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Strategic analysis and valuation of Novo Nordisk A/S

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Executive summary

Novo Nordisk is a global leading pharmaceutical company producing treatments to variety of diseases. The market capitalization of Novo Nordisk has been increasing with more than 150bn DKK during 2010 this master thesis will investigate whether Novo Nordisk's financial figures as well as their strategic position and their pipeline substantiate this increase in the market capitalization.

Novo Nordisk are currently finding themselves in a good position in the market, with several blockbusters in their product portfolio. This along with a promising pipeline, that potentially can produce two or three blockbusters more, is creating a firm ground for Novo Nordisk to build, and continue, a high-growth company. Within diabetes care alone, Novo Nordisk has three blockbusters (Levemir, NovoRapid and NovoMix), and the haemophilia product NovoSeven has also been a blockbuster for previous years selling for more than 8bn DKK in 2010.

The financial figures of Novo Nordisk has also been improving significantly during the past years, and they have moved from being an average performing pharmaceutical company, to a company in top of the league. The fact that Novo Nordisk almost has doubled their sales from 2005 to 2010 is a good example of how well they have performed.

I have chosen to use the DCF model as my primary method to price Novo Nordisk. I have in my thesis made a budget for the valuation, a budget that I have based on a strategic analysis and a financial statement analysis. I do it this way to get the most accurate fair value of Novo Nordisk. The DCF valuation results in a fair value of Novo Nordisk of 750 DKK per share, which is about 20% higher than the closing price of 611 DKK on the 4th of February 2011.

A sensitivity analysis is conducted to see what impact the estimated variables in the valuation have on the share price. The findings are that the cost of capital and the chance of getting products approved have a high impact on the share price.

Content

1 Introduction

Today the Danish life science sector is regarded as one of the most important industries in the Danish economy. Large Danish companies within life science, such as Novo Nordisk A/S (Novo Nordisk) and H. Lundbeck A/S are widely acknowledged internationally for their contribution to the development of medical drugs. The life science sector is divided into three main sectors: biotech, pharmaceuticals and medico technology. Novo Nordisk acts within the pharmaceutical industry, with main emphasis on diabetes, haemophilia and inflations.

In Europe more than 50% are overweight[1] (BMI[2] of >25), obese (BMI of >30), or morbidly obese (BMI of >40). Even more are overweight in North America, and the tendency in the developing countries is that people are getting heavier and heavier. Especially the growing number of overweight people in China will make it a much larger market for Novo Nordisk since diabetes is highly interrelated with overweight and obesity. In the 2010 annual report for the first time Novo Nordisk have, separated China as one of their main markets, which show the increasing importance on this market.

Approvals of new drugs, and hence the development of the pipeline, are essential for biotech and pharmaceutical companies. Pipelines are difficult to valuate primarily due to the risk of the products failing in different stages of the R&D process. The reason why this is so essential is that when a patent on a drug ends, competitors will produce generics at a much lower price. Generics are copies of products that previously have been protected by a patent.

Today Novo Nordisk have a market capitalization of DKK 354bn DKK (calculated as the closing price on 4th of February times the number of outstanding stocks), which is DKK 155bn more than on the 1st of January 2010. The huge increase was highly impacted by the launch of Victoza in USA and Europe. Since 2010, Victoza is just the first product that has been launched from a very attractive pipeline, and more projects can be filed for

[1] http://www.reuters.com/article/2010/12/07/us-europe-idUSTRE6B62B020101207
[2] BMI is calculated as the body mass in kg divided by the height in meter squared.

approval over the coming years. These products are primarily the modern insulin called Degludec and the insulin mixture DegludecPlus together with the anti-obesity drug Liraglutide.

1.1 Research questions

Through the following research question, I will analyse Novo Nordisk to see if the recent increase in the share price is justified, and to find a fair value of Novo Nordisk.

In the light of the recent development in market capitalization, what is the fair value of Novo Nordisk as of 4th of February 2011?

To answer this question I will use the following sub-questions:

- Is Novo Nordisk's recent increase in market capitalization substantiated by their financial figures?
- How has Novo Nordisk's financial performance been, if you compare it to their peers'?
- What is the competitive situation of Novo Nordisk?
- Is Novo Nordisk's pipeline adding value to the share price?

2 Methodology

I have chosen to divide the thesis into three main parts: financial statement analysis, strategic analysis, and valuation. Below I will go into more details about the three parts.

2.1 Accounting analysis

I use the latest annual statements as basis for the analysis. I will reformulate the financial statements, and balance sheet, and will use these to make a key-ratio analysis. These key-ratios will be compared to ratios from a selected peer-group. Furthermore I will make a trend analysis to see how Novo Nordisk's financial performance has changed during the last years.

2.2 Strategic analysis

My strategic analysis is divided into 4 parts, each with a different focus:

1. A PESTEL analysis, which I use to find the relevant macro economic impact on Novo Nordisk. I find this a good model to analyse the macro-environment due to the possibilities to adjust the model to fit to Novo Nordisk. In this way I can make sure that I focus on the factors I find most interesting. A negative part of this model is that it is easier to use in a retrospective view, which will not give a good view of the future in sectors with a high degree of changes
2. A Porter's Five Forces to analyse the industry that Novo Nordisk is acting within – the pharmaceutical industry. It gives a good framework to determine the competition in the industry, and hence analyse the attractiveness of the industry. One of the drawbacks of the model is that you see your customers and suppliers as "enemies" whom you need to be stronger than, instead of necessary partners to cooperate with
3. A GE/McKinsey Matrix to estimate the possibilities of Novo Nordisk's products and pipeline. This is done through estimations of the market attractiveness and business unit strength, and helps me estimating the future sales of the different products
4. It is all summed up in a SWOT that will work as a conclusion to this chapter of my thesis. I have chosen this model because it provides a good framework to get an overview of Novo Nordisk's competitive situation

2.3 Valuation

My primary valuation method is the DCF analysis, which I have chosen because of the value it adds to my thesis. Theoretically it is the correct way, because it finds the value today of all future cash flows. It has pros and cons like any other valuation method, but in my opinion it is the best valuation method. Especially when using it on pharmaceutical and biotech companies, it is relevant because of the possibilities to adjust the future sales from the risk of pipeline products not being marketed. However, as I said it has its shortcomings as well and is a subject to the "garbage in, garbage out" principle. This means that poor budgeting will result in misleading or incorrect results. Furthermore, it is of obvious reasons not possible to estimate infinite results, but a growing annuity will be used to calculate the terminal period.

Furthermore, I have chosen to include an EVA valuation as well, which will give the reader another view of Novo Nordisk. It focuses on financial measures, such as ROIC compared to the cost of capital.

Another method to value companies is through relative valuation methods, where you price a company based on how the sector is priced. Examples of these kinds of valuation methods are price earning (P/E), enterprise value EBITDA (EV/EBITDA) and enterprise value EBIT (EV/EBIT). I have chosen not to include these in my valuation, primary because I have a limited amount of pages in my thesis and I find I more relevant to use the DCF and the EVA valuation method.

2.4 Delimitations

I have chosen a deadline for the information flow, because it will not be possible to include all new information until I hand in. I have chosen the 4th of February 2011 as my deadline, because it is the day Novo Nordisk published their 2010 annual report.

Furthermore, my thesis will alone analyse Novo Nordisk A/S and not their subsidiaries, Novo A/S or the Novo Nordisk Foundation.

3 About Novo Nordisk

Novo Nordisk is a Danish pharmaceutical company acting in the global market with main focus on diabetes care. Furthermore, it offers treatment within rare bleeding disorders, growth hormone deficiency, as well as hormone replacement therapy. During the last years, Novo Nordisk have during the last years experienced a high growth rate, and today they are one of Denmark's largest companies in terms of sales, while being the largest in terms of market capitalization.

3.1 The history of Novo Nordisk

The history of Novo Nordisk can be traced back to 1922 where August Krogh and his wife, who had diabetes, were in North America. One of the purposes of their travel was to meet with the person who the year before as the first ever, had extracted insulin from the pancreas. August Krogh hoped to get a license to produce insulin in Denmark based

on this meeting. He was given the license and went back to Denmark. Where he teamed up with H.C. Hagedorn (specialist within regulation of blood sugar) and August Kongsted (ovner of Løvens Kemiske Fabrik) and founded "Nordisk Insulinlaboratorium". In Marts 1923 their first product, Insulin Leo, was launched.

Harald and Thorvald Pedersen, two brothers and former employees of Nordisk Insulinlaboratorium, decided that they wanted to make their own type of insulin, and founded "Novo Terapeutisk Laboratorium". In the first year Novo's production was in the basement of Harald Pedersen and his wife's house. In fall 1926, they moved into the first factory on Borups Allé in Copenhagen, and the sale was going better than anyone could imagine, and in 1932 the sales reached DKK 800,000. This growth meant that the factory soon became too small, and Novo moved to a new establishment on Nordre Fasanvej.

Both Novo Terapeutisk Laboratorium and Nordisk Insulinlaboratorium were doing great during the next decades. The first real crisis that hit Novo was in September of 1961 when Thorvald Pedersen, who at that time was CEO, died after having been sick only a few days. Harald Pedersen's son-in-law Knud Hallas-Møller was appointed as new CEO and continued the management of Novo in the same way as Thorvald did. In 1966 the last founder, Harald Pedersen, died, 88 years old.
The 16th of May 1974, the B-shares in Novo Terapeutisk Laboratorium were listed on the Copenhagen Stock Exchange. From 1974 to 1980 there were three more rights issues, and the money from these were used to build new production facilities for more than DKK 630m, and 1000 new employees were hired. This made the sales grow from DKK 250m in 1971 to DKK 1.6bn in 1980.

