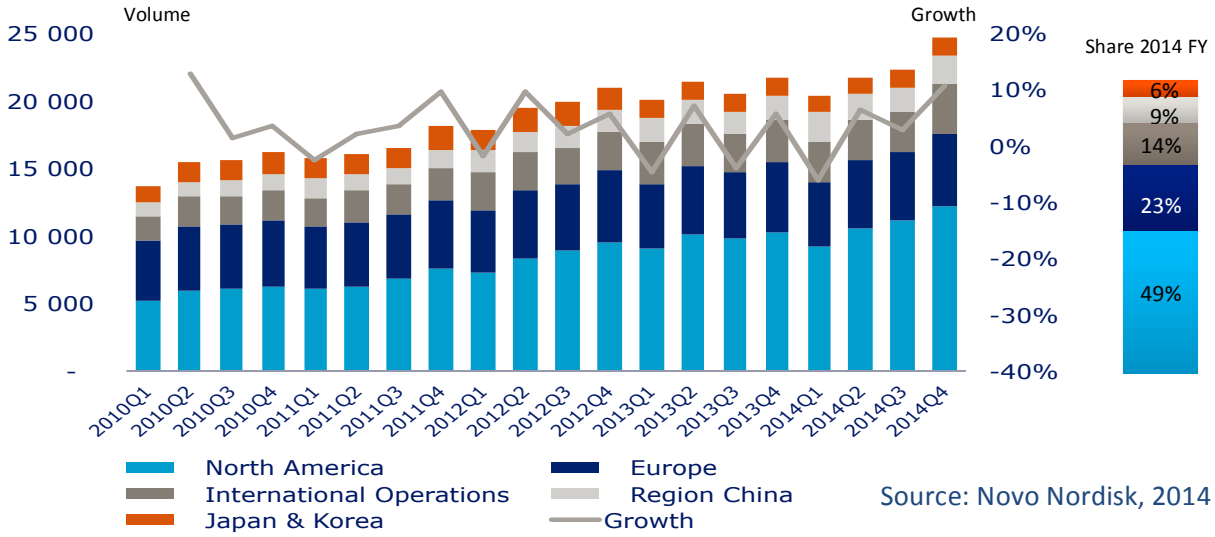
[34] Biobetters refer to a recombinant protein drug that is in the same class as an existing biopharmaceutical but is not identical; it is improved over the original. See http://www.biopharma-reporter.com/Bio-Developments/Generation-of-biobetters-could-push-out-biosimilar-development-says-expert, accessed 20-07-2015.

[35] As presented in section 1.4, this timeframe presents a good picture of the challenges that the pharmaceutical industry is facing today and will need to deal with in the coming years.

According to Figure 15, diabetes care is NVO's largest and fastest-growing business area, representing almost 80% of NVO's total sales in 2014. Sales in this business area grew by almost 70% in five years, while biopharmaceutics grew 41% during the same period (NVO, 2014).

Additionally, Europe and the US are the most important markets for NVO, with almost 72% of the total sales concentrated in these two regions in 2014. Figure 16 presents NVO's total sales by region from 2010 to 2014.

Figure 16 NVO's total sales by region



Source: Novo Nordisk, 2014

Sections 2.3.1 and 2.3.2 will present NVO's diabetes and biopharmaceutical business areas and simultaneously reveal how their products differ from other products in the market.

2.3.1 Diabetes

According to the American Diabetes Association (ADA, 2015), diabetes is a chronic condition primarily defined by the body's inability to produce insulin to control glucose level in the blood. The International Diabetes Federation (IDF, 2015) defines insulin as a hormone made by the pancreas that helps the body to absorb glucose (sugar) from food.

Over the long-term, high or low glucose levels can damage or cause the failure of various organs and tissue, inducing conditions such as heart disease, stroke, amputations, high blood pressure, blindness, kidney disease, neuropathy, seizures, unconsciousness, brain damage, and even premature death (IDF, 2015).

Diabetes is considered one of the most common non-communicable diseases, NCDs, affecting both men and women, generally above 40 years old. The World Health Organization (WHO, 2015) defines two main diabetes variations: type-1 and type-2 diabetes.

In type-1 diabetes, the body does not produce insulin to process the sugar and convert it into energy. It generally develops at a young age. In type-2 diabetes, the body is unable to produce

enough insulin to effectively pump the glucose into the cells. Type-2 diabetes is the most prevalent type of diabetes worldwide. It normally results from a combination of genetic factors and inadequate diet, excess body weight, and a low level of physical activity.

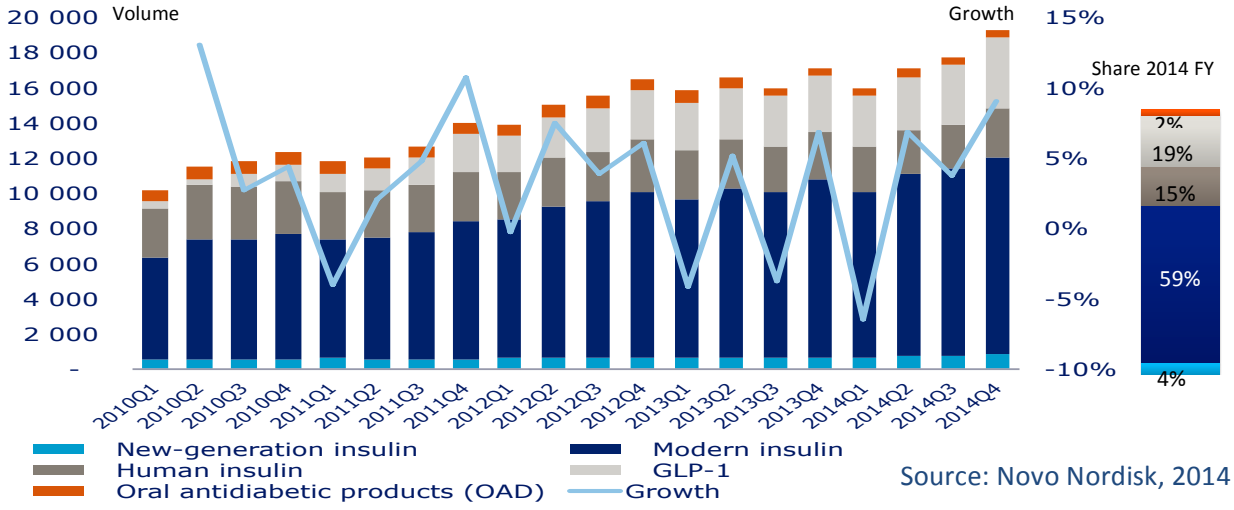
According to IDF (2015), treatments for type-1 diabetic patients require the use of insulin for an indefinite period, usually the rest of the patient's life. People with type-2 diabetes need customized treatments as the disease develops.

The treatment for type-2 diabetic patients generally starts with changes in the patient's lifestyle and the use of some oral anti-diabetes medicines. If the stage of the disease is more advanced, the treatment can be supplemented with insulin or glucagon-like peptide-1, GLP-1.

The central goal of diabetes therapies is to prevent micro- and macro-vascular complications in order to improve the patient's life expectancy and quality of life (Mathieu, 2010). The success of diabetes treatments relies on matching the right amount of insulin to the patient's needs.

NVO has focused its activities on developing medicines for the treatments of diabetic patients over the past century. The product mix for diabetes at NVO consists of insulin, GLP-1, oral anti-diabetes agents, and diabetes devices. The company's portfolio of diabetes products is considered the most diversified in the market (NVO, 2014). Figure 17 presents the total sales of diabetes care per category.

Figure 17 NVO's diabetes sales per category



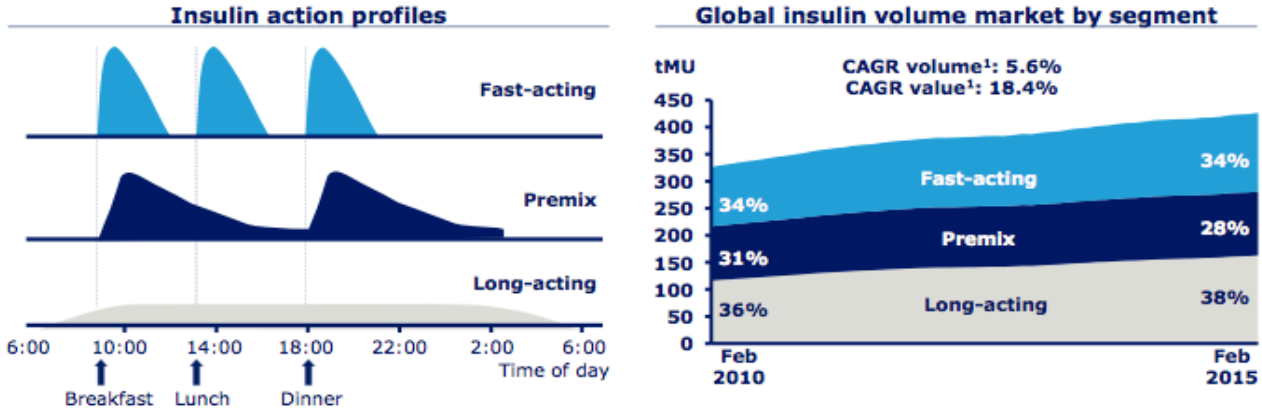
Source: Novo Nordisk, 2014

2.1.1.1 Insulin

Representing 78% of the entire NVO sales of diabetes products in 2014, insulin is the company's biggest diabetes category. It is divided into three main subcategories: new-generation insulin, modern insulin, and human insulin. These subcategories consist of rapid-, premix or intermediate-, and long-acting insulin. What distinguishes these three types of insulin are their speed of action

and the duration of the effect. Figure 18 presents a graphic schematization of how these three types of insulin work and their respective global market share.

Figure 18 Insulin types and their market share 2010-2015



Source: Novo Nordisk, 2015

According to IDF (2015), fast-acting insulin is insulin that starts working approximately 15 minutes after injection and lasts for 3 to 5 hours. It is often taken before a meal. Premix or intermediate-acting insulin generally starts working 1 to 3 hours after injection and can last 12 to 16 hours. Lastly, long-acting insulin is described as insulin that starts working more slowly, but which lasts for 24 hours or more.

The accelerated rise of the ageing population, urbanization, and obesity are the main volume drivers of the insulin market, as they are the drivers of the diabetes pandemic worldwide. Additionally, historical data has shown that an intensification of insulin treatments with modern and new-generation insulin, associated with a sustainable net pricing development in these categories, have been the main value drivers for NVO's profitability growth.[36]

New-generation insulin. Launched in 2013 in Europe, this is the newest and most promising category in NVO's portfolio of insulin. In two years, it captured almost 4% of NVO's total sales of diabetes products. This new line of insulin received the green light for commercialization in Europe and it is currently awaiting FDA's approval in the US.

The new-generation insulin is primarily based on long-acting insulin. Its main function is to prolong the product's duration of action in the body and also lower the incidence of hypoglycaemic events in both type-1 and type-2 diabetic patients. Hypoglycaemia can be a side effect from an overdose of insulin. The main products in this category are Tresiba, Ryzodeg, and Xultophy.

Tresiba is the newest insulin on the market that offers patients the possibility to delay injections beyond 42 hours. It provides a better action profile than SNY's Lantus, as it reduces the rate of hypoglycaemia and increases dosing flexibility when needed (EMA, 2015). Additionally, it is

[36] See Appendix 2 for more information about the insulin market share by region 2010-2015.

currently commercialized in 22 countries and it is expected to reach a total of 52 countries by 2017 (NVO, 2015).

Ryzodeg combines Tresiba with the most prescribed rapid-acting insulin in the market, NVO's NovoRapid. It provides both fast absorption and long regulation of glucose levels right after mealtime (EMA, 2015).

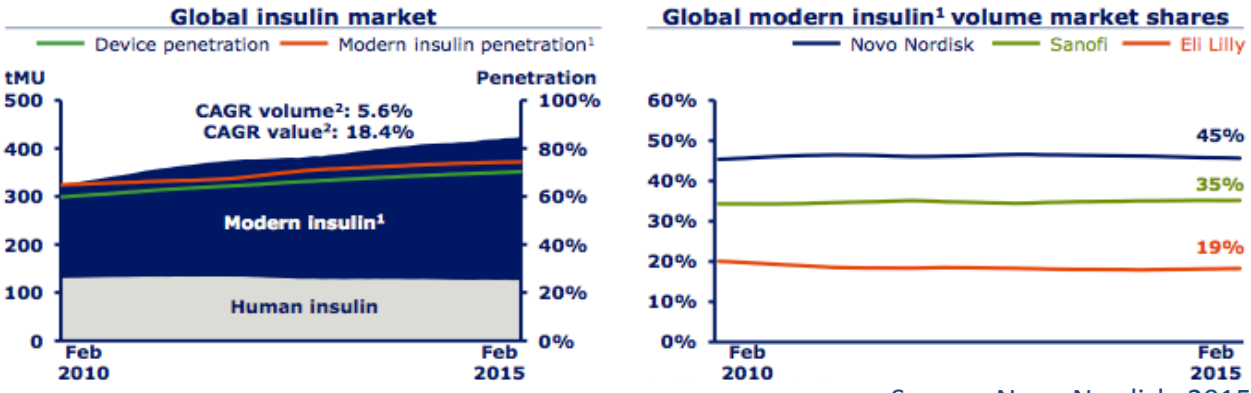
Xultophy combines Tresiba with the company's blockbuster GLP-1 Victoza, offering treatment for type-2 diabetes patients with a once-daily injection (EMA, 2015).

Modern Insulin. This is the biggest insulin sub-category, representing almost 60% of NVO's total diabetes sales in 2014 (NVO, 2014). Modern insulin is an improved version of human insulin and it consists of fast-, intermediary-, and long-acting insulin types (Mathieu, 2010). According to Figure 19, this category has show strong market growth potential and stable market share development. The main products in this category are NovoRapid, Levemir, and NovoMix.

NovoRapid (NovoLog in the US) is the world's most widely used fast-acting insulin for the treatment of type-1 and type-2 diabetes (NVO, 2015). It increases the speed of action of insulin in the body. It is used to treat diabetes in adults, children over the age of two, and pregnant women.

Levemir is a once-daily-use insulin that can last up to 24 hours in the body (NVO, 2015). It is used for treatments of type-2 diabetes. One of the advantages of Levemir is its lower impact on weight gain than its main competitor, SNY's Lantus.

Figure 19 Global insulin market growth and market share 2010-2015



Source: Novo Nordisk, 2015

NovoMix (NovoLog Mix in the US) is a premix insulin that contains the active substance aspart in three different compositions: NovoMix 30, NovoMix 50, and NovoMix 70. They can be considered blended modern insulins, as they are characterised by both fast- and long-acting modern insulin.[37]

Human Insulin. Representing around 15% of the total sales of NVO's diabetes care in 2014, human insulin is a synthetic insulin grown in laboratories to mimic the insulin in humans.[38] Commercially

[37] For instance, with 70% of aspart protamine-crystals and 30% soluble aspart, NovoMix 70 provides an early onset of action as well as an intermediate duration length (EMA, 2015).

available human insulin is produced through recombinant DNA technology, where the gene for making human insulin is transferred into simple cells such as bacteria or baker's yeast.

The insulin made by those cells is the same as the insulin made by the human pancreas. Unlike animal insulin, recombinant DNA human insulin can be made in unrestricted quantity, since it does not rely on the supply of bovine and porcine pancreases (IDF, 2015). The main products in this category are Insulatard, Actrapid, and Mixtard.

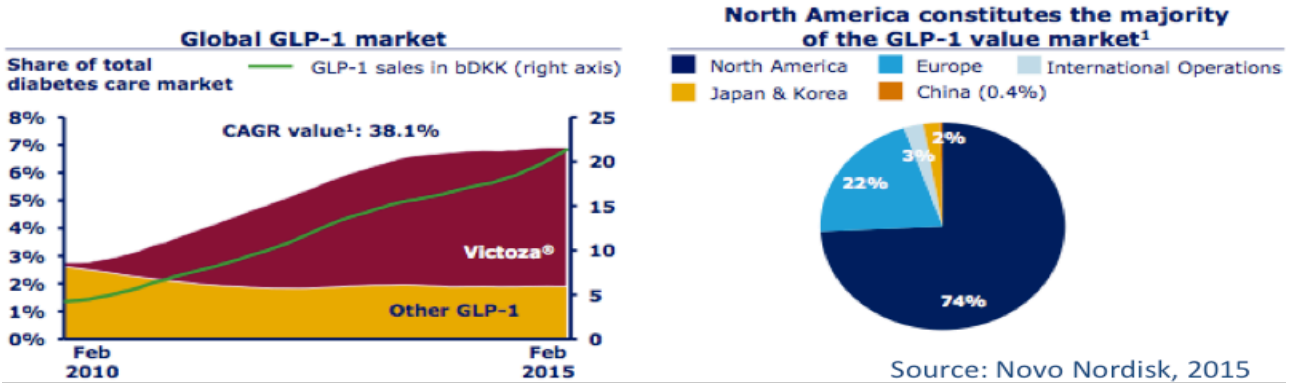
Human insulin is gradually losing volume and value representativeness in NVO's portfolio of products. It is expected that modern and new-generation insulin will replace human insulin in the median-term. This cannibalization in the insulin portfolio is due to NVO's strategy to deliver innovative insulin treatments with higher value added.

2.1.1.2 GLP-1

Launched in 2009, GLP-1 is the second biggest category, representing almost 20% of NVO's total sales of diabetes products in 2014. The company is investing heavily in this category, with almost half of its pipeline in 2014 focusing on the development of new GLP-1 products. This reveals that NVO's long-term business strategy is devoted to expand its leadership in the global GLP-1 market.

GLP-1 is a hormone that helps the pancreas to release the appropriate amount of insulin when blood glucose levels are higher than normal (NVO, 2015). As GLP-1 is not insulin, it is recommended only for patients with type-2 diabetes. The main NVO products in this category are Victoza and Saxenda. Figure 20 presents more detailed information about the GLP-1 market.

Figure 20 GLP 1 Market developments 2010-2015



Victoza is the leader in the GLP-1 market, capturing 78% of the global market share (NVO, 2014). Studies have shown that Victoza performs better than its competitors in increasing the amount of insulin released by the pancreas in response to food (EMA, 2015). It is also prescribed to lower the incidence of hypoglycaemic events in type-2 diabetic patients. Victoza has been shown to be beneficial for patients seeking weight-loss, although it is not commercialized as a weight-loss

[38] It was developed in the 1960s and 1970s and accepted for pharmaceutical use in 1982 (ADA, 2015).

product. However, this could give Victoza a unique selling point against other therapies for controlling type-2 diabetes, a disease that is closely linked with obesity.

Saxenda is the first NVO product focused on the treatment of patients with obesity issues. It was first launched in the beginning of 2015 in US. Saxenda is essentially a double dose of Victoza, focusing on patients who experience difficulties with losing weight.[39] It tackles obesity by mimicking a naturally-occurring hormone that the pancreas secretes when we eat food. By doing this, it decreases hunger and increases the feeling of fullness (NVO, 2015).

2.1.1.3 Oral Anti-diabetes Agents

This category represented around 2% of NVO's total sales in 2014. There has been a sharp decrease in the sales of this category since 2013, when the patent of its products expired. However, NVO is developing a long-acting oral anti-diabetes product intended as a once-daily tablet treatment (NVO, 2014). It is currently in phase one of development, and the period for commercialization has not yet been defined. The existing product in this category is NovoNorm.[40]

2.1.1.4 Diabetes Devices

This category consists of a bundle of prefilled or durable insulin delivery systems and needles. They are all designed to improve the way NVO insulin products are administrated by patients and professionals. The newest products in this category are FlexTouch and NovoFine Plus. FlexTouch is a prefilled insulin delivery system, which was rated by healthcare professionals and patients as the easiest pen to use among those currently available in the market (NVO, 2015). NovoFine Plus is an ultra-short and ultra-thin needle designed to proportionate a fast and painless application of insulin.[41] Table 11 presents an overview of NVO's portfolio of products for the entire diabetes business area.[42]

Table 11 Overview of NVO's portfolio of products for diabetes care

Categories	Products
Insulin	New-generation insulin (Tresiba®, Ryzodeg®, and Xultophy®); modern insulin (Levemir®, NovoRapid®, and NovoMix®); and human insulin (Insulatard®, Actrapid®, Mixtard®)
GLP-1	Victoza® and Saxenda®
Oral anti-diabetes agents	NovoNorm® and Prandin®
Diabetes devices	FlexTouch®, FlexPen®, NovoPen Echo®, NovoPen® 3, 4 and 5, InnoLet®, NovoFine®, NovoFine® Plus, NovoFine® AutoCover®, NovoTwist®, GlucaGen®, and GlucaGen® Hypokit

Source: Novo Nordisk, 2015

[39] Saxenda focuses on people with a body mass index, BMI, of 30 or greater, or 27 or greater in the presence of at least one weight-related comorbidity (EMA, 2015).
[40] It is only used for the treatment of patients with type-2 diabetes.
[41] See Appendix 3 for a detailed list of diabetes devices currently commercialized by Novo Nordisk.
[42] See Appendix 3 for detailed descriptions of each product and their differentiated characteristics.

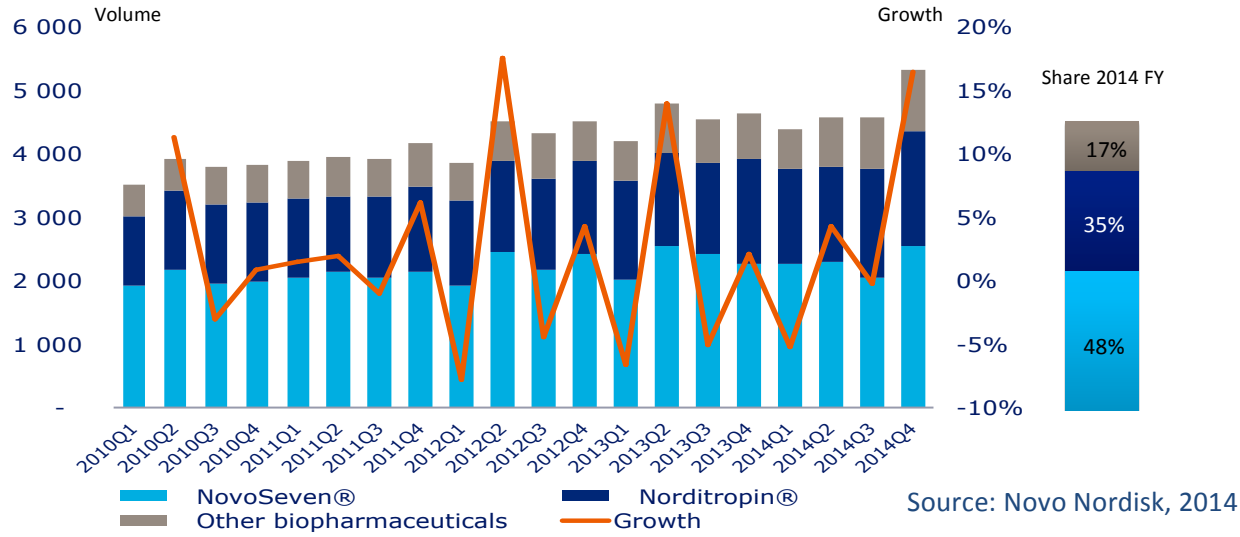
2.3.2 Biopharmaceutics

The biopharmaceutical segment represented around 20% of NVO's total sales in 2014. It is focused on developing medicines for the treatment of haemophilia as well as growth hormone therapy and hormone replacement therapy. The segment consists of eight medicines, but only two of them accounted for almost 84% of the entire biopharmaceutical sales in 2014.

Figure 21 shows the total sales of biopharmaceuticals by category from 2010 to 2014. According to NVO (2014), sales of the entire category increased by 4% in DKK in 2014. Additionally, sales growth has been primarily driven by the American, Indian, Brazilian, and Chinese markets (NVO, 2014).

Haemophilia. This is a relatively rare bleeding disorder that can be inherited or acquired. The disorder impedes blood-clotting (NVO, 2015). According to Mahony (2011), patients with haemophilia require lifelong treatment with clotting factor in order to control regular bleeding incidents. In the absence of good therapy, patients with haemophilia face unstoppable bleeding, joint damage, loss of mobility, internal organ damage, and eventually premature death (Mahony, 2011).

Figure 21 Novo Nordisk's biopharmaceutical sales per category



Source: Novo Nordisk, 2014

NVO has been in this market since 1996 when it launched NovoSeven. This medicine works by activating the body's coagulation system. Nearly half of NVO's biopharmaceutical sales in 2014 came from the sales of NovoSeven. In addition to NovoSeven, NVO has also commercialized two more products for the treatment of haemophilia; NovoEight and NovoThirteen, targeting different variations of the disease.

Growth hormone and hormone replacement therapies. Growth hormone deficiency occurs when the body cannot produce enough growth hormone on its own. Hormone replacement in general is any form of hormone therapy where a patient receives hormones to supplement a lack of

naturally occurring hormones, or to substitute other hormones for naturally occurring ones (NVO, 2015).

NVO has been in this market for more than forty years. However, it has only Norditropin as a medicine targeting growth hormone disorders. Norditropin is NVO's second most profitable medicine in the biopharmaceutical segment, representing almost 40% of the total sales in 2014.

Hormone replacement therapy focuses on the female hormones oestrogen and progesterone, whose levels drop significantly during menopause (NVO, 2015). The therapy helps to top up a woman's levels of essential hormones. NVO has four products dedicated to this kind of treatment. Their share of NVO's total sales for biopharmaceutical products was around 8% in 2014. Table 12 presents NVO's portfolio of products for the biopharmaceutical business area.

Table 12 Overview of Novo Nordisk's portfolio of biopharmaceutical products

Categories	Products
Haemophilia	NovoSeven®, NovoThirteen®, and NovoEight®
Growth Hormone Therapy	Norditropin®
Hormone Replacement Therapy	Vagifem®, Activelle®, Estrofem®, and Novofem®
Devices	Norditropin® FlexPro®, Norditropin® NordiFlex®, NordiPen®, NordiLet®, and PenMate®

Source: Novo Nordisk, 2015

2.4 Industry Analysis of Diabetes and Biopharmaceuticals

This section focuses on understanding how the structure of the diabetes and biopharmaceutical markets drives competition and consequently profitability. The emphasis of the analysis is on the diabetes market as it represents almost 80% of NVO's business. However, differences between the diabetes and biopharmaceutical markets will be addressed when necessary.

Porter's Five Forces framework is used to carry out this analysis. This framework was developed by Michael Porter of Harvard Business School and views the profitability of an industry as determined by five forces of competition: suppliers, buyers, substitutes, new entrants, and established rivals (Grant, 2010). According to Porter (2008), the five forces reveal why the profitability of an industry is the way it is.

Critics of Porter's framework, however, argue that due to the static nature of the framework analysis, it does not illustrate changes in the competitive environment, which can be rather dynamic (Grant, 2010). In this thesis, the analysis of NVO's strategic business areas is based on facts and events affecting the industry up until April 30 2015. Therefore, the Five Forces framework suits the objective of this thesis, as the analysis of past and future events relies on information gathered over a static period of time.

2.4.1 Bargaining Power of Suppliers

The profitability of an industry is associated with the ease with which the companies in the industry can switch between different input suppliers and the relative bargaining power of each player (Porter, 2008).

According to my analysis, three main suppliers were identified as playing a big role in NVO's diabetes and biopharmaceutical markets: suppliers of active ingredients; suppliers of advanced technology; and the labor market.

Suppliers of active ingredients are usually chemical companies. Due to the direct effect that the quality of active ingredients has on the safety and efficacy of a medicine, these suppliers tend to have a strong bargaining power. Consequently, many leading pharmaceutical companies have invested large amounts of money in fine chemical manufacturing, or developed facilities to produce their own main chemicals in a bid to boost profits and reduce suppliers' bargaining power (IMS, 2014).

When it comes to technology**,** which is generally related to the supply of laboratory equipment and processes for chemical or biological compounds, manufacturers of diabetes and biopharmaceutical products are usually able to obtain the best quality and cost balance of technological materials and services (PwC, 2012). This reduces suppliers' power. However, newly advanced or very specialized technologies can greatly increase suppliers' bargaining power. Due to the differentiation inherent in high-tech products, especially in the early stages of the technology lifecycle, product substitution can be limited.

Another important group of suppliers is high-skilled scientists. According to my analysis, there is a close connection between the knowledge these workers possess and the future profitability of the product pipeline. Pharmaceutical companies aim to have the best scientists in their labs and thus they are constantly competing with each other to hire and retain the best talents. Consequently, this environment can increase the bargaining power of scientists, especially in very specialized fields like biopharmaceuticals, where the availability of skilled workers can be scarce. Based on the above, I consider the bargaining power of suppliers moderate.

2.4.2 Bargaining Power of Buyers

The interaction between producers of goods and services and their costumers creates value for both sides during the transaction. However, their economic power over each other defines how the value created is shared between them (Grant, 2010).

Although patients in need of diabetes or biopharmaceutical products interact with manufacturers of medicines through political systems rather than a straightforward value chain, they still have significant economic power over the purchasing process. Nowadays, patients are becoming more aware of treatment options and they are increasingly using information and data about

themselves and providers to get the best treatment at a time, place, and cost suitable for them (Taylor, 2014).

Other buyers in the pharmaceutical value chain can influence manufacturers' profitability. The diabetes and biopharmaceutical value chains consist of two main stakeholders: distributors and retailers. Distributors and retailers acquire medicines with the expectation of selling them with a profit margin. According to the WHO/HAI (2008), there are five components that define the price of a medicine. These five components and their average weight in the price composition of a medicine are presented in Figure 22.

Figure 22 Pharmaceutical price build-up (% of the price paid by patients, on average)

Source: WHO/HAI, 2008

Based on Figure 22, there are numerous factors that impact the level of a manufacturer's net price. One of the most important is trade discount that is offered by manufacturers to wholesalers or retailers and is negotiated in business-to-business transactions (IMS, 2014).

According to my analysis, manufacturers usually try to sell their medicines to wholesalers who provide high turnover of products and economies of scale. These wholesalers tend to be big and are generally able to buy large amounts of medicines. Consequently, these kinds of wholesalers may gain significant bargaining power over manufacturers.

Some buyers' bargaining power has also increased in recent years. For instance, in the US, employers as well as the government contract with intermediaries such as health plans and pharmacy benefit managers, PBMs, to manage the purchase and delivery of healthcare. Health plans and PBMs provide a variety of health services based on the agreements they set up with physicians, hospitals, and pharmacy networks. A PBM is an intermediary that contracts with employers, the government, and health plans to manage the pharmacy benefit for a specific population (NVO, 2015).

The methods of controlling the use and costs of medicines by these agents have harmed the industry's profitability. Methods such as generic substitution, quantity limits, prior authorizations, development of preferred drug lists to be used by health providers, reduction of contract duration, and the application of some price protection mechanisms have constrained the ability of the pharmaceutical industry to negotiate rebates (Oehlricha and Daemmrichb, 2013).

Nowadays, new contracts between health plans and manufacturers are short-term and often have some kind of price protection mechanisms built in, such as an automatic increase in the rebate level when there is an increase in the list price of the medicine (NVO, 2014). Based on the above,

healthcare insurers, who generally co-participate in the payment of the patient's medicine expenses, are increasingly deploying mechanisms that will impact the economic power of pharmaceutical companies and push the medicine prices down.

Governments are another important buyer that is increasing its power over manufacturers. According to my analysis, the bargaining power of governments is affecting manufacturers' profitability more than any other buyer. Many governments are squeezing manufacturers' profits by controlling medicine prices or automatically defining very low reimbursement prices for medicines commercialized in their markets (Oehlricha and Daemmrichb, 2013).

Additionally, as presented in the macroeconomic analysis, governments are moving towards a value-based pricing system, which may greatly change the way medicines are priced (Oehlricha and Daemmrichb, 2013). Overall, these changes increase buyers' bargaining power and consequently impact the price and volume of medicines sold on the market. Thus I find that the bargaining power of these players is high.

2.4.3 Threat of Substitutes

The threat of substitutes is dependent on the availability of alternative medicines and treatments for costumers. In a market with several medicines providing similar outcomes, demand tends to be elastic with response to price. However, the extent to which substitutes reduce prices and profits relies on the inclination of buyers to replace a medicine with its alternative substitutes.

According to my analysis, there are no products or treatments available nowadays that could considerably replace those medicines currently commercialized in the diabetes and biopharmaceutical markets. However, in the diabetes market substitution is fragmented.

Branded oral anti-diabetes agents face a very strong competition from generics, while in the insulin segment, generic options are almost non-existent. This is due to two main factors: difficulties with replication of biological medicines and regulatory barriers.[43]

Replicating insulin is scientifically more difficult than replicating an ordinary chemical medicine. Due to the biological nature of insulin, it is also difficult to identify and classify the similarities between branded and generic insulin. Thus, regulatory authorities tend to reject generic insulin, as they are unable to define the differences between products. However, this is changing.

In 2014, FDA and EMA started loosening their regulatory requirements for generic insulin for the first time since 1923, when the insulin market was created. When approved, it is expected that the price of generic insulin may be around 20-40% lower than their branded counterparts, which is already well below the 60-80% discount price range usually applied in the ordinary generic drug market.[44] The reason for this variation in price ranges is related to the complexity of the insulin

[43] See http://weinberggroup.com/fda-approved-generic-insulin/, accessed 06-07-2015.
[44] See http://uk.businessinsider.com/why-is-there-no-generic-insulin-2015-3?r=US&IR=T, accessed 28-09-2015.

production. They are usually far harder to produce than traditional generics. Still, with regulatory authorities becoming more relaxed in approving generic insulin, the market for branded-insulin is expected to change considerably in the near future.

Nowadays, the main substitutes of NVO's diabetes and biopharmaceutical medicines are their competitors' branded medicines. In the biopharmaceutical market, treatments generally require the use of a specific and differentiated medicine, thus reducing the patient's flexibility to switch to another branded medicine. In the diabetes market, however, products can be switched more easily. Additionally, there are currently several diabetes medicines in development that, if they reach the market, will increase the number of substitutes of diabetes medicines.

The launch of new diabetes products is expected to increase in the next years. According to a study carried out by the Pharmaceutical Research and Manufacturers of America, PhRMA (2014), there are currently around 180 diabetes medicines going through clinical trials around the world. Table 13 shows the number of products in development by the four leading manufacturers of diabetes medicines.

Table 13 Pipeline overview of the leading manufacturers of diabetes medicines in 2014

Category	Manufacturer	Phase I	Phase II	Phase III	Submitted for approval	Total
GLP-1	Eli Lilly	0	0	0	1	1
	Novo Nordisk	4	1	2	1	8
	Total GLP-1	**4**	**1**	**2**	**2**	**9**
Insulin	Eli Lilly	3	1	3	2	9
	Novo Nordisk	2	0	1	3	6
	Sanofi	1	1	2	0	4
	Merck	0	0	1	0	1
	Total insulins	**6**	**2**	**7**	**5**	**20**
Oral anti-diabetes agents	Eli Lilly	7	2	1	0	10
	Novo Nordisk	1	0	0	0	1
	Merck	4	0	0	0	4
	Total orals	**12**	**2**	**1**	**0**	**15**
Grand total		**22**	**5**	**10**	**7**	**44**

Sources: PhRMA, 2014; Novo Nordisk, 2014

According to my analysis, however, manufacturers tend to discontinue the commercialization of old versions of their products as they launch new product alternatives.[45] This strategy is especially apparent the insulin market. By discontinuing old versions of their products, manufacturers can control the number of branded medicines in the market, and thus reduce the threat of substitution or cannibalization.