1981 was another important year for Novo Terapeutisk Laboratorium. Most important was that they decided to be listed on the New York Stock Exchange as well, as the first Scandinavian company. This gave Novo more than DKK 500m from the listing.

In 1989 Novo Terapeutisk Laboratorium and Nordisk Gentofte (as Nordisk Insulinlaboratorium was now called) merged. The two companies had been fierce competitors for more than 60 years and were at that time Europe's two larges insulin

producers. However, Novo was more than 5 times the size of Nordisk. The new company Novo Nordisk A/S was now having about 50% of the world market of insulin, 7,500 employees and a sale of DKK 7,3bn.

In 2000 Novo Nordisk A/S was split into three companies:

1. Novo A/S – the holding company of Novo Nordisk A/S and Novozymes, and the owner of all A-shares in both Novo Nordisk A/S and Novozymes A/S
2. Novozymes A/S – the enzyme business
3. Novo Nordisk A/S – the health care business

This happened on an extraordinary general meeting, on the 13th of November, and at the same time a new CEO – Lars Rebien Sørensen – was appointed for the new Novo Nordisk A/S. Lars Rebien Sørensen had been working in Novo Nordisk for 18 years and as a director of the health care business for the previous 6 years. When he was appointed, he became the first (and today still the only) CEO without a familial relation to the founders.

3.2 The business[3]

The sales of Novo Nordisk's products are primarily taking place in Europe and North America, and Figure 1, illustrates the breakdown of the sales in the geographic areas they use in their annual report.

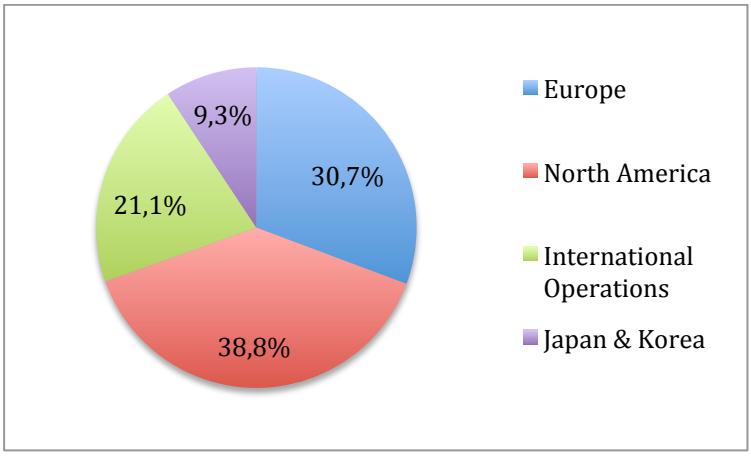

Figure 1 – Geographic breakdown of sales – Source: own creation based on Novo Nordisk annual report 2010

[3] Source: all numbers are taken from Novo Nordisk Annual Report 2010, and www.novonordisk.com

Figure 2 below illustrates Novo Nordisk's product portfolio, and shows that insulin is by far the largest part of the business.

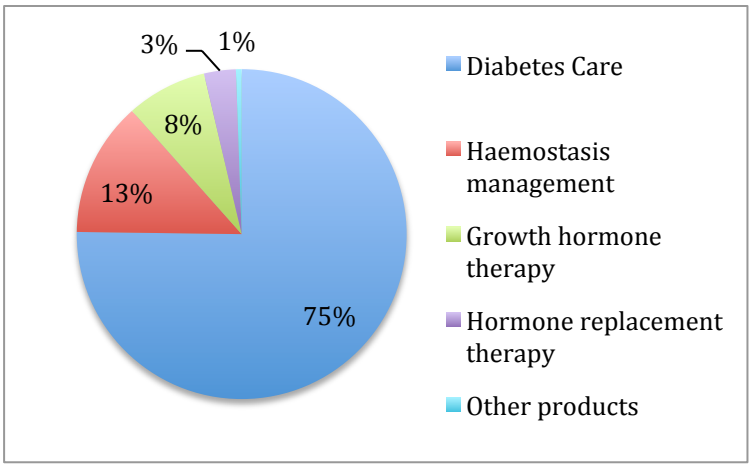

Figure 2 – Breakdown of sales into business areas – Source: own creation based on Novo Nordisk annual report 2010

3.3 Share structure

At the end of 2010 Novo Nordisk A/S share capital was nominal DKK 600m and divided up into A-shares with a nominal capital of DKK 107,487,200 and B-shares with a nominal capital of DKK 492,512,800. All the A-shares are owned by Novo A/S, which again is owned by the Novo Nordisk Foundation. The A-shares (with a nominal value of DKK 1) each carry 1,000 votes, while the B-shares (with a nominal value of DKK 1) each carry 100 votes. Novo A/S has 25.5% of the total share capital, while they control 72,8% of the votes[4] (excluding treasury shares[5]).

As suggested by the Board of Directors, 20,000,000 B shares were cancelled at the annual general meeting. This reduced the total nominal share capital from DKK 600m to DKK 580m, and the B share nominal capital from DKK 492,512,800 to 472,512,800.

3.4 Products

Novo Nordisk sells drugs within five disease areas: diabetes, haemophilia, growth hormone deficiency, hormone replacement therapy and treatment of inflammatory diseases. I will now go through each disease and the drugs that Novo Nordisk produces

[4] As of end of 2010, source: Novo Nordisk Annual Report 2010, p. 55
[5] Treasury shares are shares owned by Novo Nordisk A/S, and does not have voting rights or are paid dividends

in each area. Furthermore, in appendix 1, there is a short description of diabetes as a disease.

3.4.1 Diabetes

The diabetes care is divided into two main parts: modern insulin and human Glucagon-like Peptide (GLP-1) analogues. Within the modern insulin, Novo Nordisk has three products: Levemir, NovoRapid and NovoMix, and within GLP-1 analogues they have Victoza.

Levemir

Levemir is long-acting modern insulin that is for once-daily use. Levemir is used to treat type 2 diabetes patients and is often tricked in case of unhealthy eating and exercise habits. Insulin has long been associated with a weight gain, which has been a barrier in starting the treatment of diabetes, but Levemir has a positive weight profile. This means that Levemir is able to control the patient's glucose levels in the blood without gaining weight.

2010 was an important year for Levemir; it was the first year it reached blockbuster levels (sales of more than USD 1bn). A total sale of DKK 6,880m was enough to break that limit, and become a blockbuster. It was an increase from 2009 of more than 30%.

NovoRapid

NovoRapid (Called NovoLog in the US) is rapid acting insulin and is used at mealtimes. It is the world most used rapid acting insulin, and is used to treat people with both type-1 and type-2 diabetes. It is often used together with another basal insulin to help attain and maintain the desired treatment targets.

NovoRapid is Novo Nordisk's best selling product and has in 2010 for the first time reached the status of double-blockbuster (USD 2bn). NovoRapid's total sale was in 2010 DKK 11,900m a more than 20% increase from 2009.

NovoMix

NovoMix 70/50/30 (called NovoLog Mix 70/30 in US) is dual-release insulin that covers basal requirements as well as mealtime requirements. It is a mix of long acting and rapid acting insulin and can be bought in different mixtures. It contains 30% rapid acting

insulin aspart and 70% insulin aspart protamine that delay the effect. This mix gives the patients the need for fewer daily injections.

In 2010 it kept its status as blockbuster, with a total sale of DKK 7,821m. It was a 20% increase from 2009.

Victoza

Victoza is Novo Nordisk's first GLP-1 analogue, and it was launched in 2009 in Europe and in 2010 in US and Japan. Today it is available in more than 24 markets. Victoza is a once-daily drug, and works by stimulating the beta cells in the pancreas to release insulin when blood sugar is low, and only when it is low. This help avoiding one of the most severe side effects – hypoglycemia. This is the state where you have too low blood sugar, which could be a side effect from an overdose of insulin. The effects of too low blood sugar range from dysphoria to unconsciousness to the most severe consequences such as brain damage or death. Victoza helps avoiding these side effects by stimulating the beta cells so that the pancreas only releases insulin when necessary. The new GLP-1 technology is a major breakthrough, and can help many type 2 diabetes patients to avoid hypoglycaemia.

Victoza is still in an early stage of its life cycle, and had in 2010 a total sale of DKK 2,317m. 2010 was the first year with a global sale of Victoza, and hence not comparable with earlier years.

3.4.2 Haemophilia

There are on a world basis about 400,000[6] people with the bleeding disorder haemophilia. Haemophilia is a disorder that prevents the blood from clotting. It comes in different states and you can lack it either partially or completely. It can from internal bleeding without treatment cause pain, severe damage or event death.

Novo Nordisk has developed NovoSeven to help people who have developed antibodies or inhibitors to their normal treatment. On a global basis there are more than 4,000 persons, and NovoSeven can be used for rapid control when bleeding episodes occur.

[6] Novo Nordisk Annual Report 2010, p. 37

In 2010, NovoSeven experienced a 14% sales growth measured in DKK compared to 2009 figures. The sale in 2010 was in total DKK 8,030m and NovoSeven kept its ranking as a blockbuster.

3.4.3 Growth hormone deficiency

Novo Nordisk has more than 40 years of experience within growth hormone therapy, and the product Nodritropin is used to treat kids as well as adults. When you have a deficit of growth hormone it is because the pituitary gland does not produce enough hormones and for kids the growth will be slower than normal. Research shows[7] that kids without growth hormone more often experience difficulties in school, and hence treatment is important. For adults deficiency can result in a lower quality of life and to maintain a normal level of fat, muscles and bone strength.

Norditropin had a total sale of DKK 4,803m in 2010, approximately a 10% increase from 2009.