[45] See http://uk.businessinsider.com/why-is-there-no-generic-insulin-2015-3?r=US&IR=T, accessed 28-09-2015.

As presented above, patients are usually focused on receiving treatments that provide the most reliable outcomes in terms of safety and effectiveness. Consequently, from a patient perspective, the price elasticity for medicines tends to be low. Contrarily, healthcare providers and insurers, who tend to be the ultimate buyers, are usually concerned with controlling their expenditures on medicines and thus tend to be more sensitive to price than patients. As a result, with the potential development of generic insulin and the launches of new branded-insulin on the market in the future, price competition will increase as the number of substitutes increases.

In the future, new treatments may also become more attractive than the traditional methods based on medicines. There are studies focused on stem cells[46] and pancreas transplantation[47] as an alternative to cure type-1 diabetic patients. If clinically and financially viable, diabetic patients, who normally rely on medication for the rest of their lives, could be cured. This scenario would negatively impact prices of diabetes medicines to some extent. Thus, based on the analysis above, the threat of substitutes is considered high, especially in the diabetes markets.

2.4.4 Threat of New Entrants

Usually, the threat of new entrants constrains prices. If there are no restrictions for new entrants, the rate of profit will fall toward its competitive level (Porter, 2008). The main barriers to entry in the diabetes and biopharmaceutical markets are intense government regulation and capital requirements. Entry into the medical and biopharmaceutical markets usually requires a license from a public authority.

Manufacturers are required to certify the safety of their products as well as their effectiveness to a national regulator in order to be approved for commercialization. This process can be very costly and time-consuming (Deloitte, 2014). Consequently, regulatory requirements put new entrants at a disadvantage in comparison with established pharmaceutical companies because compliance costs and time tend to weigh more heavily on newcomers (Deloitte, 2014).

Patent is an important regulatory barrier. As presented in the macroeconomic analysis, it prevents competitors from replicating medicines with the same molecules for a certain period of time. Major players in the pharmaceutical industry seek to get or extend patents for their medicines in order to reduce the entry of generic competitors.

Consequently, barriers to entry for a generics manufacturer rely on the expiry of patents on the medicines it wants to reproduce. However, patent owners may attempt to safeguard their market position by offering a similar medicine under a new or extended patent (OECD, 2009). According to my analysis, however, from a generic manufacturer's perspective, these risks may be worth taking, as developing new medicines from scratch can be very costly and risky.

[46] See http://www.diabetesresearch.org/stem-cells, accessed 03-09-2015.
[47] See http://www.diabetes.org/living-with-diabetes/treatment-and-care/transplantation/pancreas-transplantation.html, accessed 03-09-2015.

It generally takes eight to fifteen years to develop a medicine and on average only one in 5,000 compounds developed actually ends up being approved by regulatory authorities.[48] A company that plans to develop a completely new medicine needs to consider this significant risk in its R&D investments.

In addition to investing a significant amount of money in product development and regulatory compliance, manufacturers also have considerable expenses for promotion in order to achieve economies of scale (Deloitte, 2014). This further raises the capital required by new entrants. As a result, competition tends to be concentrated among few players, generally two or three big manufacturers who usually compete on a product-by-product basis (e.g. NVO, SNY, and LLY in the insulin market) (PwC, 2012). Therefore, based on my analysis, I consider the threat of new entrants in the diabetes and biopharmaceutical markets low.

2.4.5 Industry Rivalry

In many industries, the major factor of the overall level of competition and profitability is determined by the competition among the companies within the industry. According to Grant (2010), the intensity of competition between established firms is the result of interactions between six factors: concentration, product differentiation, diversity of competitors, excess capacity, exit barriers, and cost conditions.

2.4.5.1 Concentration

The concentration of competitors is higher in the diabetes market than in the biopharmaceutical market. In the diabetes market, for instance, the four largest manufacturers represented almost 80% of the global diabetes market in 2014 (EvaluatePharma, 2015).

Although market share of the major manufacturers of diabetes medicines is expected to decrease, there is no indication that a new manufacturer will become a real threat to the four leading producers.[49]

According to my analysis, due to the high concentration of competitors and intense government regulation[50], price competition tends to be low. Consequently, competitors in the diabetes and biopharmaceutical markets tend to focus on expanding their market share through economies of scale.

2.4.5.2 Product Differentiation

Medicines can be highly differentiated through their clinical effectiveness (WHO, 2008). Pharmaceutical companies safeguard this differentiation strategy by obtaining patent rights over

[48] Information presented in section 2.1.3, Figure 8.
[49] See Section 2.2.1 for more information about the market share decrease of the four leading manufacturers of diabetes products in 2020.
[50] Explained in section 2.2.1 Political and Legal Analysis.

their medicines.[51] In the diabetes markets, however, and especially in the insulin segment, the differentiated benefits of branded-insulin available in the market are sometimes not clearly identifiable.

Although insulin is considered a highly innovative product, its differentiated benefits in terms of quality and safety can be blurred. If patients, for instance, are not able to distinguish between the benefits of branded- and generic-insulin, they will be more willing to buy the product that offers a competitive price.

For instance, during the period when the patent of SNY's Lantus was active in Europe and the US, the product became the most profitable diabetes medicine in the world. However, after the patent expired in Europe, Lantus is expected to lose substantial market share, mainly due to generic competition.

Lantus's potential global market competitor after its patent expiration is LLY and Boehringer Ingelheim's new generic insulin, Adasria. Initially, it was expected that LLY/Boehringer's new product would be available in the US market by medio-2015. However, due to SNY's lawsuit against LLY for patent infringements, it may take around two years for Adasria to be launched in the US market. The lawsuit has been seen by experts as SNY's attempt to delay the launch of LLY/Boehringer's generic version of Lantus in the US.[52] However, it has not stopped LLY to go further with its product in the European market, where it is still expected to come to market in 2015.[53]

Lantus will also see its market share shrink due to threats coming from Gan&Lee's generic-insulin Basalin. Introduced in the Chinese market in 2005, this insulin is a generic version of Lantus and it is the second biggest insulin product in terms of sales in the Chinese market.[54] With Lantus patent expiry, the European and US markets will be more exposed to the introduction of generic versions, such as Basalin.

Another possible competitor to Lantus is NVO's new-generation insulin, Tresiba. In fact, Tresiba will also become a strong competitor to SNY's new long-acting insulin, Toujeo, which is SNY's 'replacement' for Lantus. However, after some issues with the FDA, Tresiba will not be

[51] See Appendix 4 for more information about the products of the largest manufacturers in the diabetes market and their expected patent expiry in the American and European markets.

[52] See http://www.reuters.com/article/2014/07/08/us-elililly-sanofi-lawsuit-idUSKBN0FD20720140708, accessed 01-07-2015. There is space between footnote 48 and 49 here – why? ☺ Also, there is space between the two lines of footnote 48.

[53] See http://www.bloomberg.com/news/articles/2015-06-06/lilly-to-introduce-lantus-biosimilar-in-europe-in-third-quarter, accessed 06-07-2015. Please note that the current analysis only considers events up until April 30, 2015. Thus the launch of Adasria in Europe will not be considered further here.

[54] See http://www.prnewswire.com/news-releases/insulin-glargine-market-research-reports-with-2019-global-and-china-forecasts-as-well-as-comprehensive-patent-search-info-506020811.html, accessed 25-09-2015.

commercialized in the US until the middle of 2016.[55] Consequently, with the lawsuit against LLY's Adasria and FDA issues with NVO's Tresiba, SNY is gaining time to strategically consolidate Toujeo in the US market.

In conclusion, Lantus will become the first insulin product available in a generic version. However, generics will not just capture Lantus market share. They will also impose threats to the whole portfolio of branded-insulin products in the market. For instance, Tresiba's ability to capture Lantus market share is likely to be related with its ability to safeguard its own future against generic competition. The scenario above shows that rivalry in the market is increasing due to future launches of new branded-medicines and especially the potential introduction of generic insulin in the European and American markets.

2.4.5.3 Diversity of Competitors

Numerous multinational companies control the global research-based pharmaceutical industry, alongside smaller firms such as biotech players focused on a small number of new products (NVO, 2014). However, the diabetes market is characterised by more similar competitors than the biopharmaceutical market. Although the four largest companies in the diabetes market originate in three different countries, they present similar cost structures, strategies, and management mind-sets. Additionally, they also have a long history of developing diabetes medicines.

Of this group, NVO is the only company for whom the diabetes business represents more than 70% of the company's total revenue (NVO, 2014). The other three competitors have a more diversified portfolio of products, targeting a number of diseases beyond diabetes. This fact has two important and opposite conclusions: on the one hand, it allows NVO to develop strong competitive advantages in the diabetes market due to product development focus and specialization; on the other hand, it increases the vulnerability of NVO due to competition, patent loss, and a highly concentrated business.

2.4.5.4 Excess Capacity, Exit Barriers, and Cost Conditions

Excess capacity occurs when there is a disproportional balance between demand and capacity. It can encourage competitors to offer price cuts to increase demand (Grant, 2010). According to my analysis, although there are many similar diabetes medicines in the diabetes market, excess capacity is low. This is due to the increasing prevalence of diabetes[56], which is pushing the global demand for diabetes products up.

Exit barriers concern the difficulties of ceasing production and developing or selling off assets. Although many of the pharmaceutical manufacturers' assets are patents, trademarks, or synthetic methods, which can be easily sold, I still consider the exit barriers in the market to be moderate.

[55] See http://www.reuters.com/article/2015/04/07/us-novo-nordisk-fda-idUSKBN0MY21420150407, accessed 01-07-2015.
[56] See section 2.2.3 for more information about non-communicable diseases.

The risks and high costs associated with the future marketability of the pipeline can be a potential exit barrier according to my analysis. Products in the pipeline usually have very low likelihoods of becoming successful products in the early stages of development, and thus they may not be easy to pass on. Consequently, exiting the market could compromise shareholders' value, as the company would encounter difficulties in recovering the pipeline's R&D costs.

On the other hand, pharmaceutical companies rely on creating valuable intellectual property at a high cost, which can then be explored to generate large-scale product production at a relatively low cost. It is relatively easy for global manufacturers to expand output. They can also develop licensing agreements with other companies in order to scale up their production without investing heavily in new facilities (PwC, 2012). Table 14 presents a summary of Porter's Five Forces framework for the diabetes and biopharmaceutical markets.

Table 14 Summary of Porter's Five Forces framework

Porter's Five Forces	Status	Description
Bargaining power of suppliers	Moderate	Low flexibility to change suppliers of newly advanced or very specialized technologies, and dependency on high-skilled scientists
Bargaining power of buyers	High	Governments', healthcare insurers' and distributors' mechanisms for controlling prices
Threat of substitutes	High	Especially in the diabetes market, where there are a variety of similar branded products available
New entrants	Low	Government regulation and capital requirements
Industry rivalry	High	In the diabetes market, four manufacturers represent almost 80% of the global market, competing by increasing market share through market penetration, and by applying product differentiation strategies, where they obtain patent rights over their medicines

2.5 Analysis of Novo Nordisk's Core Resources and Capabilities

The emphasis of the previous analyses was on the identification of profit opportunities and threats in NVO's external environment. In this section, however, the emphasis changes from the interface between strategy and external environment towards the interface between strategy and NVO's internal environment.

By focusing on NVO's resources and capabilities, this analysis takes a resource-based view approach, RBV. According to Yeoh and Roth (1999), the RBV approach provides a firm-specific perspective on the importance of the resources and capabilities that are unique to a company's source of competitiveness. Thus, the RBV focuses on explaining the basis on which the resources and capabilities of a company are sources of sustainable competitive advantage.

This section concentrates on addressing the following two groups of questions: 1) What are NVO's core resources and capabilities? What are NVO's competitive strengths and weaknesses? 2) What strategic advantages has NVO developed, or does it plan to develop, in reaction to business

opportunities and threats? Answering these questions will help to identify NVO's ability to create and sustain competitive advantages capable of minimizing threats and exploiting market opportunities.

2.5.1 Core Resources

Resources are the productive assets owned by NVO that when working together provide organizational capabilities (Grant, 2010). Based on my analysis, I identified four core resources of NVO: R&D, production, distribution, and financial resources.

Nowadays, with regulatory authorities relaxing their processes for approving generic insulin[57], NVO's growth and profitability in the future will rely even more heavily on the ability of the company's R&D to engineer, formulate, and deliver competitive and differentiated medicines, than it does today. Otherwise, NVO runs a risk of losing competitive advantages, as its products age and the market evolves.

In addition to NVO's R&D, the company's production resources will also play a key role in supporting competitive advantages. NVO has seventeen production facilities located in key strategic markets for diabetes and biopharmaceutical products, such as the US, China, Brazil, Japan, Russia, and Europe.[58]

NVO's production policies are designed to protect production from raw material supply shortages and price volatility. For some important raw materials, NVO usually has close and long-term relationships with key suppliers in order to secure at least dual sourcing (NVO, 2014). Although this strategy does not completely eliminate risks of manufacturing disruptions, it helps the company to reduce their exposure to risk.

NVO also has geographically extensive distribution with the potential strength to expand to the emerging markets. The company has recently invested extensively in developing additional capacity for insulin filling and active pharmaceutical ingredients production. These strategies support NVO in reducing the bargaining power of suppliers of active ingredients[59] and also provide the structure to penetrate new markets.

Finally, based on its operating free cash flows, NVO has been able to organically increase global expansion of its manufacturing capacities.[60] The total net capital expenditure for property, plant, and equipment was DKK 4.0 billion in 2014 compared with DKK 3.2 billion in 2013 (NVO, 2014). The company expects to invest approximately DKK 5.0 billion in fixed assets in 2015 in order to expand its production capacity, allowing it to meet growing worldwide demand in the median- and long-term future (NVO, 2014).

[57] See section 2.4.3 for more information about generic insulin competition in the near future.
[58] As mentioned in sections 2.1 and 2.2, the prevalence of diabetes, haemophilia, and growth hormone dysfunctions is concentrated in these markets.
[59] See section 2.4.1 for more information about the bargaining power of suppliers.
[60] Section 3.2 provides more information about NVO's financial performance.

2.5.2 Core capabilities

Capabilities are what a company can do to extract the best outcomes from its resources (Grant, 2010). The primary interest in this analysis is identifying capabilities that can provide the basis for competitive advantages. Based on my analysis, I grouped NVO's business capabilities into four strategic groups: business focus, R&D productivity, sustainable large-scale production processes, and integrated approach to business strategy. I believe business focus is the most important capability, as it ties together all the other core capabilities. Next, I develop the rationale of my analysis.

NVO has always been focused on diabetes, since when the company was founded ninety years ago. Nowadays, NVO is still the only pharmaceutical company in the market that has a complete portfolio of diabetes products. Due to the company's focus on few therapeutic areas[61], it is able to develop a deep disease understanding, which is fundamental to formulate and deliver innovative and differentiated medicines.

R&D productivity is related to a company's ability to innovate and differentiate. With around 7,000 researchers focused on three main therapeutic areas, NVO was ranked 9th in the global top 22 firms by R&D productivity in 2014, ahead of all of its competitors.[62] Additionally, in 2014, the company was also ranked number two in science careers survey and the most innovative pharmaceutical company in Europe (NVO, 2014). These recognitions reinforce NVO's strengths in R&D activities. These recognitions also support the company in attracting high-skilled workers to its laboratories, and thus, sustaining its high R&D productivity.

Sustainable large-scale production is another capability of NVO. Manufacturing high-quality and cost-effective products is complex, but a prerequisite for competing successfully in an increasingly competitive market (NVO, 2014). For instance, supply interruptions, product recalls, or inventory losses can potentially reduce sales, adversely affect operating results and financial conditions, delay the launch of new products, and negatively impact a company's image (SNY, 2014). Therefore, sustainable production capability can have a big impact on NVO's profitability.

NVO has also been ranked among the global 100 most sustainable corporations in the world in the last years[63], ahead of its competitors. The rank methodology is based on evaluating the companies' energy and water consumption, carbon emission, waste management, innovation capability, company culture, and corporate governance.[64] Additionally, for many years NVO has been ranked highly in surveys of the best workplaces in countries including Denmark, the US,

[61] See section 2.3 for more information about Novo Nordisk's strategic therapeutic areas.
[62] See http://www.forbes.com/sites/matthewherper/2014/05/22/new-report-ranks-22-drug-companies-based-on-rd/, accessed 20-09-2015.
[63] See http://www.novonordisk.com/sustainability/how-we-manage/awards-and-recognition/2013-01-novo-nordisk-leads-industry-in-sustainability.html, accessed 20-09-2015.
[64] See http://www.corporateknights.com/reports/2015-global-100/key-performance-indicators/, accessed 20-09-2015.

Brazil, Australia, India, and Mexico (NVO, 2014). I believe these acknowledgments are the results of NVO's integrated approach to business strategy.

The foundation of NVO's business strategy is based on what the company calls 'the triple bottom line' strategy. This means focusing not only on the financial bottom line, but also the social and environmental ones in the company's internal planning and execution processes for each of its strategic business areas. I believe this reflects the company's willingness to take a broad and long-term view of its businesses, providing the potential for a differentiated position in the market.

Based on the above, business focus is what binds NVO's R&D productivity, the sustainable large-scale production processes, and the integrated approach to business strategy together. On the contrary, NVO's competitors are all involved in a variety of therapeutic areas, making their production processes highly complex and their business strategies fragmented. This may make them less flexible in responding to fast-paced changes in the market. Thus, when comparing NVO with its competitors, I believe that the strategy based on specialization in few therapeutic areas is NVO's main competitive advantage.

2.5.3 Business risks

Business risks are associated with internal and external threats to the ability of a company to sustain its competitive advantages in the median- and long-term (Grant, 2010). The longer the length of time its competitive advantages can persist, the longer a company can sustain a high return on invested capital, ROIC, and thus the more value it can create (Koller et al., 2010).

In accordance with this premise, I will appraise the sustainability of NVO's resources and capabilities by evaluating their durability and replicability. Table 15 presents a summary evaluation of the resources and capabilities analysed in sections 2.5.1 and 2.5.2.

There are numerous risks associated with developing, producing, and commercializing medicines. Although important, risks such as delays or failure of pipeline products, supply disruptions, product quality and safety issues, rapid changes in information technology, exchange rate fluctuations and tax disputes, as well as business ethics are all examples of common risks for any global pharmaceutical company. Thus, companies in the pharmaceutical industry have to be able to deal with them.

Risks such as the regulatory environment and market competition, however, require more caution during the risk analysis. I believe they are the risks under which a company's competitive advantages will be intensively tested. According to my analysis, a tougher regulatory environment and competition, especially from the potential introduction of generic insulin in the diabetes market, may substantially impact the company's profitability.

As pointed out in section 2.1.1, with regulatory agents increasing price pressure and reimbursement restrictions on pharmaceutical manufacturers in the coming years, I believe this

scenario will impact the ability of NVO to sustain the high levels of revenue growth presented in section 2.3.

Table 15 Appraising Novo Nordisk's resources and capabilities

Resources - R Capabilities - C	Impor-tance (a)	Novo Nordisk relative strength (b)	Comments
R1 R&D resources	8	9	Strong technological strengths, supports intellectual property/patent development
R2 Production	8	9	Plants located in strategic markets; organic growth of investment in upgrading plants
R3 Finance	7	8	Positive operating free cash flows
R4 Distribution	8	8	Geographically extensive distribution with the potential of expanding to the emerging markets
C1 Strategic management	7	10	Strong business focus on few therapeutic areas and supported by an integrated approach to business strategy (the triple bottom line)
C2 R&D productivity	10	10	Strong R&D productivity; sustained leadership in insulin innovation
C3 Manufacturing	8	9	Sustainable large-scale production, based on high-quality and cost-efficient products

a) Scales range from 1 to 10 (1 = very low, 10 = very high)
b) Novo Nordisk's resources and capabilities are compared to those of SNY, LLY, and MRK. The ratings are based on the author's subjective judgement.

In the near future, I also expect that the threat from generic competition will increase the race for patent protection. This can potentially overload the company's R&D capabilities in recycling the portfolio of products with differentiated medicines. Although this is already a reality for most of the medicines in the market, the insulin and some biopharmaceutical products remain unaffected. However, as presented in section 2.4.5.2, LLY is the only one of NVO's competitors that seems to be preparing its business to face generic competition by beginning to develop its own.[65]

Although it performs better than its competitors, NVO's R&D productivity is not immune to generic competition.[66] The insulin market is filled with branded medicines that essentially do the same thing in similar ways.[67] Thus I expect that manufacturers will face more pressure to provide differentiated efficacy and safety information about their products so that buyers can get added benefits from paying higher prices for their medicines.

[65] Eli Lilly's Adasria® is a generic version of Sanofi's Lantus®. The product was created through a partnership with Boehringer Ingelheim. Expected commercialization date is middle-2016. I would here simply refer to the correct section above instead of repeating this here.
[66] See section 2.1.1 for more information about generic competition.
[67] See http://www.forbes.com/sites/greatspeculations/2014/02/06/novo-hiring-new-reps-now-they-need-something-to-sell/, accessed 22-09-2015.

Generic insulin is not expected to lead to the same aggressive price-reduction as in the ordinary medicine market because insulin involves an expensive production process.[68] However, generic insulin will still drive the profitability of branded-insulin down. As a result, I consider the durability of NVO's R&D resources and capabilities short- and median-term strengths.

In terms of production, the locations of NVO's production facilities play an important role in the distribution process. The company's production is located in strategic markets for diabetes and biopharmaceutical products – NVO's competitors take the same approach with production facilities in similar locations. As a result, I believe this resource, although essential for NVO's growth, does not bring a sustainable differentiation from its competitors due to its replicability.

According to Koller et al. (2010), when companies have found a strategy that creates competitive advantages, they are often able to sustain and renew these advantages over many years. Thus, I believe NVO's strategic management is what stands out in comparison to its competitors.

As presented in Table 15, this is a result of the company's ability to focus its business on few therapeutic areas for decades, and support them through an integrated approach to business strategy. I believe that these capabilities of NVO are fundamental for a durable competitive advantage over its competitors in the median- and long-term.

The diabetes and biopharmaceutical markets present huge opportunities for growth.[69] Especially in the insulin segment, where the product is scalable, the cost of supplying additional units can be reduced through economies of scale. Koller et al. (2010) argue that advantages that arise from quality on the price side and scalability on the cost side tend to be more durable than those arising from more temporary sources of advantage. Based on NVO's core resources and capabilities, the company has the strengths to explore sustainable large-scale production, based on high-quality and cost-efficient products.

As a result, I expect that the current competitive advantages of NVO will still be effective in sustaining growth and profitability in the short-term. However, uncertainties about the developments in the regulatory environment and increasing competition, especially from generic insulin in the future, will impose substantial risks on the company's core resources and capabilities. In order to earn an attractive ROIC in the median and long-term, NVO will need to adapt to these conditions in the future.

[68] See section 2.4.3 for more information about generic price competition.
[69] See sections 2.1.3 and 2.2.1 for more information about the global diabetes pandemic.

2.6 Conclusion of the Business Environment and Strategy Analysis

The business environment and strategy analysis focused on analysing the external and internal market drivers of NVO's business growth and profitability. On one hand, the main findings show that the markets that NVO operates in are expected to continue to grow, especially in volume, as the global population grows, ages, and urbanizes.

On the other hand, medicine prices are no longer only influenced by competitive market forces but also by national interventions. With an intensification of governmental control, competition is expected to increase, both in terms of R&D productivity and product commercialization.

In the internal environment, NVO's differentiation relies on its strong business focus on few therapeutic areas, which is supported by an integrated approach to business strategy. However, this strength does not immunize the company from the challenges imposed by the external environment. Thus, NVO will need to redesign its core resources and capabilities in order to prosper and grow in the long-term. The main findings from the business environment and strategy analysis are summarized in a SWOT analysis in Table 23.

SWOT is an acronym for strengths, weaknesses, opportunities, and threats. This analysis consists of structurally classifying the external and internal factors presented throughout this section as favourable or unfavourable for NVO's business growth and profitability in the diabetes and biopharmaceutical markets.

Table 16 SWOT Analysis

	Internal factors	External factors
Favourable factors	**Strengths**	**Opportunities**
	* Strong business focus on few therapeutic areas, supported by an integrated approach to business strategy (the triple bottom line) * Strong technological strengths, supports intellectual property/patent development * Sustainable large-scale production, based on high-quality and cost-efficient products * Broad portfolio of products capable of sustaining global leadership position * Plants located in strategic markets/ organic growth of investment in upgrading plants * Positive operating free cash flows * Geographically extensive distribution with the potential to expand to emerging markets	* Increasing prevalence of diabetes and obesity worldwide due to increasing urbanization and life expectancy * Commercialization of products based on management of outcomes * R&D synergies with external agents * Development of integrated healthcare data processing and management tools and processes * Low threat of new entrants * Moderate bargaining power of suppliers
Unfavourable factors	**Weaknesses**	**Threats**
	* Issues with FDA in getting the commercialization approval for Tresiba in the US market in 2014 * 70% of the company's total revenue comes from the diabetes segment. The other three competitors have a more diversified portfolio of products, targeting a number of diseases beyond diabetes. This one fact has two important and opposite conclusions: on the one hand, it allows NVO to develop strong competitive advantages in the diabetes market due to product development focus and specialization; on the other hand, it increases NVO's vulnerability in the market due to competition, patent loss, and a highly concentrated business.	* Tougher regulatory and legal environments * Healthcare reforms in major markets * Increased competition (generics) * Global economic instability may put more pressure on manufacturers * Increased consumer expectations and more transparent proof of medicines' efficacy/safety may increase costs * Complexity and costly development of data processing and management tools * Tougher environmental regulation leads to higher expenditure on environmental compliance measures * Worsening weather conditions require costly decisions, such as moving manufacturing facilities to safer regions * High bargaining power of buyers, threat of substitutes, and industry rivalry

3 Financial Statement Analysis

The objective of the financial statement analysis is to calculate/discover/research NVO's return on invested capital, ROIC, and organic revenue growth. Based on this information, this section will provide the answers to the following questions: 1) What is NVO's current financial situation compared to its competitors? 2) Based on NVO's macroeconomic environment and strategy analysis, what risks and rewards do NVO's underlying operating performance expose?

A substantial amount of information used to evaluate NVO's financial performance comes from its own financial statements, such as balance sheets and income statements. These reports, however, differ in terms of accounting and financial analysis purposes (Koller et al., 2010). According to Subramanyam (2009), the purpose of accounting analysis is to measure the near past performance of a company. Inversely, financial analysis entails a more forward-looking perspective of a company's performance (Damodaran, 2006).

Due to the differences between accounting and financial analyses, some adjustments to NVO's financial statements are required. Based on my analysis of the valuation literature, I found that authors, such as Subramanyam (2009), Petersen and Plenborg (2012), Damodaran (2006), and Koller et al. (2010), advocate different technics to organize the financial statements for financial and valuation purposes. Although their technics will lead to similar results, I chose to rely on the accounting and financial analysis of Koller et al. (2010).

I believe choosing one particular framework is necessary in order to avoid confusion and increase coherency in the process of financial analysis. Koller et al.'s (2010) framework is based on reorganizing the balance sheet and income statement so that they respectively present the total capital required to fund the company's operations and the after-tax profits created only from operations, NOPLAT.

Hence, based on Koller et al.'s (2010) work, section 3.1 presents the accounting analysis and the adjustments in the financial statements for financial analysis. Next, the focus will be on analysing the financial performance of NVO from 2010 to 2014.[70] Section 3.2 will also rely on the analysis generated in section 2, as it will help to identify whether and how NVO's financial performance is in sync with its external environment and business strategy.

3.1 Accounting Analysis

Accounting analysis is the process of appraising how a company's accounting numbers reproduce economic reality (Subramanyam, 2009). Publicly traded companies are legally obliged to follow some accounting policies. NVO's financial statements follow the International Financial Reporting Standards, IFRS. SNY also prepares its financial statements based on the IFRS's principles, while LLY and MRK follow the Generally Accepted Accounting Principles, GAAP.

[70] See the introduction to section 2.3 for more information about the criteria used to select the period for Novo Nordisk's historical performance analysis.

Analyzing financial statements of companies that apply different accounting frameworks require some caution. The conceptual level of IFRS relies on a principle-based standard, while GAAP is considered more rule-based (Subramanyam, 2009). This results in different ways of reporting some financial transactions in the financial statements, such as inventories.

Independent of the accounting policy applied, however, financial statements are not structured to present a straightforward differentiation between a company's operating activities and its non-operating activities. According to Koller et al. (2010), in order to understand a company's economic performance, a thorough analysis of its operating activities is required. The authors argue that operating activities are the primary drivers of a company's value creation.

Base on the authors' work, the next sections will delve into NVO's financial statements in order to identify potential accounting limitations for financial performance analysis. For this part, I will also employ the notes to the consolidated financial statements available in the company's annual reports. When relevant, observations about the financial statements of NVO's competitors will be made.

3.1.1 Impact of changes in accounting standards and intra-group transactions

The changes in the IFRS's accounting standards from 2009 to 2014 did not produce any material impact on NVO's consolidated financial statements (NVO, 2014). Additionally, the consolidated financial statements have been prepared on the historical cost basis except for derivative financial instruments, equity investments and marketable securities measured at fair value (NVO, 2014). Lastly, the consolidated financial statements do not include any intra-group transactions.

3.1.2 Reformulating the Balance Sheet

The balance sheet is reformulated in order to calculate NVO's invested capital. Invested capital represents the total capital required to fund the company's operations (Koller et al., 2010). According to Koller et al. (2010), invested capital sums operating working capital, fixed assets, operating intangible assets, and net other long-term operating assets.[71] The main changes undertaken in the companies' original balance sheets are described below.

3.1.2.1 Operating working capital

In order to calculate the operating working capital for NVO and its competitors, some adjustments to the companies' excess cash and inventories were carried out. With regards to excess cash, according to Koller et al. (2010), failing to separate excess cash from core operations will incorrectly depress the company's ROIC. However, excess cash is generally not reported in the companies' balance sheets.

For that reason, the authors analyzed the excess cash of the S&P 500 nonfinancial companies and found that a good proxy to define a company's excess cash is any cash that represents more than 2% of a company's total sales.

[71] Appendix 5 presents the original and reorganized balance sheets for NVO and its competitors.

The authors point out that this is not a rule, as it can vary depending on the industry. However, they argue that it can be a good estimation if the industry holds low cash flow volatility. I consider a proxy of 2% of sales to define excess cash sufficient, because NVO's and its competitors' cash and cash equivalents are relatively stable, and thus, they meet the authors' criteria.

Lastly, in relation to inventories, NVO and SNY apply the first-in, first-out, FIFO, method to define the cost of its inventories. LLY and MRK apply last-in, first-out, LIFO, method for inventories in the US and FIFO for inventories outside the US. According to Subramanyam (2009), the LIFO method generally understates costs, and thus, can result in an artificial increase in gross profits. Due to the effects of the LIFO method on profitability analysis, I choose to restate LLY's and MRK's inventories from LIFO to FIFO.[72]

3.1.2.2 Fixed, intangible, and other assets

The most important adjustments undertaken before computing the company's invested capital are those related to intangible assets and operating leases. NVO's intangible assets are fully considered as part of its core operations as they are related to patents and software. However, I opted to adjust it by capitalizing R&D expenses. NVO and its competitors report their R&D activities entirely as an expense in the period they are incurred. Consequently, this expense is reported in the income statement, but not in the balance sheet. For companies with significant investments in R&D, such as the pharmaceutical companies, not recognizing R&D activities in the balance sheet can end up understating invested capital and overstating ROIC (Koller, et al., 2010).[73] Hence, I believe the capitalization of R&D activities is important for a better understanding of the companies' financial performances.

Similarly, I also chose to capitalize operating leases, due to their representativeness in the companies' total operating assets.[74] According to Koller et al. (2010), although the choice of accounting treatment for leases and R&D expenses will not affect intrinsic value, they do affect the quality of ROIC analysis. Leases will not affect valuation as long as they are incorporated correctly in the free cash flow, the cost of capital, and debt equivalents. Correspondingly, R&D expenses will appear either in the income statement when expensed or in the investing section when capitalized (Koller, et al., 2010).

3.1.2.3 Reconciliation of the invested capital calculation

I opted to reconcile the invested capital computation by calculating the total funds invested from 'uses', such as investments, and 'sources', such as debt and equity. The benefit of this reconciliation is to check the consistency of the accounting reorganization process (Koller et al., 2010). Koller et al. (2010) also emphasize that the reconciliation helps to avoid mistakes such as missing accounting transactions during the reformulation of the balance sheet.

[72] See Appendix 10 for more information about the adjustments in LLY's and MRK's inventories from LIFO to FIFO.
[73] See Appendix 9 for more information about the capitalization of R&D expenses.
[74] See Appendix 8 for more information about the capitalization of operating lease.

3.1.3 Reformulating the Income Statement

The reformulation of the income statement was carried out in order to determine NVO's NOPLAT. According to Koller et al. (2010), NOPLAT is the after-tax profits created only from operations. It is calculated by removing non-operating gains and expenses embedded within EBITA[75], and subtracting operating cash tax from the adjusted EBITA. The main changes undertaken in NVO's and its competitors' original income statements to determine NOPLAT are described below.[76]

3.1.3.1 Depreciation and amortization

NVO does not report depreciation and amortization individually in its income statements. Thus, I opted to reorganize depreciation and amortization so that I could analyze them separately. Apart from that adjustment, major changes in depreciation and amortization are related to operating lease and R&D capitalizations and adjustments related to the discontinuation of the inflammatory disorder activities.

3.1.3.2 Earnings before interest, tax, and amortization of acquired intangibles, EBITA

Base on the notes to the financial statements and on Koller et al. (2010), the main adjustments undertaken in the income statements to compute EBITA are related to gains and losses on sales of fixed assets, pension expenses, discontinuation of the inflammatory disorder activities, and capitalization of R&D and lease expenses.

3.1.3.3 Calculating operating cash tax

NVO provides insufficient information about its tax situation to allow me to build a comprehensive estimate of operating and non-operating taxes. Thus, I chose to estimate the operating cash tax by applying the simple approach calculation proposed by Koller et al. (2010), assuming that non-operating items are taxed domestically. In order to calculate operating cash tax, I reorganized deferred taxes to reflect only operating deferred taxes.

I also made an adjustment related to R&D capitalization. According to Koller et al. (2010), operating cash taxes should remain unchanged after the capitalization of R&D expenses, because the full amount is tax deductible. The authors emphasize that just using the R&D amortization would overstate the company's tax burden. Therefore, I calculated the income tax at statutory domestic rate using adjusted EBITA without considering the capitalization of R&D expenses.

3.1.3.4 Reconciliation of NOPLAT

Based on Koller et al. (2010), I opted to reconcile net income to NOPLAT in order to ensure that the reconciliation is complete. Similar to the reconciliation of the balance sheet for invested capital calculation, the benefit of the reconciliation is to check the consistency and coherence of the reorganization of the income statement for NOPLAT computation.

[75] Earnings before interest, taxes and amortization.
[76] Appendix 6 presents the original and reorganized income statements for NVO and its competitors.