3.4.4 Hormone replacement therapy and inflammatory diseases

The hormone replacement therapy and the inflammatory diseases are small parts of the product portfolio in terms of sales, and I will not spend much time on them in my thesis. In total they account for only 5% of the total sales, with the inflammatory diseases being the smallest with a sale of DKK 341m in 2010 and hormone replacement therapy with a sale of DKK 1,892m.

3.5 Pipeline

Novo Nordisk has an extensive pipeline, and has 21 projects from phase 1 to 3. In the descriptions I have chosen to focus on five products in phase 3 and one in phase 2. For a complete overview see appendix 2. The reason I have chosen these are, that they have all shown good results in phase 2.

Degludec

Degludec is long acting basal insulin, with more than 24 hours duration. It has shown impressive results in the phase 3a studies, which was completed in June 2010 and the first results were published in October 2010. In total there were 17 phase 3a trials within the BEGIN programme with more than 7,000 patients in total. The primary

[7] Novo Nordisk Annual Report 2010, p. 39

endpoint of not being inferior to insulin glargine (marketed by Sanofi-Aventis under the name Lantus) was met, and also the risk of nocturnal hypoglycemia was significantly lower, with a reduction of 35%. Degludec also showed good safety and tolerability profile. The final results are expected to be published on Novo Nordisk's capital market day on the 5th of May 2011.

DegludecPlus

DegludecPlus is a mixture of long acting insulin and rapid acting bolus insulin. It is built on the same base as Degludec but the mixture with bolus insulin gives the patients the advantage of higher control of the blood sugar around meal times. The phase 3a trials, the BOOST programme, had more than 3,000 patients enrolled, and were running at the same time as the Degludec BEGIN programme.

As the long acting insulin is the same as in Degludec, the already published results has shown the same results with a high degree of safety and tolerability, as well as a low risk of hypoglycemia. The final results are expected to be published on Novo Nordisk's capital market day on the 5th of May 2011. These will give the result of trials where Novo Nordisk compares DegludecPlus with NovoMix and other insulin mixtures.

Semaglutide

Semaglutide is a once weekly GLP-1 analogue to control of blood sugar, and hence can be used with fewer injections than Victoza. The phase 3a trials was postponed in June 2010, and is waiting for a strategic decision of whether or not Novo Nordisk should focus on long term insulin. The finished phase 2 trials had more than 400 patients and were completed in 2009.

Liraglutide

Liraglutide is already on the market under the name Victoza. It is a once daily GLP-1 analogue – the current use of Victoza can be found earlier in this thesis. A positive side effect is that the patients treated with Victoza experience a sustainable weight loss. The first phase 3a studies were completed in the third quarter of 2010 and Novo Nordisk is expecting to initiate the last phase 3a studies of Liraglutide as a drug against obesity on mid-2011.

NN1841

NN1841 is a drug under development to prophylactic treat patients with the coagulation factor XIII deficiency. All phase 3a trials were completed during the second quarter of 2010, and a submission to the regulatory in US and Europe is expected in the first half of 2011[8]. Factor XIII deficiency is one of the rarest bleeding disorders, and is estimated at one of five million births[9]. It is an inherited disease that affect, men and women equally as well as all ethnical groups.

NN7008

Haemophilia A (factor VIII deficiency) is the most common type of Haemophilia, and Novo Nordisk is developing the drug NN7008 to prevent and treat bleeding from patients with Haemophilia A. About one of every 5,000 born in the US is completely or partly missing the factor VIII. All ethic races and economic groups are affected equally[10].

3.6 Peers

I have chosen to divide Novo Nordisk's peers into two groups, a main group and an "other" group. This is mainly because some companies are more relevant to compare Novo Nordisk to than other. The main group is consisting of three companies while the other group is consisting of 5 companies. I will in this chapter quickly go through why I have selected the eight companies. What is the same for the eight companies, is that they all engages in research and development, manufacturing and marketing of pharmaceutical drugs.

Eli Lilly & Co: The first of the main peers, is an American company that was among the first to produce insulin. Furthermore, it is one of the largest competitors to Novo Nordisk due to the broad product portfolio within diabetes and especially the product Byetta and Bydureon in their pipeline that both will compete against Victoza. They are like Novo Nordisk operating in a global market, and hence the similarity to Novo Nordisk is high.

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[8] Novo Nordisk Annual Report 2010, p. 24-25

[9] http://www.hemophilia.org/NHFWeb/MainPgs/MainNHF.aspx?menuid=71&contentid=58

[10] http://www.hemophilia.org/NHFWeb/MainPgs/MainNHF.aspx?menuid=180&contentid=45&rptname=bleeding

Pfizer Inc: Another main peer is also an American company with a broad product portfolio covering several diseases. They are the second largest pharmaceutical company measured by revenue[11]. I have chosen them to be one of the main peers because the cover several of Novo Nordisk's treatment areas, like Diabetes and growth hormones.

Sanofi-Aventis: The last main peer, is a French company with focus on diabetes, among a number of other diseases. They are included as a main peer because of their product Lantus that is one of the best selling diabetes products worldwide.

I have chosen the five other peers to be Abbott Laboratories, Bristol-Myers-Squibb Co, GlaxoSmithKline plc., Merck & Co and Novartis AG. The similarities between these companies and Novo Nordisk are that they all are having diabetes care within their portfolio of drugs. The reason why I have not selected them to be main peers, are that they do not have diabetes care as one of their primary focus areas. However, I have still chosen to include them as other peers, because the difference from Novo Nordisk is primarily the focus on different diseases.

4 Financial Statement Analysis

In this chapter I have focused on the financial reports of Novo Nordisk. First I have made an analysis based on the reported figures of Novo Nordisk, to decide what period the financial statement analysis should cover. After that, I have reformulated the income statements and balance sheets for the years chosen, which all end up in three analyses:

1. Trend analysis
2. Key-ratio analysis
3. Common size analysis

Ad 1: In the trend analysis I analyse the change in selected items, by using index figures, from the income statement and the balance sheet.

11 http://money.cnn.com/magazines/fortune/global500/2009/industries/21/index.html

Ad 2: The key-ratio analysis is an analysis of Novo Nordisk's financial strength. In this analysis I calculate the key-ratios I find most important for Novo Nordisk.

Ad 3: The third and last analysis on the financial statement analysis will cover Novo Nordisk and its peers. This analysis will be used to see the difference between Novo Nordisk and their peers in a pure financial view.

4.1 Choice of period for the financial statement analysis

To choose the length of the financial period I have tried to find some consistency and cycles in the development of the sales growth, operating profit growth, and the Return on Invested Capital (ROIC). Novo Nordisk has had a positive development in the sales every year since 2000. The annual increase is ranging from 4.5% (from 2001 to 2002) to 19.0% (from 2009 to 2010).

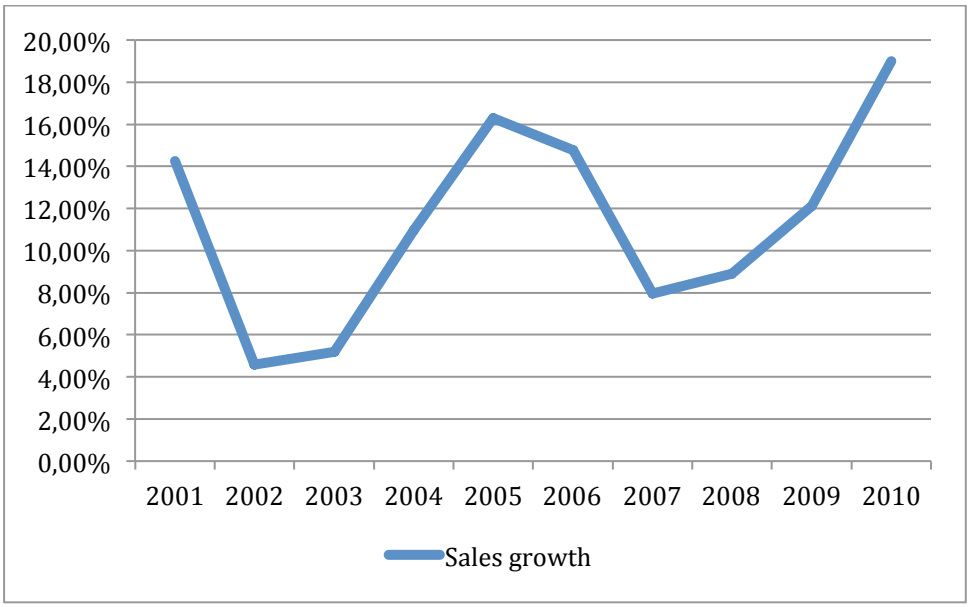

Figure 3 – Annual sales growth 2001-2010 – Source: own creation based on Novo Nordisk Annual reports

As you can see from figure 3 there is what looks like a 6-year cycle. First there is a year with high sales growth (e.g. 2005) followed be two years of declining but positive growth rates, one year with a slightly higher growth rate, and finally two years to get back to the same high growth rate as in the beginning of the cycle. The year of high growth rates could easily be connected to the years after a launch of a new product, e.g. the launch of Victoza in 2010.

The growth in the operating profit has been much more volatile and without a clear cycle, see also figure 4 below. It has been ranging from -2% to +38.5% annual growth, or from 5.5% to 38.5% if you correct the figures for one-off costs related to the discontinuation of the R&D project AERx, which was an inhaled insulin project. It was cancelled in phase 3 due to a new strategy of focusing on GLP-1 insulin via inhalation.

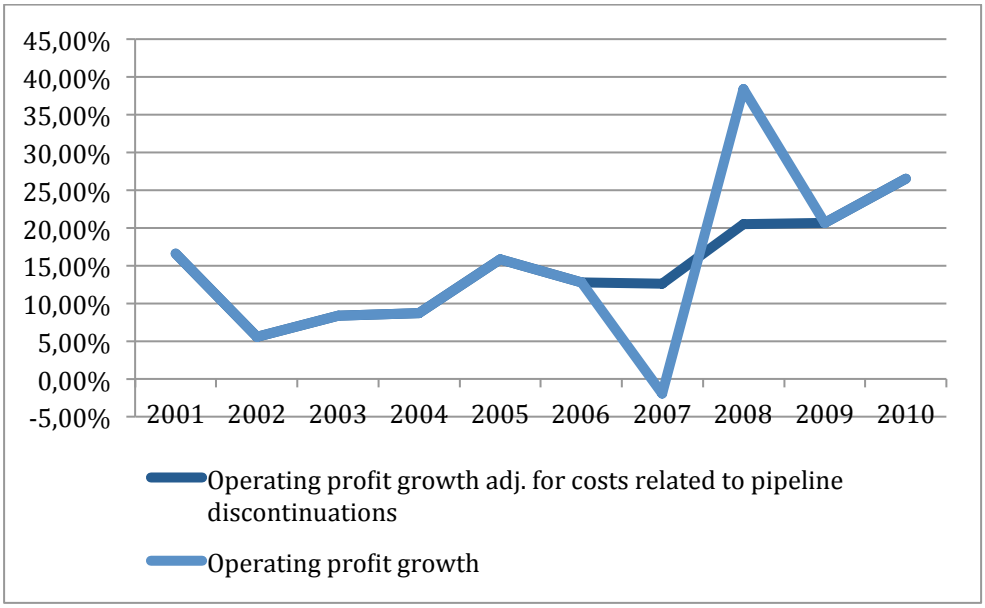

Figure 4 - Operational profit growth 2001 - 2010 – Source: own creation based on Novo Nordisk annual reports

If you take a look at the development of ROIC as it is reported in the annual reports, there has not been a clear cycle. From 2000 to 2004 the ROIC was stable, only moving within a few percentage points. After 2004, there has been an explosive increase in the ROIC, and it has more than tripled from 2004 to 2010, reaching an impressive 63.6% in 2010. This is also illustrated in figure 5 below.

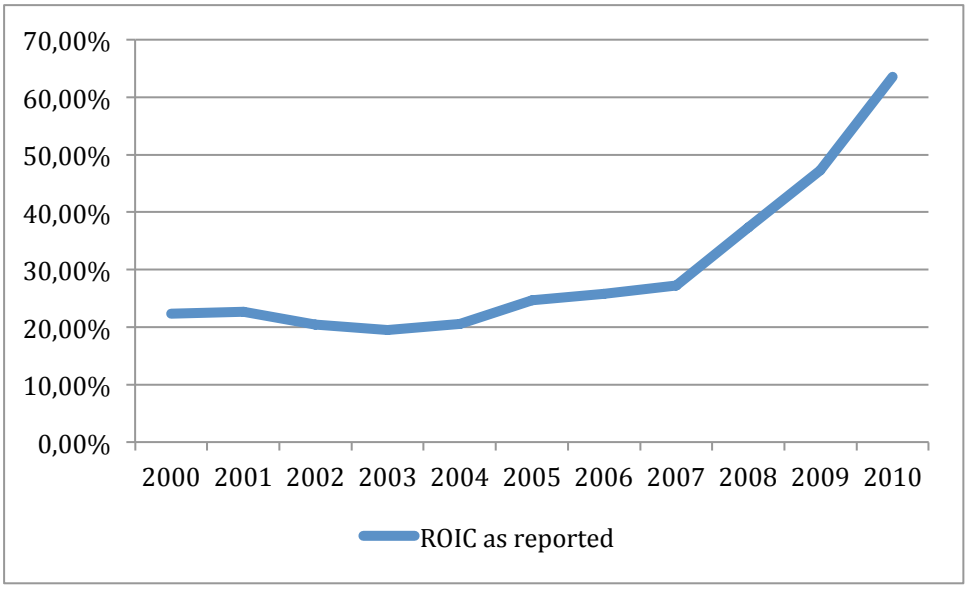

Figure 5 - ROIC 2000-2010 – Source: Own creation based on Novo Nordisk annual reports

4.1.1 Accounting standard

By law, all companies based within the European Union, were forced to adapt to the International Financial Reporting Standards (IFRS) no later than the 1st of January 2005, and Novo Nordisk changed their accounting standards one year before. This means that there are no major changes in the way Novo Nordisk report their financial figures in the chosen period, thus it have no impact on my financial analysis. Some minor changes to reconcile with US GAAP were made in the years after adapting to IFRS, but I will not take these changes into account because the difference is insignificant. In table 1 below the difference between IFRS and US GAAP can be found:

	2000	2001	2002	2003	2004	2005	2006
IFRS profit	3,154	3,62	4,116	4,883	5,013	5,864	6,452
US GAAP profit	3,505	3,411	4,270	4,844	4,685	4,898	6,31
Difference	-351	209	-154	39	328	966	142

Table 1 – Difference between IFRS and GAAP – Source: Own creation based on Novo Nordisk Annual Report 2000 – 2006

As I will use only the IFRS figures, the figures and ratios I will calculate in the financial statement analysis is comparable from one year to another.

Based on the aforementioned, I have chosen a period of 6 years ranging from FY2005 to FY2010 as basis of the financial statement analysis. I mainly build my analysis on the sales growth cycle since the operating profit has no obvious cycle.

4.2 Reformulation of the income statement and the balance sheet

For my financial statement analysis, I have made reformulations of the income statement and the balance sheet to separate the operations from the finance. This is done to give the most objective view of Novo Nordisk in financial terms. When the reformulations are done correctly you can identify what drives the profit (loss) of a company, and I find this relevant to apply to Novo Nordisk. The reformulated income statement and reformulated balance sheet can be found in appendix 3 and 4 respectively. In this part I will explain why I have chosen to see different items as operational or financial.

In the balance sheet I have chosen the following to be operational assets due to the direct link to the operations: intangible assets, property, plant and equipment, deferred tax income, inventories, trade receivables and tax receivables. Other current assets I have chosen to divide into operational and financial assets. This is done based on note 17 in the annual report 2010, where I have chosen to include the four underlying items prepayments, rent deposit, VAT receivable and other receivable as operational assets. These four can all be related to the operations in Novo Nordisk. Marketable securities and financial derivatives are also split into both operational and financial assets, with the underlying item equity investments being the only operational. Last operational asset is cash at bank and in hand, where I have chosen to include 0.5% of the sale as operational asset and the rest as a financial asset. This is done because cash is needed in the daily operations, and to set it as 0.5% of the sales are a way of estimating the amount of cash needed in the daily operation. The notes to the item do not state what is operational and what is financial and I have chosen to divide it as mentioned previously as they need some cash to continue the operations.

I have chosen to use deferred tax liabilities, trade payables, tax payables, other current liabilities and other provisions (current) as operational liabilities. These can be referred to the operations and are not generating any (or very little) interests. I have also chosen

to include provisions for pension as an operational asset; this is because I see the pensions as a natural consequence of having employees. These employees are a part of production, research, administration and other positions in Novo Nordisk that are necessary for the continuing operations of the company. The item ,other liabilities, is also an operational liability because the underlying items can all be related to the operations[12].

Investments in associated companies and other non-current financial assets are financial assets. The financial parts of other current assets include interest receivable and amounts owed by affiliated companies. Marketable securities and financial derivatives are the full item minus equity investments according to earlier in this chapter. Cash at bank and in hand is also mainly financial, but a small amount is operational according to earlier in this chapter.

On the financial liability side I have chosen to include long-term debt and other provisions (long-term) as the financial liabilities as they are creating interest expenses and cannot be directly related to the daily operations in Novo Nordisk.

4.3 Trend analysis

I have chosen to divide the trend analysis into two parts, the first part regarding the income statement, and the second regarding the balance sheet.

4.3.1 Trends in the income statement

Based on my reformulation of the income statement, I have calculated index figures that can be seen in table 2:

[12] Novo Nordisk annual report 2010, note 24, p 79

Income Statement						
	2005	2006	2007	2008	2009	2010
Sales	100	114.8	123.9	134.9	151.3	180.0
Cost of sales	100	104.4	106.7	110.2	113.7	127.3
Gross profit	100	118.6	130.3	144.2	165.3	199.7
Research and development costs	100	124.2	141.8	148.1	154.7	188.8
Total operating expenses from sales	100	121.5	132.0	137.9	155.8	183.1
Operating income from sales (before taxes)	100	112.7	126.9	157.0	184.6	233.6
Operating income from sales (after taxes)	100	114.2	141.3	172.0	202.5	257.1
Operating income (after taxes)	100	126.4	149.7	135.0	242.7	280.1
Net comprehensive income	100	133.8	164.6	144.6	236.0	263.3

Table 2 - Indexed income statement – Source: own creation based on the reformulated income statement

What I find most interesting is the development in sales, cost of sales and hence the gross profit. The gross profit has almost doubled during the six years even though the sales only increased 80%. This development is a clear value driver and a sign of a very sound driven company. The development can also be explained by a positive development in the product mix with the sale moving from human insulin to modern insulin[13] with a higher gross margin. New products and higher market shares are other reasons, and I will get much more into that in later chapters.

Less positive is it that the total operating expenses from sales has been increasing more than the sales. However, I find this a minor issue, and it has no significant impact on the total result, since it is only a 3.1% higher growth over 6 years. The research and development cost (R&D costs) is a large part of the total operating expenses from sales, and the development of this is slightly higher than the development in the total sale, but in the years 2007 and 2008 it can be related to the expensive phase III trials of Victoza while the large numbers in 2009 and 2010 are related to the phase III trials of Degludec. However, this increase is important for the future income and a natural part of every pharma/biotech company. And the increase of only 8% more than the sale is an acceptable level.