3.1.4 Free Cash Flow Calculation

The free cash flow is the fundamental element when valuing a company's operations (Koller et al., 2010). It equals NOPLAT plus noncash-operating expenses, such as depreciation, and minus investments in invested capital, such as changes in working capital, net property, plant and equipment, and capitalized operating leases and R&D expenses. The main difference between the free cash flow and the cash flow reported in the companies' statement of cash flow is that the free cash flow is independent of financing and non-operating items.[77]

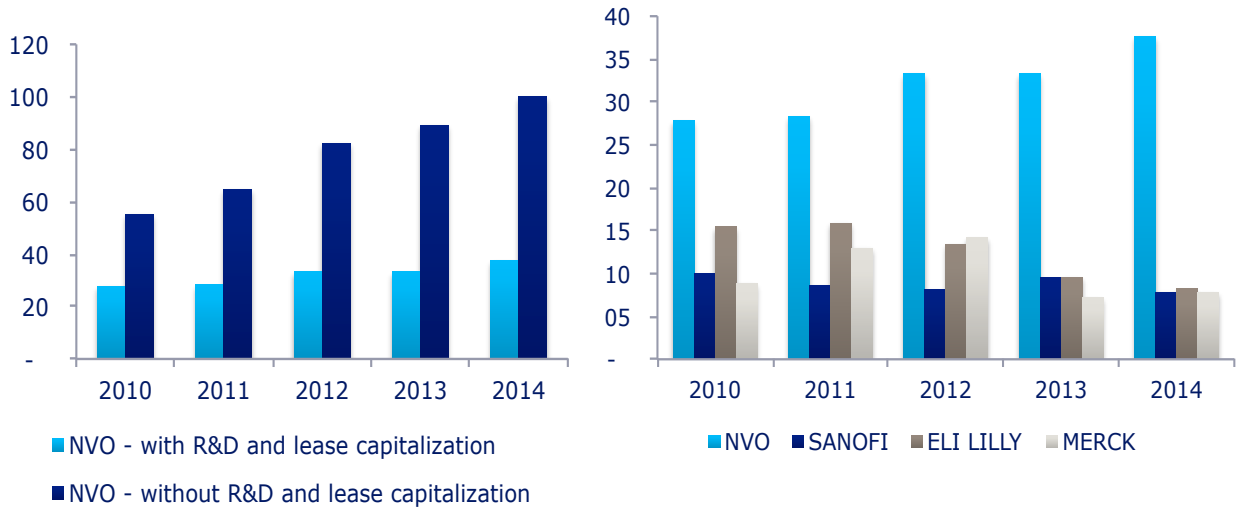
3.2 Financial Analysis

In this section, I will delve into the reformulated financial statements computed in section 3.1 in order to calculate and analyze ROIC and identify the drivers of organic revenue growth for NVO. According to Koller et al. (2010), a company's value is driven by its ability to earn a healthy ROIC and grow organically. The authors argue that these are the main ingredients to achieve a sustainable free cash flow performance. Finally, the information produced in this section will be useful for making a rational forecast of NVO's expected free cash flows.

3.2.1 Return on Invested Capital, ROIC

According to Koller et al. (2010), ROIC measures the ratio of the profits from operations, NOPLAT, to the total capital required to fund a company's operations, the invested capital. Figure 23 shows NVO's ROIC with and without R&D and operating lease capitalizations from 2010 to 2014. NVO's competitors' ROIC is also shown in Figure 23.[78]

Figure 23 ROIC from 2010 to 2014



[77] Appendix 7 presents NVO's historical free cash flow calculation.

[78] NVO's competitors' ROIC include the capitalization of R&D and operating lease expenses as well. However, they exclude goodwill. Goodwill is the price premium paid for acquisitions of companies. It is usually not part of a company's operating activities (Koller et al., 2010). Thus, it is not included in the ROIC when the purpose of the analysis is to measure the underlying operating performance of a company, which it is the case.

In 2014, NVO's ROIC drops from 100% to 37,6% when R&D and operating lease expenses are capitalized. During the five-year period, NVO's ROIC adjusted increased 8% on average per year, while the ROIC unadjusted increased on average 16% per year. These variations exemplify how R&D and operating lease expenses can artificially boost ROIC when not capitalized. Consequently, by capitalizing these expenses, a more accurate view of NVO's historical financial performance is revealed.

According to Figure 23, even after the capitalization adjustments, NVO still presents the best underlying operating performance from 2010 to 2014. NVO is the only company that has consistently sustained ROIC above 28 percent. None of its competitors were able to outperform NOV's ROIC during the years analyzed. In order to understand the drivers responsible for this result, I disaggregated NVO's ROIC according to its main elements: capital efficiency and EBITA margin (Koller et al., 2010).[79] Table 17 shows some components of the disaggregated ROIC.

Table 17 Return on invested capital (average)

		2010	2011	2012	2013	2014
Operating tangible assets/revenues	NVO	44,1	42,3	37,1	36,0	36,3
	SANOFI	31,0	38,7	35,9	37,7	37,0
	ELI LILLY	44,2	39,3	42,1	41,1	48,3
	MERCK	43,4	39,6	39,5	39,6	36,6
Operating intangible assets/revenues	NVO	81,0	80,6	75,2	77,0	79,2
	SANOFI	151,3	183,6	168,8	167,2	163,1
	ELI LILLY	151,2	154,2	173,8	176,6	213,6
	MERCK	176,2	166,9	166,2	172,2	176,1
Operating working capital/revenues	NVO	9,3	6,6	4,6	4,5	2,4
	SANOFI	20,8	23,8	20,5	22,4	21,1
	ELI LILLY	16,0	11,0	10,1	12,5	11,0
	MERCK	238,5	227,8	230,2	242,6	229,9
Revenue/Invested capital (times)	NVO	0,8	0,8	0,9	0,9	0,9
	SANOFI	0,5	0,5	0,4	0,4	0,5
	ELI LILLY	0,5	0,5	0,4	0,4	0,4
	MERCK	0,4	0,4	0,4	0,4	0,4

From a capital efficiency perspective, in 2014 NVO averaged 0,9 times revenue to average invested capital, compared with only 0,5 times for SNY, and 0,4 times for LLY and MRK. All the companies' capital turnovers remained stable during the past five years.

NVO's capital turnover derived primarily from the efficiency of intangible assets, such as R&D. NVO's investment in R&D increased from 57% of the total invested capital in 2010 to almost 70% in 2014. In that same period, investments in R&D represented respectively 56%, 74%, and 56% of SNY's, LLY's, and MRK's total invested capital.[80] Overall, the four companies presented an ascending trend in R&D investments during the past five years.

LLY and NVO have the highest percentage of investments in R&D in relation to their total invested capital. R&D productivity is an important driver of value creation and competitiveness for NVO, as

[79] See Appendix 11 for a complete view of the historical performance ratios used in this analysis.

[80] See Appendix 5 for more information about R&D assets and the total invested capital for the companies analysed.

it is the motor of product innovation.[81] As mentioned in section 2.1.2 and 2.4.3, companies in the pharmaceutical industry are constantly seeking to renew their product pipeline in order to safeguard patent rights.

As opposed to its competitors, however, NVO's R&D productivity is focused on few therapeutic fields. By limiting its R&D scope, NVO can develop a profound knowledge about its target diseases. Thus, this kind of specialization can increase the odds of NVO succeeding in bringing new medicines to market, and consequently, improve its ROIC.[82]

From a margin perspective, NVO's EBITA/revenues ratio is 51,6% versus 24,3% for LLY, 22,1% for SNY, and 23,2% for MRK in 2014.[83] Thus, the driver of NVO's high ROIC is high margins, with NVO increasing its margin from 42,4% in 2010 to 51,6% in 2014. Moreover, NVO's higher margin can mainly be attributed to lower expenses in R&D and costs of goods sold per kroner of revenue compared to its competitors.

In terms of R&D expenses reported, NVO and SNY spent on average 14,5 øre in R&D per kroner of revenue in 2014, while LLY and MRK spent respectively 24,1 and 17,0 øre on average per kroner of revenue in 2014. Cost of goods sold is another area where NVO differentiates itself. In 2014, the company was able to spend on average 13,9 øre per kroner of revenue on cost of goods sold, while SNY, Elli Lilly, and MRK spent respectively 27,0, 25,1, and 39,7 øre per kroner of revenue in the same period.

NVO's selling and general expenses represented 30,0 øre per kroner of revenue in 2014. Only LLY underperformed compared with NVO, with 33,8 øre per kroner of revenue spent on selling and general expenses. In spite of the high ratio, NVO showed strong improvements. It was able to reduce its selling and general expenses from 34,8% in 2010 to 30,0% in 2014, without compromising sales. This represents a decrease of -14% in five years, while MRK's decreased -4%, SNY's increased 7%, and LLY's increased 10% during the same period.

As presented in section 2.3, NVO is the only company that has more than half of its operating activities focused only on the diabetes segment. Additionally, section 2.5.3 also shows that focusing on few therapeutic areas enables NVO to develop differentiated resources and capabilities in production and research. As a result, I believe NVO's ROIC reflects these strengths of the company.

[81] See section 2.4.5 for more information about product innovation and competitiveness in the pharmaceutical industry.
[82] See section 2.5.3 for more information about NVO's R&D specialization strategy.
[83] See Appendix 11 for a complete view of the historical performance ratios used in this analysis.

3.2.2 Drivers of Revenue Growth

According to Koller et al. (2010), the main objective of the historical revenue growth analysis is to identify the drivers of organic revenue growth. Organic growth is the growth exclusively related to a company's sustainable operations (Koller et al., 2010).

When calculating organic revenue growth, factors such as currency effects, mergers and acquisitions, and accounting changes should be removed from the revenue growth reported (Koller et al., 2010). According to my analysis, currency effects are the primary matter when examining NVO's organic revenue growth.

Table 18 Revenue growth analysis from 2012 to 2014[84]

%	NVO			SNY			LLY			MRK		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Revenue growth reported	17,6	7,1	6,3	4,7	-5,7	2,5	-6,9	2,3	-15,1	-1,6	-6,8	-4,1
Currency effects	6,0	-3,0	-2,0	-2,0	-5,0	7	0	0	-5,0	0	0	0
Organic revenue growth	11,6	10,1	8,3	6,7	-0,7	-4,5	-6,9	2,3	-10,1	-1,6	-6,8	-4,1

Bases on Table 18, currency fluctuation has a direct impact on reported revenue growth for NVO and SNY, with both companies being vulnerable to dollar fluctuations. In 2014, almost 99% of NVO's revenue originated in currencies other than the Danish krone, DKK (Novo Nordisk, 2014). As shown in sections 2.2.1.1 and 2.3, nearly half of NVO's revenue is concentrated in the US market.

When computing organic revenue growth, NVO's CAGR is +10,0%, while SNY, LLY, and MRK have a CAGR of 0,5%, -4,9%, and -4,2% respectively. Overall, the four companies presented declining organic revenue growth rates during the years analyzed. Although in decline, NVO is the only company that has consistently sustained positive organic revenue growth over the past years.

As shown throughout section 2, market risks caused by an increasingly tough regulatory environment, increasing competition, and stronger pressure on prices and reimbursement, notably in the US market, may be the main factors for this negative trend in the companies' revenue developments.

Additionally, the lower operating performance of NVO's competitors can be also related to their expansion strategy based on M&A.[85] NVO is the only company in the group that has not undertaken major M&A to boost its ROIC and revenue growth.

According to NVO's press reports, its positive revenue growth in the last years is driven by favorable price developments and a positive impact from product mix, particularly due to increased sales of modern insulin and Victoza.

[84] See Appendix 11 for a complete view of the historical revenue growth ratios used in this analysis.
[85] Sections 2.1.1 and 2.2.1 address M&A strategy currently applied by in the industry and by NVO's competitors.

Based on my analysis, price developments enabled NVO to absorb the extra costs imposed by the changes in the political and legal environments[86], while product mix developments supported its expansion to new markets.[87]

Although NVO's revenue growth was favorably impacted by price increases over the past years, the main driver of revenue growth in the future will be market penetration, particularly in the diabetes segment. As shown in sections 2.1.1 and 2.2.1, attracting new diabetic patients to take diabetes medicines will drive revenue growth more than price development.

As a result, market penetration can be a powerful source of revenue growth for NVO. One of the advantages of a market expansion based on the growth of the market rather than on capturing competitors' market share, is that it generally minimizes the risks of retaliation by competitors. Increases in market share that do not come at the expense of competitors can more likely become a source of value creation in the long-term (Koller et al., 2010).

[86] See section 2.1.1 for more information about the political and legal environment for NVO.
[87] See section 2.3 for more information about NVO's portfolio of products for diabetes and biopharmaceutics.

3.3 Conclusion of the Financial Statement Analysis

Based on Koller et al. (2010), I reorganized NVO's and its competitors' original financial statements in order to retrieve the companies' operating performances. The results above show that NVO has the best underlying operating performance from 2010 to 2014, with ROIC above 28 percent in all the years analyzed. None of its competitors managed to achieve that mark.

Despite the challenges in the external environment, NVO was able to grow organically +10% on average during the last five years. I believe this strong organic growth is supported by the company's specialization in few therapeutic fields. By focusing on few therapeutic areas, NVO can enhance its efficiency in production and research.

Finally, as mentioned above, the number of people with diabetes is growing worldwide. Thus, I believe a major driver of NVO's continued organic revenue growth will be based on bringing new diabetic patients to the diabetes market, rather than by a favorable price development.

4 Valuation

This final section of the thesis begins by addressing the following question: How does NVO's business strategy and financial performance influence its cash flow prospects? Section 4.1 will answer this question by translating the analyses built in sections 2 and 3 into a set of financial forecasts predicting NVO's expected performance over the next years.

Next, based on NVO's forecast, section 4.2 focuses on the main objective of this thesis, which consists in answering the following question: 'What is the intrinsic value of Novo Nordisk's stock as of April 30th 2015 based on the enterprise discounted cash flow valuation?'

Damodaran (2006), Copeland et al. (2000), English (2001), Penman (2001), and Koller et al. (2010) promulgate different valuation techniques in their valuation textbooks, such as the DCF model, and relative valuation, and view them as simultaneously and contextually useful. The authors also emphasize that good valuation models should provide estimates based on realistic assumptions and should be easy to use and understand.

Nowadays, the enterprise DCF model and relative valuation are the simplest and most reliable methods to valuate companies (Koller et al., 2010). Finance practitioners largely apply these two methods because they are easy to use and understand (Damodaran, 2006). Thus, based on the above, the enterprise DCF model and relative valuation are selected to valuate NVO. Additionally, a sensitivity analysis is also conducted to check the valuation findings. Finally, in order to preserve the coherence and consistency throughout the valuation process, the DCF model and relative valuation follow Koller et al. (2010).[88]

4.1 Forecasting NVO's expected performance

A 15-year explicit forecast is defined to estimate NVO's expected performance. According to Koller et al. (2010), the ideal explicit forecast period should be long enough that the company's growth rate becomes less than or equal to that of the economy.

I expect that NVO's revenue growth will start slowing down more intensively after 2025, and will reach a steady-state performance after 2030, when it will start growing in accordance with the global economy.

Forecasting revenue requires some caution. According to Koller et al. (2010), as most line items in the forecast are driven by revenue, any fault in the revenue forecast will be carried through the whole model. Therefore, section 4.1.1 focuses on presenting the rationale behind the estimation of NVO's revenues from 2015 to 2030. Next, section 4.1.2 focuses on describing the process for estimating expected NOPLAT, invested capital, and ultimately, NVO's expected free cash flows from 2015-2030.

[88] See the opening part of section 3 for more information about the reasons for choosing Koller et al.'s (2010) work as a framework for the financial and valuation analyses.

4.1.1 Estimating NVO's revenues from 2015 to 2030

The process of estimating NVO's revenues is organized in four phases. The first phase begins by estimating the size of the total market for diabetes and biopharmaceutics. In the second phase, NVO's market shares in those two markets are estimated in order to calculate the company's gross revenues. Next, the total expenses with rebates, discounts, and sales returns are estimated to find NVO's net revenues. Finally, a decomposition of NVO's net revenues by product and geographic segment is provided. A description of the rationale behind NVO's revenue estimation is specified subsequently.[89]

Based on the analyses in sections 2.2.1 and 2.4, I expect that the diabetes and biopharmaceutical markets will have a CAGR of 7,5% and 3,4% respectively. For instance, in 2014, the diabetes segment consisted of almost 100 million patients, and represented a market value of almost 350 million DKK. In fifteen years, I expect that around 570 million people will be living with diabetes. Of this total, I estimate that the number of patients undergoing diabetes treatments will reach around 380 million, representing a market value of around 1,1 trillion DKK in 2030. In fifteen years, this results in a market value growth of 215%, or a CAGR of 7,5%.

Although the increase in the number of people with diabetes will drive the sales volume up, the sales value will start decelerating throughout the forecast period. This is due to increasing competition, especially from generics. Nowadays, generic competition in the insulin market is almost non-existent.[90] However, I expect this scenario to change over the next decades.

As pointed out in section 2.4.3, in 2014, FDA and EMA started relaxing their regulatory requirements for generic insulin. Thus, the odds of generic insulin hitting the market at some point in the forecast period is high. When it happens, generic insulin will gradually absorb market share, especially from NVO and SNY. NVO's modern insulin category, which is currently the company's biggest category, will be harshly impacted as all of the products' patents will expire soon.[91]

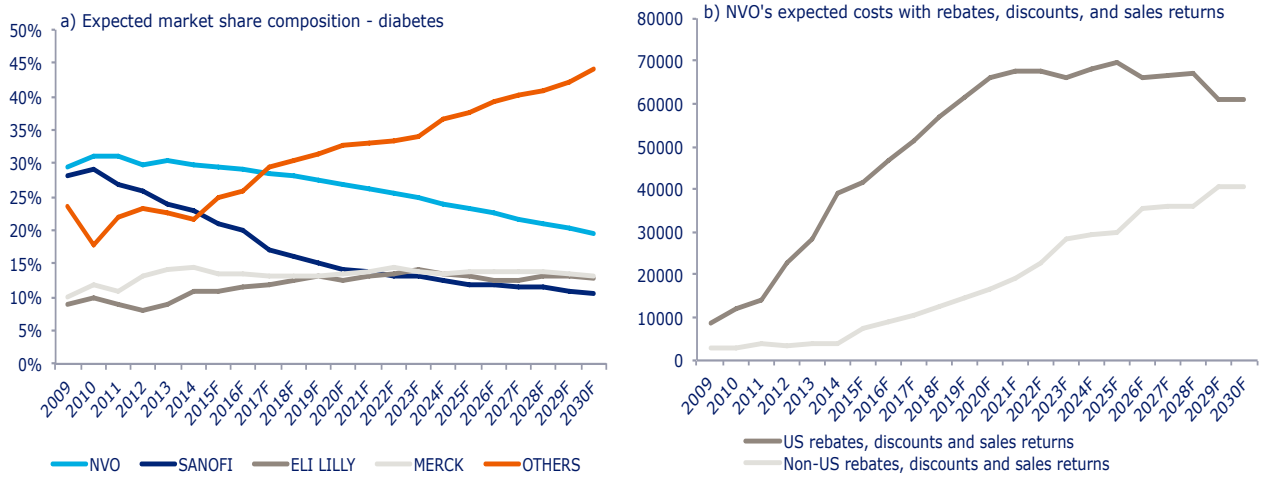
As a result, the leading manufacturers of diabetes medicines will face a decrease in market share from 80% in 2014 to around 68% in 2020, 56% in 2025, and stabilizing at 52% in 2030. As Figure 24.a shows, in spite of the negative outlook, NVO will still remain the leader in the diabetes market, as I believe the company's resources and capabilities will enable it to outcompete its competitors in the median-term. [92]

NVO's net revenues from 2015 to 2030 were estimated by subtracting the expected costs with rebates, discounts, and sales returns from gross revenues. As analyzed in section 2.1.1, the burden cost for pharmaceuticals due to governmental control over rebates and medicine prices will

[89] The entire revenue forecast is available in Appendix 12.
[90] See section 2.4.3 for more information about generic competition in the insulin market.
[91] See Appendix 4, for more a detailed list of NVO's and its competitors' patents expiration deadlines.
[92] See section 2.5 for more information about NVO's resources and capabilities.

continue to increase over the coming decades. Figure 24.b above shows NVO's expected expenses with rebates, discounts, and sales returns for the forecast period.

Figure 24 Expected market share and rebates, discounts, and sales returns of NVO



Next, I expect that the company's organic revenue growth will decrease from 7% in 2015 to 5% in 2020, 3% in 2025, and stabilize at around 2% after 2030. In fifteen years, this results in a CAGR of 4,7%. The projected organic revenue growth rate is the sum of volume growth and price and product mix changes. As mentioned above, the descending curve is justified by the costs related to the increase in governments' control with rebates and medicine prices, and also the decrease in sales value due to increasing competition, especially from generics in the insulin market.

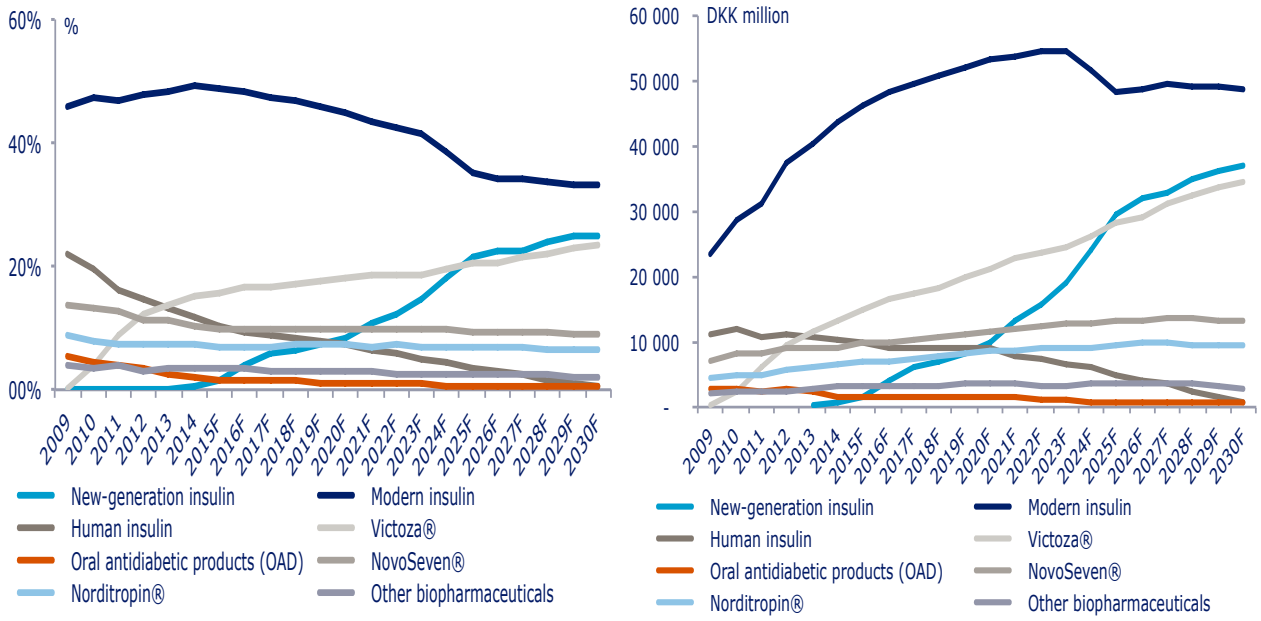
In terms of products, information about NVO's medicines in the pipeline is scarce and difficult to estimate. Although I expect NVO will be able to launch new medicines in the future, the forecast exercise focuses on the potential of NVO's current portfolio of products, applying a business-as-usual scenario when it comes to products in the pipeline. The business-as-usual scenario assumes that the company will maintain the current level of R&D during the forecast period, with no major disruptions.[93]

Based on the analysis in section 2.3.1, I expect that new-generation insulin, such as Tresiba, Ryzodeg and Xultophy, and GLP-1 categories, such as Victoza and Saxenda, will be the motor of value growth, while modern insulin, such as NovoRapid, Levemir, and NovoMix will be responsible for volume growth.

I expect that human insulin and oral anti-diabetes products will have a very low contribution to NVO's total organic revenue growth in the forecast period. As mentioned previously in section 2.1.1.1, modern insulin and new-generation insulin will replace human insulin in the median-term future. Figure 25 presents NVO's expected revenue by business segment.

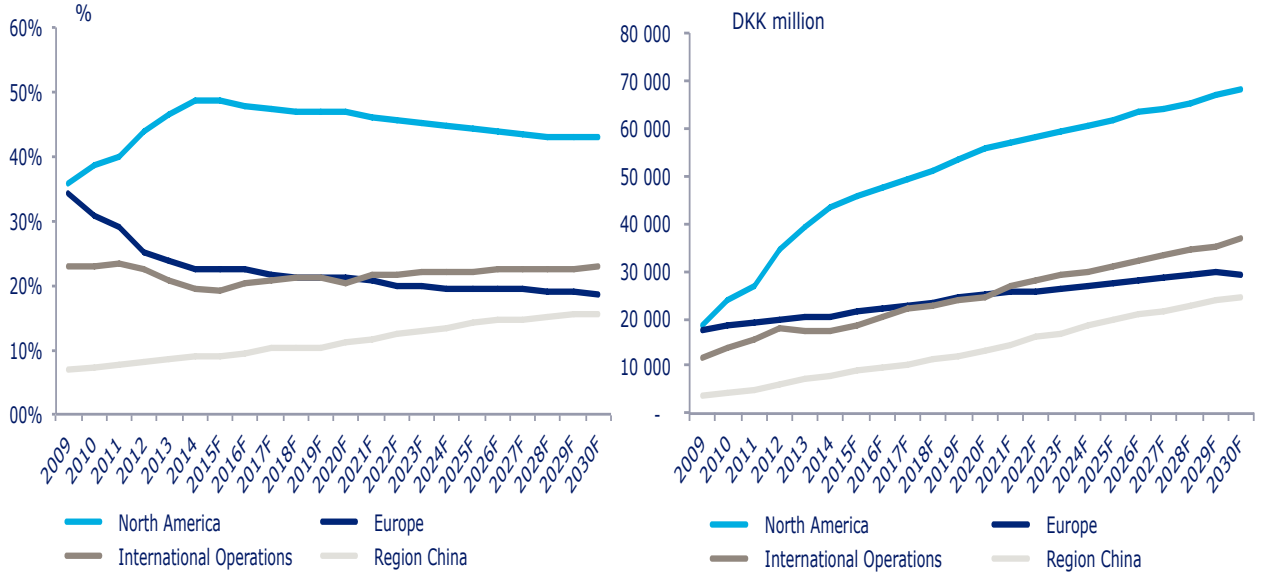
[93] Section 4.2.4 deals with R&D productivity scenarios.

Figure 25 NVO's expected revenue by business segment



Most of NVO's revenue will be concentrated in the US market. Although I expect the share of some other markets to increase, the US market will continue to account for around 40% of the company's total revenue throughout the forecast period. This is due to the impact this market has in both volume and value growth for NVO as well as the entire industry. Moreover, volume growth will be concentrated in the international operations and China, while Europe will switch slowly from value to volume growth over the next decades. Figure 26 provides an overview of NVO's expected revenue growth by geographic segment.

Figure 26 NVO's expected revenue by geographic segment



4.1.2 Estimating NVO's free cash flows, FCF

After forecasting NVO's revenues, the estimation of NOPLAT and the capital invested can be computed in order to find NVO's estimated FCF from 2015 to 2030.[94] For NOPLAT, I estimated operating expenses as a percentage of revenues at 2014 levels.

NVO's operating expenses decreased from 47% of revenues in 2010 to 38% in 2014. In the same year, NVO's competitors' rates were all above 60%. Since cost advantages are difficult to protect, I estimated that the total operating expenses would stabilize, remaining around 38% of revenue during the forecast period.

Depreciation of property, plant, and equipment, PP&E, and amortization of operating intangibles were all estimated based on their respective assets. Although the growth of assets is linked directly to revenue, I chose to link depreciation and amortization directly to their respective assets because of some adjustments related to the capitalization of R&D and operating lease expenses.[95] Finally, NVO's operating cash tax rate is expected to remain at its 2014 level of 29,7%, with cash taxes equal to that proportion of operating profits.

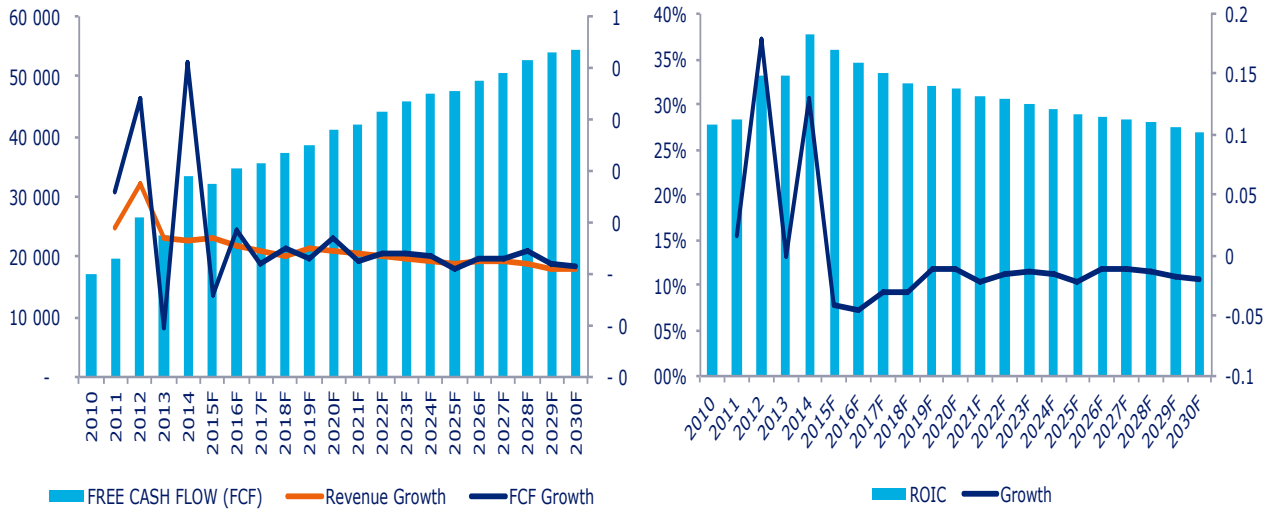
For invested capital, I estimated PP&E, net long operating assets, most items from the net working capital, and operating intangible assets as a percentage of revenues, assuming constant rates at 2014 levels. However, I estimated that operating provision with sales rebates would progressively rise from 13% of revenue in 2014 to 16% in 2030.[96] Additionally, I also estimated that PP&E will gradually decrease from 26% of revenue in 2014 to 20% in 2030. From 2010 to 2014, NVO has reduced its investments in PP&E in relation to its revenue from 38% to 26%. Combined with a deceleration in revenue growth, I expect a smooth decrease in PP&E will be maintained in the long-term.

The capitalization of R&D and operating lease expenses were also undertaken, so that forecasted NOPLAT can be in line with historical NOPLAT.[97] After computing NOPLAT and invested capital, I estimated NVO's free cash flows from 2015 to 2030.

As shown in Figure 27, I expect NVO's FCF will sustain a CARG of 6,5% throughout the period analysed, which is higher than the company's average expected organic revenue growth of 4,7% during the same period. Additionally, I expect NVO's operating activities will support a NOPLAT CARG of 2,8%, and an invested capital CARG of 4,8% over the next fifteen years.

[94] Forecast of NOPLAT, invested capital, and free cash flows for NVO are available in Appendix 13, 14, and 15, respectively.
[95] The process to capitalize R&D expenses and operating leases are described in section 3.1.2.2.
[96] The increase is related to the changes in the political and legal environments analysed in sections 2.1.1 and 4.1.1.
[97] By capitalizing R&D and operating leases, I adjusted depreciation and amortization accordingly.

Figure 27 NVO's FCF and ROIC from 2010 to 2030



Finally, NVO's ROIC is estimated to be around 27% in 2030, including capitalization of R&D and operating lease expenses during the forecast period. Thus, in fifteen years, I expect NVO's ROIC will drop to 2010 levels. This decrease is mainly due to tougher regulatory environments worldwide and increasing competition, especially from generic insulin. However, although it is decreasing, NVO's ROIC is estimated to be consistently well above its cost of capital throughout the forecast period.

4.2 Enterprise Discounted Free Cash Flow Valuation, DCF

The enterprise discounted free cash flow valuation, DCF, is the model used to estimate NVO's intrinsic value. This type of valuation approach is based on calculating the present value of a company's expected free cash flows (Koller et al., 2010). Equation 1 shows how to compute the present value of NVO's estimated free cash flows through the enterprise DFC model:

Equation 1 – Enterprise DCF model

$$NVO\ Value = \frac{FCFF_{2015}}{(1+WACC)^{2015}} + \frac{FCFF_{2016}}{(1+WACC)^{2016}} + \cdots + \frac{FCFF_{2030}}{(1+WACC)^{2030}} + \frac{NOPLAT_{2031}\left(1-\frac{g}{RONIC}\right)}{WACC-g} \times \frac{1}{(1+WACC)^{2030}}$$

Where: $FCFF_t$ is NVO's free cash flow; $WACC$ is the weighted average cost of capital; $NOPLAT_{n+1}$is the net operating profit less adjusted taxes in the first year after the explicit forecast period; g is the expected growth rate in NOPLAT in perpetuity; and $RONIC$ is the expected rate of return on new invested capital (Koller et al., 2010).

The first part of Equation 1 comprises calculating the present value of NVO's free cash flows during the explicit forecast period 2015-2030. The last part of Equation 1 calculates NVO's

continuing value, which is the present value of the company's free cash flows after the explicit forecast period.

From Equation 1, the next sections will explore the process of computing a company's intrinsic value by using the enterprise DCF model. The process consists of the following phases: Firstly, NVO's WACC and its continuing value are estimated. Secondly, NVO's $FCFF_t$ and its continuing value are valued by discounting them at the company's WACC.

Next, the company's non-operating assets are added to operating assets in order to compute the enterprise value. Finally, all debt and other non-equity claims against the enterprise value are subtracted in order to determine the value of common equity. After that, by dividing the value of common equity by the number of shares outstanding, the intrinsic value of NVO's stock is estimated (Koller et al., 2010).

4.2.1 Estimating WACC

WACC is a measure of the company's cost of capital. It basically blends the cost of debt with the cost of equity. According to Koller et al. (2010), WACC is the opportunity cost that all investors face when investing their resources in one particular business instead of others with similar risk. Equation 2 presents NVO's WACC components considering capitalization of operating lease[98]:

Equation 2 – Components of WACC

$$NVO\ WACC = \frac{D}{V}k_d(1-T_m) + \frac{E}{V}k_e + \frac{CL}{V}k_{cl}(1-T_m)$$

Where: D/V is the target level of debt to enterprise value using market-based values; E/V is the target level of equity to enterprise value using market-based values; CL/V is the target level of capitalized operating lease to enterprise value; k_d is the cost of debt; k_e is the cost of equity; k_{cl} is the cost of capitalized operating lease; and T_m is the company's marginal income tax rate (Koller et al., 2010).

NVO's WACC components can be grouped in four parts, the after-tax cost of debt, the cost of equity, the cost of capitalized operating lease, and the company's target capital structure. The next section will deal with each component of the WACC in detail.