The operating income from sales (both before and after taxes) is also showing a large increase and has much more than doubled in my analysis period. This shows the low

[13] Novo Nordisk annual report 2010, note 2, p. 67

impact that the increase in the total operating expenses from sales has on the final result. Last, the operating income and the net comprehensive income are both in 2010 more that 2.5 time the 2005 figures, and are a clear sign that Novo Nordisk has improved their business and has become much better at making money.

4.3.2 Trends in the balance sheet

Based on my reformulation of the balance sheet, I have calculated index figures that can be seen in table 2:

Balance Sheet						
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Property, plant and equipment	100	102.1	98.3	93.5	96.4	102.8
Inventories	100	107.9	115.9	123.5	128.7	124.5
Trade receivables	100	107.7	127.1	137.3	147.3	177.3
Total operating assets	100	107.9	111.1	111.7	116.4	126.5
Trade payables	100	114.1	129.8	152.1	149.5	193.7
Other liabilities	100	106.2	108.3	127.9	148.9	173.8
Total operating liabilities	100	98.0	104.8	123.8	132.5	171.9
Net operating assets	100	113.4	114.6	105.0	107.6	101.5
Cash at bank and in hand	100	98.2	147.2	272.9	352.3	373.7
Long-term debt	100	94.1	77.0	78.5	77.7	40.4
Net financial assets	100	86.7	126.1	192.8	240.5	299.2
Common shareholders equity	100	109.0	116.5	119.3	129.3	133.8

Table 3 - indexed balance sheet – Source: own creations based on the reformulated income statement

The property, plant and equipment item has only increased with 2.8%, which can be interpreted as if Novo Nordisk has or had some unused production capacity they started to use now, since Novo Nordisk still could increase the sales with 80%. I find this very important, as it in 2010 accounts for about 1/3 of the total assets (20,507/61,402). The increase in inventories is lower than the increase in sales, and of the utmost importance it has decreased from 2009 to 2010 even though the sale increased by more than DKK 9bn. This is important as Novo Nordisk has less money tied up in inventories. This money can be used to improve other parts of the company. The trade receivables have developed pretty much in line with the sales. This is a natural effect of the increasing sale, and is of no importance of the total financial state of Novo Nordisk. The total operating assets have developed significantly slower than the sale and are mainly due to the very small change in property, plant and equipment.

The item, trade payables is related to the sale, and the increase is larger than the increase in sales is positive. This helps improving the working capital relatively to the sale because there are fewer funds tied up in inventories. Other liabilities refer mainly to deferred cost regarding the production[14]. However, the difference to the change in sales is neglectable and I will not put much emphasis on it. In relative terms, the total operating liabilities has increased a lot more than the total operating assets; this is, however, due to the much lower starting point. If you look at the net operating assets they are almost unchanged from 2005 to 2010, being highest in 2007 with a 14.6% increase compared to 2005. This is because both operational assets and –liabilities have increased about the same in absolute terms, and hence the difference is almost the same.

The long-term debt in Novo Nordisk has decreased significantly during the period. In 2010, the long-term debt was only around 40% of the one in 2005. In absolute terms it has decreased from DKK 1,248m to DKK 504m. Operating with only DKK 504m of long-term debt is a very low amount of debt, and a thing that is very special for the pharmaceutical industry. I will go more into depth with the debt/equity ratio in chapter "4.5.5 Debt / Equity Ratio"

The net financial assets are in 2010 300% of the 2005 figures, mainly driven by the impressive increase in the item cash at bank and in hand that is growing with the same speed. It has an absolute increase of more than DKK 8bn from 2005 to 2010, which is reflected in the net financial asset as mentioned before. The common shareholders' equity has also increased with 33.8% from 2005 to 2010, driven by the increase in the net financial assets.

4.4 Key-ratio analysis

The key-ratio analysis is used to evaluate the financial strength and opportunities of Novo Nordisk. It is split in two parts, first a breakdown of ROI (return on investments) and secondly a breakdown on ROCE (return on common equity). The reason why I choose to do it like this is that I can see what factors that drive the cash flows, and what causes a high (or low) return.

[14] Novo Nordisk annual report 2010, note 24, p. 79

2005 is not included in this analysis, as when referring to items from the reformulated balance sheet, I use average figures from primo and ultimo each year to get a more unbiased result and in my reformulation the first figures are from ultimo 2005.

4.4.1 Return on investments (ROI)

To make the breakdown of ROI, I have chosen to use the DuPont model, named after the American chemical company that developed the model in the 1920's. I have pictured it in figure 6.

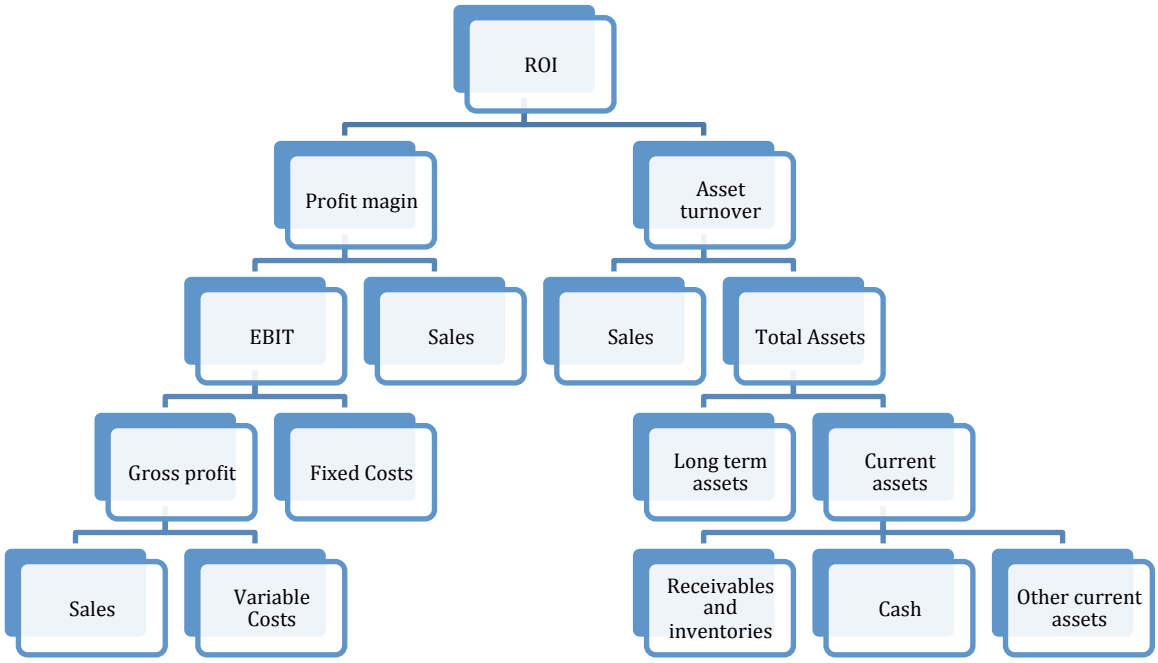

Figure 6 - DuPont model – Source: own creation

My calculations are split into three parts, first my calculations of ROI, then the breakdown of the profit margin, and the then breakdown of the asset turnover before I go back and conclude what drives the ROI for Novo Nordisk. Table 4 show the calculations in determining the ROI.

	2006	2007	2008	2009	2010
Return on Investment	19.5%	20.5%	24.1%	26.7%	30.0%
Profit margin	23.5%	24.5%	27.9%	29.2%	31.1%
EBIT	9,119	10,267	12,698	14,933	18,891
Sales	38,743	41,831	45,553	51,078	60,776
Gross profit	29,158	32,038	35,444	40,640	49,096
Fixed costs	20,039	21,771	22,746	25,707	30,205
Sales	38,743	41,831	45,553	51,078	60,776
Gross profit	29,158	32,038	35,444	40,640	49,096
Asset turnover ratio	82.9%	83.6%	86.4%	91.3%	964%
Sales	38,743	41,831	45,553	51,078	60,776
Total assets	46,723	50,044	52,731.5	55,959	63,036.5
Current assets	23,594.5	26,401	30,247.5	34,151.5	39,944
Long Term Assets	23,128.5	23,643	22,484	21,807.5	23,092.5
Other current assets	6,794	7,665	7,129	6,573	9,929
Cash at bank and in hand	3,286.5	4,046.5	6,802	10,038.5	11,656.5
Receivables and inventories	13,514	14,689.5	16,316.5	17,540	18,358.5

Table 4 – DuPont model 2006 – 2010 – Source: Own creations

Year after year, Novo Nordisk has shown an impressive and steady increase in the ROI. Going from a ROI less than 20% in 2006 to one at 30% in 2010 is nothing less than impressive. Especially the increase from 2006 to 2007 of 360 bps and the 330 bps from 2009 to 2010 are high yearly increases. During this chapter I will try to analyse the underlying reasons in order to find the value drivers.

Relative to ROI the profit margin has increased with 2.5 percentage points less during the 5-year period, but has still shown increases every year. The large increases have been the same years as where the ROI showed large increases, which again can be tracked to the increase in EBIT that has increased relatively more than the sales. This means that the costs have increased less than the sales, and if we take a look at both the fixed and the variable costs we see a positively low increase. The fixed costs have increased approximately 50% while the variable costs have increased 21%. These figures have to be compared to the increase in sales of 56% during the 5-year period.

Also in absolute terms, the total costs (fixed and variable) only increased with approximately DKK 12m, while the sales increased with DKK 22m.

A value driver behind the increase in sales could be the non-financial key ratio market share. The market shares on the three types of modern insulin (rapid-acting, long-acting, and a mix of the two) have all raised, see also Figure 7 below. This is very important for the gross profit margin due to higher margins on the sale of modern insulin than on sale of human insulin.