4.2.1.1 After-tax cost of debt

The after-tax cost of debt, $k_d(1-T_m)$, can be estimated by 1) determining the company's credit rating on unsecured long-term debt, 2) examining the average yield to maturity on a portfolio of long-term bonds with the same credit rating, 3) summing it up with the risk-free rate, and 4) adjusting k_d by multiplying one minus marginal income tax (Koller, et al., 2010).

[98] See section 3.1.2.2 for more information about capitalization of operating lease.

Long-term government bond yield can be a good proxy to estimate risk-free rate, due to their low covariance in relation to market movements. Koller et al. (2010) point out that it is important to use government bond yields denominated in the same currency as the company's cash flows, so that inflation will be modeled consistently between cash flows and the discount rate.

NVO's historical and expected free cash flows are in kroners. Thus, based on Koller et al. (2010), a 10-year Danish benchmark government bond yield is defined as the base to estimate the risk-free rate. However, the current yield to maturity of these kinds of bonds has oscillated widely during the last years. Thus, the risk-free rate was computed on a 10-year average of the 10-year Danish benchmark government bond yield, which resulted in a risk-free rate of 2,82%.[99]

In relation to credit rating, Moody's and Standard and Poor's, S&P's, rate NVO's long-term debt as respectively A1 and AA-, meaning the company's risk of default is quite low.[100] In Denmark, the default premium for AA-rated companies has historically been around 5,28 basis points, or 0,0528%.[101] Thus, since the Danish risk-free rate was 2,82%, and with a marginal income tax rate, T_m, at 24,5%, NVO´s '$k_d(1 - T_m)$' is estimated at 2,17%.

4.2.1.2 Cost of equity

The cost of equity, k_e, is estimated by applying the capital asset pricing model, CAPM. The model assumes that the expected rate of return on any security equals the risk-free rate plus the security's beta times the market risk premium (Koller et al. 2010).

Despite the theoretical assumptions and limitations of the CAPM applicability, it was chosen to estimate WACC by using CAPM, as it is a simple and still reliable reference for the systematic risk and the required returns. Equation 3 presents CAPM in more details:

Equation 3 - CAPM's components

$$CAPM = k_e = E(R_i) = r_f + \beta_i[E(R_m) - r_f]$$

According to Koller et al. (2010), the risk-free rate and market risk premium are common to all companies. Only β_i varies across companies. The authors define β_i as a stock's incremental risk to a diversified investor, where risk is defined as the extent to which the stock co-varies with the aggregate stock market.

In order to estimate the market risk premium, Koller et al. (2010) mention that none of today's models are efficient in estimating the market risk premium. However, the authors point out that in most cases different forms of measurement end up converging on an approximate range of

[99] See https://research.stlouisfed.org/fred2/series/IRLTLT01DKM156N, accessed 10-11-2015.
[100] See http://www.standardandpoors.com/en_US/web/guest/ratings/entity/-/org-details/sectorCode/CORP/entityId/375765, and Bloomberg for Moody's rates, accessed 10-11-2015.
[101] Default premium for AA- companies was extracted from Bloomberg, based on Bloomberg's NVO's cost of debt of 0,0462 on 31-12-2014, accessed 20-11-2015.

market risk premium of 4,5 to 5,5%, which has even remained stable during and after the financial crisis of 2008. Thus, I use Koller et al.'s (2010) framework to estimate $\left[E(R_m) - r_f\right]$.

Based on my analysis from section 2, I estimate a reasonable market risk premium for NVO of 5,5%. Due to the increasing challenges from the macroeconomic environment, especially related to the pressure on R&D productivity, I expect NVO's riskiness will escalate in the coming years.[102] Risky investments require higher 'premiums'. Otherwise, investors will place their funds in safer investments.

Next, NVO's β_i is estimated by regressing the company's historical returns against five-year-monthly-returns of the MSCI World index. The MSCI World index is a value-weighted, well-diversified market portfolio. The Danish OMXC20 Index and OMXC20 CAP, which some might prefer, are not chosen for this analysis because NVO's stocks represent a large share in these portfolios. NVO's stocks account for around 40% and 20%, respectively, of those two Danish market portfolios. Thus, NVO's weights in these portfolios can mislead the regression analysis, as it will not be measuring the market-wide systematic risk, but rather NVO's sensitivity to a particular industry.

The regression calculated above resulted in a true beta of 0,6 for NVO.[103] However, computing betas of individual companies can generally lead to imprecise estimation. Additionally, the coefficient of determination, R^2, which indicates how well NVO's returns are explicable by the variability of MSCI World index, is only 22%. In order to improve the regression, Koller et al. (2010) propose to derive an unlevered industry β_i and then re-levering it to the company's target capital structure. Table 19 shows the calculations to improve the estimation of NVO's β_i.[104]

Table 19 Determining industry beta

31/12/14	NVO	SANOFI	ELI LILLY	MERCK
Unlevering calculation				
Regression β*	0,60	0,86	0,63	0,52
Debt-to-equity ratio**	0,01	0,21	0,16	0,17
Unlevered β***	0,59	0,71	0,55	0,44
Relevering calculation				
Industry-average unlevered β****	0,57	0,57	0,57	0,57
Debt-to-equity ratio	0,01	0,21	0,16	0,17
Relevered β	**0,58**	**0,69**	**0,66**	**0,67**

* Raw regression
** Market value as of 31-12-2014
*** βu= βe/(1+D/E)
**** βu average of the four companies

[102] See section 2.1.1 for more information about the expected future of R&D productivity.
[103] $\beta_i < 1$ low correlation, $\beta_i = 1$ even correlation, $\beta_i > 1$ high correlation, to market variability.
[104] Appendix 16 presents the regressions exposed in Table 19.

Based on Table 19, NVO's β_i decreased to 0,58. Its competitors, however, experienced larger variations, with SNY dropping from 0,86 to 0,69, and MRK increasing from 0,52 to 0,67. This is due to the companies' different levels of leverage, and the variability of their β_u in relation to the estimated industry beta.

Overall, NVO's debt-to-equity ratio, including capitalization of operating lease, was around 1% in 2014. Adding to that the low variability of NVO's β_u in relation to the industry, it resulted in a new beta similar to the company's true beta. Since NVO's beta is lower than 1, and also the lowest in the group analyzed, equity investment in NVO seems less risky than investment in its competitors.

As a result, based on Equation 3, with a β_i of 0,58, a market risk premium of 5,5%, and a risk free rate at 2,82%[105], NVO's k_e is estimated at 6,01%.

4.2.1.3 Capital structure and WACC

In 2014, NVO's capital structure in market value was composed of 99,25% equity, 1,27% capitalized operating lease, and -0,52% debt. The company's negative debt is due to its high excess cash, which the company has sustained consistently around 2,5 times the total debt in the last five years. Moreover, the company's historical capital structure remained stable over the past years.

Finally, based on NVO's press releases, the company does not have any major plan to change its capital structure over the next years. Thus, I expect NVO's capital structure to remain at the same level as of 2014. Having defined that, and based on Equation 2, Table 20 shows the computation of NVO's cost of capital, WACC.

Table 20 NVO's WACC[106]

	Target capital structure	Cost	Weighted cost
Debt	-1%	0,0217	-0,01%
Capitalized operating lease	1%	0,0378	0,05%
Common equity	99%	0,0601	5,97%
Total	100%		**6,00%**

Thus, to compute the present value of NVO's estimated free cash flows, which were calculated in section 4.1.2, a cost of capital of 6,00% will be applied.

4.2.2 Estimating continuing value

An explicit forecasting of long periods of a company's free cash flows can become complex and do little to minimize uncertainty. Thus, for the period after 2031 (the unforeseeable future), it is more reliable to estimate a company's expected free cash flows through an implicit forecast, rather than an explicit one. The implicit forecast is based on calculating a company's continuing value of its future free cash flows beyond the explicit forecast period.

[105] Section 4.2.1.1 presents the analysis to compute risk-free rate.
[106] See Appendix 8 for more information about the cost of capital for capitalized operating leases.

According to Koller et al. (2010), estimating a company's continuing value is essential to any valuation, because continuing value often represents a large percentage of a company's total value. The authors propose to estimate continuing value by applying the value driver model.

Back to Equation 1 in section 4.2, the value driver model consists of estimating NVO's NOPLAT in 2031, its return on future invested capital, RONIC, and the company's growth rate after 2031. The advantage of using this model is that it is not tied up with FCFF, which helps to reduce inconsistency issues related to the level of free cash flow estimated with the growth rate being forecast (Koller et al., 2010).

Based on the forecast analysis from section 4.1, I project NVO's 2031 NOPLAT to be 60.575 DKK billion. I also estimated NVO's WACC to remain at 6%, as I do not expect any relevant change in the company's capital structure analyzed in section 4.2.1.3 or business risks mentioned in section 2.5.3. Additionally, I project NVO's RONIC to remain at the 2030 level of 27,3%, which I also presume to be consistent with the forecast performance in the years leading up to 2031.

In terms of NVO's expected growth rate after 2031, I estimate NOPLAT to grow with 1,7%, based on 1,2% volume growth and 0,5% price increase, and constant margins. This trend is in line with the earlier years in the forecast. Thus, based on the value driver model and by using the estimated parameters above, I compute NVO's continuing value of 1.319.661 trillion DKK.

4.2.3 NVO's intrinsic value

After estimating all the variables from Equation 1, the final step of the enterprise discounted cash flow model consists in calculating the present value of NVO's expected free cash flows from 2015-2030 and its continuing value after 2031, using WACC as a discount factor.

The analysis developed throughout this thesis results in an estimated equity value of NVO as of April 30th 2015 of 962.827 billion DKK, or 367,49 DKK per share, as shown in Table 21.[107] To compute the equity value, the market value of non-operating assets such as excess cash, marketable securities, and other financial assets were added to the value of operations.

Then, short/long-term debt, non-operating provisions, and retirement liabilities were subtracted subsequently in order to determine the equity value at December 31st 2014. Finally, based on NVO's WACC, an adjustment factor representing four months in 2015 was computed in order to obtain NVO's intrinsic value at April 30th 2015.

NVO's equity value reported on April 30th 2015 was 378,7 DKK per share, which is 11,21 DKK per share, or around 29 billion DKK higher than the equity value I estimated through the enterprise discounted cash flow model.

[107] Appendix 17 presents more information about the calculation of NVO's intrinsic value.

Based on my analysis, NVO's stock was overvalued 3% on April 30th 2015. However, given the small difference, it is difficult to give a final purchase or sale recommendation. The share is classified as an investment where the underlying risk fairly reflects earnings potential.

Table 21 Computing NVO's intrinsic value at 30-04-2015

Year	Free cash flow (FCF)	Discount factor	Present Value of FCF
2015	32 051	0,9434	30 236
2016	34 789	0,8900	30 961
2017	35 462	0,8396	29 773
2018	37 177	0,7920	29 446
2019	38 329	0,7472	28 639
2020	40 931	0,7049	28 852
2021	41 936	0,6650	27 887
2022	43 602	0,6273	27 353
2023	45 201	0,5918	26 750
2024	46 764	0,5583	26 109
2025	47 349	0,5267	24 939
2026	48 686	0,4969	24 191
2027	49 916	0,4687	23 398
2028	52 103	0,4422	23 040
2029	53 329	0,4172	22 247
2030	54 522	0,3935	21 457
2031 and beyond	1 319 661	0,3935	519 346
Operating value			**944 622**
Non-operating assets			12 920
Enterprise value			**957 542**
Non-operating debt			-13 738
Equity value			**943 804**
Adjustment factor			1,0202
Equity value at 30-04-2015			**962 827**
Number of shares outstanding (million)			2 620
Value per share (DKK)			**367,49**

4.2.4 Sensitivity Analysis and Scenarios

Due to the nature of the analysis, the value drivers of NVO are subjective. Thus, I considered it necessary to carry out a sensitivity analysis in which I have been guided by the parameters in the forecast that embed high uncertainty. It starts by determining the key uncertainties that affect NVO's future profitability, and the likelihood of their materiality.

The key uncertainty it is necessary to assess in the sensitivity analysis is related to R&D productivity. As mentioned in section 2.1.3, R&D productivity is the cornerstone for the creation of competitive advantage in the pharmaceutical industry. Thus, NVO's pipeline is analysed in order to identify the impact of changes on NVO's R&D productivity from the company's equity value, revenue growth, cost of capital, and ROIC.

According to NVO's annual report from 2014, the company had 11 medicines in its pipeline, of which 64% were in phase 1, 9% in phase 2, and 27% in phase 3.[108] NVO does not provide any information about the probabilities of the products in the pipeline ending up being commercialized. However, I believe the likelihood of these products coming to market is estimated at 10% for products in phase 1, 25% in phase 2, and 50% in phase 3.[109]

Based on the probabilities above, two scenarios were constructed. The first scenario relies on a 22%[110] probability of NVO bringing all products in the pipeline to market. In this scenario, NVO's new medicines reinvigorate organic revenue growth, especially in value and increase operating margins, and thus boost ROIC to levels well above WACC.

The second scenario consists of a 78% probability of being unsuccessful. With NVO's failure to launch new products, revenue growth stagnates and starts declining as prices erode rapidly. NVO also loses substantial market share, and its ROIC declines to a level closer to the cost of capital.

NVO's equity value estimated under scenario 1 was 1.436.807 trillion DKK. With the launch of new products and maintaining operating activities at the same levels as in the forecast in section 4.2.3, NVO sustained 31% of market share on average throughout the forecast period. Under scenario 2, however, NVO's equity value dropped to 679.376 billion DKK. Without the launch of any new products, the company's market share gradually decreases from 30% in 2015 to 13% in 2030.

Based on both scenarios, NVO's probability-weighted equity value is 846.011 billion DKK or 322,91 DKK per share[111], which represents a decrease of 12% in comparison to the company's equity value estimated in section 4.2.3 of 962.827 billion DKK, or 367,49 DKK per share. The results show that NVO's organic revenue growth is highly sensitive to the success of NVO's R&D productivity. Although negatively affected, NVO's ROIC ended up remaining above the cost of capital in both scenarios analysed.[112]

In terms of cost of capital, scenarios one and two were built considering WACC constant at 6% throughout the forecast period. However, based on Table 22.b, when keeping growth constant at 1,7%, and varying the cost of capital, for example, from 6% to 8%, price per share decreases 30%.

On the other hand, decreasing the cost of capital to 4% would make the price per share increase by 80%. Based on Table 22.a, similar results are found when applying the same WACC changes to compute price per share through the enterprise DCF model in section 4.2.3. Thus, the analysis

[108] See Table 21 in section 2.4.3 for more information about NVO's pipeline in 2014.
[109] See Figure 28 in section 2.1.2 for more information about the probability of product development.
[110] Determined by 64%*10%+9%*25%+27%*50% = 22% is the chance of NVO being successful in launching all the products in its pipeline.
[111] Probability-weighted equity value = Scenario1*22% + scenario2*78%
[112] Appendix 18 presents more details about the computation of the probability-weighted equity value after combining the two scenarios analysed in section 4.2.4.

shows that NVO's share price is also very sensitive to the choice of WACC, with only 1% change in WACC leading to changes above 30% in the value of NVO's share.

Table 22 Sensitivity of NVO's price per share in relation to changes in growth and WACC[113]

a) Price per share, variation from 367,49 DKK

Growth	-0,3%	0,7%	1,7%	2,7%	3,7%
WACC					
8,00%	-38%	-36%	-33%	-29%	-23%
7,00%	-28%	-24%	-20%	-12%	-1%
6,00%	-14%	-9%	100%	14%	40%
5,00%	4%	15%	32%	63%	142%
4,00%	32%	53%	91%	187%	

b) Price per share, variation from 322,91 DKK

Growth	-0,3%	0,7%	1,7%	2,7%	3,7%
WACC					
8,00%	-34%	-32%	-30%	-27%	-22%
7,00%	-24%	-21%	-18%	-12%	-3%
6,00%	-12%	-7%	100%	11%	32%
5,00%	5%	14%	28%	54%	119%
4,00%	31%	48%	80%	160%	

In conclusion, the valuation is sensitive to changes in revenue growth and WACC, with minor adjustments to these factors resulting in large changes in the share price. Additionally, the sensitivity analysis also shows that the market expectations compared to my expectations may differ, due to the possible future success of NVO's new products. Although forecasting the future success of products is characterized by a high degree of subjectivity, the results from the sensitivity analysis do not vary greatly from the results of the value estimated by the enterprise DCF model. Thus, I believe that the sensitivity analysis all in all supports the value estimated in section 4.2.3.

4.3 Relative Valuation

A relative valuation is undertaken in order to check up on the value found in section 4.2.3. A relative valuation, also called multiples analysis, involves estimating the value of an asset by looking at how the market prices comparable assets (Damodaran, 2006). In other words, it consists of defining the value of a company based on what investors are willing to pay for it or something similar to it. However, Koller et al. (2010) point out that companies are rarely equal and thus finding comparable assets is usually a difficult task in the relative valuation, as their differences impact the quality of the analysis.

NVO's main competitors, such as LLY, SNY, and MRK differ in terms of accounting principles, capital structure, and risk. They also have business that goes beyond diabetes and biopharmaceuticals.[114] Although different, these companies can still be considered good comparable assets because of their representativeness in the diabetes market, where NVO's business is primarily focused. Moreover, in NVO's annual reports LLY and SNY are also acknowledge as NVO's main competitors.

The enterprise multiple is selected for this valuation. According to Koller et al. (2010), the enterprise multiple is the most reliable multiple to valuate a company because it is independent of

[113] Prices per share were calculated based on the probability-weighted equity value.

[114] As presented in section 2.2 and 2.5, NVO is the only company that has diabetes as its main business area. All the other competitors commercialize products in at least three more business areas, excluding diabetes.

capital structure and non-operating items (Koller et al., 2010). Ratios that rely on earnings, such as the price-to-earnings ratio, P/E, can significantly be impacted by capital structure and non-operating items, thus causing the ratio to be artificially high or low (Koller et al., 2010). Table 23 shows the enterprise multiple for NVO and its competitors. It was calculated based on data from Bloomberg on the estimates for the next financial statements.

Table 23 Enterprise Multiple, EV/EBITDA

	Current Market Cap	Debt/ Enterprise Value	P/E Ratio	**EV/EBITDA**
Industry average	738.85B	0.10	24,58	14,56
NOVO NORDISK A/S-B	992.68B	0.00	28,55	18,74
SANOFI	808.04B	0.14	14,71	10,77
ELI LILLY & CO	658.56B	0.10	24,66	18,07
MERCK & CO. INC.	1.06T	0.13	15,19	10,39

Source: Bloomberg, 2015

Based on Table 23, NVO trades with a significant price premium. Its EV/EBIDTA of 18,74% is the highest in the group and above the industry average. This can be explained by the fact that the markets for NVO's business areas are growing faster than the overall pharmaceutical industry.[115] Additionally, as presented in section 2.5, NVO is the only company in the market with 70% of its business focused on diabetes. By focusing on fast-growing markets, NVO can improve revenue growth especially through market penetration.

NVO is also the only company that offers a complete portfolio of products for diabetes. By providing a diversified portfolio of diabetes products, NVO can become less vulnerable to future price competition, especially from branded-medicines.[116] The above factors explain the company's high performance in relation to its competitors and the industry.

After NVO, LLY emerges with the second highest enterprise multiple in the group. This is not a surprise considering the number of products the company has launched recently, especially in the diabetes segment.[117] Moreover, LLY is also the only large manufacturer that has developed generic insulin, which is expected to hit the market next year. This may increase the company's ability to penetrate more aggressively into the market, especially in the US market.

SNY's and MRK's performances in this analysis do not deviate greatly from my expectations, especially SNY's. Due to the patent expiration of its blockbuster Lantus in the US and EU markets this year, SNY is now exposed to tougher competition.

[115] Based on the analysis from section 2.2, the diabetes market grew 155% in six years, while the biopharmaceuticals market grew 300% in fifteen years. Both markets are expected to grow at around 6% annually for the next years, which is above the pharmaceutical industry's expected annual growth of 4%.
[116] See section 2.4.3 for more information about the competition environment of diabetes and biopharmaceuticals.
[117] See section 2.2.1.2 for more information about LLY's portfolio of products.

As a result, considering NVO's high enterprise multiple, and its competitors' performances, NVO's enterprise value seems highly valued by the market. On this basis, I conclude the multiple analysis supports my estimation of NVO's equity value, which I found to be overvalued by around 3%.[118]

[118] See section 4.2.3 for more information about the calculation of NVO's intrinsic value.

4.4 Conclusion of the Valuation Analysis

Throughout the forecast period, I estimate NVO's FCF will sustain a CARG of 6,5%, which is higher than the company's average expected organic revenue growth of 4,7%. Revenue growth will be driven by market penetration, as growth based on value will be constrained by a tougher regulatory environment worldwide, and by increasing competition, especially from generics. Following this tendency, NVO's ROIC is estimated to remain around 27% by 2030.

Based on the enterprise DCF model, NVO's intrinsic value was at 367,49 DKK per share as of April 30th 2015, which is 3% lower than the value of NVO's stocks traded on the market that day. The sensitivity analysis shows that NVO's intrinsic value is very sensitive to even small changes in revenue growth and WACC. However, a multiple analysis supports the result. Thus, NVO's stock is assessed as being an investment that broadly reflects the underlying risk and earnings potential.

5 Conclusion

For most pharmaceutical companies, non-market forces are as significant as market factors. Government institutions, for instance, can shape the political and legal environments in ways that have direct implications for the companies' bottom lines.

With the regulatory environment opening up the market for generic insulin, competition is expected to intensify. When that happens, it will not only impact revenue growth for manufacturers of branded-medicines, but it will also increase the pressure on the companies' R&D productivity.

Although the scenario seems pessimistic, the main findings also show that the markets that NVO operates in are expected to grow, especially in volume, as the global population grows, ages, and urbanizes. Thus, one of the main drivers of NVO's organic revenue growth will actually be based on bringing new diabetic patients to the diabetes market, rather than by a favorable price development.

Despite the challenges in the external environment, NVO was able to grow organically +10% on average over the last five years. This is a result of NVO's strong business focus on few therapeutic areas, which is supported by an integrated approach to business strategy.

Additionally, after assessing NVO's and its competitors' operating performances, the results showed that NVO has the best underlying operating performance between 2010 and 2014, with ROIC above 28% in all the years analyzed. None of its competitors managed to achieve that mark.

In terms of future performance, NVO's FCF is estimated to sustain a CARG of 6,5% over the next fifteen years, which is higher than the company's average expected organic revenue growth of 4,7%. However, due to a tougher regulatory environment and increasing competition, especially from generics in the future, NVO's ROIC is estimated to remain around 27% by 2030.

Finally, based on the enterprise DCF model proposed by Koller et al. (2010), NVO's intrinsic value was estimated at 367,49 DKK per share as of April 30th 2015. This value is 3% lower than the value of NVO's stocks traded on the market that day, which was at 378,7 DKK per share. The sensitivity analysis showed that the observed value is very sensitive to even small changes in revenue growth and WACC. On the other hand, the intrinsic value is also supported by the multiples analysis. Thus, NVO's stock is assessed as being an investment where the underlying risk fairly reflects earnings potential.

Bibliography

Barney, J. (1991), *'Firm resources and sustained competitive advantage'*, Journal of Management, 17(1), 99–120.

Beran D. (2015), *'The impact of health systems on diabetes care in low and lower middle Income Countries'*, Springer Science and Business Media New York, 15:20.

Brown, R. B. (2006), *'Doing Your Dissertation in Business and Management'*, SAGE Publications, 1st Edition, pp. 12-17.

Copeland T., Koller T., Murrin J. (2000), '*Valuation: measuring and managing the value of companies'*, McKinsey & Company, 3rd Edition.

Damodaran, A. (2006), *'Damodaran on Valuation: Security Analysis for Investment and Corporate Finance'*, Wiley Finance, 2nd Edition.

Deloitte (2014), *'2014 Global health care sector outlook'*, report, Deloitte Touche Tohmatsu Limited.

Ecyclopedia of Global Industries (2011), *'Pharmaceuticals'*, Cengage Learning, 5th Edition, SIC 2834, NAICS 325412.

Eli Lilly (2014), *'Eli Lilly Annual Report'*, 2014, 2013, 2012, 2011 and 2010, available at: https://investor.lilly.com/financials.cfm

English J. (2001), '*Applied equity analysis'*, McGraw Hill, New York.

Ernest & Young (2012), 'Preparing for water scarcity: raising business awareness on water issues', EYGM,

European Environment Agency (2010), 'Pharmaceutical in the environment', EEA, Copenhagen.

Evaluate (2015), *'EvaluatePharma, World Preview 2015, Outlook 2020'*, Evaluate, June 8th Edition, www.evaluategroup.com/wp2015.

Fisher N., Liebman Scott (2015), *'Are M&A replacing R&D in pharma?*', Forbes, April 22, http://www.forbes.com/sites/nicolefisher/2015/04/22/are-ma-replacing-rd-in-pharma/

GlobalData (2015), *'Growth Hormone Deficiency – Opportunity Analysis and Forecast to 2024'*, GlobalData.

Grant R. M. (2010), '*Contemporary Strategy Analysis*', John Wiley & Sons, 7th Edition, ISBN 978-0-470-74709-4.

Greene J. A., Riggs K. R. (2015), *'Why Is There No Generic Insulin? Historical Origins of a Modern Problem'*, The New England Journal of Medicine, 372:1171-1175, March 19.

International Diabetes Federation (2013), *'IDF Diabetes Atlas'*, 6th Edition.

IMS Health (2014), *'Understanding the pharmaceutical value chain'*, IMS Institute.

Jarzabkowski, P. (2005), *'Strategy as Practice - An Activity- Based Approach'*, Sage, London.

Koller T., Goedhart M., Wessels D., (2010), 'Measuring and managing the value of companies', John Wiley & Sons, Mckinsey & Company, 5th Edition.

Lev, B. and Thiagarajan, R. (1993), *'Fundamental Information Analysis'*, Journal of Accounting Research, Vol. 31 (Autumn), pp. 190–215.

Mahony, B. (2011), *'An introduction to key concepts in health economics for haemophilia organisations'*, Pharmaceuticals Policy and Law, 13th Edition.

Mantere S. (2013), *'What is organizational strategy? A language-based view'*, Journal of management Studies, December, 50:8.

Mathieu C. (2010), *'Basal Insulin analogues: from controversies to concepts'*, The Association of Physicians of India, Medicine Update, Vol. 20, 2:16.

Merck (2014), *'Merck Annual Report'*, 2014, 2013, 2012, 2011 and 2010, available at: http://www.merck.com/investors/financial-reports/home.html

Mintzberg, H. (1978). *'Patterns of strategy formation'*, Management Science, 24, 934–48.

Mintzberg, H. (1990), *'The design school: reconsidering the basic premises of strategic management'*, Strategic Management Journal, 11, 171–95.

Novo Nordisk S/A (2014), *'Novo Nordisk Annual Report'*, 2014, 2013, 2012, 2011 and 2010, available at: http://www.novonordisk.com/investors.html

Organization for Economic Cooperation and Development (2009), *'Generic Pharmaceuticals'*, OECD.

Oehlricha M. and Daemmrichb A. (2013), *'Legal and political competitiveness for pharmaceuticals'*, Pharmaceuticals Policy and Law, IOS Press, 15: 93–97.

Ostwald D. A., Zubrzycki K., Knippel J. (2015), *'The economic footprint of the pharmaceutical industry'*, WifOR Wirtschaftsforschung.

Pengfei Y. (2012), *'The Value of Active Investing: Can Active Institutional Investors Remove Excess Comovement of Stock Returns?'*, Journal of Finance and Quantitative Analysis, Vol. 47, nº 3, pp. 667-688.

Penman S. (2001),'*Financial statement analysis and security valuation'*, McGraw-Hill, Boston.

Petersen, C. V., Plenborg, T. (2012), *'Financial Statement Analysis'*, Pearson.

Pettigrew, A.M. (1997), *'What is processual analysis?'*, Scandinavian Journal of Management, 13(4), 337-48.

Pharmaceutical Manufacturers Association (2014), *'Medicines in Development in Diabetes'*, Pharmaceutical Research and Manufacturers of America, PhRMA, Washington.

Porter, M.E. (1980), *'Competitive strategy - techniques for analysing industries and competitors'*, Free Press, New York.

Porter, M. E. (2008), *'The five competitive forces that shape strategy'*, Harvard Business Review 57, January, 57-71.

Porter, M. E. (1996). *'What is strategy?'*, Harvard Business Review, 74, 61-78.

PriceWaterHouseCoopers (2012), *' From vision to decision. Pharma 2020'*, PwC.

Robson, C. (2002), *'Real World Research: A Resource for Social Scientists and Practitioner-Researchers*', Oxford-Blackwell, 2nd Edition.

Sanofi (2014), *'Sanofi Annual Report'*, 2014, 2013, 2012, 2011 and 2010, available at: http://en.sanofi.com/investors/key_facts_figures/key_financial_data/key_financial_data.aspx

Statista Dossier (2015), '*Diabetes Care Market'*, Statista, Inc (NY).

Statista Dossier (2015), *'Global pharmaceutical industry report'*, Statista, Inc. (NY).

Subramanyam, K. R. and Wild, J. J. (2009), *'Financial Statement Analysis'*, McGraw-Hill, 10th Edition.

Taylor K., Ronte H., Hammett S. (2014), *'Healthcare and Life Science predictions 2020'*, Deloitte Centre for Health Solutions.

Teece, D.J., Pisano, G. and Shuen, A. (1997), *'Dynamic capabilities and strategic management'*, Strategic Management Journal, 18(7), 509-33.

Thomas J. G. and Bond D. S. (2014), *'Review of Innovations in Digital Health Technology to Promote Weight Control'*, this article is part of the Topical Collection on Obesity, Springer Science and Business Media New York, 14:485.

United Nations (2013), *'World population ageing 2013'*, United Nations Department of Economic and Social Affairs, Population Division, New York.

Wechsler J. (2015), *'Politics & prices dominate 2015 agenda: transparency, quality, collaboration key to filling pipelines, gaining reimbursement'*, Pharmaceutical Executive Jan. 2015: 9 Edition. Business Insights: Essentials. Web. 14 Apr. 2015.

World Health Organization (2006), *'Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia'*, World Health Organization and International Diabetes Federation, WHO/IDF, Geneva, ISBN 92 4 159493 4, (NLM classification: WK 810).

World Health Organization (2008), *'Measuring medicine prices, availability, affordability and price components'*, WHO/HAI Global, 2nd Edition.

World Health Organization (2011), *'Global status report on non-communicable diseases 2010,* WHO Press.

World Health Organization (2015), *'World Health Statistics 2015'*, WHO Press, ISBN 978 92 4 069443 9.

Yeoh P., Roth K. (1999), *'An empirical analysis of sustained advantage in the US pharmaceutical industry: impact of firm resources and capabilities'*, Strategic Management Journal, 20: 637-653.

Yin, R. K. (2009), *'Case Study Research, Design and Methods'*, SAGA Publications, 4th Edition.

Sites

American Diabetes Association, http://www.diabetes.org/diabetes-basics/common-terms/#sthash.kempTTap.dpuf, 15-05-2015.

Deloitte, www.deloitte.com/2014healthcareoutlook, 30-06-2015.

Elli Lily and Company, http://www.lilly.com/Pages/Home.aspx

European Medicines Agency, http://www.ema.europa.eu/ema/, 30-04-2015.

Food and Drug Administration, http://www.fda.gov, 30-04-2015.

International Diabetes Federation, http://www.idf.org/about-diabetes, 15-05-2015.

Kaiser Family Foundation, http://kff.org/globaldata/, 06-06-2015.

Merck, http://www.merck.com

Novo Nordisk S/A, http://www.novonordisk.com

Sanofi S/A, http://en.sanofi.com

World Bank, http://data.worldbank.org, 06-06-2015.

World Health Organization, http://www.who.int/mediacentre/factsheets/fs312/en/, 15-05-2015.

Victoza webpage, http://www.victoza.com/considering/how-victoza-works, 20-05-2015

Appendix

Appendix 1 Economic snapshot of the pharmaceutical industry

Appendix 2 Insulin market share overview by regions 2010-2015

Appendix 3 Detailed description of the portfolio of products for diabetes care

Appendix 4 Patent expiration of diabetes medicines by leading manufacturers

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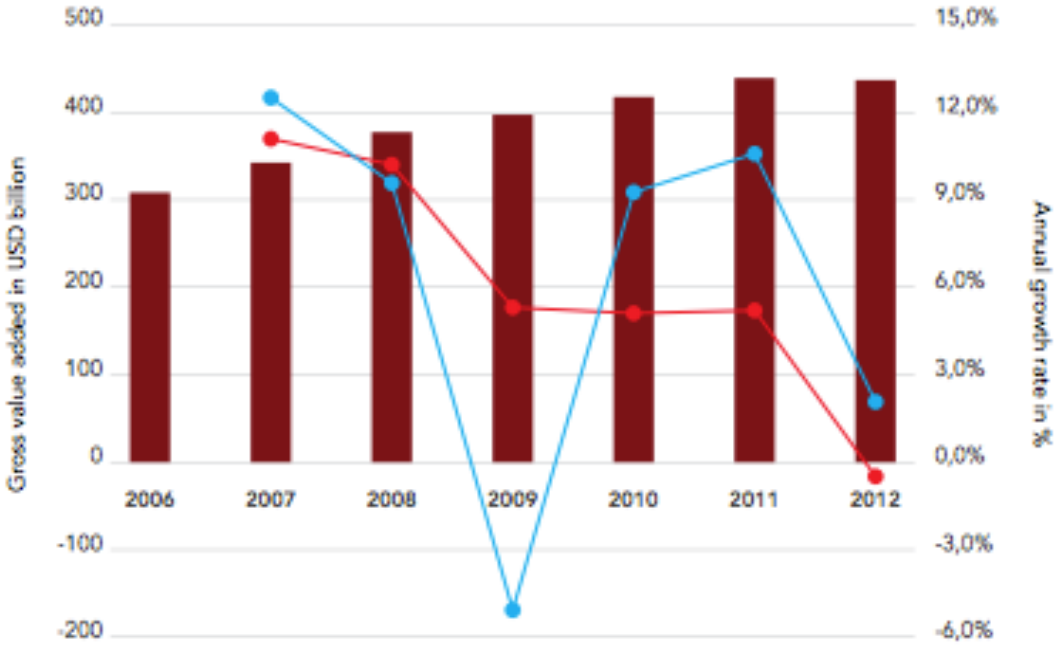
Appendix 1 Economic snapshot of the pharmaceutical industry

DIAGRAM 1: DEVELOPMENT OF THE GROSS VALUE ADDED IN USD BILLIONS AND THE ANNUAL GROWTH RATE (RED LINE) IN COMPARISON TO THE WORLDWIDE GDP (BLUE LINE)



Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

In the years from 2006 to 2012 the gross value added increased by USD 128.6 billion to reach a total of USD 436.8 billion. This corresponds to an average annual growth rate of 6.0 percent. Thus the pharmaceutical industry grew on average by 0.3 percent less than the worldwide gross domestic product (6.3 percent). The diagram indicates that the sector experienced strongly increased rates of growth in the worldwide value added with a respective 11.1 and 10.2 percent particularly in the years 2007 and 2008. In the year 2009 the sector grew by 5.3 percent, stabilizing the worldwide economy during the global recession. In the years 2010 and 2011 the growth rate remained around 5 percent, before the industry faced a recession in 2012. The findings confirm that the sector was able to provide positive growth stimuli worldwide during a long period of time. The recent downturn may be a sign that the industry is struggling under global cost reduction efforts. The most important findings are listed in Table 2.

Source: Ostwald et al., 2015

Appendix 1 Economic snapshot of the pharmaceutical industry (Cont.)

TABLE 2: GROSS VALUE ADDED IN THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012
Gross value added (USD billion)	308.2	342.5	377.3	397.3	417.6	439.2	436.8
Growth rate		11.1%	10.2%	5.3%	5.1%	5.2%	-0.5%
Global share	0.61%	0.60%	0.61%	0.67%	0.65%	0.62%	0.60%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

The pharmaceutical industry generated a 0.6 percent share of the worldwide gross value added in the year 2012. In relation to the gross value added of the global manufacturing sector the pharmaceutical industry accounted for 3.8 percent. In the year 2012 the economic strength of the sector roughly corresponded to the gross value added of Argentina, with USD 434.7 billion.[5]

TABLE 4: PRODUCTION VALUE OF THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012
Production value (USD billion)	651.4	728.8	822.8	844.4	899.0	964.6	966.1
Growth rate		11.9%	12.9%	2.6%	6.5%	7.3%	0.2%
Value added rate	47.3%	47.0%	45.9%	47.1%	46.5%	45.5%	45.2%

Source: INDSTAT4, ESA, STAN Database, own calculation.

The production value of the pharmaceutical industry increased by an annual average of 6.8 percent, or by USD 314.6 billion in the years from 2006 to 2012. In the year 2012 the production value amounted to USD 966.1 billion. The value added rate, i.e. the value added, in relation to the production value, fell by 2.1 percentage points to 45.2 percent since 2006. On average there was a value add ed rate of 46.3 percent.

TABLE 7: REGIONAL BREAKDOWN OF THE GROSS VALUE ADDED IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012	CAGR
Asia	85.1	94.9	119.9	131.1	148.7	157.2	163.3	11.5%
Europe	104.3	120.9	135.1	130.5	135.1	146.0	134.8	4.4%
Northern America	95.4	100.4	94.2	110.5	104.9	102.6	105.3	1.7%
Latin America	18.5	20.8	22.7	18.4	20.4	25.2	24.9	5.1%
Africa	3.1	3.4	3.3	4.4	5.0	5.0	5.1	8.8%
Oceania	1.8	2.2	2.1	2.4	3.5	3.2	3.3	11.0%
Worldwide pharmaceutical industry	308.2	342.5	377.3	397.3	417.6	439.2	436.8	6.0%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

TABLE 8: REGIONAL SHARES OF THE PHARMACEUTICAL INDUSTRY'S GROSS VALUE ADDED

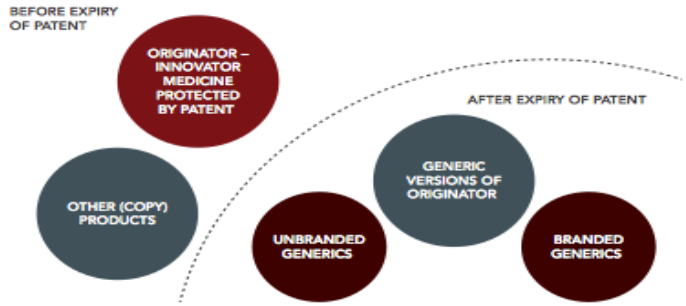
	2006	2007	2008	2009	2010	2011	2012
Asia	27.6%	27.7%	31.8%	33.0%	35.6%	35.8%	37.4%
Europe	33.9%	35.3%	35.8%	32.8%	32.4%	33.3%	30.9%
Northern America	30.9%	29.3%	25.0%	27.8%	25.1%	23.4%	24.1%
Latin America	6.0%	6.1%	6.0%	4.6%	4.9%	5.7%	5.7%
Africa	1.0%	1.0%	0.9%	1.1%	1.2%	1.1%	1.2%
Oceania	0.6%	0.6%	0.6%	0.6%	0.8%	0.7%	0.8%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

Source: Ostwald et al., 2015

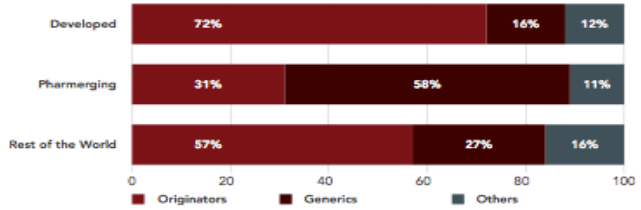
Appendix 1 Economic snapshot of the pharmaceutical industry (Cont.)

DIAGRAM 3: STRUCTURE OF THE MEDICINES MARKET



Source: WHO (2004), IMS Health (2006).

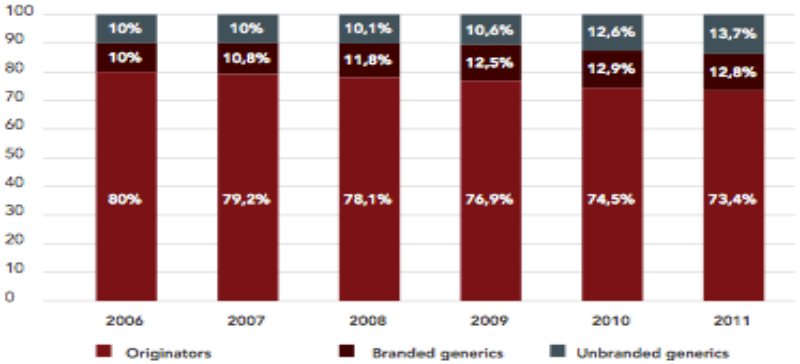
DIAGRAM 6: VALUE SHARES (KEY FACTORS) OF ORIGINATORS, GENERICS AND REMAINING DRUGS FOR CATEGORIZED COUNTRIES IN 2012



Source: IMS Health (2013a), p. 23.

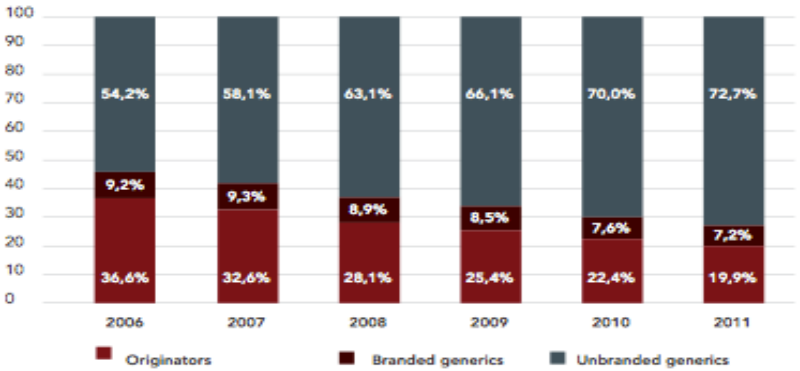
The IMS health research indicates that the generic industry has the biggest market share of sales in pharmerging countries with 58 percent. In the developed countries the originators generate the most sales with 72 percent. Other pharmaceutical products remain at a relatively low level in all countries between 11 and 16 percent of the market share.

DIAGRAM 4: GLOBAL VALUE SALES MARKET SHARES IN % USD OF ORIGINATORS AND GENERICS FROM 2006 TO 2011



Source: GPhA (2011).

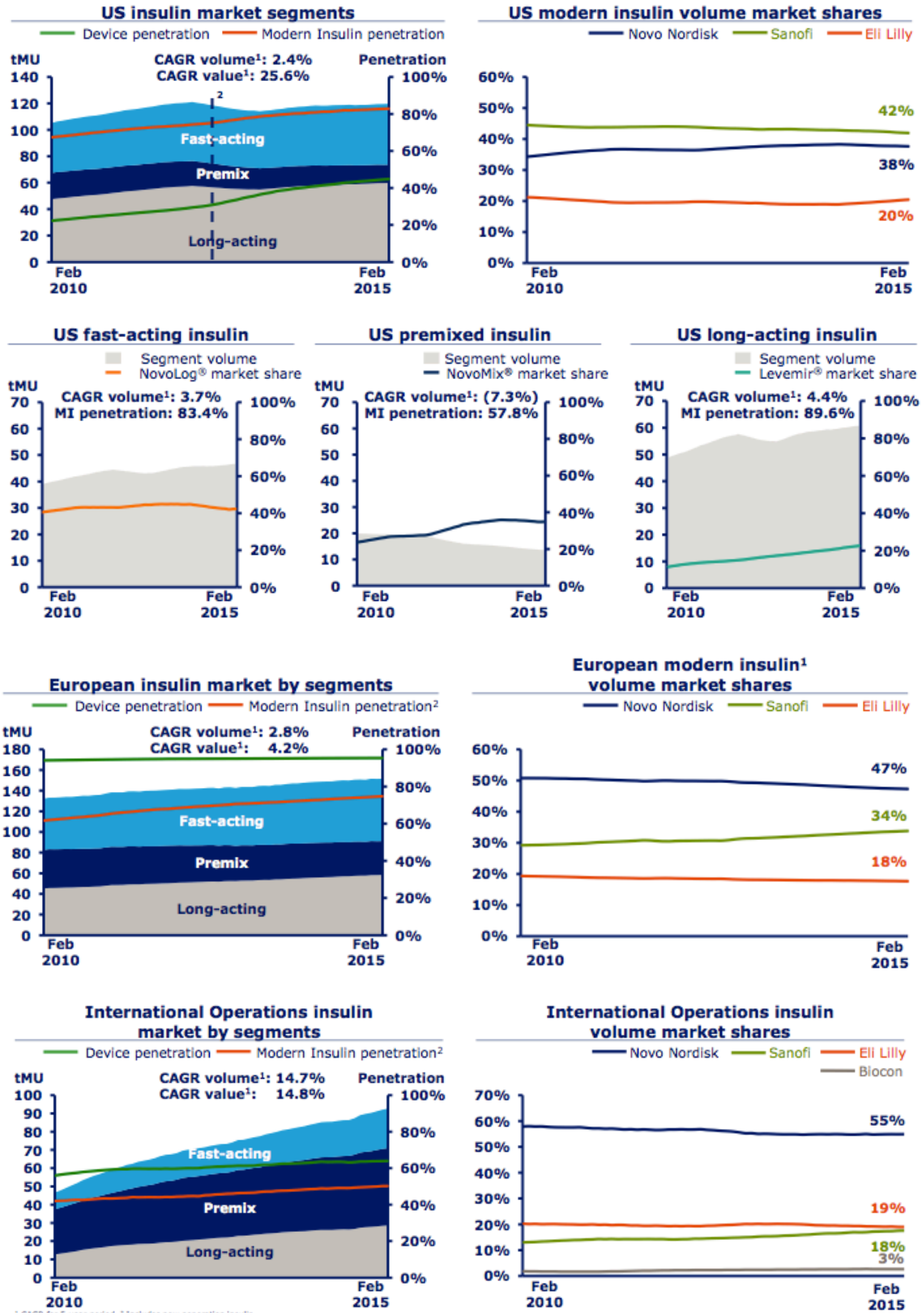
DIAGRAM 5: GLOBAL VOLUME SALES MARKET SHARES IN % TOTAL PRESCRIPTIONS OF ORIGINATORS AND GENERICS FROM 2006 TO 2011



Source: GPhA (2011).

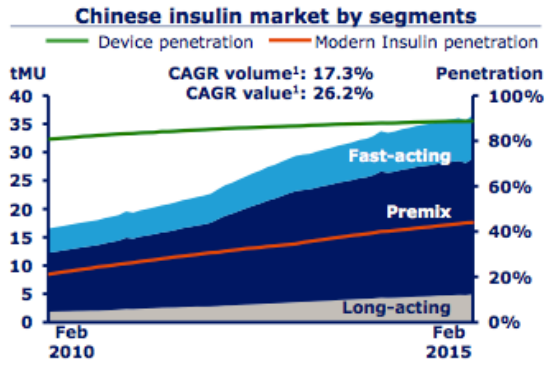
Source: Ostwald et al., 2015

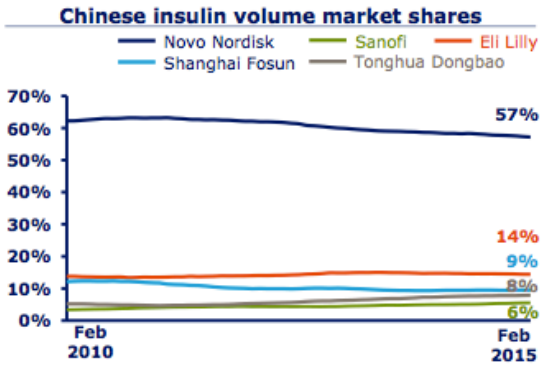
Appendix 2 Insulin market share overview by regions 2010-2015

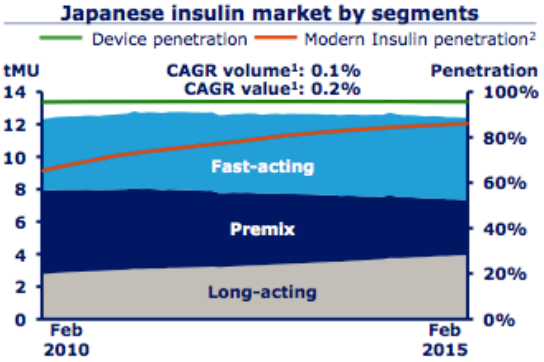


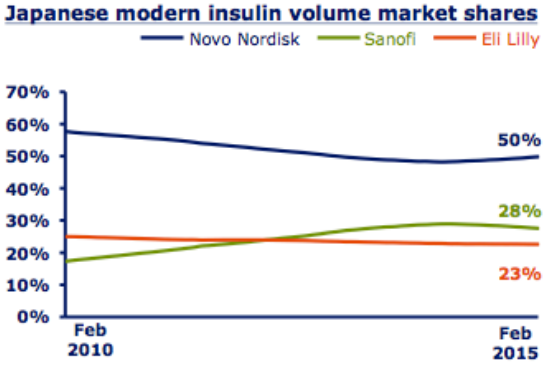
Novo Nordisk, 2015

Appendix 2 Insulin market share overview by regions 2010-2015 (Cont.)









Novo Nordisk, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care

Product	Category	Description	Objective	How it is used	Benefit
Tresiba®	New-Generation Insulins (prescription required)	It is a medicine that contains the active substance insulin degludec. It is available as a solution for injection in a cartridge (100 units/ml) and in a pre-filled pen (100 units/ml and 200 units/ml).	It is used to treat type-1 and type-2 diabetes in adults and children.	Injected once a day, preferably at the same time every day. The correct dose is determined individually for each patient. In type-1 diabetes, it must always be used in combination with rapid acting insulin, which is injected at mealtimes. In type-2 diabetes, it can be used alone or in combination with other diabetes medicines.	Studies showed that Tresiba® was effective in controlling blood glucose levels in adults with type-1 and type-2 diabetes. It is an insulin very similar to the insulin made by the body with a difference that it the insulin degludec is absorbed more slowly in the body and takes longer to reach its target, and consequently, providing a long duration of action.
Ryzodeg®	New-Generation Insulins (prescription required)	It contains the active substances insulin degludec and insulin aspart. It is available as a solution for injection in a cartridge (100 units/ml) and in a prefilled pen (100 units/ml).	It is used to treat type-1 and type-2 diabetes in adults.	Injected either once or twice a day, at mealtimes. The correct dose is determined individually for each patient. In type-1 diabetes, it is used in combination with rapid-acting insulin, which is injected at other mealtimes.	It works very similar as the insulin made by the body. Insulin degludec and insulin aspart are slightly different from human insulin. In addition to the insulin degludec, Ryzodeg® has insulin aspart. It starts working soon after it is injected. As the body absorbs it quickly, it has a short duration of action.
Xultophy®	New-Generation Insulins (prescription required)	The active substances are insulin degludec and liraglutide. It is available as pre-filled disposable pens.	It is used to treat type-2 diabetes. It is used together with diabetes medicines taken by mouth in adults whose blood sugar levels are not satisfactorily controlled by these medicines alone.	Injected once a day, preferably at the same time each day. The dose is adjusted individually for each patient, and the patient's blood glucose should be regularly tested to find the lowest effective dose. Patients can inject themselves if they have been trained appropriately.	Once-daily injection has shown to be beneficial in controlling blood glucose. In addition to insulin degludec, Xustophy® also has the active substance liraglutide. It acts in the same way as the hormones produced in the gut. It increases the amount of the body's own insulin released by the pancreas in response to food.

Source: European Medicine Agency, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care (Cont.)

Product	Category	Description	Objective	How it is used	Benefit
Victoza®	Glucagon-like Peptide-1 (prescription required)	It is a solution for injection that contains the active substance liraglutide. It is available in pre-filled pens (6 mg/ml).	It is used to treat type-2 diabetes in adults. It is used as an 'add-on' to other diabetes medicines and/or basal insulin, when these medicines together with exercise and diet are not providing adequate control of blood glucose. Basal insulin is a long-acting background insulin.	Injected once a day. It is given independent of meals and preferably at the same time each day. The starting dose is 0.6 mg. After at least one week, the dose is increased to 1.2 mg. In some patients, the dose can be further increased to 1.8 mg one week later to achieve better control of blood glucose.	Combinations containing Victoza® were more effective at controlling blood glucose than combinations without the medicine. It increases the amount of insulin released by the pancreas in response to food.
Saxenda®	Glucagon-like Peptide-1 (prescription required)	It contains the active substance liraglutide 3mg. It is available as a solution for injection in pre-filled pens.	It is used along with diet and exercise to help manage weight in adults: who are obese (body-mass index – BMI – of 30 or more); who are overweight (have a BMI between 27 and 30) and have weight-related complications such as diabetes. BMI is a measurement that indicates body weight relative to height.	Injected once per day, preferably at the same time every day. The starting dose is 0.6 mg per day. The dose is then increased each week by 0.6 mg to a maximum of 3.0 mg per day. The doctor should re-assess the need of continuing treatment once a year.	The active substance, liraglutide, is a 'glucagon -like peptide-1 (GLP-1) receptor agonist'. It appears to act on the parts of the brain that regulate appetite, by attaching to GLP-1 receptors in brain cells and thereby increasing feelings of fullness and lowering feelings of hunger.
Levemir®	Modern Insulins (prescription required)	It is a solution for injection that contains the active substance insulin detemir. It is available in cartridges and in pre-filled pens.	It is used to treat diabetes in adults, adolescents and children over the age of two years.	Injections that can be used in the following ways: once a day as an add-on to anti-diabetes medicines taken by mouth; in combination with injections of a short- or rapid-acting insulin at mealtimes; once a day as an add-on to liraglutide (an anti-diabetes medicine given by injection).	Studies showed that Levemir® controls blood glucose levels, with less risk of low blood glucose levels during the night and no associated weight gain. The active substance, insulin detemir, is different from human insulin in a way that it is absorbed more slowly by the body, and takes longer to reach its target, providing a long duration of action.

Source: European Medicine Agency, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care (Cont.)

Product	Category	Description	Objective	How it is used	Benefit
NovoRapid® (NovoLog® in US)	Modern Insulins (prescription required)	It is a solution for injection that contains the active substance insulin aspart. It is available in vials, cartridges (PenFill and PumpCart) and pre-filled pens (FlexPen, FlexTouch and InnoLet).	It is used to treat type-1 and type-2 diabetes in adults, adolescents and children over the age of two years.	The usual dose is between 0.5 and 1.0 units per kilogram body weight per day. When it is used with meals, 50 to 70% of the insulin requirement may be provided by NovoRapid and the remainder by intermediate or long-acting insulin. NovoRapid can be used in pregnant women.	It has the same safety profile as human insulin when used during pregnancy. The active substance, insulin aspart, is very slightly different from human insulin. The change means that it is absorbed faster by the body, and can therefore act faster than human insulin.
NovoMix® (NovoLog® Mix in US)	Modern Insulins (prescription required)	It is a range of suspensions for injection, which are available in cartridges and prefilled pens. It contains the active substance biphasic insulin aspart (100 units [U] per millilitre) in three forms: NovoMix® 30 contains 30% soluble insulin aspart and 70% protamine-crystallised insulin aspart; NovoMix® 50 contains 50% soluble and 50% crystallised; and NovoMix® 70 contains 70% soluble and 30% crystallised.	It is used to treat type-1 and type-2 diabetes. NovoMix® 30 can be used in patients aged 10 years or over. NovoMix® 50 and 70 can only be used in adults over 18 years.	The usual dose is between 0.5 and 1.0 U per kilogram body weight per day. In type-2 diabetes, NovoMix® can be given on its own or together with metformin (another antidiabetes medicine). NovoMix® 30 can also be used with other antidiabetes medicines that are taken by mouth. Patients can inject themselves with NovoMix® once they have been trained appropriately.	NovoMix® 30 gave almost identical results as human insulin at the end of the studies. NovoMix® 50 and 70 gave better overall control of blood glucose than biphasic human insulin. NovoMix® contains insulin aspart in two forms: the soluble form, which works within 10 minutes of injection and the crystallised form, which is absorbed much more slowly during the day.
Insulatard®	Human Insulins (Prescription required)	It is a suspension for injection that contains the active substance human insulin, isophane (NPH) insulin. It is available as vials, cartridges (Penfill), or pre-filled pens (InnoLet or FlexPen).	It is used to treat type-1 and-2 diabetes.	It can be given once or twice a day, with or without a fast-acting insulin (given at meal times). The usual dose is between 0.3 and 1.0 international units (IU) per kilogram body weight per day.	It decreases in the blood sugar levels to a similar level to that seen with other human insulins. The active substance, human insulin, contain insulin mixed with another substance, protamine, in an 'isophane' form which is absorbed much more slowly during the day. This gives Insulatard a longer duration of action.

Source: European Medicine Agency, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care (Cont.)

Product	Category	Description	Objective	How it is used	Benefit
Actrapid®	Human Insulins (Prescription required)	It is a solution for injection that contains the active substance regular human insulin. It is available as vials, cartridges (Penfill) or prefilled pens (NovoLet, InnoLet or FlexPen).	It is used to treat type-1 and-2 diabetes.	The usual dose is between 0.3 and 1.0 international units (IU) per kilogram body weight per day. Actrapid is given 30 minutes before a meal. Actrapid is a fast-acting insulin and may be used with intermediate or long-acting insulins.	The active substance in Actrapid, human insulin, is produced by a method known as 'recombinant technology': the insulin is made by yeast that has received a gene (DNA), which makes it able to produce insulin.
Mixtard®	Human Insulins (Prescription required)	It is a suspension for injection that contains the active substance biphasic human insulin. It is available as vials, cartridges or pre-filled pens. It contains both fast-acting (soluble) and long-acting (isophane) insulin: Mixtard® 30: soluble insulin 30% and isophane insulin 70%; Mixtard® 40: soluble insulin 40% and isophane insulin 60%; and Mixtard® 50: soluble insulin 50% and isophane insulin 50%.	It is used in patients with type-1 and type-2 diabetes.	The usual dose is between 0.3 and 1.0 international units (IU) per kilogram body weight per day. Mixtard is given 30 minutes before a meal. It is usually given once or twice a day when a rapid initial effect together with a more long-lasting effect is needed.	Mixtard contains insulin in two forms: a soluble form, which acts quickly (within 30 minutes of injection) and an 'isophane', form which is absorbed much more slowly during the day. This gives Mixtard a longer duration of action.
Saxenda®	Human Insulins (Prescription required)	It contains the active substance liraglutide 3mg. It is available as a solution for injection in pre-filled pens.	It is used along with diet and exercise to help manage weight in adults: who are obese (body-mass index – BMI – of 30 or more); who are overweight (have a BMI between 27 and 30) and have weight-related complications such as diabetes. BMI is a measurement that indicates body weight relative to height.	Injected once per day, preferably at the same time every day. The starting dose is 0.6 mg per day. The dose is then increased each week by 0.6 mg to a maximum of 3.0 mg per day. The doctor should re-assess the need of continuing treatment once a year.	The active substance, liraglutide, is a 'glucagon -like peptide-1 (GLP-1) receptor agonist'. It appears to act on the parts of the brain that regulate appetite, by attaching to GLP-1 receptors in brain cells and thereby increasing feelings of fullness and lowering feelings of hunger.

Source: European Medicine Agency, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care (Cont.)

Product	Category	Description	Objective	How it is used	Benefit
NovoNorm® or Prandin®	Oral antidiabetic agents (prescription required)	It is a medicine that contains the active substance repaglinide. It is available as round tablets (white: 0.5 mg; yellow: 1 mg; peach: 2 mg).	It is used to treat type-2 diabetes in adults over 18 years.	The recommended starting dose is 0.5 mg. This dose may need to be increased after one or two weeks. If patients are transferred from another antidiabetes medicine, the recommended starting dose is 1 mg.	NovoNorm® helps the pancreas to produce more insulin at mealtimes.
PrandiMet®	Oral antidiabetic agents (prescription required)	It is a medicine that contains the active substance repaglinide/metformin. It is available as round tablets (white: 0.5 mg; yellow: 1 mg; peach: 2 mg).	It is used to treat type-2 diabetes in adults over 18 years.	The recommended starting dose is 0.5 mg. This dose may need to be increased after one or two weeks. If patients are transferred from another antidiabetes medicine, the recommended starting dose is 1 mg.	Prandin® produced a good insulin response to a meal within 30 minutes of being dosed in type-2 diabetes patients, leading to a blood glucose-lowering effect throughout the meal. The raised insulin levels returned to normal after the meal. Prandin helps the pancreas to produce more insulin at mealtimes.
FlexTouch®	Diabetes devices	Prefilled insulin delivery system	Facilitates the application of insulin	Vary depending the medicine used	It was rated easiest to use by healthcare professionals and patients. The only prefilled insulin pen with no dose button extension and low injection force.
FlexPen®	Diabetes devices	Prefilled insulin delivery system	Facilitates the application of insulin	Vary depending the medicine used	Delivers accurate and precise insulin doses. It permits dose corrections without loss of insulin and provides doses in one-unit increments up to 60 units per injection.
NovoPen Echo®	Diabetes devices	Durable insulin delivery system with memory function	Facilitates the application of insulin	Vary depending the medicine used	Intended for children, it has a memory function and also an appealing design.
NovoPen® 5	Diabetes devices	Durable insulin delivery system with memory function	Facilitates the application of insulin	Vary depending the medicine used	Easy-to-use memory function. Shows time elapsed and last dose volume, providing a consistent insulin delivery.
NovoPen® 4	Diabetes devices	Durable insulin delivery system with memory function	Facilitates the application of insulin	Vary depending the medicine used	Accurate insulin delivery system with durability of at least 5 years.

Source: European Medicine Agency, 2015

Appendix 3 Detailed description of the portfolio of products for diabetes care (Cont.)

Product	Category	Description	Objective	How it is used	Benefit
NovoPen® 3	Diabetes devices	Durable insulin delivery system with memory function	Facilitates the application of insulin	Vary depending the medicine used	Colour versions allow easy differentiation of insulin types.
InnoLet®	Diabetes devices	Prefilled insulin delivery system	Device to facilitate the application of insulin	Vary depending the medicine used	Its large, easily readable dial and ergonomic design helps people manage insulin self-injection. It is a doser specifically developed for people with diabetes who face difficulties in insulin injection due to poor eyesight and reduced manual dexterity. InnoLet comes prefilled with 300 units of insulin and is disposable.
NovoFine® Plus	Diabetes devices	Needle	Device to facilitate the application and absorption of insulin products	Vary depending the medicine used	Untra-short and ultra-thin neddle. Improve flow to a faster injection. Compatible will all pen devices to simplify use. It is the newest needle in the portfolio designed for all kinds of patients with diabetes.
NovoFine® AutoCover®	Diabetes devices	Needle	Device to facilitate the application and absorption of insulin products	Vary depending the medicine used	Designed to reduce neddlestick injuries. Helps to reduce neddle anxiety. Simple screw-on neddle with automatic safety shield feature.
NovoFine®	Diabetes devices	Needle	Device to facilitate the application and absorption of insulin products	Vary depending the medicine used	Designed to fit all pen devices (it includes also pens from other manufacturers). It has an integrated glue tower to reduce the risk of needle breakage. It also reliably delivers insulin in adults, children, and obese patients - reducing the risk of injection into muscle.
NovoTwist®	Diabetes devices	Needle	Device to facilitate the application and absorption of insulin products	Vary depending the medicine used	Designed to reduce the risk of intramuscular injection.
GlucaGen® and GlucaGen® Hypokit	Diabetes devices (prescription required)	It contains the substance glucagon (rDNA origin) for injection. It is an antihypoglycemic agent and a gastrointestinal motility inhibitor	GlucaGen is indicated for treatment of severe hypoglycaemic reactions, which may occur in the management of insulin treated children and adults with diabetes.	Vary depending the medicine used	GlucaGen has shown to be effective for treatment of severe hypoglycaemic reactions.

Source: European Medicine Agency, 2015

Appendix 4 Patent expiration of diabetes medicines by leading manufacturers

Table bellow presents a list with more information about the products of the largest manufacturers in the diabetes market and their expected patent expiry in the American and European markets.

Patent expiration of diabetes medicines by leading manufacturers

Category	Type	Product	Manufacturer	Patent Expiry	
				US	EU
Insulin	Ultra long-acting	Tresiba®	Novo Nordisk	2030	2028
Insulin	Ultra-long-acting	Toujeo®	Sanofi	2034	2034
Insulin	Long-acting	Levemir®	Novo Nordisk	2019	2018
Insulin	Long-acting	Insulatard®	Novo Nordisk	Expired	Expired
Insulin	Long-acting	Lantus®	Sanofi	Expired	Expired
Insulin	Rapid- and long-acting	Ryzodeg®	Novo Nordisk	2030	2028
Insulin	Rapid- and long-acting	Xultophy®	Novo Nordisk	2028	2028
Insulin	Rapid-acting	NovoRapid®	Novo Nordisk	2017	2017
Insulin	Rapid-acting	Actrapid®	Novo Nordisk	Expired	Expired
Insulin	Rapid-acting	Apidra®	Sanofi	2018	2019
Insulin	Rapid-acting	Afrezza®	Sanofi	n/a	n/a
Insulin	Rapid-acting	Humulin R®	Eli Lilly	Expired	Expired
Insulin	Rapid-acting	Humalog®	Eli Lilly	Expired	Expired
Insulin	Intermediate-acting	NovoMix®	Novo Nordisk	2017	2015
Insulin	Intermediate-acting	Mixtard®	Novo Nordisk	Expired	Expired
Insulin	Intermediate-acting	Insuman®	Sanofi	n/a	n/a
Insulin	Intermediate-acting	Humulin N®	Eli Lilly	Expired	Expired
Insulin	Intermediate-acting	HumanlogMix®	Eli Lilly	Expired	Expired
GLP-1	n/a	Victoza®	Novo Nordisk	2023	2023
GLP-1	n/a	Saxenda®	Novo Nordisk	2022	2022
GLP-1	n/a	Lyxumia®	Sanofi	2020	2020
GLP-1	n/a	Trulicity®	Eli Lilly	2034	2034
Oral anti-diabetes	Long-acting	Janumet®	Merck	2027	2028
Oral anti-diabetes	Long-acting	Janumet® XR	Merck	2032	2028
Oral anti-diabetes	Long-acting	Januvia®	Merck	2026	2027
Oral anti-diabetes	Short-acting	NovoNorm®	Novo Nordisk	Expired	Expired
Oral anti-diabetes	Short-acting	PrandMet®	Novo Nordisk	Expired	Expired
Oral anti-diabetes	Short-acting	Amaryl®	Sanofi	Expired	Expired
Oral anti-diabetes	Short-acting	Trajenta®	Eli Lilly	2025	2025
Oral anti-diabetes	Short-acting	Jentadueto®	Eli Lilly	2030	2030
Oral anti-diabetes	Short-acting	Jardiance®	Eli Lilly	2025	2025
Oral anti-diabetes	Short-acting	Glyxambi®	Eli Lilly	2030	n/a

*n/a - not approved

Source: FDA and EMA, 2015

Appendix 5 Original and reformulated balance sheets for NVO and its competitors

NOVO NORDISK ORIGINAL BALANCE SHEET

DKK million	31 Dec 2009	31 Dec 2010	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014	
ASSETS							
Intangible assets	1 037	1 458	1 489	1 495	1 615	1 378	1
Property, plant and equipment	19 226	20 507	20 931	21 539	21 882	23 136	2
Investment in associated companies	176	43					
Deferred income tax assets	1 455	1 847	2 414	2 244	4 231	5 399	3
Other financial assets	182	254	273	228	551	856	4
TOTAL NON-CURRENT ASSETS	**22 076**	**24 109**	**25 107**	**25 506**	**28 279**	**30 769**	-
							-
Inventories	10 016	9 689	9 433	9 543	9 552	11 357	5
Trade receivables	7 063	8 500	9 349	9 639	10 907	13 041	6
Tax receivables	799	650	883	1 240	3 155	3 210	7
Other receivables and prepayments	1 962	2 403	2 376	2 705	2 454	2 750	8
Marketable securities	1 013	3 926	4 094	4 552	3 741	1 509	9
Derivative financial instruments	517	108	48	931	1 521	30	10
Cash at bank and on hand	11 296	12 017	13 408	11 553	10 728	14 396	11
TOTAL CURRENT ASSETS	**32 666**	**37 293**	**39 591**	**40 163**	**42 058**	**46 293**	-
TOTAL ASSETS	**54 742**	**61 402**	**64 698**	**65 669**	**70 337**	**77 062**	**-**
EQUITY AND LIABILITIES							
Share capital	620	600	580	560	550	530	12
Treasury shares	(32)	(28)	(24)	(17)	(21)	(11)	13
Retained earnings	34 435	36 097	37 111	39 001	41 137	41 277	14
Other reserves	711	296	(219)	1 088	903	(1 502)	15
TOTAL EQUITY	**35 734**	**36 965**	**37 448**	**40 632**	**42 569**	**40 294**	-
Loans	970	504	502	-			
Deferred income tax liabilities	3 010	2 865	3 206	732	672	7	16
Retirement benefit obligations	456	569	439	760	688	1 031	17
Provisions	1 157	2 023	2 324	1 907	2 183	2 041	18
Total non-current liabilities	**5 593**	**5 961**	**6 471**	**3 399**	**3 543**	**3 079**	-
Current debt	418	562	351	500	215	720	19
Trade payables	2 242	2 906	3 291	3 859	4 092	4 950	20
Tax payables	701	1 252	1 171	593	2 222	2 771	21
Other liabilities	6 658	7 954	8 534	8 982	9 386	11 051	22
Derivative financial instruments	155	1 158	1 492	48	-	2 607	23
Provisions	3 241	4 644	5 940	7 656	8 310	11 590	24
Total current liabilities	**13 415**	**18 476**	**20 779**	**21 638**	**24 225**	**33 689**	-
TOTAL LIABILITIES	**19 008**	**24 437**	**27 250**	**25 037**	**27 768**	**36 768**	-
TOTAL EQUITY AND LIABILITIES	**54 742**	**61 402**	**64 698**	**65 669**	**70 337**	**77 062**	**-**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