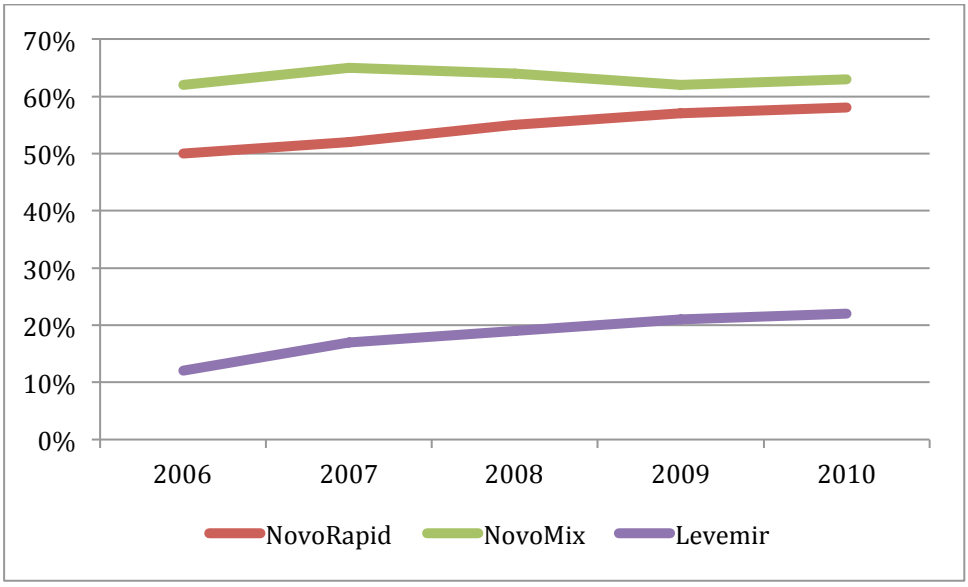

Figure 7 – Novo Nordisk market share on modern insulin – Source: own creation based on Novo Nordisk annual report 2010, page 6 and 7

The development in the market share divided on the different geographical areas look, however, is very weak and can be seen in figure 8 below. Over a five-year period Novo Nordisk's market share has only increased slightly in North American and International Operations, while it has taken a large fall in both Europe, and Japan & Korea. The fall in the market share in Japan & Korea is mainly due to higher competition from Novo Nordisk's large competitors.

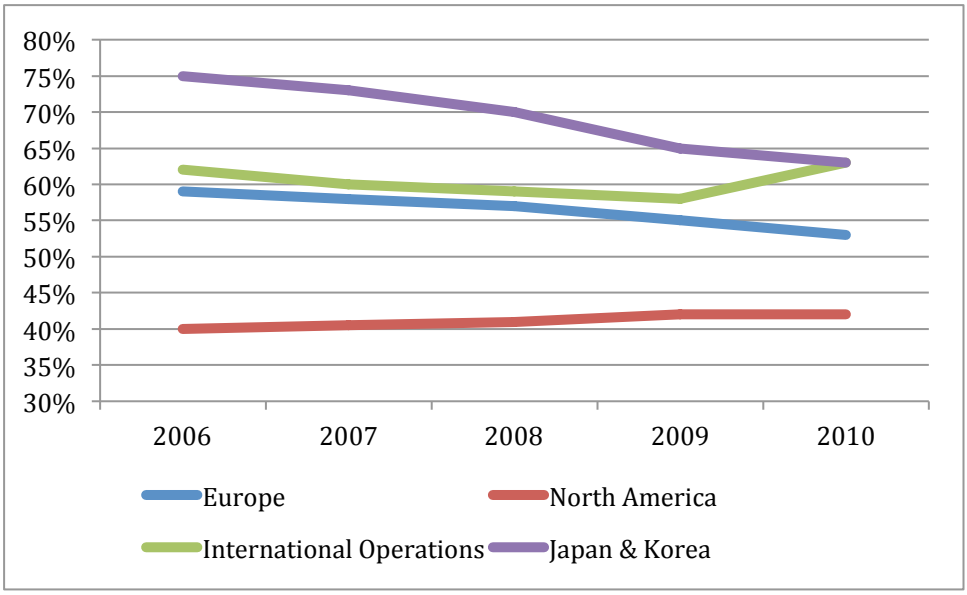

Figure 8 – Novo Nordisk market share on geographical areas – Source: own creation based on Novo Nordisk annual report 2010, page 6 and 7

The decrease in the market share in Japan & Korea was expected as they started on a very high level, with only few competitors. Now it looks as if it has reached a more natural level just above 50%, the same that historically has been the share on other markets. All in all, I think that the development in the market share on modern insulin is the main driver of the increased sale.

Below, in Table 5, I have calculated the total global size of the modern insulin market, from Novo Nordisk's sale of the products and their global market share (the 2006 and 2007 figures of the product sale are read from a figure, and can deviate from the actual market size). It is Interesting that the market for long-acting modern insulin is almost the same as the total markets of the rapid acting and the mixed insulin market in total. This makes Novo Nordisk's increase in Levemir's market share and much more essential, and is a momentous factor for the increase in sales.

Total market	2006	2007	2008	2009	2010
Rapid Acting Modern Insulin	11800	12115	14500	17725	21250
Long Acting Modern Insulin	12500	13529	20263	26115	33762
Insulin Mix	5323	7385	8672	10482	12414

Table 5 – Total market size of modern insulin – Source: own creation based on Novo Nordisk Annual report 2010 and 2007

The asset turnover ratio has increased with 13.5 percentage points over the 5-year period, this is more than ROI and the profit margin. At the first glance you can argue that the value is created here, but let us dig a little deeper. Since the asset turnover has increased, the sales must have increased more than the total assets. This is positive in an industry as the pharmaceutical because normally you have a large amount of fixed assets in production facilities that are correlated to the sale (if you cannot produce more you cannot increase the sale). According to chapter "4.3.2 Trends in the balance sheet" this is also the case for Novo Nordisk, with approximately 1/3 of the total assets being "property, plants and equipment". This means that they are now having a better and more efficient use of the production facilities. Also when we look closely into the matter, it can be seen that the fixed assets (long term assets) basically have not changed from 2005 to 2010. Actually it fell from 2005 to 2009, but approximately returned to the 2005 level in 2010. If we break down the current assets, it is especially the cash that has increased mostly in relative terms, going from DKK 3,286m to DKK 11,656m in the 5-year period. If this were lowered to the 2005 figures, or to have increased with only the same rate as the sale, the total assets would decrease to be lower than the sales, which would give an asset turnover above 100%

4.4.2 Return on common equity (ROCE)

	2006	2007	2008	2009	2010
ROCE	24.6%	28.1%	23.6%	36.5%	38.5%
RNOA	27,9%	30.9%	29.0%	53.7%	63.1%
RNFA	5.43%	12.43%	4.65%	-6.82%	-10.31%
ROOA	18.6%	20.9%	18.6%	32.5%	35.2%
FLEV	0.15	0.15	0.22	0.28	0.34
NBC	-5.4%	-12.4%	-4.6%	6.8%	10.3%
PM	17.8%	19.5%	16.1%	25.9%	25.1%
ATO	1.6	1.6	1.8	2.1	2.5
RFA	3.8%	8.6%	3.6%	-5.7%	-8.7%

Table 6 – ROCE breakdown 2006 – 2010 – Source: Own creation based on my reformulations

I find Return on Common Equity (ROCE) to be one of the most important measures because it calculates the profitability ratio for the shareholders. ROCE of Novo Nordisk is growing steadily every year during the period. The only decline is from 2007 to 2008, and it can be related to other comprehensive income that in 2008 was more than DKK

2bn lower than in 2007. I find the 2009 and 2010 ratio very impressive, due to the low amount of financial liabilities. Higher financial liabilities would lower the net financial assets and hence the common shareholders equity and cause the ROCE to increase. Instead the increase in marketable securities and financial instruments and cash at bank and in hand have increased causing the net financial assets to almost triple from 2005 to 2010 (according to the trend analysis). Novo Nordisk has only been able to increase the ROCE due to increasing sales; this is a clear sign that the Novo Nordisk business has improved significantly during the last years.

I will make the first-level breakdown of ROCE to distinguish the effect of the operating activities and the financial activities. ROCE can also be calculated from the following equation:

$$ROCE = RNOA - \left[\frac{NFA}{CSE} \cdot (RNOA - RNFA)\right]$$

RNOA being Return on Net Operating Assets calculated as operating income divided by net operating assets, NFA being the Net Financial Assets, CSE being the Common Shareholders Equity, RNOA being Return on Net Operating Asset and RNFA being Return on Net Financial Assets. The formula is only for companies with net financial assets (like Novo Nordisk) instead of net financial obligations.

The development in the RNOA is very impressive, and is really showing that Novo Nordisk is creating higher profit without increasing the net operating assets. The increasing RNOA is the primary reason that the return on common equity has increased. The decrease in RNFA has, however, dragged ROCE in a negative direction. The reason for this is the larger financial expenses and lower financial income of Novo Nordisk that occurred in 2010 compared to the previous years. This can also be seen from the FLEV ratio that has increased from 0.15 in 2006 to 0.34 in 2010, approaching 0.4 what Penman argues is the typical FLEV[15]. RNOA can also be calculated as the profit margin times the asset turnover, and can in that way be seen as a measure of the ability to generate sale compared to the NOA. The asset turnover of 2.5 means that Novo Nordisk generates DKK 2.5 for every DKK in net operating asset or need DKK 0.4 of net operating asset to generate one DKK of sales. The profit margin is 25.1% and hence RNOA is 25.1%

[15] Stephen H. Penman – Financial Statement Analysis and Security Valuation, p 364

* 2.5 ≈ 63.1% (25.1% * 2.5 is not 63.1%, but this is because my calculations are done with more decimals).