NOVO NORDISK REFORMULATED BALANCE SHEET

DKK million	2009	2010	2011	2012	2013	2014	
Total Fund Invested: Uses							
Inventories	10 016	9 689	9 433	9 543	9 552	11 357	5
Tax receivables	799	650	883	1 240	3 155	3 210	7
Other receivables and prepayments	1 879	2 306	2 263	2 618	2 379	2 724	8
Trade receivables	7 063	8 500	9 349	9 639	10 907	13 041	6
Cash at bank and on hand - operating cash	1 022	1 216	1 327	1 561	1 671	1 776	11
Operating Current Assets	**20 779**	**22 361**	**23 255**	**24 601**	**27 664**	**32 108**	-
Trade payables	2 242	2 906	3 291	3 859	4 092	4 950	20
Tax payables	701	1 252	1 171	593	2 222	2 771	21
Other liabilities	6 813	7 954	8 534	8 982	9 386	10 931	22
Provisions for sales rebates	2 623	4 364	5 666	7 352	7 950	11 002	
Provision for product returns	588	215	222	233	272	319	
Operating provision	3 211	4 579	5 888	7 585	8 222	11 321	24
Operating Current Liabilities	**12 967**	**16 691**	**18 884**	**21 019**	**23 922**	**29 973**	-
Operating Working Capital	**7 812**	**5 670**	**4 371**	**3 582**	**3 742**	**2 135**	43*
Property, plant and equipment	19 226	20 507	20 931	21 539	21 882	23 051	2
Net long-term operating assets	182	81	82	81	376	490	4, 19
Operating Lease capitalization	4 100	6 220	7 060	7 333	7 833	8 733	35*
Invested capital (excluding intangibles)	**31 320**	**32 478**	**32 444**	**32 535**	**33 834**	**34 409**	-
R&D Capitalizaition	42 896	47 749	51 969	57 206	62 752	69 323	36*
Operating intangible assets	1 037	1 458	1 489	1 495	1 615	983	1
INVESTED CAPITAL (including intangibles)	**75 253**	**81 684**	**85 902**	**91 236**	**98 201**	**104 715**	42*
		8,5%	5,2%	6,2%	7,6%	6,6%	
Reconciliation							
Cash at bank and on hand - excess cash	10 274	10 801	12 081	9 992	9 057	12 620	11
Marketable securities	1 013	3 926	4 094	4 552	3 741	1 509	9
Interest receivable	83	97	113	87	75	26	8
Other financial NO-CURRENT assets - non-operating	176	216	191	147	175	366	4
Discontinuation of inflammatory activities	-	-	-	-	-	120	22
Remove: Impairment of intangible assets - inflammatory disorder activities	-	-	-	-	-	85	2
Impairment of property, plant, and equipment - inflammatory disorder activities	-	-	-	-	-	395	1
Retirement benefit obligations - assets	607	883	924	904	856	944	17
Net derivatives financial instruments	362	-1 050	-1 444	883	1 521	-2 577	10, 23
Tax loss carry-forwards	44	113	87	66	54	32	3
Total funds invested	**87 812**	**96 671**	**101 948**	**107 867**	**113 680**	**117 995**	-
Total Fund Invested: Sources							
Short term debt	1 233	1 066	853	500	215	720	19
Provisions - current liabilities - others	30	65	52	71	88	269	24
Provisions - non-current liabilities	1 157	2 023	2 324	1 907	2 183	2 041	18
Retirement benefit obligations - non-current liabilities	1 063	1 452	1 363	1 664	1 544	1 975	17
Operating Lease Capitalization	4 100	6 220	7 060	7 333	7 833	8 733	35*
Debt and debt equivalents	**7 583**	**10 826**	**11 652**	**11 475**	**11 863**	**13 738**	-
Deferred income tax - operating	47	697	783	472	972	1 968	3, 16
Deferred income tax - non-operating	-1 646	-1 828	-1 662	974	2 533	3 392	3, 16
Net deferred income tax	-1 599	-1 131	-879	1 446	3 505	5 360	3, 16
R&D Capitalizaition	42 896	47 749	51 969	57 206	62 752	69 323	36*
Share capital	620	600	580	560	550	530	12
Treasury shares	(32)	(28)	(24)	(17)	(21)	(11)	13
Retained earnings	34 435	36 097	37 111	39 001	41 137	41 277	14
Other reserves	711	296	(219)	1 088	903	(1 502)	15
Equity and equity equivalents	**80 229**	**85 845**	**90 296**	**96 392**	**101 816**	**104 257**	-
Total funds invested	**87 812**	**96 671**	**101 948**	**107 867**	**113 680**	**117 995**	-

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

SANOFI ORIGINAL BALANCE SHEET

(€ million)	2009	2010	2011	2012	2013	2014
Property, plant and equipment	7 830	8 155	10 750	10 578	10 182	10 396
Goodwill	29 733	31 932	38 582	38 073	37 134	39 197
Other intangible assets	13 747	12 479	23 639	20 192	15 395	14 543
Investments in associates and joint ventures	955	924	807	487	448	2 384
Other non-current assets	998	1 644	2 399	3 799	4 826	2 575
Deferred tax assets	2 912	3 051	3 633	4 369	4 144	4 860
Non-current assets	**56 175**	**58 185**	**79 810**	**77 498**	**72 129**	**73 955**
Inventories	4 444	5 020	6 051	6 379	6 352	6 562
Accounts receivable	6 015	6 507	8 042	7 507	6 831	7 149
Other current assets	2 104	2 000	2 401	2 355	2 287	2 157
Current financial assets	277	51	173	178	185	218
Cash and cash equivalents	4 692	6 465	4 124	6 381	8 257	7 341
Current assets	**17 532**	**20 043**	**20 791**	**22 800**	**23 912**	**23 427**
Assets held for sale or exchange	6 544	7 036	67	101	14	10
Total assets	**80 251**	**85 264**	**100 668**	**100 399**	**96 055**	**97 392**
Equity attributable to equity holders of Sanofi	48 322	53 097	56 203	57 352	56 904	56 120
Equity attributable to non-controlling interests	258	191	170	134	129	148
Total equity	**48 580**	**53 288**	**56 373**	**57 486**	**57 033**	**56 268**
Long-term debt	5 961	6 695	12 499	10 719	10 414	13 276
Non-current liabilities related to business combination	75	388	1 336	1 350	884	1 133
Provisions and other non-current liabilities	8 236	9 326	10 346	11 043	8 735	9 578
Deferred tax liabilities	4 933	3 808	6 530	5 932	5 060	4 105
Non-current liabilities	**19 205**	**20 217**	**30 711**	**29 044**	**25 093**	**28 092**
Accounts payable	2 654	2 800	3 183	3 190	3 003	3 651
Other current liabilities	5 369	5 624	7 221	6 728	6 725	7 712
Current liabilities related to business combinations and	76	98	220	100	24	131
Short-term debt and current portion of long-term debt	2 866	1 565	2 940	3 812	4 176	1 538
Current liabilities	**10 965**	**10 087**	**13 564**	**13 830**	**13 928**	**13 032**
Liabilities related to assets held for sale or exchange	1 501	1 672	20	39	1	-
Total liability and equity	**80 251**	**85 264**	**100 668**	**100 399**	**96 055**	**97 392**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

SANOFI REFORMULATED BALANCE SHEET

(€ million)	2009	2010	2011	2012	2013	2014
Total Fund Invested: Uses						
Inventories	4 444	5 020	6 051	6 379	6 352	6 562
Accounts receivable	6 015	6 507	8 042	7 507	6 831	7 149
Other operating current assets	2 104	2 000	2 401	2 355	2 287	2 157
Cash and cash equivalents	596	647	668	699	659	675
Operating Current Assets	**13 159**	**14 174**	**17 162**	**16 940**	**16 129**	**16 543**
Accounts payable	2 654	2 800	3 183	3 190	3 003	3 651
Taxes payable	631	785	1 060	932	978	948
Accrued salaries	1 458	1 411	1 957	1 882	1 813	1 912
Other operating liabilities	2 087	2 460	3 020	3 766	2 963	2 898
Operating Current Liabilities	**6 830**	**7 456**	**9 220**	**9 770**	**8 757**	**9 409**
Operating Working Capital	6 329	6 718	7 942	7 170	7 372	7 134
Property, plant and equipment	7 830	8 155	10 750	10 578	10 182	10 396
Operating intangible assets	13 747	12 479	23 639	20 192	15 395	14 543
R&D capitalized	35 497	36 494	37 656	38 795	39 686	40 541
Operating lease capitalization	1 860	1 873	2 160	1 960	2 253	2 113
Invested capital (excluding goodwill)	**63 403**	**63 847**	**79 987**	**76 735**	**72 635**	**72 615**
	56%					56%
Goodwill	29 733	31 932	38 582	38 073	37 134	39 197
Cumulative amortization and unrecorded goodwill	6 401	6 883	7 545	7 770	9 331	9 397
Invested capital (including goodwill)	**99 537**	**102 662**	**126 114**	**122 578**	**119 100**	**121 209**
Reconciliation						
Current financial assets	277	51	173	178	185	218
Investments in associates and joint ventures	955	924	807	487	448	2 384
Other non-current assets	998	1 644	2 399	3 799	4 826	2 575
Assets held for sale or exchange	6 544	7 036	67	101	14	10
Excess cash	4 096	5 818	3 456	5 682	7 598	6 666
Tax loss carry-forward	70	152	524	593	600	738
Total funds invested	**112 478**	**118 286**	**133 540**	**133 418**	**132 771**	**133 800**
Total Fund Invested: Sources						
Current liabilities related to business combinations and to non-controlling interests	76	98	220	100	24	131
Short-term debt and current portion of long-term debt	2 866	1 565	2 940	3 812	4 176	1 538
Long-term debt	5 961	6 695	12 499	10 719	10 414	13 276
Non-current liabilities related to business combinations and to non-controlling interests	75	388	1 336	1 350	884	1 133
Provisions and other non-current liabilities	8 236	9 326	10 346	11 043	8 735	9 578
Liabilities related to assets held for sale or exchange	1 501	1 672	20	39	1	-
Other current liabilities	1 193	968	1 184	148	971	1 954
Operating lease capitalization	1 860	1 873	2 160	1 960	2 253	2 113
Debt and debt equivalents	**19 908**	**20 712**	**28 545**	**27 211**	**25 205**	**27 610**
Cumulative amortization and unrecorded goodwill	6 401	6 883	7 545	7 770	9 331	9 397
R&D capitalized	35 497	36 494	37 656	38 795	39 686	40 541
Deferred tax - operating	- 886	- 1 273	- 1 429	- 1 830	- 1 579	- 1 911
Deferred tax - non-operating	2 977	2 182	4 850	3 986	3 095	1 894
Equity attributable to equity holders of Sanofi	48 322	53 097	56 203	57 352	56 904	56 120
Equity attributable to non-controlling interests	258	191	170	134	129	148
Equity and equity equivalents	**92 569**	**97 574**	**104 995**	**106 207**	**107 566**	**106 189**
Total funds invested	**112 477**	**118 286**	**133 540**	**133 418**	**132 771**	**133 799**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

ELI LILLY ORIGINAL BALANCE SHEET

(Dollars in millions, except per-share data)	2009	2010	2011	2012	2013	2014
Cash and cash equivalents	4 463	5 993	5 923	4 019	3 830	3 872
Short-term investments	35	734	975	1 666	1 567	955
Accounts receivable, net of allowances of **$55.0 (**	3 343	3 494	3 598	3 336	3 434	3 235
Other receivables	489	664	640	552	588	567
Inventories	2 850	2 518	2 300	2 644	2 929	2 740
Prepaid taxes	714	828				
Prepaid expenses and other	593	609	813	822	756	812
Total current assets	**12 487**	**14 840**	**14 248**	**13 039**	**13 105**	**12 180**
Restricted cash	-	-	-	-	-	5 406
Investments	1 156	1 780	4 030	6 313	7 625	4 569
Goodwill	1 175	1 424	1 501	1 435	1 517	1 758
Other intangibles, net	2 525	3 395	3 627	3 318	2 814	2 884
Sundry	1 921	1 622	2 493	2 534	2 213	2 418
Property and equipment, net	8 197	7 941	7 760	7 760	7 976	7 964
Total assets	**27 461**	**31 002**	**33 660**	**34 399**	**35 249**	**37 178**
Short-term borrowings and current maturities of lc	27	156	1 522	12	1 013	2 689
Accounts payable	968	1 072	1 125	1 188	1 119	1 128
Employee compensation	894	852	805	940	944	759
Sales rebates and discounts	1 110	1 373	1 771	1 777	1 942	2 069
Dividends payable	538	540	542	541	524	530
Income taxes payable	347	458	262	144	254	94
Deferred income taxes			422	1 048	793	1 467
Other current liabilities	2 684	2 651	2 481	2 739	2 328	2 473
Total current liabilities	**6 568**	**7 101**	**8 931**	**8 390**	**8 917**	**11 208**
Long-term debt	6 635	6 771	5 465	5 519	4 200	5 368
Accrued retirement benefits	2 335	1 887	3 069	3 012	1 549	2 563
Long-term income taxes payable	1 088	1 235	1 086	1 334	1 079	999
Other noncurrent liabilities	1 310	1 595	1 574	1 369	1 863	1 654
Total non-current liabilities	**11 368**	**11 487**	**11 193**	**11 236**	**8 691**	**10 583**
Common stock	719	721	724	717	699	695
Additional paid-in capital	4 636	4 799	4 887	4 963	5 050	5 292
Retained earnings	9 830	12 733	14 898	16 088	16 992	16 483
Employee benefit trust	- 3 013	- 3 013	- 3 013	- 3 013	- 3 013	- 3 013
Accumulated other comprehensive loss	- 2 472	- 2 670	- 3 859	- 3 797	- 2 003	- 3 992
Cost of common stock in treasury, **810 shares (2**	- 99	- 96	- 95	- 192	- 94	- 91
Deferred costs -ESOP	- 77	- 52				
Total Eli Lilly and Company shareholders' equ	**9 524**	**12 420**	**13 542**	**14 765**	**17 631**	**15 373**
Noncontrolling interests	2	- 8	- 6	9	9	15
Total equity	**9 525**	**12 413**	**13 536**	**14 774**	**17 641**	**15 388**
Total liabilities and equity	**27 461**	**31 001**	**33 660**	**34 399**	**35 249**	**37 178**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

ELI LILLY REFORMULATED BALANCE SHEET

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Total Fund Invested: Uses						
Inventories	2 996	2 736	2 510	2 826	3 095	2 868
Accounts receivable	3 343	3 494	3 598	3 336	3 372	3 180
Cash and cash equivalents	437	462	486	452	462	392
Other operating current assets	1 796	2 102	1 454	1 374	1 344	1 378
Operating Current Assets	**8 572**	**8 793**	**8 047**	**7 989**	**8 274**	**7 819**
Accounts payable	968	1 072	1 125	1 188	1 119	1 128
Other operating current liabilities	3 794	4 024	4 253	4 516	4 270	4 541
Operating Current Liabilities	**4 762**	**5 096**	**5 378**	**5 704**	**5 389**	**5 670**
Operating Working Capital	**3 810**	**3 697**	**2 670**	**2 285**	**2 885**	**2 149**
Property and equipment, net	8 197	7 941	7 760	7 760	7 976	7 964
Operating intangibles	1 921	1 622	2 493	2 534	2 213	2 418
Leasing capitalization	2 252	2 262	1 783	1 748	1 515	1 515
R&D capitalization	31 536	33 266	34 960	36 742	38 600	39 473
Invested capital (excluding goodwill)	**47 716**	**48 788**	**49 666**	**51 069**	**53 187**	**53 519**
Goodwill	1 175	1 424	1 501	1 435	1 517	1 758
Acquired intangibles	2 525	3 395	3 627	3 318	2 814	2 884
Amortization and impairment	277	386	469	563	555	536
Invested capital (including goodwill)	**51 693**	**53 993**	**55 263**	**56 385**	**58 073**	**58 697**
Reconciliation						
Excess cash	4 026	5 532	5 437	3 567	3 368	3 479
Short-term investments	35	734	975	1 666	1 567	955
Restricted cash	-	-	-	-	-	5 406
Other non-operating assets	967	2 055	3 921	5 604	7 806	3 580
Total funds invested	**56 721**	**62 313**	**65 596**	**67 222**	**70 814**	**72 117**
Total Fund Invested: Sources						
Short-term borrowings and current maturities of long-term debt	27	156	1 522	12	1 013	2 689
Employee compensation	894	852	805	940	944	759
Long-term debt	6 635	6 771	5 465	5 519	4 200	5 368
Accrued retirement benefits	2 335	1 887	3 069	3 012	1 549	2 563
Other noncurrent liabilities	1 310	1 595	1 574	1 369	1 863	1 654
Leasing capitalization	2 252	2 262	1 783	1 748	1 515	1 515
Tax loss carry-forward	883,6	917	1 101	1 073	806	545
Debt and debt equivalents	**14 336**	**14 439**	**15 318**	**13 675**	**11 890**	**15 092**
Operating deferred taxes	893	681	999	1 097	847	1 022
Non-operating deferred taxes	- 525	403	- 428	- 328	611	- 49
Dividends payable	538	540	542	541	524	530
Common stock	719	721	724	717	699	695
Additional paid-in capital	4 636	4 799	4 887	4 963	5 050	5 292
Retained earnings	9 972	12 917	15 097	16 245	17 140	16 608
Employee benefit trust	- 3 013	- 3 013	- 3 013	- 3 013	- 3 013	- 3 013
Accumulated other comprehensive loss	- 2 472	- 2 670	- 3 859	- 3 797	- 2 003	- 3 992
Cost of common stock in treasury, 810 shares (2014) and 833 sha	- 99	- 96	- 95	- 192	- 94	- 91
Deferred costs -ESOP	- 77	- 52	-	-	-	-
Noncontrolling interests	2	- 8	- 6	9	9	15
Amortization and impairment of goodwill and acquired intangibl	277	386	469	563	555	536
R&D capitalization	31 536	33 266	34 960	36 742	38 600	39 473
Equity and equity equivalents	**42 385**	**47 873**	**50 278**	**53 547**	**58 924**	**57 025**
Total funds invested	**56 721**	**62 313**	**65 596**	**67 222**	**70 814**	**72 117**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

MERCK ORIGINAL BALANCE SHEET

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Cash and cash equivalents	9 311	10 900	13 531	13 451	15 621	7 441
Short-term investments	293	1 301	1 441	2 690	1 865	8 278
Accounts receivable	6 603	7 344	8 261	7 672	7 184	6 626
Inventories	8 048	5 868	6 254	6 535	6 226	5 571
Deferred income taxes and other current ass	4 177	3 651	3 694	4 509	4 789	5 257
Total current assets	**28 432**	**29 064**	**33 181**	**34 857**	**35 685**	**33 173**
Investments	432	2 175	3 458	7 305	9 770	13 515
Property, Plant and Equipment (at cost)	30 874	30 563	32 473	33 415	33 094	31 140
Less: accumulated depreciation	12 595	13 481	16 176	17 385	18 121	18 004
Goodwill	12 038	12 378	12 155	12 134	12 301	12 992
Other intangibles, net	47 757	39 456	34 302	29 083	23 801	20 386
Other Assets	5 376	5 626	5 735	6 723	9 115	5 133
Total non-current assets	**83 882**	**76 717**	**71 947**	**71 275**	**69 960**	**65 162**
Total assets	**112 314**	**105 781**	**105 128**	**106 132**	**105 645**	**98 335**
Loans payable and current portion of long-te	1 379	2 400	1 990	4 315	4 521	2 704
Trade accounts payable	2 244	2 308	2 462	1 753	2 274	2 625
Accrued and other current liabilities	9 455	8 514	9 731	9 737	9 501	10 523
Income taxes payable	1 167	1 243	781	1 200	251	1 606
Dividends payable	1 189	1 176	1 281	1 343	1 321	1 308
6% Mandatory convertible preferred stock, $	207					
Total current liabilities	**15 641**	**15 641**	**16 245**	**18 348**	**17 868**	**18 766**
Long term debt	16 095	15 482	15 525	16 254	20 539	18 699
Deferred income taxes	19 093	17 853	16 415	16 067	6 776	4 266
Other non-current liabilities	-	-	-	-	8 136	7 813
Total non-current liabilities	**35 188**	**33 335**	**31 940**	**32 321**	**35 451**	**30 778**
Common stocks	1 781	1 788	1 788	1 788	1 788	1 788
Other paid-in capital	39 683	40 701	40 663	40 646	40 508	40 423
Retained earnings	41 405	37 536	38 990	39 985	39 257	46 021
Accumulated other comprehensive loss	- 2 767	- 3 216	- 3 132	- 4 682	- 2 197	- 4 323
Less treasury stock, at cost:	- 21 044	- 22 433	- 23 792	- 24 717	- 29 591	- 35 262
Total Merck & Co., Inc. stockholders' equity	**59 058**	**54 376**	**54 517**	**53 020**	**49 765**	**48 647**
Noncontrolling interests	2 427	2 429	2 426	2 443	2 561	144
Total equity	**61 485**	**56 805**	**56 943**	**55 463**	**52 326**	**48 791**
Total liabilities and equity	**112 314**	**105 781**	**105 128**	**106 132**	**105 645**	**98 335**

Appendix 5 Original and reformulated balance sheets for NVO and its competitors (Cont.)

MERCK REFORMULATED BALANCE SHEET

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Total Fund Invested: Uses						
Inventories	10 348	6 093	7 943	8 242	8 526	8 171
Accounts receivable	6 603	7 344	8 261	7 672	7 184	6 626
Other operating current assets	4 875	5 154	5 238	6 196	8 734	4 732
Cash and cash equivalents	549	920	961	945	881	845
Operating Current Assets	**22 375**	**19 511**	**22 403**	**23 055**	**25 325**	**20 374**
Trade accounts payable	2 244	2 308	2 462	1 753	2 274	2 625
Accrued and other operating current liabiliti	9 455	8 514	9 731	9 737	9 501	10 523
Operating Current Liabilities	**11 699**	**10 822**	**12 193**	**11 490**	**11 775**	**13 148**
Operating Working Capital	**10 676**	**8 689**	**10 210**	**11 565**	**13 550**	**7 226**
Property, Plant and Equipment (at cost)	30 874	30 563	32 473	33 415	33 094	31 140
Accumulated depreciation	- 12 595	- 13 481	- 16 176	- 17 385	- 18 121	- 18 004
Operating intangibles, net	47 757	39 456	34 302	29 083	23 801	20 386
R&D Capitalization	33 867	41 592	45 900	49 478	52 033	54 010
Operating leases capitalization	1 580	2 873	2 740	2 640	2 447	2 333
Invested capital (excluding goodwill)	**112 159**	**109 692**	**109 448**	**108 796**	**106 803**	**97 091**
Goodwill	12 038	12 378	12 155	12 134	12 301	12 992
Accumulated amotization and impairment o	-	2 441	705	200	765	1 222
Invested capital (including goodwill)	**124 197**	**124 511**	**122 308**	**121 130**	**119 869**	**111 305**
Reconciliation						
Excess cash	8 762	9 980	12 570	12 506	14 740	6 596
Short-term investments	293	1 301	1 441	2 690	1 865	8 278
Investments	432	2 175	3 458	7 305	9 770	13 515
Other non-operating assets	501	472	497	527	381	401
Total funds invested	**134 185**	**138 439**	**140 274**	**144 158**	**146 626**	**140 095**
Total Fund Invested: Sources						
Loans payable and current portion of long-te	1 379	2 400	1 990	4 315	4 521	2 704
Income taxes payable	1 167	1 243	781	1 200	251	1 606
Dividends payable	1 189	1 176	1 281	1 343	1 321	1 308
6% Mandatory convertible preferred stock, $	207	-	-	-	-	-
Long term debt	16 095	15 482	15 525	16 254	20 539	18 699
Other non-current liabilities	-	-	-	-	8 136	7 813
Operating leases capitalization	1 580	2 873	2 740	2 640	2 447	2 333
Debt and debt equivalents	**21 617**	**23 174**	**22 317**	**25 752**	**37 215**	**34 463**
Operating deferred income taxes	1 018	418	850	1 006	1 360	1 553
Non-operating deferred income taxes	14 703	13 863	12 462	11 149	1 432	- 1 634
R&D Capitalization	33 867	41 592	45 900	49 478	52 033	54 010
Impairments of goodwill	-	2 441	705	200	765	1 222
Common stocks	1 781	1 788	1 788	1 788	1 788	1 788
Other paid-in capital	39 683	40 701	40 663	40 646	40 508	40 423
Retained earnings	42 900	37 682	40 088	41 094	40 752	47 711
Accumulated other comprehensive loss	- 2 767	- 3 216	- 3 132	- 4 682	- 2 197	- 4 323
Less treasury stock, at cost:	- 21 044	- 22 433	- 23 792	- 24 717	- 29 591	- 35 262
Noncontrolling interests	2 427	2 429	2 426	2 443	2 561	144
Equity and equity equivalents	**112 568**	**115 265**	**117 957**	**118 406**	**109 411**	**105 632**
Total funds invested	**134 185**	**138 439**	**140 274**	**144 158**	**146 626**	**140 095**

Appendix 6 Original and reformulated income statements for NVO and its competitors

NOVO NORDISK ORIGINAL INCOME STATEMENT

DKK million	2009	2010	2011	2012	2013	2014	
Net sales	**51 078**	**60 776**	**66 346**	**78 026**	**83 572**	**88 806**	**-**
Cost of goods sold	-10 438	-11 680	-12 589	-13 465	-14 140	-14 562	25
Gross profit	**40 640**	**49 096**	**53 757**	**64 561**	**69 432**	**74 244**	
Sales and distribution costs	-15 420	-18 195	-19 004	-21 544	-23 380	-23 223	26
Research and development costs	-7 864	-9 602	-9 628	-10 897	-11 733	-13 762	27
Administrative costs	-2 764	-3 065	-3 245	-3 312	-3 508	-3 537	28
Licence fees and other operating income, net	341	657	494	666	682	770	29
Operating profit	**14 933**	**18 891**	**22 374**	**29 474**	**31 493**	**34 492**	-
Share of profit/(loss) of associated companies, net of tax	-55	1 070					
Financial income	375	382	514	125	1 702	167	30
Financial expenses	-1 265	-2 057	-963	-1 788	-656	-563	31
Profit before income taxes	**13 988**	**18 286**	**21 925**	**27 811**	**32 539**	**34 096**	-
Income taxes	-3 220	-3 883	-4 828	-6 379	-7 355	-7 615	32
NET PROFIT FOR THE YEAR	**10 768**	**14 403**	**17 097**	**21 432**	**25 184**	**26 481**	**33**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

NOVO NORDISK REFORMULATED INCOME STATEMENT

Million DKK	2009	2010	2011	2012	2013	2014	
Net sales	**51 078**	**60 776**	**66 346**	**78 026**	**83 572**	**88 806**	-
Cost of goods sold, adjusted	-8 587	-9 848	-10 709	-11 475	-12 059	-12 316	25
Sales and distribution costs, adjusted	-15 377	-18 135	-18 909	-21 448	-23 302	-23 159	26
Research and development costs, adjusted	-7 336	-9 142	-8 995	-10 434	-11 267	-12 846	27
Administrative costs, adjusted	-2 635	-3 009	-3 187	-3 259	-3 449	-3 454	28
Licence fees and other operating income, net	341	716	565	757	797	896	29
Remove: Lease rental expense	615	933	1 059	1 100	1 175	1 310	35*
Remove: Research and development expenses	7 336	9 142	8 995	10 434	11 267	12 846	27
Remove: Operating provisions	1 622	1 368	1 309	1 697	637	3 099	24
Remove: Gain/Loss on sales of fixed assets	-3	71	-3	21	-1	1	39*
Pension adjustments	-207	-174	5	-282	-16	-263	17
Remove: Discontinuation of inflammatory disorders activities	-	-	-	-	-	120	40*
Adjusted EBITDA	**26 847**	**32 698**	**36 476**	**45 137**	**47 354**	**55 040**	-
Depreciation, as reported	-2 473	-2 387	-2 505	-2 501	-2 520	-2 869	37*
Remove: Depreciation of R&D	505	441	494	416	340	491	36*
Remove: Impairment of property, plant, and equipment - inflammatory disorder activities						85	37*
Add: Lease Depreciation	-410	-622	-706	-733	-783	-873	35*
Depreciation, adjusted	-2 378	-2 568	-2 717	-2 818	-2 963	-3 166	37*
Amortization of operating intangibles, as reported	-78	-80	-232	-192	-279	-566	38*
Remove: Amortization of R&D	23	19	139	47	126	425	36*
Remove: Impairment of intangible assets - inflammatory disorder activities						395	38*
Add: Amortization of R&D assets, capitalized	-3 951	-4 290	-4 775	-5 197	-5 721	-6 275	36*
Amortization of operating intangibles, adjusted	-4 006	-4 351	-4 868	-5 342	-5 874	-6 021	38*
Adjusted EBITA	**20 463**	**25 779**	**28 891**	**36 977**	**38 517**	**45 852**	-
Statutory domestic tax rate	25%	25%	25%	25%	25%	24,5%	32
Income tax at statutory domestic rate	4 138	5 117	6 010	7 819	8 126	9 400	32
Tax effect of foreign operations	364	512	721	657	650	729	32
Income tax at blended global rate	3 773	4 605	5 288	7 162	7 476	8 671	32
Income tax at blended global rate	43,6%	38,7%	36,5%	34,3%	35,5%	33,6%	
Increase (decrease) in operating deferred taxes	384	650	86	-311	500	996	3, 16
Operating cash tax	3 389	3 955	5 202	7 473	6 976	7 675	32
Operating cash tax rate	39,2%	33,3%	35,9%	35,8%	33,1%	29,7%	32
NOPLAT	**17 074**	**21 824**	**23 689**	**29 503**	**31 541**	**38 178**	41*
		27,8%	8,5%	24,5%	6,9%	21,0%	
Reconciliation with net income							
Net income	**10 768**	**14 403**	**17 097**	**21 432**	**25 184**	**26 481**	33
Pension expense	-207	-174	5	-282	-16	-263	17
Discontinuation of inflammatory disorder activities	-	-	-	-	-	120	40*
Impairment of property, plant, and equipment - inflammatory disorder activities	-	-	-	-	-	85	37*
Remove: Impairment of intangible assets - inflammatory disorder activities	-	-	-	-	-	395	38*
Lease interest	205	311	353	367	392	437	35*
Gain/Loss on sales of fixed assets	-3	71	-3	21	-1	1	39*
Operating provisions	1 622	1 368	1 309	1 697	637	3 099	24
Decrease (increase) in operating deferred taxes liability	384	650	86	-311	500	996	3, 16
Interest income	-313	-235	-274	-124	-56	-101	30
Other net financial expenses	874	340	448	1 729	-1 045	458	30, 31
Nonoperating taxes	-553	-722	-460	-783	-121	-1 056	32
R&D capitalization	3 913	5 312	4 853	5 700	6 012	7 487	36*
Adjusted net profit	**16 690**	**21 324**	**23 414**	**29 445**	**31 486**	**38 139**	-
Interest expense	384	500	275	58	55	39	31
NOPLAT	**17 074**	**21 824**	**23 689**	**29 503**	**31 541**	**38 178**	-

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

SANOFI ORIGINAL INCOME STATEMENT

(€ million)	2009	2010	2011	2012	2013	2014
Net sales	**29 785**	**32 367**	**33 389**	**34 947**	**32 951**	**33 770**
Other revenues	1 447	1 669	1 669	1 010	355	339
Cost of sales	- 8 107	- 9 398	- 10 902	- 11 098	- 10 991	- 11 029
Gross profit	**23 125**	**24 638**	**24 156**	**24 859**	**22 315**	**23 080**
Research and development expenses	- 4 626	- 4 547	- 4 811	- 4 905	- 4 770	- 4 824
Selling and general expenses	- 7 464	- 8 149	- 8 536	- 8 931	- 8 603	- 9 107
Other operating income	861	369	319	562	691	327
Other operating expenses	- 481	- 292	- 315	- 414	- 241	- 163
Amortization of intangible assets	- 3 528	- 3 529	- 3 314	- 3 291	- 2 914	- 2 482
Impairment of intangible assets	- 372	- 433	- 142	- 117	- 1 387	26
Fair value remeasurement of contingent consideration liabilities	-	-	15	- 192	314	- 303
Restructuring costs	- 1 080	- 1 384	- 1 314	- 1 141	- 300	- 411
Other gains and losses, and litigation	-	- 138	- 327	-	-	-
Operating income	**6 435**	**6 535**	**5 731**	**6 430**	**5 105**	**6 143**
Financial expenses	- 325	- 468	- 552	- 751	- 612	- 605
Financial income	27	106	140	93	109	193
Income before tax and associates and joint ventures	**6 137**	**6 173**	**5 319**	**5 772**	**4 602**	**5 731**
Income tax expense	- 1 399	- 1 430	- 455	- 1 108	- 763	- 1 171
Share of profit/(loss) of associates and joint ventures	953	978	1 070	393	35	- 51
Net income	**5 691**	**5 721**	**5 934**	**5 057**	**3 874**	**4 509**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

SANOFI REFORMULATED INCOME STATEMENT

(€ million)	2009	2010	2011	2012	2013	2014
Net sales	**29 785**	**32 367**	**33 389**	**34 947**	**32 951**	**33 770**
Cost of sales	- 8 107	- 9 398	- 10 902	- 11 098	- 10 991	- 11 029
Selling and general expenses	- 7 464	- 8 149	- 8 536	- 8 931	- 8 603	- 9 107
Research and development expenses	- 4 626	- 4 547	- 4 811	- 4 905	- 4 770	- 4 824
Remove: Lease rental expense	279	281	324	294	338	317
Add: Lease depreciation	- 186	- 187	- 216	- 196	- 225	- 211
Other operating income - licence fees	646	315	202	258	191	47
Other operating expenses	- 186	- 169	- 121	- 66	- 30	- 23
Remove: Reported pension expense	553	361	320	136	424	295
Add: Current and past pension service costs	- 234	- 254	- 269	- 221	- 238	-219
Amortization of intangible assets	- 3 528	- 3 529	- 3 314	- 3 291	- 2 914	- 2 482
Remove: amortization of goodwill	422	482	662	225	1 561	66
Amortization of operating intangible assets, adjusted	- 3 106	- 3 047	- 2 652	- 3 066	- 1 353	- 2 416
Remove: Researsh and development expenses	4 626	4 547	4 811	4 905	4 770	4 824
Add: amortization of R&D asset	- 3 430	- 3 550	- 3 649	- 3 766	- 3 880	- 3 969
EBITA adjusted	**8 550**	**8 570**	**7 890**	**8 291**	**8 584**	**7 455**
Statutory domestic tax rate	34,4%	34,4%	34,4%	34,4%	34,4%	34,4%
Income tax at statutory domestic rate	2 530	2 605	2 314	2 460	2 647	2 270
Tax effect of foreign operations	588	757	740	973	900	825
Income tax at blended global rate	1 941	1 848	1 574	1 488	1 746	1 445
Increase (decrease) in operating deferred taxes	- 205	- 387	- 156	- 401	251	- 332
Operating cash tax	2 146	2 235	1 730	1 889	1 495	1 777
Operating cash tax rate	29,2%	29,5%	25,7%	26,4%	19,4%	26,9%
NOPLAT	**6 403**	**6 335**	**6 159**	**6 403**	**7 089**	**5 678**
Reconciliation with net income						
Net income	**5 691**	**5 721**	**5 934**	**5 057**	**3 874**	**4 509**
Other revenues	- 1 447	- 1 669	- 1 669	- 1 010	- 355	- 339
Other non-operating income	- 215	- 54	- 117	- 304	- 500	- 280
Other operating expenses	295	123	194	348	211	140
Share of profit/(loss) of associates and joint ventures	- 953	- 978	- 1 070	- 393	- 35	51
Interest income	- 88	- 61	- 100	- 68	- 49	- 68
Other net financial expenses	76	38	87	309	186	119
Amortization of goodwill	422	482	662	225	1 561	66
Impairment of intangible assets	372	433	142	117	1 387	- 26
Fair value remeasurement of contingent consideration liabilities	-	-	- 15	192	- 314	303
Restructuring costs	1 080	1 384	1 314	1 141	300	411
Other gains and losses, and litigation	-	138	327	-	-	-
Lease interest	93	94	108	98	113	106
Decrease (increase) in operating deferred taxes	- 205	- 387	- 156	- 401	251	- 332
Non-opertaing taxes	- 542	- 418	- 1 119	- 380	- 983	- 274
Remove: Reported pension expense	553	361	320	136	424	295
Add: Current and past pension service costs	- 234	- 254	- 269	- 221	- 238	- 219
R&D capitalization	1 196	997	1 162	1 139	890	855
Adjusted net profit	**6 093**	**5 950**	**5 734**	**5 986**	**6 723**	**5 317**
Interest expense	310	385	425	417	366	361
NOPLAT	**6 403**	**6 335**	**6 159**	**6 403**	**7 089**	**5 678**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

ELI LILLY ORIGINAL INCOME STATEMENT

(Dollars in millions, except per-share data)	2009	2010	2011	2012	2013	2014
Revenue	**21 836**	**23 076**	**24 287**	**22 603**	**23 113**	**19 616**
Cost of sales	4 247	4 366	5 068	4 797	4 908	4 933
Research and development	4 327	4 884	5 021	5 278	5 531	4 734
Marketing, selling, and administrative	6 893	7 053	7 880	7 514	7 126	6 621
Acquired in-process research and development	90	50	388	-	57	200
Asset impairment, restructuring, and other specia	693	192	401	281	121	469
Other—net, (income) expense	230	5	179	- 674	- 519	- 341
	16 478	16 551	18 937	17 195	17 224	16 615
Income before income taxes	**5 358**	**6 525**	**5 350**	**5 408**	**5 889**	**3 000**
Income taxes	1 029	1 456	1 002	1 320	1 205	610
Net income	**4 329**	**5 070**	**4 348**	**4 089**	**4 685**	**2 391**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

ELI LILLY REFORMULATED INCOME STATEMENT

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Revenue	**21 836**	**23 076**	**24 287**	**22 603**	**23 113**	**19 616**
Cost of sales	- 4 247	- 4 366	- 5 068	- 4 797	- 4 908	- 4 933
Research and development	- 4 327	- 4 884	- 5 021	- 5 278	- 5 531	- 4 734
Marketing, selling, and administrative	- 6 893	- 7 053	- 7 880	- 7 514	- 7 126	- 6 621
Add: Inventory FIFO adjustments	- 141	- 185	- 200	- 157	- 147	- 125
Remove: Lease rental expense	338	339	267	262	227	227
Add: Lease depreciation	- 225	- 226	- 178	- 175	- 151	- 152
Remove: R&D expenses	4 327	4 884	5 021	5 278	5 531	4 734
Add: R&D amortization	- 3 023	- 3 154	- 3 327	- 3 496	- 3 674	- 3 860
Remove: Special chargers - non-operating	- 693	- 192	- 401	- 281	- 121	- 400
Remove: Impairment of goodwill and acquired intangibles	- 277	- 386	- 469	- 563	- 555	- 536
Remove: Pension expenses	1 437	617	1 296	1 262	- 1 028	1 832
Add: Pension past and current services	- 296	- 276	- 309	- 316	- 535	- 274
EBITA adjusted	**7 816**	**8 195**	**8 019**	**6 829**	**5 336**	**4 776**
Statutory domestic tax rate	3%	15%	5%	14%	12%	3%
Income tax at statutory domestic rate	215	988	327	699	401	109
Tax effect of foreign operations	1 036	454	857	532	310	685
Income tax at blended global rate	820	533	529	167	91	576
Increase (decrease) in operating deferred taxes	26 -	212	318	99 -	250	175
Operating cash tax	795	745	212	68	342	401
Operating cash tax rate	12,2%	11,5%	3,3%	1,3%	9,8%	10,3%
NOPLAT	**7 021**	**7 449**	**7 807**	**6 761**	**4 994**	**4 374**
Reconciliation with net income						
Net Income	**4 329**	**5 070**	**4 348**	**4 089**	**4 685**	**2 391**
Acquired in-process research and development	90	50	388	-	57	200
Asset impairment, restructuring, and other special charges	693	192	401	281	121	469
Other—net, (income) expense	154 -	47 -	7 -	852 -	679 -	489
Inventory FIFO adjustments	- 141	- 185	- 200	- 157	- 147	- 125
Lease interest	113	113	89	87	76	76
R&D capitalization	1 303	1 731	1 694	1 782	1 857	874
Non-operating taxes	209	922	472	1 153	1 113	34
Special chargers	- 693	- 192	- 401	- 281	- 121	- 400
Impairmenet of goodwill and acquired intangibles	- 277	- 386	- 469	- 563	- 555	- 536
Decrease (increase) in operating deferred taxes	26 -	212	318	99 -	250	175
Pension adjustments	1 141	341	988	945 -	1 563	1 558
Adjusted net profit	**6 946**	**7 397**	**7 621**	**6 583**	**4 834**	**4 226**
Interest expense	75	52	186	178	160	149
NOPLAT	**7 021**	**7 449**	**7 807**	**6 761**	**4 994**	**4 374**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

MERCK ORIGINAL INCOME STATEMENT

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Sales	**27 428**	**45 987**	**48 047**	**47 267**	**44 033**	**42 237**
Materials and production	9 019	18 396	16 871	16 446	16 954	16 768
Marketing and administrative	8 543	13 125	13 733	12 776	11 911	11 606
Research and development	5 845	11 111	8 467	8 168	7 503	7 180
Restructuring costs	1 634	985	1 306	664	1 709	1 013
Equity income from affiliates	- 2 235	- 587	- 610	- 642	- 404	- 257
Other (income) expense, net	- 10 668	1 304	946	1 116	815	- 11 356
	12 138	**44 334**	**40 713**	**38 528**	**38 488**	**24 954**
Income Before Taxes	15 290	1 653	7 334	8 739	5 545	17 283
Taxes on income	2 268	671	942	2 440	1 028	5 349
Net Income	**13 022**	**982**	**6 392**	**6 299**	**4 517**	**11 934**

Appendix 6 Original and reformulated income statements for NVO and its competitors (Cont.)

MERCK REFORMULATED INCOME STATEMENT

($ in millions except per share amounts)	2009	2010	2011	2012	2013	2014
Sales	**27 428**	**45 987**	**48 047**	**47 267**	**44 033**	**42 237**
Materials and production	- 9 019	- 18 396	- 16 871	- 16 446	- 16 954	- 16 768
Marketing and administrative	- 8 543	- 13 125	- 13 733	- 12 776	- 11 911	- 11 606
Research and development	- 5 845	- 11 111	- 8 467	- 8 168	- 7 503	- 7 180
Add: Inventory FIFO adjustments	- 1 495	- 146	- 1 098	- 1 109	- 1 495	- 1 690
Remove: Vioxx and other legal defence costs	110	5 096	240	308	160	215
Remove: Reported pension expense	6 910	926	222	3 351	- 964	1 900
Add: Current and past pension service costs	472	692	729	637	- 784	- 644
Remove: Lease rental expense	237	431	411	396	367	350
Add: Lease depreciation	- 158	- 287	- 274	- 264	- 245	- 233
Remove: R&D expenses	5 845	11 111	8 467	8 168	7 503	7 180
Add: amortization of R&D assets	- 3 114	- 3 387	- 4 159	- 4 590	- 4 948	- 5 203
Remove: impairment of goodwill	-	2 441	705	200	765	1 222
EBITA adjusted	**12 828**	**20 232**	**14 219**	**16 973**	**8 025**	**9 779**
Statutory domestic tax rate	35%	35%	35%	35%	35%	35%
Income tax at statutory domestic rate	3 534	4 378	3 469	4 688	1 914	2 731
Tax effect of foreign operations	808	14 208	3 003	3 000	1 296	671
Income tax at blended global rate	2 726	9 831	466	1 688	618	2 060
Increase (decrease) in operating deferred ta	107	- 600	432	156	354	193
Operating cash tax	2 619	10 431	34	1 531	264	1 867
Operating cash tax rate	25,9%	83,4%	0,3%	11,4%	4,8%	23,9%
NOPLAT	**10 209**	**9 801**	**14 186**	**15 442**	**7 760**	**7 912**
Reconciliation with net income						
Net Income	**13 022**	**982**	**6 392**	**6 299**	**4 517**	**11 934**
Restructuring costs	1 634	985	1 306	664	1 709	1 013
Equity income from affiliates	- 2 235	- 587	- 610	- 642	- 404	- 257
Other (income) expense, net	- 11 128	589	251	402	14	- 12 088
Vioxx and other legal defence costs	110	5 096	240	308	160	215
Reported pension expense	6 910	926	222	3 351	- 964	1 900
Current and past pension service costs	472	692	729	637	- 784	- 644
Decrease (increase) in operating defreed tax	107	- 600	432	156	354	193
Non-operating taxes	- 458	- 9 160	476	752	410	3 289
Impairment of goodwill	-	2 441	705	200	765	1 222
Inventory FIFO adjustments	- 1 495	- 146	- 1 098	- 1 109	- 1 495	- 1 690
Lease interest	79	144	137	132	122	117
R&D capitalization	2 731	7 724	4 308	3 578	2 555	1 977
Adjusted net profit	**9 749**	**9 086**	**13 491**	**14 728**	**6 959**	**7 180**
Interest expense	460	715	695	714	801	732
NOPLAT	**10 209**	**9 801**	**14 186**	**15 442**	**7 760**	**7 912**

Appendix 7 NVO's historical free cash flow calculated

DKK million	2010	2011	2012	2013	2014	
NOPLAT	**21 824**	**23 689**	**29 503**	**31 541**	**38 178**	41*
Add: Depreciation, adjusted (without lease depreciation)	1 946	2 011	2 085	2 180	2 293	35*, 37*
Add: Amortization of operating intangibles, adjusted	4 351	4 868	5 342	5 874	6 021	38*
Other non-cash itens: Operating provisions	1 368	1 309	1 697	637	3 099	24
Gross cash flow	**29 489**	**31 877**	**38 627**	**40 232**	**49 591**	-
Change in operating working capital	(2 142)	(1 299)	(789)	161	(1 607)	43*
Net capital expenditures	4 331	3 265	3 577	3 579	3 449	1, 2, 37*, 38*
Investment in capitalized operating leases	2 120	840	273	500	900	35*
Investment in R&D	9 142	8 995	10 434	11 267	12 846	36*
Change in net long-term operating assets	(101)	1	(1)	295	114	4, 19
Increase (decrease) in foreign-currency translation reserve	(864)	342	(1 286)	756	530	34
Gross investment	**12 486**	**12 144**	**12 208**	**16 558**	**16 232**	-
FREE CASH FLOW	**17 003**	**19 732**	**26 419**	**23 674**	**33 359**	-
Reconciliation						
Interest income	235	274	124	56	101	30
Gain/loss from discontinued operations	-	-	-	-	(600)	40*
Gain/Loss on sales of fixed assets	71	(3)	21	(1)	1	39*
Other net financial expenses	(340)	(448)	(1 729)	1 045	(458)	30, 31
Non-operating taxes	722	460	783	121	1 056	32
Interest receivable	97	113	87	75	26	8
Change in cash at bank and on hand - excess cash	527	1 280	(2 089)	(936)	3 563	11
Change in marketable securities	2 913	168	458	(811)	(2 232)	9
Change in other financial NO-CURRENT assets - non-operating	40	(25)	(44)	28	191	4
Change in net derivatives financial instruments	(1 412)	(394)	2 327	638	(4 098)	10, 23
Change in tax loss carry-forwards	69	(26)	(21)	(12)	(22)	3
Change in retirement benefit obligations - assets	78	(5)	(51)	(22)	33	17
Non-operating cash flow	**3 000**	**1 394**	**-133**	**181**	**-2 439**	-
Cash flow available to investors	**20 003**	**21 126**	**26 286**	**23 855**	**30 920**	-
Interest expense	500	275	58	55	39	31
Lease interest	311	353	367	392	437	35*
Change in capitalized operating lease	(157)	180	628	951	1 098	35*
Change current debt - bank overdrafts	167	213	353	285	(505)	19
Change provisions - current liabilities - others	35	(13)	19	17	181	24
Change provisions - non-current liabilities	866	301	(417)	276	(142)	18
Change retirement benefit obligations - liabilities	254	(208)	169	(313)	419	17
Change in operating provisons						
Flow to (from) debt holders	**1 976**	**1 101**	**1 176**	**1 662**	**1 526**	
Dividends paid	4 400	5 700	7 742	9 715	11 866	44*
Change in deferred tax - non-operating	-182	166	2 636	1 559	859	3, 16
Change in share capital	-20	-20	-20	-10	-20	12
Change in treasury shares	4	4	7	-4	10	13
Change in retained earnings	1 662	1 014	1 890	2 136	140	14
Change in other reserves, adjusted	3 343	2 566	958	-5 127	1 872	15
Purchase of treasury shares, net	8 820	10 595	11 896	13 924	14 667	45*
Flow to (from) equity holders	**18 027**	**20 025**	**25 109**	**22 193**	**29 394**	-
Cash flow available to investors	**20 003**	**21 126**	**26 286**	**23 855**	**30 920**	-

Appendix 8 Lease capitalization

The capitalization of operating lease was undertaken for Novo Nordisk, Sanofi, Eli Lilly, and Merck, by applying Koller et al, (2010) framework, extracted from Chapter 27 of their book 'Measuring and managing the value of companies', and reproduced below:

1) The value of capitalized operating leases is added to book assets to long-term debt. The corresponding adjustments increase both sources and uses of invested capital.
2) Implicit lease interest expense is removed from operating profits. The value of implicit interest expense was found by multiplying the value of operating leases by the cost of secured debt (Koller et al., 2010). The remaining rental expense is renamed lease depreciation. Since depreciation is not related to capital structure, it remains as an operating expense.
3) To calculate free cash flows, lease depreciation is not added back to NOPLAT to compute gross cash flow. This is done because although depreciation is a noncash charge for the lessor, it is a cash charge for the lessee.

The value of the leased assets was estimated as none of the companies analysed provide this information in their annual reports. To compute the value of leased assets, the equation below was applied.

$$Asset\ value_{t-1} = \frac{Rental\ expense_t}{k_d + \frac{1}{Asset\ life}}$$

Where:

- Rental expenses used are the ones provided by all the four companies in their annual reports;
- The cost of debt, k_d, was estimated by using the AA-rated yield of 5%, proposed by Koller at al., (2010). Operating lease is usually less risky than the company's unsecured debt, as they are directly linked to an underlying asset. Thus, using the cost of a secured debt as a proxy to the cost of operating lease can be applied.

Example: Computing NVO capitalized operating lease in 2014

Considering rental expense reported as 1.310 million DKK, $k_d$of 5%, and asset life as 10 years, the capitalized operating lease estimated for in 2014 is 8.733 million DKK. In order to adjust invested capital, the amount estimated is added to book assets and to long-term debt in the reorganized balance sheet in Appendix 5. NOPLAT is adjusted by excluding rental expenses from EBITDA, and adjusting depreciation to lease capitalized in order to compute NOPLAT as shown in Appendix 6.

Appendix 9 R&D Capitalization

According to Koller et al. (2010), the benefits of capitalizing R&D expenses are: 1) to represent historical investment more accurately; 2) to prevent manipulation of short-term earnings; and 3) to improve performance assessments of long-term investments.

The process for capitalizing R&D expenses in order to estimate ROIC is based on Koller et al. (2010) work, and consists of three steps:

1) Build and amortize the R&D asset. Using an appropriate asset life;
2) Adjust invested capital upward by the historical cost of the R&D asset;
3) Adjust NOPLAT by replacing R&D expenses with R&D amortization. However, since R&D expense is tax deductible, operating taxes should not be adjusted.

Appendixes 5, 6 and 7, show how the adjustments were computed in the reorganized financial reports for NVO and its competitors. The computation of capitalized R&D assets is summarized below.

NOVO NORDISK

	1994	2004	2014	2015	2016	2017	2018	2019	2020	2024	2030	2031 *
R&D intangible start	-	-20 892	-62 752	-69 323	-76 109	-82 944	-89 746	-96 383	-103 117	-129 564	-165 042	-170 362
R&D expense	-531	-5 531	-12 846	-13 719	-14 445	-15 096	-15 612	-16 373	-17 068	-19 281	-21 825	-22 213
Amortization**	-	-2 089	-6 275	-6 932	-7 611	-8 294	-8 975	-9 638	-10 312	-12 956	-16 504	-17 036
R&D intangible end	-531	-24 334	-69 323	-76 109	-82 944	-89 746	-96 383	-103 117	-109 873	-135 889	-170 362	-175 539

* Estimates include forecast period from 2015-2031.

**A 10 year-life is used to compute R&D amortization.

SANOFI

	1994	2004	2009	2010	2011	2012	2013	2014
R&D intangible start	-	26 982	34 301	35 497	36 494	37 656	38 795	39 686
R&D expense	3 875	4 375	4 626	4 547	4 811	4 905	4 770	4 824
Amortization	-	2 698	3 430	3 550	3 649	3 766	3 880	3 969
R&D intangible end	3 875	28 659	35 497	36 494	37 656	38 795	39 686	40 541

ELI LILLY

	1994	2004	2009	2010	2011	2012	2013	2014
R&D intangible start	-	22 839	30 232	31 536	33 266	34 960	36 742	38 600
R&D expense	3 052	3 902	4 327	4 884	5 021	5 278	5 531	4 734
Amortization	-	2 284	3 023	3 154	3 327	3 496	3 674	3 860
R&D intangible end	3 052	24 456	31 536	33 266	34 960	36 742	38 600	39 473

MERCK

	1994	2004	2009	2010	2011	2012	2013	2014
R&D intangible start	-	11 512	31 136	33 867	41 592	45 900	49 478	52 033
R&D expense		3 221	5 845	11 111	8 467	8 168	7 503	7 180
Amortization			3 114	3 387	4 159	4 590	4 948	5 203
R&D intangible end	-	14 733	33 867	41 592	45 900	49 478	52 033	54 010

Appendix 10 Inventory conversion from LIFO to FIFO

I used Subramanyam's (2009) work to adjust ELI LILLY and MERCK inventories from LIFO to FIFO. The conversion process consists of three steps:

1) Inventories should equal reported LIFO inventory plus LIFO reserve
2) Increase deferred tax payable by LIFO reserve multiplied by tax rate
3) Retained earnings should equal reported retained earnings plus LIFO reserve multiplied by one minus tax rate.

The inventory adjustments are presented below:

ELI LILLY

BALANCE SHEET REFORMULATED	2009	2010	2011	2012	2013	2014
ASSETS						
LIFO Inventories	2 850	2 518	2 300	2 644	2 929	2 740
LIFO reserve	146	218	211	183	167	128
FIFO Inventories	**2 996**	**2 736**	**2 510**	**2 826**	**3 095**	**2 868**
Total funds invested adjusted	**110 488**	**117 111**	**121 079**	**126 882**	**131 077**	**126 101**
EQUITY AND LIABILITY						
Operating deferred income taxes	888	647	988	1 072	828	1 018
LIFO income tax	5	33	11	25	19	4
Deferred income taxes, adjusted	**893**	**681**	**999**	**1 097**	**847**	**1 022**
Retained earnings	9 830	12 733	14 898	16 088	16 992	16 483
LIFO reserve after tax	141	185	200	157	147	125
Retained earnings, adjusted	**9 972**	**12 917**	**15 097**	**16 245**	**17 140**	**16 608**
Total funds invested adjusted	**110 488**	**117 111**	**121 079**	**126 882**	**131 077**	**126 101**

INCOME STATEMENT REFORMULATED	2009	2010	2011	2012	2013	2014
Materials and production	- 4 247	- 4 366	- 5 068	- 4 797	- 4 908	- 4 933
Change in retained earnings	- 141	- 185	- 200	- 157	- 147	- 125
Materials and production, adjusted	**- 4 388**	**- 4 551**	**- 5 268**	**- 4 954**	**- 5 055**	**- 5 057**
Net Income	4 329	5 070	4 348	4 089	4 685	2 391
LIFO reverse, after tax	- 141	- 185	- 200	- 157	- 147	- 125
Net Income, adjusted	**4 187**	**4 885**	**4 148**	**3 931**	**4 537**	**2 266**

Appendix 10 Inventory conversion from LIFO to FIFO (Cont.)

MERCK

BALANCE SHEET REFORMULATED	2009	2010	2011	2012	2013	2014
ASSETS						
LIFO Inventories	8 048	5 868	6 254	6 535	6 226	5 571
LIFO reserve	2 300	225	1 689	1 707	2 300	2 600
FIFO Inventories	**10 348**	**6 093**	**7 943**	**8 242**	**8 526**	**8 171**
Total funds invested adjusted	**134 185**	**138 439**	**140 274**	**144 158**	**146 626**	**140 095**
EQUITY AND LIABILITY						
Operating deferred income taxes	213	339	259	409	555	643
LIFO income tax	805	79	591	597	805	910
Deferred income taxes, adjusted	**1 018**	**418**	**850**	**1 006**	**1 360**	**1 553**
Retained earnings	41 405	37 536	38 990	39 985	39 257	46 021
LIFO reserve after tax	1 495	146	1 098	1 109	1 495	1 690
Retained earnings, adjusted	**42 900**	**37 682**	**40 088**	**41 094**	**40 752**	**47 711**
Total funds invested adjusted	**134 185**	**138 439**	**140 274**	**144 158**	**146 626**	**140 095**

INCOME STATEMENT REFORMULATED	2009	2010	2011	2012	2013	2014
Materials and production	- 9 019	- 18 396	- 16 871	- 16 446	- 16 954	- 16 768
Change in retained earnings	- 1 495	- 146	- 1 098	- 1 109	- 1 495	- 1 690
Materials and production, adjusted	**- 10 514**	**- 18 542**	**- 17 969**	**- 17 555**	**- 18 449**	**- 18 458**
Net Income	13 022	982	6 392	6 299	4 517	11 934
LIFO reverse, after tax	- 1 495	- 146	- 1 098	- 1 109	- 1 495	- 1 690
Net Income, adjusted	**11 527**	**836**	**5 294**	**5 190**	**3 022**	**10 244**

Appendix 11 Historical performance ratios

Operating ratios	**2010**	**2011**	**2012**	**2013**	**2014**
Adjusted EBITA/revenues					
NVO	42,4	43,5	47,4	46,1	51,6
SANOFI	34,7	23,6	23,7	26,1	22,1
ELI LILLY	45,4	33,0	30,2	23,1	24,3
MERCK	44,0	29,6	35,9	18,2	23,2
R&D expenses/revenues					
NVO	15,0	13,6	13,4	13,5	14,5
SANOFI	14,0	14,4	14,0	14,5	14,3
ELI LILLY	21,2	20,7	23,4	23,9	24,1
MERCK	24,2	17,6	17,3	17,0	17,0
Selling and general expenses/revenues					
NVO	34,8	33,3	31,7	32,0	30,0
SANOFI	25,2	25,6	25,6	26,1	27,0
ELI LILLY	30,6	32,4	33,2	30,8	33,8
MERCK	28,5	28,6	27,0	27,1	27,5
Cost of good sold/revenues					
NVO	16,2	16,1	14,7	14,4	13,9
SANOFI	29,0	32,7	31,8	33,4	32,7
ELI LILLY	18,9	20,9	21,2	21,2	25,1
MERCK	40,0	35,1	34,8	38,5	39,7

Return on investe capital (average)	**2010**	**2011**	**2012**	**2013**	**2014**
Operating tangible assets/revenues					
NVO	44,1	42,3	37,1	36,0	36,3
SANOFI	31,0	38,7	35,9	37,7	37,0
ELI LILLY	44,2	39,3	42,1	41,1	48,3
MERCK	43,4	39,6	39,5	39,6	36,6
Operating intangible assets/revenues					
NVO	81,0	80,6	75,2	77,0	79,2
SANOFI	151,3	183,6	168,8	167,2	163,1
ELI LILLY	151,2	154,2	173,8	176,6	213,6
MERCK	176,2	166,9	166,2	172,2	176,1
Operating working capital/revenues					
NVO	9,3	6,6	4,6	4,5	2,4
SANOFI	20,8	23,8	20,5	22,4	21,1
ELI LILLY	16,0	11,0	10,1	12,5	11,0
MERCK	238,5	227,8	230,2	242,6	229,9
Revenue/Invested capital (times)					
NVO	0,8	0,8	0,9	0,9	0,9
SANOFI	0,5	0,5	0,4	0,4	0,5
ELI LILLY	0,5	0,5	0,4	0,4	0,4
MERCK	0,4	0,4	0,4	0,4	0,4
Pretax ROIC					
NVO	32,9	34,5	41,7	40,7	45,2
SANOFI	0,3	0,3	0,3	0,2	0,3
ELI LILLY	17,0	16,3	13,6	10,2	9,0
MERCK	18,2	13,0	15,6	7,4	9,6
After tax ROIC					
NVO	27,8	28,3	33,3	33,3	37,6
SANOFI	10,0	8,6	8,2	9,5	7,8
ELI LILLY	15,4	15,9	13,4	9,6	8,2
MERCK	8,8	12,9	14,2	7,2	7,8

Appendix 11 Historical performance ratios (Cont.)

Growth rates	**2010**	**2011**	**2012**	**2013**	**2014**
After tax ROIC					
NVO		1,6	17,8	-0,0	13,0
SANOFI		-14,0	-4,6	16,2	-17,6
ELI LILLY		2,7	-15,4	-28,6	-14,4
MERCK		46,5	9,3	-49,1	7,8
Revenue growth rate					
NVO	19,0	9,2	17,6	7,1	6,3
SANOFI	8,7	3,2	4,7	-5,7	2,5
ELI LILLY	5,7	5,2	-6,9	2,3	-15,1
MERCK	67,7	4,5	-1,6	-6,8	-4,1
Organic revenue growth rate					
NVO	13,0	11,2	11,6	10,1	8,3
SANOFI	0,7	3,2	6,7	-0,7	-4,5
ELI LILLY	5,7	5,2	-6,9	2,3	-10,1
MERCK	67,7	4,5	-1,6	-6,8	-4,1
Currency effects on revenue growth					
NVO	6,00	-2,00	6,00	-3,00	-2,00
SANOFI	8,00	-	-2,00	-5,00	7,00
ELI LILLY	-	-	-	-	-5,00
MERCK	-	-	-	-	-
Adjusted EBITA growth rate					
NVO	26,0	12,1	28,0	4,2	19,0
SANOFI	0,2	-7,9	5,1	3,5	-13,2
ELI LILLY	4,8	-2,1	-14,8	-21,9	-10,5
MERCK	57,7	-29,7	19,4	-52,7	21,9
NOPLAT growth rate					
NVO	27,8	8,5	24,5	6,9	21,0
SANOFI	-1,1	-2,8	4,0	10,7	-19,9
ELI LILLY	6,1	4,8	-13,4	-26,1	-12,4
MERCK	-4,0	44,7	8,9	-49,7	2,0
Invested capital growth rate					
NVO	8,5	5,2	6,2	7,6	6,6
SANOFI	0,7	25,3	-4,1	-5,3	-0,0
ELI LILLY	2,2	1,8	2,8	4,1	0,6
MERCK	-2,2	-0,2	-0,6	-1,8	-9,1
Net income growth rate					
NVO	33,8	18,7	25,4	17,5	5,2
SANOFI	0,5	3,7	-14,8	-23,4	16,4
ELI LILLY	17,1	-14,2	-6,0	14,6	-49,0
MERCK	-92,5	550,9	-1,5	-28,3	164,2

Appendix 12 Forecast of NVO's revenues from 2015 to 2031

	HISTORICAL						FORECAST														
	2009	2010	2011	2012	2013	2014	2015F	2016F	2017F	2018F	2019F	2020F	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031T
DIABETES MARKET																							
World population with diabetes (million)	**342**	**352**	**361**	**370**	**380**	**390**	**400**	**410**	**421**	**432**	**443**	**454**	**466**	**478**	**490**	**502**	**515**	**526**	**536**	**547**	**558**	**563**	**569**
Diabetic patient undergoing treatment	86	88	90	93	95	98	100	117	120	144	148	151	166	171	175	179	184	210	238	243	319	376	379
Diabetic patient not undergoing treatment	257	264	271	278	285	293	300	293	301	288	295	303	299	307	315	323	331	315	298	304	239	188	190
Global Market Growth - Diabetes (DKK million)	**155 980**	**182 681**	**206 170**	**272 160**	**297 555**	**348 450**	**390 264**	**433 193**	**476 512**	**522 972**	**572 654**	**624 193**	**674 129**	**726 374**	**780 852**	**835 512**	**889 820**	**943 209**	**990 369**	**1 029 984**	**1 066 034**	**1 098 015**	**1 130 955**
Growth		17%	13%	32%	9%	17%	12%	11%	10%	10%	10%	9%	8%	8%	7%	7%	6%	6%	5%	4%	3%	3%	3%
NVO	29,4%	31,2%	31,1%	29,8%	30,5%	29,8%	29,5%	29,0%	28,5%	28,0%	27,5%	27,0%	26,3%	25,5%	24,8%	24,0%	23,3%	22,5%	21,8%	21,3%	20,5%	19,6%	19,1%
SANOFI	28,0%	29,0%	27,0%	26,0%	24,0%	23,0%	21,0%	20,0%	17,0%	16,0%	15,0%	14,2%	13,7%	13,2%	13,2%	12,5%	12,0%	11,8%	11,6%	11,4%	10,9%	10,4%	10%
ELI LILLY	9,0%	10,0%	9,0%	8,0%	9,0%	11,0%	11,0%	11,5%	12,0%	12,5%	13,0%	12,6%	13,1%	13,6%	14,1%	13,6%	13,1%	12,6%	12,6%	13,1%	13,0%	12,9%	13%
MERCK	10,0%	12,0%	11,0%	13,0%	14,0%	14,5%	13,5%	13,5%	13,0%	13,0%	13,0%	13,4%	13,9%	14,4%	13,9%	13,4%	13,9%	13,9%	13,8%	13,7%	13,6%	13,1%	13%
OTHERS	23,6%	17,8%	21,9%	23,2%	22,5%	21,7%	25,0%	26,0%	29,5%	30,5%	31,5%	32,8%	33,1%	33,3%	34,1%	36,5%	37,8%	39,2%	40,3%	40,6%	42,0%	44,0%	45%
BIOPHARMACEUTICAL MARKET																							
Global Market Growth - Haemophilia (DKK million)	**61 282**	**72 140**	**74 084**	**89 152**	**93 461**	**95 882**	**99 238**	**102 711**	**106 306**	**110 027**	**113 878**	**117 863**	**121 989**	**126 258**	**130 677**	**135 251**	**139 985**	**144 884**	**149 955**	**155 204**	**160 636**	**166 258**	**172 077**
Global Market Growth - GHormone (DKK million)	**10 024**	**11 689**	**11 892**	**14 176**	**14 722**	**14 961**	**15 335**	**15 718**	**16 111**	**16 514**	**16 927**	**17 350**	**17 784**	**18 229**	**18 684**	**19 151**	**19 630**	**20 121**	**20 624**	**21 140**	**21 668**	**22 210**	**22 765**
Growth		18%	3%	20%	5%	2%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%
NVO - Haemophilia	23%	22%	23%	21%	22%	24%	24%	24%	24%	23%	23%	22%	22%	21%	21%	20%	20%	19%	19%	18%	18%	17%	17%
NVO - Ghormone	25%	25%	27%	29%	31%	33%	33%	33%	33%	32%	32%	32%	31%	31%	30%	30%	29%	29%	28%	27%	27%	26%	25%
NVO REVENUE DEVELOPMENTS																							
DIABETES GROSS SALES (estimated)	**45 859**	**57 018**	**64 136**	**81 115**	**90 781**	**103 892**	**115 128**	**125 626**	**135 806**	**146 432**	**157 480**	**168 532**	**176 959**	**185 225**	**193 261**	**200 523**	**206 883**	**212 222**	**215 405**	**218 872**	**218 537**	**214 881**	**215 673**
BIOPHARMACEUTICS GROSS SALES (estimated)	**16 601**	**18 793**	**20 250**	**22 833**	**25 125**	**27 949**	**28 878**	**29 542**	**30 218**	**30 907**	**31 609**	**31 934**	**32 246**	**32 543**	**32 824**	**33 086**	**33 329**	**33 510**	**33 666**	**33 796**	**33 897**	**34 465**	**35 035**
Gross sales	**62 459**	**75 811**	**84 386**	**103 948**	**115 906**	**131 841**	**144 005**	**155 168**	**166 024**	**177 339**	**189 089**	**200 467**	**209 205**	**217 769**	**226 084**	**233 609**	**240 212**	**245 732**	**249 072**	**252 668**	**252 434**	**249 347**	**250 709**
US rebates, discounts and sales returns	8 719	12 155	14 215	22 725	28 544	38 930	41 791	46 456	51 181	56 919	61 482	65 980	67 951	68 828	67 484	70 221	72 458	68 828	69 197	69 703	62 540	59 083	58 290
Non-US rebates, discounts and sales returns	2 662	2 880	3 825	3 197	3 790	4 105	7 375	8 849	10 483	12 494	14 422	16 495	19 166	22 943	28 922	30 095	31 053	37 061	37 260	37 533	41 694	39 388	38 860
Total rebates, discounts, and sales returns	11 381	15 035	18 040	25 922	32 334	43 035	49 166	55 304	61 664	69 413	75 903	82 475	87 116	91 771	96 406	100 315	103 511	105 890	106 457	107 236	104 234	98 471	97 150
Share	18,2%	19,8%	21,4%	24,9%	27,9%	32,6%	34,1%	35,6%	37,1%	39,1%	40,1%	41,1%	41,6%	42,1%	42,6%	42,9%	43,1%	43,1%	42,7%	42,4%	41,3%	39,5%	38,8%
Growth		8,8%	7,8%	16,7%	11,9%	17,0%	4,6%	4,4%	4,2%	5,4%	2,6%	2,5%	1,2%	1,2%	1,2%	0,7%	0,3%	0,0%	-0,8%	-0,7%	-2,7%	-4,4%	-1,9%
Net sales	**51 078**	**60 776**	**66 346**	**78 026**	**83 572**	**88 806**	**94 840**	**99 863**	**104 360**	**107 926**	**113 185**	**117 991**	**122 089**	**125 997**	**129 678**	**133 293**	**136 701**	**139 842**	**142 615**	**145 431**	**148 200**	**150 876**	**153 559**
Organic volume growth		19,0%	9,2%	17,6%	7,1%	6,3%	3,7%	3,2%	2,9%	2,4%	3,4%	3,0%	2,4%	2,4%	2,2%	2,1%	1,9%	1,6%	1,3%	1,2%	1,0%	1,0%	1,0%
Price increase and mix change							3,1%	2,1%	1,6%	1,0%	1,5%	1,3%	1,0%	0,8%	0,7%	0,7%	0,6%	0,7%	0,7%	0,8%	0,9%	0,8%	0,8%
Organic Revenue Growth	10,6%	13,0%	11,2%	11,6%	10,1%	8,3%	**6,8%**	**5,3%**	**4,5%**	**3,4%**	**4,9%**	**4,2%**	**3,5%**	**3,2%**	**2,9%**	**2,8%**	**2,6%**	**2,3%**	**2,0%**	**2,0%**	**1,9%**	**1,8%**	**1,8%**

Appendix 12 Forecast of NVO's revenues from 2015 to 2031 (Cont.)