Novo Nordisk's return on financial assets has since 2007 been decreasing, and they were negative in 2009 and 2010. In these two years Novo Nordisk had larger financial expenses than financial income. This is, however, primarily due to some large expenses from losses on derivatives[16] which account for about 68% (1,406/2,057) of the total financial expenses. The reason the RFA is negative in 2010 even though Novo Nordisk is having net financial assets and not net financial obligations, is the huge amount of cash that is not generating any (or very little) interests.

4.5 Common size analysis

In my common size analysis I compare Novo Nordisk to a number of selected peers and divide them into main peers and other peers. A short description of the peers can be found in chapter "3.6 Peers". I have selected five measures that I think give a good picture of how Novo Nordisk is doing compared to their competitors. This is the change in sales, cost of goods divided by sales, R&D costs divided by sales, R&D costs divided by total assets and the debt / equity ratio. I think these five measures can be analysed in a way that gives a broad but good and correct view of Novo Nordisk and their peers. I have selected two R&D-ratios due to the importance R&D has on all the companies in the pharmaceutical industry.

I have chosen to compare Novo Nordisk's figures with both the simple average and the median of the peers. The reason why I include the median is that the average can be misleading when there is an outlier that distorts the result. Some of the data has unfortunately not been available for all companies, N.A. (not available) will figure where calculations are not possible due to missing data.

4.5.1 Change in sales

The changes in sales are measured by taking the current year's sale divided by the sale of the previous year. I will use this measure to see how Novo Nordisk is managing to continuously increase the revenue compared to the peers. The calculations can be seen in table 7 below.

[16] Novo Nordisk annual report 2010, note 8, p. 69

Change in sales					
	2006	2007	2008	2009	2010
Main peers					
Eli Lilly & Co	7.1%	18.8%	9.3%	7.2%	5.7%
Pfizer Inc	2.0%	0.1%	-0.3%	3.5%	35.6%
Sanofi-Aventis	3.9%	-1.1%	-1.7%	6.3%	3.7%
Average main peers	**4.4%**	**5.9%**	**2.5%**	**5.7%**	**15.0%**
Median main peers	**3.9%**	**0.1%**	**-0.3%**	**6.3%**	**5.7%**
Novo Nordisk	14.8%	8.0%	8.9%	12.1%	19.0%
Other peers					
Abbott Laboratories	12.4%	15.3%	13.9%	4.2%	14.3%
Bristol-Myers-Squibb Co	-6.7%	8.0%	6.5%	-8.7%	3.6%
GlaxoSmithKline plc	7.2%	-2.2%	7.2%	16.5%	0.1%
Merck & Co.	2.8%	6.9%	-1.4%	15.0%	67.7%
Novartis AG	16.2%	5.7%	8.9%	6.8%	14.4%
Average other peers	**6.4%**	**6.7%**	**7.0%**	**6.8%**	**20.0%**
Median other peers	**7.2%**	**6.9%**	**7.2%**	**6.8%**	**14.3%**
Novo Nordisk	14.8%	8.0%	8.9%	12.1%	19.0%

Table 7 – Change in sales Novo Nordisk against peers – Source: own creation based on annual reports

If we compare Novo Nordisk with their main peers, they are in general performing better during all years both compared to the mean the average. This is mainly due to weak performances from Pfizer and Sanofi-Aventis in 2006 to 2008, whereas Eli Lilly had a higher increase in the sales in 2007 and 2008 than Novo Nordisk, and Pfizer had an impressive 35% increase from 2009 to 2010. This increase in sales for Pfizer is, however, mainly due to the acquisition of their competitor Wyeth for USD 68bn, which was the largest acquisition in approximately three years[17]. Compared to the main peers, I can conclude that Novo Nordisk has shown the most stable and high increase year after year, with Eli Lilly tracing just after.

Looking at the other peers, Novo Nordisk is again outperforming the peers both on average and the median except 2010 where the average is one percentage point higher than Novo Nordisk's increase in sales. However, this is due to Merck's merger with Schering-Plough in 2009. If you correct for this Merck would only have a 2% increase in

[17] http://www.nytimes.com/2009/01/26/business/26drug.html

the sales, and the average would fall to 6.9%, which is much on line with the previous years' average, ranging from 6.4% to 7.0%. The only one of the other peers that can keep up with Novo Nordisk's increase in the sale is Abbott Laboratories, with a double-digit increase in four of the five years.

4.5.2 Cost of goods sold / Sales

This measure is good to see how much the companies are spending on the production of their products, to see if there has been a general trend during the last years, and to see if Novo Nordisk is more or less efficient than their peers. The calculations can be seen in table 8 below.

Cost of Goods Sold / Sales						
	2005	2006	2007	2008	2009	2010
Main peers						
Eli Lilly & Co	23.7%	22.6%	22.8%	21.5%	19.4%	18.9%
Pfizer Inc	15.3%	15.8%	23.2%	16.8%	17.8%	24.0%
Sanofi-Aventis	27.7%	26.7%	27.0%	26.6%	26.9%	28.7%
Average main peers	**22.2%**	**21.7%**	**24.3%**	**21.6%**	**21.4%**	**23.9%**
Median main peers	**23.7%**	**22.6%**	**23.2%**	**21.5%**	**19.4%**	**24.0%**
Novo Nordisk	27.2%	24.7%	23.4%	22.2%	20.4%	19.2%
Other peers						
Abbott Laboratories	N.A.	43.7%	44.1%	42.7%	42.9%	41.7%
Bristol-Myers-Squibb Co	30.9%	33.2%	32.1%	31.1%	27.3%	27.1%
GlaxoSmithKline plc	22.0%	21.6%	23.4%	26.3%	25.5%	26.7%
Merck & Co.	23.4%	26.5%	21.3%	23.4%	32.9%	40.0%
Novartis AG	26.6%	28.6%	29.0%	27.6%	27.5%	28.6%
Average other peers	**25.7%**	**30.7%**	**30.0%**	**30.2%**	**31.2%**	**32.8%**
Median other peers	**25.0%**	**28.6%**	**29.0%**	**27.6%**	**27.5%**	**28.6%**
Novo Nordisk	27.2%	24.7%	23.4%	22.2%	20.4%	19.2%

Table 8 – Cost of goods sold / Sales Novo Nordisk against peers – Source: own creation based on annual reports

Novo Nordisk has consequently improved the cost of goods sold / sales, and hence the gross margin, and Eli Lilly has done the same (apart from 2006 to 2007 where they had a 0.1 %-point increase), and is having a higher gross margin than Novo Nordisk all years through the analysis. Since neither Sanofi-Aventis nor Pfizer have improved their costs of goods sold / sales, Novo Nordisk has improved compared to the average and the median of the main peers. Pfizer has traditionally been ahead of Novo Nordisk but was

in 2010 overtaken, because Novo Nordisk kept lowering their costs compared to the sales while Pfizer had higher costs. When you look at Pfizer's figures, you can see that it has been very volatile which makes it hard to conclude that Novo Nordisk over time will outperform them. However, it is obvious that Novo Nordisk continuously can present a better gross margin than Sanofi-Aventis.

It has not been possible to retrieve information about the cost of goods sold for Abbott Laboratories for 2005 and hence it has not been possible to calculate this ratio. General for the other peers are that they are having higher costs of goods sold relative to their sales, and Novo Nordisk has been the one with lowest margin compared to the other peers since 2007. Only GlaxoSmithKline had a lower ratio in 2006. Novo Nordisk has also beaten both the average and the median ever since 2006, while they in 2005 were slightly trailing. However, I will not neglect the impact on the average the high ration Abbot is operating with, but even when they are not used in the calculations, Novo Nordisk is beating both the average and the median from 2006 and forward. General for the other peers is that they are not significantly improving their costs of goods sold relative to their sales. GlaxoSmithKline, Merck and Novartis have even raised their costs of goods sold relative to sales during this six-year period.

What I can conclude from this sub-analysis is that Novo Nordisk has performed much better than most of their peers, and Eli Lilly is the only competitor that has shown similar improvements in the ratio.

4.5.3 Research & Development / Sales

Another important measure is how much the companies are spending on R&D compared to the sales. By doing it this way, the size of the company is not important and the R&D costs are comparable through company sizes. I will use this measure to see if Novo Nordisk is spending more or less money on R&D compared to the competitors, and to see if there is a trend in the industry. The calculations can be seen in table 9 below.

R&D/Sales						
	2005	2006	2007	2008	2009	2010
Main peers						
Eli Lilly & Co	20.7%	19.9%	18.7%	18.9%	19.8%	21.2%
Pfizer Inc	15.3%	15.7%	16.7%	16.5%	15.7%	13.9%
Sanofi-Aventis	14.8%	15.6%	16.2%	16.6%	15.6%	14.5%
Average main peers	**16.9%**	**17.1%**	**17.2%**	**17.3%**	**17.0%**	**16.5%**
Median main peers	**15.3%**	**15.7%**	**16.7%**	**16.6%**	**15.7%**	**14.5%**
Novo Nordisk	15.1%	16.3%	17.2%	16.5%	15.4%	15.8%
Other peers						
Abbott Laboratories	9.0%	10.0%	9.7%	9.1%	8.9%	10.6%
Bristol-Myers-Squibb Co	14.3%	17.1%	17.0%	17.4%	19.4%	18.3%
GlaxoSmithKline plc	14.5%	14.9%	14.6%	15.1%	14.5%	15.7%
Merck & Co.	17.5%	21.1%	20.2%	20.1%	21.3%	23.9%
Novartis AG	15.6%	14.8%	16.9%	17.4%	16.9%	17.9%
Average other peers	**15.8%**	**15.2%**	**15.3%**	**15.4%**	**15.4%**	**17.0%**
Median other peers	**15.6%**	**14.9%**	**15.8%**	**16.3%**	**15.7%**	**16.8%**
Novo Nordisk	15.1%	16.3%	17.2%	16.5%	15.4%	15.8%

Table 9 – R&D per sale Novo Nordisk against peers – Source: own creation based on annual reports

When concentrating on the main peers, Novo Nordisk is very much in line with the spending on R&D compared to sales of Pfizer and Sanofi-Aventis. Eli Lilly, however, is spending a bit more, and is constantly being the one with highest R&D/Sales ratio. Eli Lilly is also the only one of the peers that can compete with Novo Nordisk on sales growth, which might be due to the amount spend on R&D.