	HISTORICAL						FORECAST															
	2009	2010	2011	2012	2013	2014	2015F	2016F	2017F	2018F	2019F	2020F	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031T
NVO REVENUE DEVELOPMENTS																							
% of revenue																							
By business segment:																							
New-generation insulin	0,0%	0,0%	0,0%	0,0%	0,2%	0,7%	1,4%	4,1%	5,9%	6,5%	7,3%	8,5%	10,6%	12,4%	14,5%	18,0%	21,5%	22,5%	22,6%	24,0%	24,7%	25,0%	25,0%
Modern insulin	45,9%	47,4%	46,8%	47,8%	48,5%	49,4%	48,8%	48,5%	47,3%	46,8%	45,9%	44,9%	43,6%	42,7%	41,4%	38,4%	35,0%	34,4%	34,3%	33,6%	33,3%	33,0%	33,0%
Human insulin	22,2%	19,5%	16,3%	14,5%	13,0%	11,6%	10,5%	9,2%	8,7%	8,3%	8,0%	7,5%	6,5%	5,8%	5,1%	4,6%	3,5%	3,0%	2,5%	1,5%	1,0%	0,5%	0,5%
Victoza®	0,2%	3,8%	9,0%	12,2%	13,9%	15,1%	15,5%	16,4%	16,5%	16,9%	17,5%	17,9%	18,6%	18,6%	18,7%	19,4%	20,5%	20,6%	21,6%	22,2%	22,8%	23,5%	23,5%
Oral antidiabetic products (OAD)	5,2%	4,5%	3,9%	3,5%	2,7%	1,9%	1,7%	1,6%	1,5%	1,3%	1,2%	1,2%	1,1%	0,9%	0,9%	0,6%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%
Diabetes care total	73,4%	75,2%	76,0%	78,0%	78,3%	78,8%	77,9%	79,8%	79,9%	79,8%	79,9%	80,0%	80,4%	80,4%	80,6%	81,0%	81,0%	81,0%	81,5%	81,8%	82,3%	82,5%	82,5%
NovoSeven®	13,8%	13,2%	12,6%	11,4%	11,1%	10,3%	10,0%	9,8%	9,8%	9,9%	9,8%	9,7%	9,7%	9,8%	9,8%	9,6%	9,5%	9,5%	9,3%	9,2%	9,0%	9,0%	9,0%
Norditropin®	8,6%	7,9%	7,6%	7,3%	7,3%	7,3%	7,1%	7,1%	7,1%	7,2%	7,2%	7,2%	7,1%	7,2%	7,0%	6,8%	7,0%	7,0%	6,7%	6,5%	6,5%	6,5%	6,5%
Other biopharmaceuticals	4,1%	3,7%	3,8%	3,2%	3,3%	3,6%	3,3%	3,3%	3,2%	3,1%	3,1%	3,1%	2,8%	2,6%	2,6%	2,6%	2,5%	2,5%	2,5%	2,5%	2,2%	2,0%	2,0%
Biopharmaceuticals total	26,6%	24,8%	24,0%	22,0%	21,7%	21,2%	21,5%	20,2%	20,1%	20,2%	20,1%	20,0%	19,6%	19,6%	19,4%	19,0%	19,0%	19,0%	18,5%	18,2%	17,7%	17,5%	17,5%
By geographic segment:																							
North America	35,8%	38,8%	40,1%	43,9%	46,7%	48,6%	48,8%	47,7%	47,4%	47,1%	47,1%	47,0%	46,1%	45,6%	45,0%	44,8%	44,1%	43,9%	43,5%	43,1%	43,0%	43,0%	43,0%
Europe	34,3%	30,7%	28,9%	25,3%	24,0%	22,7%	22,3%	22,3%	21,6%	21,3%	21,4%	21,3%	20,7%	20,1%	20,1%	19,6%	19,5%	19,3%	19,3%	19,2%	19,0%	18,5%	18,5%
International Operations	23,0%	23,0%	23,5%	22,7%	20,7%	19,6%	19,2%	20,4%	20,9%	21,1%	21,0%	20,5%	21,6%	21,8%	22,0%	22,1%	22,2%	22,3%	22,5%	22,6%	22,6%	23,0%	23,0%
Region China	6,9%	7,4%	7,5%	8,2%	8,6%	9,1%	9,2%	9,6%	10,1%	10,5%	10,5%	11,2%	11,6%	12,5%	12,9%	13,5%	14,2%	14,5%	14,7%	15,1%	15,4%	15,5%	15,5%
Value of revenue (DKK million)																							
By business segment:																							
New-generation insulin					143	658	1 342	4 094	6 157	7 015	8 263	10 029	12 941	15 624	18 803	23 993	29 391	31 464	32 231	34 904	36 605	37 719	38 390
Modern insulin	23 448	28 815	31 074	37 332	40 565	43 870	46 282	48 434	49 362	50 509	51 952	52 978	53 231	53 801	53 687	51 185	47 845	48 106	48 917	48 865	49 350	49 789	50 674
Human insulin	11 315	11 827	10 785	11 302	10 869	10 298	9 958	9 187	9 079	8 958	9 055	8 849	7 936	7 308	6 614	6 131	4 785	4 195	3 565	2 181	1 482	754	768
Victoza®	87	2 317	5 991	9 495	11 633	13 426	14 700	16 378	17 219	18 239	19 807	21 120	22 709	23 436	24 250	25 859	28 024	28 807	30 805	32 286	33 790	35 456	36 086
Oral antidiabetic products (OAD)	2 652	2 751	2 575	2 758	2 246	1 728	1 612	1 598	1 565	1 403	1 358	1 416	1 343	1 134	1 167	800	684	699	713	727	741	754	768
Diabetes care total	**37 502**	**45 710**	**50 425**	**60 887**	**65 456**	**69 980**	**73 895**	**79 691**	**83 384**	**86 125**	**90 435**	**94 393**	**98 159**	**101 302**	**104 521**	**107 968**	**110 728**	**113 272**	**116 231**	**118 963**	**121 968**	**124 472**	**126 686**
NovoSeven®	7 072	8 030	8 347	8 933	9 256	9 142	9 986	9 787	10 227	10 685	11 092	11 445	11 843	12 348	12 708	12 796	12 987	13 285	13 263	13 380	13 338	13 579	13 820
Norditropin®	4 401	4 803	5 047	5 698	6 114	6 506	7 090	7 090	7 410	7 771	8 149	8 495	8 668	9 072	9 077	9 064	9 569	9 789	9 555	9 453	9 633	9 807	9 981
Other biopharmaceuticals	2 103	2 233	2 527	2 508	2 746	3 178	3 295	3 295	3 340	3 346	3 509	3 658	3 418	3 276	3 372	3 466	3 418	3 496	3 565	3 636	3 260	3 018	3 071
Biopharmaceuticals total	**13 576**	**15 066**	**15 921**	**17 139**	**18 116**	**18 826**	**20 372**	**20 172**	**20 976**	**21 801**	**22 750**	**23 598**	**23 929**	**24 695**	**25 158**	**25 326**	**25 973**	**26 570**	**26 384**	**26 469**	**26 231**	**26 403**	**26 873**
By geographic segment:																							
North America	18 279	23 609	26 586	34 220	39 024	43 123	46 282	47 635	49 467	50 833	53 310	55 456	56 283	57 455	58 355	59 715	60 285	61 391	62 037	62 681	63 726	64 877	66 030
Europe	17 540	18 664	19 168	19 707	20 063	20 150	21 149	22 270	22 542	22 988	24 222	25 132	25 272	25 325	26 065	26 125	26 657	26 990	27 525	27 923	28 158	27 912	28 408
International Operations	11 723	13 995	15 590	17 697	17 324	17 445	18 174	20 372	21 811	22 772	23 769	24 188	26 371	27 467	28 529	29 458	30 348	31 185	32 088	32 868	33 493	34 701	35 319
Region China	3 536	4 508	5 002	6 402	7 161	8 088	8 678	9 587	10 540	11 332	11 884	13 215	14 162	15 750	16 729	17 995	19 411	20 277	20 964	21 960	22 823	23 386	23 802

Appendix 13 Forecast of NVO's NOPLAT

Million DKK	2014	2015F	2016F	2017F	2018F	2019F	2020F	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031T
Net sales		**94 840**	**99 863**	**104 360**	**107 926**	**113 185**	**117 991**	**122 089**	**125 997**	**129 678**	**133 293**	**136 701**	**139 842**	**142 615**	**145 431**	**148 200**	**150 876**	**153 559**
Cost of goods sold, adjusted	-13,9%	-13 153	-13 849	-14 473	-14 968	-15 697	-16 364	-16 932	-17 474	-17 984	-18 486	-18 958	-19 394	-19 778	-20 169	-20 553	-20 924	-21 296
Sales and distribution costs, adjusted	-26,1%	-24 732	-26 043	-27 215	-28 145	-29 517	-30 770	-31 839	-32 858	-33 818	-34 761	-35 649	-36 468	-37 191	-37 926	-38 648	-39 346	-40 045
Research and development costs, adjusted	-14,5%	-13 719	-14 445	-15 096	-15 612	-16 373	-17 068	-17 660	-18 226	-18 758	-19 281	-19 774	-20 229	-20 630	-21 037	-21 437	-21 825	-22 213
Administrative costs, adjusted	-3,9%	-3 594	-3 684	-3 746	-3 766	-3 836	-3 881	-3 955	-4 019	-4 071	-4 118	-4 155	-4 250	-4 335	-4 420	-4 504	-4 586	-4 667
Licence fees and other operating income, net	1,0%	957	1 008	1 053	1 089	1 142	1 190	1 232	1 271	1 308	1 345	1 379	1 411	1 439	1 467	1 495	1 522	1 549
Remove: Lease rental expense	1,5%	1 399	1 473	1 539	1 592	1 670	1 741	1 801	1 859	1 913	1 966	2 017	2 063	2 104	2 145	2 186	2 226	2 265
Remove: Research and development expenses	14,5%	13 719	14 445	15 096	15 612	16 373	17 068	17 660	18 226	18 758	19 281	19 774	20 229	20 630	21 037	21 437	21 825	22 213
Remove: Operating provisions		2 666	1 740	1 230	1 119	1 164	1 112	707	674	635	624	246	184	108	465	457	441	443
Pension adjustments	-0,3%	-281	-296	-309	-320	-335	-349	-362	-373	-384	-395	-405	-414	-422	-431	-439	-447	-455
Adjusted EBITDA		**58 102**	**60 211**	**62 439**	**64 527**	**67 776**	**70 670**	**72 741**	**75 078**	**77 277**	**79 469**	**81 175**	**82 974**	**84 538**	**86 563**	**88 194**	**89 763**	**91 353**
Add: Lease Depreciation		-933	-982	-1 026	-1 061	-1 113	-1 160	-1 201	-1 239	-1 275	-1 311	-1 344	-1 375	-1 402	-1 430	-1 457	-1 484	-1 510
Depreciation, adjusted	-9,9%	-2 449	-2 579	-2 695	-2 787	-2 922	-2 988	-3 031	-3 065	-3 090	-3 110	-3 122	-3 124	-3 115	-3 104	-3 089	-3 070	-3 048
Add: Amortization of R&D assets, capitalized		-6 932	-7 611	-8 294	-8 975	-9 638	-10 312	-10 987	-11 655	-12 312	-12 956	-13 589	-14 207	-14 810	-15 392	-15 956	-16 504	-17 036
Amortization of operating intangibles, adjusted	-9,5%	-99	-105	-109	-113	-119	-124	-128	-132	-136	-140	-143	-147	-150	-153	-155	-158	-161
Adjusted EBITA		**47 688**	**48 935**	**50 314**	**51 592**	**53 983**	**56 086**	**57 395**	**58 987**	**60 464**	**61 952**	**62 977**	**64 120**	**65 062**	**66 485**	**67 535**	**68 546**	**69 597**
Statutory domestic tax rate	24,5%																	
Operating cash tax		8 038	7 991	8 004	8 028	8 316	8 534	8 546	8 653	8 739	8 834	8 804	8 825	8 807	8 935	8 961	8 983	9 022
Operating cash tax rate	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%	29,7%
NOPLAT		**39 650**	**40 944**	**42 310**	**43 563**	**45 667**	**47 552**	**48 848**	**50 334**	**51 725**	**53 118**	**54 173**	**55 295**	**56 255**	**57 549**	**58 574**	**59 563**	**60 575**

Appendix 14 Forecast of NVO's invested capital

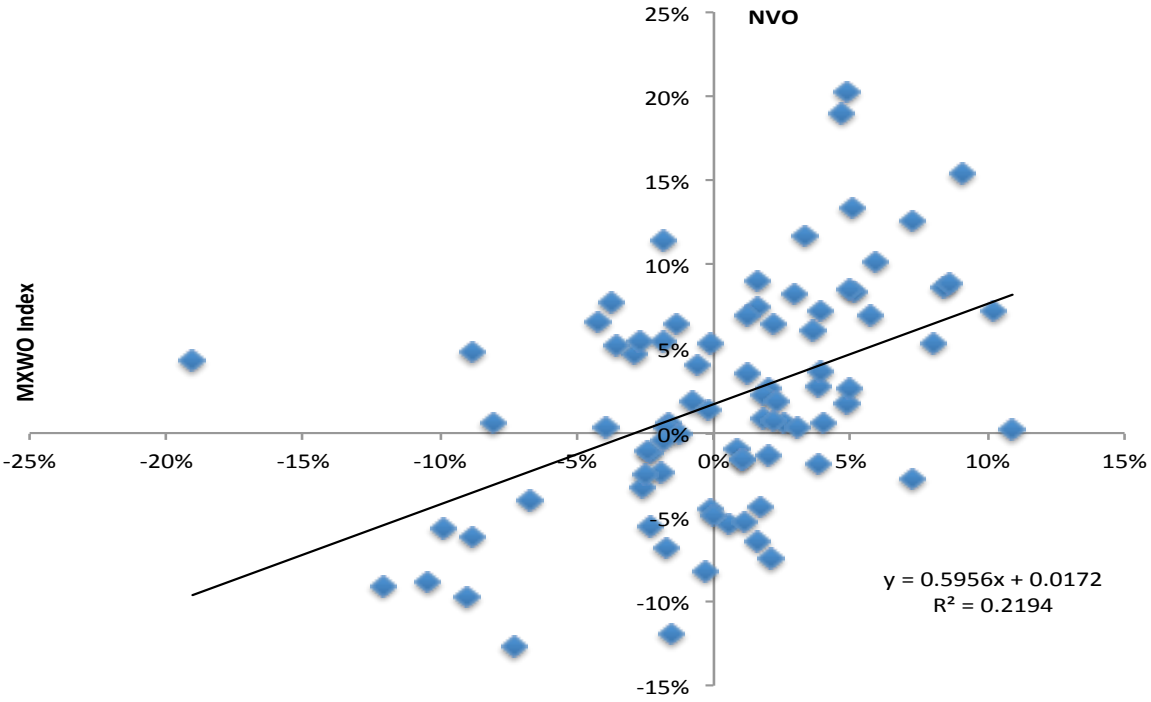
DKK million	2014	2015F	2016F	2017F	2018F	2019F	2020F	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031T
Total Fund Invested: Uses																		
Inventories	132%	17 396	18 317	19 142	19 796	20 761	21 642	22 394	23 111	23 786	24 449	25 074	25 650	26 159	26 675	27 183	27 674	28 166
Tax receivables	4%	3 428	3 610	3 772	3 901	4 091	4 265	4 413	4 554	4 687	4 818	4 941	5 055	5 155	5 257	5 357	5 454	5 551
Other receivables and prepayments	3%	2 909	3 063	3 201	3 310	3 472	3 619	3 745	3 865	3 978	4 089	4 193	4 289	4 375	4 461	4 546	4 628	4 710
Trade receivables	15%	13 927	14 665	15 325	15 849	16 621	17 327	17 929	18 502	19 043	19 574	20 074	20 536	20 943	21 356	21 763	22 156	22 550
Cash at bank and on hand - operating cash	2%	1 897	1 997	2 087	2 159	2 264	2 360	2 442	2 520	2 594	2 666	2 734	2 797	2 852	2 909	2 964	3 018	3 071
Operating Current Assets		39 557	41 652	43 527	45 015	47 208	49 213	50 922	52 552	54 087	55 595	57 016	58 327	59 483	60 658	61 812	62 929	64 048
Trade payables	58%	7 582	7 984	8 343	8 628	9 049	9 433	9 760	10 073	10 367	10 656	10 929	11 180	11 401	11 627	11 848	12 062	12 276
Tax payables	3%	2 959	3 116	3 256	3 368	3 532	3 682	3 810	3 931	4 046	4 159	4 265	4 363	4 450	4 538	4 624	4 708	4 791
Other liabilities	12%	11 674	12 292	12 846	13 284	13 932	14 523	15 028	15 509	15 962	16 407	16 826	17 213	17 554	17 901	18 242	18 571	18 901
Operating provision	13%	13 987	15 727	16 956	18 075	19 239	20 351	21 058	21 732	22 367	22 990	23 236	23 421	23 529	23 993	24 450	24 891	25 334
Operating Current Liabilities		36 202	39 118	41 401	43 356	45 751	47 989	49 656	51 245	52 742	54 213	55 257	56 177	56 934	58 059	59 164	60 232	61 303
Operating Working Capital	2%	**3 355**	**2 534**	**2 126**	**1 659**	**1 457**	**1 224**	**1 266**	**1 307**	**1 345**	**1 383**	**1 760**	**2 150**	**2 549**	**2 599**	**2 649**	**2 697**	**2 745**
Property, plant and equipment	26%	24 617	25 921	27 088	28 014	29 379	30 037	30 469	30 815	31 067	31 266	31 382	31 404	31 313	31 205	31 058	30 864	30 645
Net long-term operating assets	1%	523	551	576	595	625	651	674	695	716	735	754	772	787	802	818	832	847
Operating Lease capitalization		9 327	9 821	10 263	10 614	11 131	11 603	12 006	12 391	12 753	13 108	13 443	13 752	14 025	14 302	14 574	14 837	15 101
Invested capital (excluding intangibles)		37 822	38 827	40 053	40 882	42 591	43 515	44 416	45 208	45 880	46 492	47 339	48 077	48 674	48 908	49 098	49 230	49 338
R&D Capitalizaition		76 109	82 944	89 746	96 383	103 117	109 873	116 546	123 117	129 564	135 889	142 074	148 095	153 915	159 561	165 042	170 362	175 539
Operating intangible assets	1%	1 050	1 105	1 155	1 195	1 253	1 306	1 351	1 395	1 435	1 475	1 513	1 548	1 579	1 610	1 640	1 670	1 700
INVESTED CAPITAL (including intangibles)	**118%**	**114 981**	**122 876**	**130 954**	**138 459**	**146 961**	**154 694**	**162 313**	**169 720**	**176 879**	**183 857**	**190 926**	**197 720**	**204 168**	**210 079**	**215 781**	**221 263**	**226 577**

Appendix 15 Forecast of NVO's free cash flows

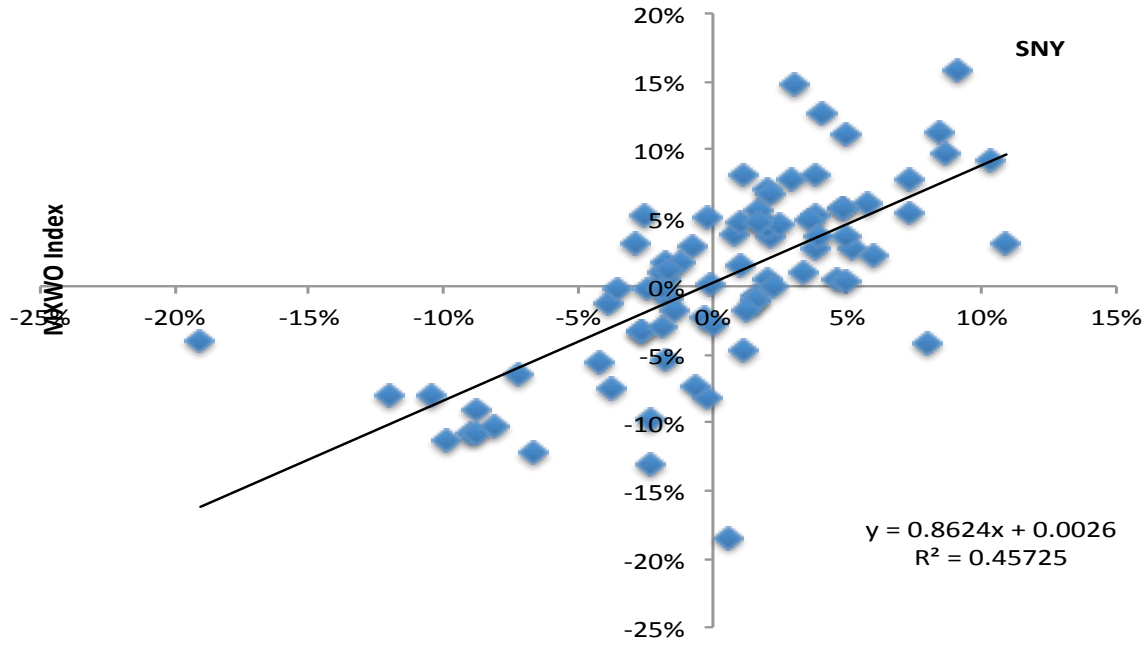
DKK million	2015F	2016F	2017F	2018F	2019F	2020F	2021F	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
NOPLAT	**39 650**	**40 944**	**42 310**	**43 563**	**45 667**	**47 552**	**48 848**	**50 334**	**51 725**	**53 118**	**54 173**	**55 295**	**56 255**	**57 549**	**58 574**	**59 563**
Add: Depreciation, adjusted (without lease depreciation)	2 449	2 579	2 695	2 787	2 922	2 988	3 031	3 065	3 090	3 110	3 122	3 124	3 115	3 104	3 089	3 070
Add: Amortization of operating intangibles, adjusted	7 032	7 716	8 404	9 088	9 757	10 435	11 115	11 787	12 448	13 096	13 732	14 354	14 959	15 544	16 111	16 662
Other non-cash itens: Operating provisions	2 666	1 740	1 230	1 119	1 164	1 112	707	674	635	624	246	184	108	465	457	441
Gross cash flow	**51 797**	**52 978**	**54 638**	**56 557**	**59 510**	**62 087**	**63 701**	**65 860**	**67 898**	**69 948**	**71 273**	**72 958**	**74 437**	**76 662**	**78 232**	**79 737**
Change in operating working capital	1 220	(821)	(408)	(467)	(202)	(233)	43	41	38	37	377	390	399	50	49	48
Net capital expenditures	4 181	4 043	4 021	3 865	4 465	3 822	3 637	3 586	3 519	3 490	3 419	3 327	3 205	3 179	3 128	3 064
Investment in capitalized operating leases	593	494	442	351	517	473	403	384	362	356	335	309	273	277	272	263
Investment in R&D	13 719	14 445	15 096	15 612	16 373	17 068	17 660	18 226	18 758	19 281	19 774	20 229	20 630	21 037	21 437	21 825
Change in net long-term operating assets	33	28	25	20	29	27	23	22	20	20	19	17	15	16	15	15
Increase (decrease) in foreign-currency translation reserve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gross investment	**19 746**	**18 189**	**19 176**	**19 380**	**21 181**	**21 156**	**21 765**	**22 258**	**22 698**	**23 184**	**23 924**	**24 272**	**24 521**	**24 559**	**24 903**	**25 215**
FREE CASH FLOW	**32 051**	**34 789**	**35 462**	**37 177**	**38 329**	**40 931**	**41 936**	**43 602**	**45 201**	**46 764**	**47 349**	**48 686**	**49 916**	**52 103**	**53 329**	**54 522**

Appendix 16 Determining Betas for NVO and its competitors

Regression of NOVO NORDISK's returns vs MXWO Index

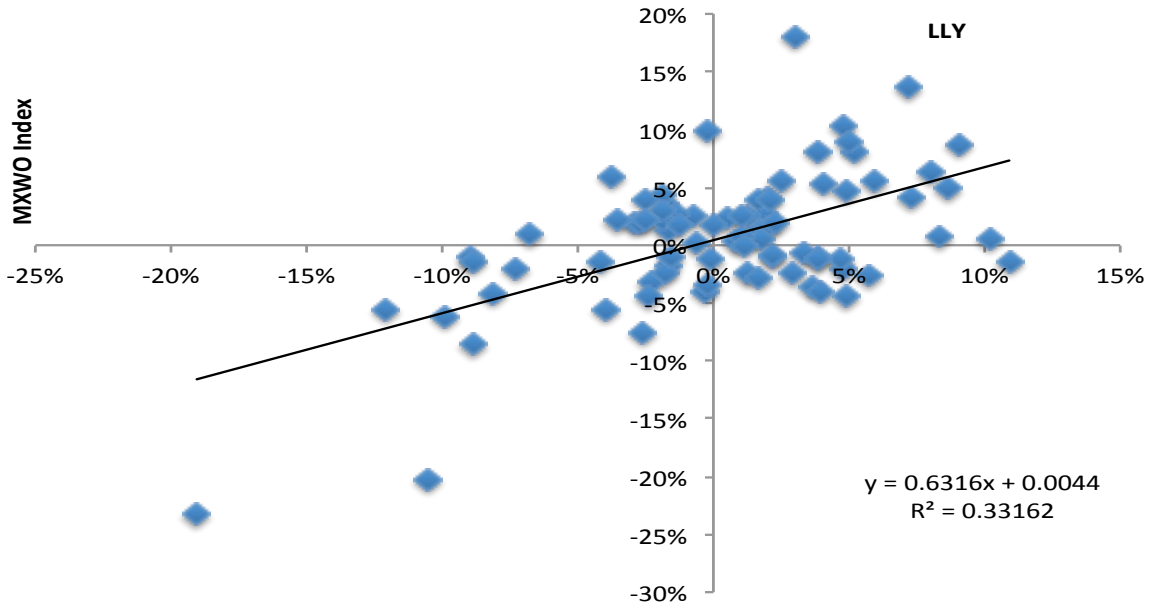


Regression of SANOFI's returns vs MXWO Index

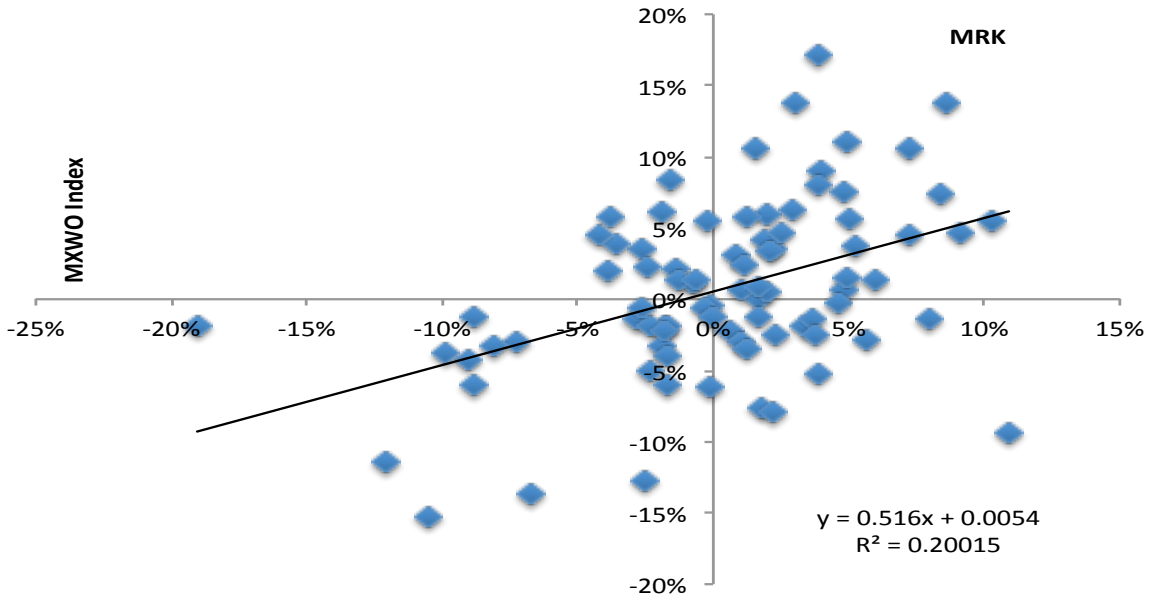


Appendix 16 Determining Betas for NVO and its competitors (Cont.)

Regression of ELI LILLY's returns vs MXWO Index



Regression of MERCK's returns vs MXWO Index



Appendix 17 NVO's intrinsic value

	Free cash flow (FCF)	Discount factor	Present Value of FCF
2015	32 051	0,9434	30 236
2016	34 789	0,8900	30 961
2017	35 462	0,8396	29 773
2018	37 177	0,7920	29 446
2019	38 329	0,7472	28 639
2020	40 931	0,7049	28 852
2021	41 936	0,6650	27 887
2022	43 602	0,6273	27 353
2023	45 201	0,5918	26 750
2024	46 764	0,5583	26 109
2025	47 349	0,5267	24 939
2026	48 686	0,4969	24 191
2027	49 916	0,4687	23 398
2028	52 103	0,4422	23 040
2029	53 329	0,4172	22 247
2030	54 522	0,3935	21 457
2031 and beyond	1 319 661	0,3935	519 346
Operating value			944 622
Excess cash			12 620
Other financial assets			268
Tax loss carry forward			32
Enterprise value			957 542
Short/Long-term debt			-720
Retirement-related liabilities			-1 975
Non-operating provisions			-2 310
Capitalized operating lease			-8 733
Equity value			943 804
Adjustment factor			1,0202
Equity value at 30-04-2015			962 827
Number of shares outstanding (million)			2 620
Value per share (DKK)			**367,49**

Appendix 18 Sensitivity analysis

Scenario 1 - 22% probability of launching all products in the pipeline

	Target capital structure	Cost	Weighted cost
Debt	-1%	0,0217	-0,01%
Capitalized operating lease	1%	0,0378	0,05%
Common equity	99%	0,0601	5,97%
Total	100%		**6,00%**

	Free cash flow (FCF)	Discount factor	Present Value of FCF
2015	32 051	0,9434	30 236
2016	34 801	0,8900	30 971
2017	35 499	0,8396	29 804
2018	37 239	0,7920	29 495
2019	38 739	0,7472	28 945
2020	43 122	0,7049	30 397
2021	45 725	0,6650	30 406
2022	49 222	0,6273	30 879
2023	53 574	0,5918	31 706
2024	58 988	0,5583	32 933
2025	62 607	0,5267	32 974
2026	67 473	0,4969	33 526
2027	71 684	0,4687	33 601
2028	76 826	0,4422	33 973
2029	81 111	0,4172	33 837
2030	85 379	0,3935	33 600
2031 and beyond	2 291 871	0,3935	901 954
Operating value			1 409 237
Excess cash			12 620
Other financial assets			268
Tax loss carry forward			32
Enterprise value			1 422 157
Short/Long-term debt			-720
Retirement-related liabilities			-1 975
Non-operating provisions			-2 310
Capitalized operating lease			-8 733
Equity value			1 408 419
Adjustment factor			1,0202
Equity value at 30-04-2015			1 436 807
Number of shares outstanding (million)			2 620
Value per share (DKK)			**548,40**

Appendix 18 Sensitivity analysis (Cont.)

Scenario 2 - 78% probability of failing to launch all products in the pipeline

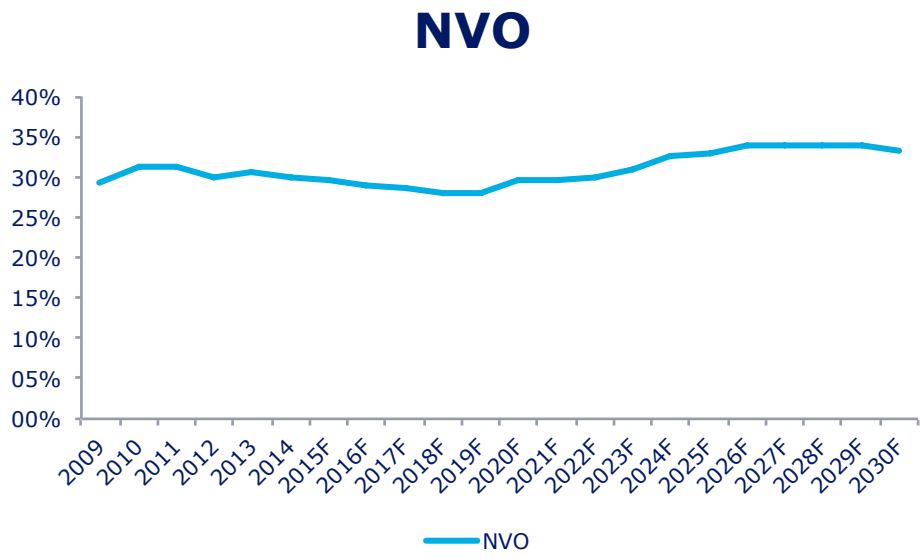
	Target capital structure	Cost	Weighted cost
Debt	-1%	0,0217	-0,01%
Capitalized operating lease	1%	0,0378	0,05%
Common equity	99%	0,0601	5,97%
Total	100%		**6,00%**

* See Appendix 13 for more information about the cost of capitalized operating lease.

	Free cash flow (FCF)	Discount factor	Present Value of FCF
2015	31 880	0,9434	30 075
2016	34 323	0,8900	30 546
2017	34 943	0,8396	29 337
2018	36 582	0,7920	28 974
2019	37 661	0,7472	28 140
2020	39 342	0,7049	27 732
2021	39 351	0,6650	26 168
2022	40 051	0,6273	25 125
2023	40 568	0,5918	24 008
2024	40 726	0,5583	22 738
2025	39 968	0,5267	21 051
2026	39 978	0,4969	19 864
2027	39 586	0,4687	18 555
2028	39 594	0,4422	17 509
2029	38 645	0,4172	16 121
2030	37 821	0,3935	14 884
2031 and beyond	726 587	0,3935	285 944
Operating value			666 772
Excess cash			12 620
Other financial assets			268
Tax loss carry forward			32
Enterprise value			679 692
Short/Long-term debt			-720
Retirement-related liabilities			-1 975
Non-operating provisions			-2 310
Capitalized operating lease			-8 733
Equity value			665 953
Adjustment factor			1,0202
Equity value at 30-04-2015			679 376
Number of shares outstanding (million)			2 620
Value per share (DKK)			**259,30**

Appendix 18 Sensitivity analysis (Cont.)

Scenario 1 Market share



Scenario 2 Market share