Within the other peers the distribution is much wider, ranging from 8.9% to 23.9% Abbott Laboratories spending the fewest money on R&D relative to their sales and Merck & Co spending the most. Novo Nordisk is, however, on line with both the average and the median, and again there is a tendency to spend between 15% and 18% of the sales on R&D.

What I can conclude from the analysis on the R&D/Sales is that there is a tendency in the industry to spend between 15% and 18% of sales on R&D with a few outliers, and Novo Nordisk is falling within the normal range.

4.5.4 R&D Costs / Total Assets

I have already analysed Novo Nordisk's R&D costs relative to their sales compared to their peers, but I find R&D costs to be one of the most relevant costs for pharma companies. Relative to the total assets R&D costs can give another insight in how much pharma companies are spending on R&D relative to their size measured as total assets. The calculations can be found in table 10 below.

R&D / Total Assets						
	2005	2006	2007	2008	2009	2010
Main peers						
Eli Lilly & Co	12.3%	14.3%	13.0%	13.1%	15.8%	15.8%
Pfizer Inc	6.2%	6.6%	7.0%	7.1%	3.7%	4.8%
Sanofi-Aventis	4.7%	5.7%	6.3%	6.4%	5.7%	5.2%
Average main peers	**7.7%**	**8.9%**	**8.8%**	**8.9%**	**8.4%**	**8.6%**
Median main peers	**6.2%**	**6.6%**	**7.0%**	**7.1%**	**5.7%**	**5.2%**
Novo Nordisk	12.1%	14.1%	15.1%	14.9%	14.4%	15.6%
Other peers						
Abbott Laboratories	N.A.	6.2%	6.3%	6.3%	5.2%	6.3%
Bristol-Myers-Squibb Co	9.8%	12.0%	12.5%	12.1%	11.8%	11.5%
GlaxoSmithKline plc	11.5%	13.5%	10.7%	9.3%	9.6%	10.6%
Merck & Co.	8.6%	10.7%	10.1%	10.2%	5.2%	10.4%
Novartis AG	8.4%	7.9%	8.5%	9.2%	7.8%	7.4%
Average other peers	**9.6%**	**10.1%**	**9.6%**	**9.4%**	**7.9%**	**9.2%**
Median other peers	**9.2%**	**10.7%**	**10.1%**	**9.3%**	**7.8%**	**10.4%**
Novo Nordisk	12.1%	14.1%	15.1%	14.9%	14.4%	15.6%

Table 10 – R&D Cost / Total Assets Novo Nordisk against peers – Source: own creation based on annual reports

Compared to the main peers, Novo Nordisk is having substantial higher R&D costs / total asset than both Pfizer and Sanofi-Aventis while Eli Lilly's costs are very similar to Novo Nordisk's. This also makes their costs higher than the average and the median, but cannot really be interpreted good or bad on a stand-alone basis. High costs are usually not good, but when spend on R&D; hopefully they will develop new or better products to generate future higher sales. If you compare the present table with the increase in sales in Table 7 you can easily see that both Novo Nordisk and Eli Lilly are having a significant higher sales growth than Pfizer and Sanofi-Aventis. One of the reasons could be that

Novo Nordisk and Eli Lilly are incurring higher R&D costs, and therefore launch relatively more products that can help increasing the total sales.

Comparing to the other peers, the deviation from the lowest to the highest value is minor, and is mainly distributed around 10%. This makes both the average and the median close to 10% and hence, it is lower than the one of Novo Nordisk. Novo Nordisk is the company incurring the highest costs relative to the total assets compared to the other peers. The peers are in general having lower sales growth, which again can be the same reason as for the main peers. Presumably, this is not the only reason, and to make the conclusion that the R&D costs are the only to determine the development in sales might be to exaggerate.

4.5.5 Debt / Equity Ratio

My final ratio in the common size analysis will be the D/E-ratio. The D/E-ratio can be calculated either by taking the Total Liabilities / Equity or by taking Long Term Debt / Equity, and I have chosen the latter. This I mainly do because if you take the total liabilities, you will include other items on the balance sheet such as payables and other non-interest bearing debt. If you only use the long-term debt, you can get a better view of how much debt the company has taken to continue the operations on a longer run. I have included this to see if there is a trend in the industry, that shows how much of your business that is funded with debt and equity. Table 11 below is showing how Novo Nordisk's debt equity ratio has developed compared to their peers.

Long Term Debt / Equity						
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Main peers						
Eli Lilly & Co	0.53	0.32	0.34	0.68	0.69	0.54
Pfizer Inc	0.10	0.08	0.11	0.14	0.48	0.44
Sanofi-Aventis	0.10	0.10	0.08	0.09	0.12	0.13
Average main peers	**0.24**	**0.16**	**0.18**	**0.30**	**0.43**	**0.37**
Median main peers	**0.10**	**0.10**	**0.11**	**0.14**	**0.48**	**0.44**
Novo Nordisk	0.05	0.04	0.03	0.03	0.03	0.01
Other peers						
Abbott Laboratories	N.A.	0.50	0.53	0.50	0.49	0.56
Bristol-Myers-Squibb Co	0.75	0.73	0.41	0.54	0.41	0.34
GlaxoSmithKline plc	0.72	0.51	0.74	1.92	1.48	1.67
Merck & Co.	0.29	0.32	0.22	0.21	0.27	0.28
Novartis AG	0.04	0.02	0.01	0.04	0.15	0.23
Average other peers	**0.45**	**0.41**	**0.38**	**0.64**	**0.56**	**0.62**
Median other peers	**0.50**	**0.50**	**0.41**	**0.50**	**0.41**	**0.34**
Novo Nordisk	0.05	0.04	0.03	0.03	0.03	0.01

Table 11 – D/E-ratio Novo Nordisk against peers – Source: own creation based on annual reports

Novo Nordisk is having a very low D/E-ratio compared to their main peers; through all years Sanofi-Aventis is the only peer that has a nearly as low D/E-ratio as Novo Nordisk. Pfizer's D/E-ratio increased heavily in 2009, primarily due to Pfizer's acquisition of Wyeth (as mentioned I chapter 4.5.1 Change in Sales) for USD 68bn financed with cash, loans, and shares. According to New York Times[18] it was financed with bank loans of USD 22.5bn, which of course will increase the D/E ratio. On the other hand Eli Lilly is operating with a stable higher level of debt compared to Novo Nordisk and the other main peers.

When comparing Novo Nordisk's D/E-ratio to the other peers, you will also see that Novo Nordisk is operating with an exceptional low amount of debt. Novartis had an equal low D/E-ratio but during the last couple of years increased the amount of debt and is now operating with a slightly higher amount of debt. What is most notable is that the

[18] http://www.nytimes.com/2009/01/26/business/26drug.html

average and median is very stable around 0.5, which can be interpreted as the normal D/E-ratio for large pharmaceutical companies.

The D/E-ratio is very different from industry to industry, and the pharmaceutical industry is having a very low amount of debt. The reason why the pharmaceutical industry has such a low amount of debt is mainly due to the high margins and hence high yearly profit. This means that they are able to operate with a minimum of debt. From a shareholder point of view, this is, however, not always the optimal solution. Sometimes the company could earn higher profits when having a higher financial gearing. First of all, debt are relatively cheaper than equity, due to the investors' risk of loosing their investment, secondly the interests are tax deductible which would lower the taxes paid and hence increase the profit.

I think that the reason why the pharmaceutical companies still operate with very low debt is due to the risk of producing drugs compared to other goods, such as for instance cars or food. First of all the patents will expire and thus the companies' main source of income might disappear. This, combined with the risk of not being able to develop a new drug with a blockbuster sale, can make the companies operate with low debt to minimize the risk of bankruptcy if no replacements for their expired products are found.

4.6 Conclusion on Financial Statement Analysis

The main conclusions from the trend analysis is that Novo Nordisk has performed very good, improving profit significantly from higher sales and improved margins. During the last years, Novo Nordisk has streamlined their business. This can be seen on the basis of the figures in the trend analysis. On the balance sheet there have also been some changes and especially the net financial assets have increased, primarily due to more cash in hand and lower loans.

From the key ratio analysis it is generally obvious that Novo Nordisk has improved their important profit ratios. The increase ROI is driven by the large increase in sales that again is driven by higher market shares on the modern insulin market is increasing at a high speed. The increase in the sale is increasing both the profit margin and the asset turnover, and that way it has a double effect on the ROI.

The return on equity I also improved during the analysis period, and from this, I can conclude that it is the return from the net operating assets that has created the value, while the return on net financial asset in negative for 2009 and 2010. From this I can conclude that the higher income is coming from the operations, which are supporting my findings of improved profitability in the primary business.

From the common size analysis of the change in sales it is also possible to conclude that Novo Nordisk has been one of the best and most stable performing pharmaceutical company over the last years. The gross margin is especially in the latter part of my analysis period better than the peers' and Novo Nordisk is showing improvements while the industry in general is much more stable. R&D compared to sales is very much in line with that of the peers', and I can conclude that there is a tendency in the industry to spend 15%-18% of the sales on R&D. However, if you measure R&D costs relative to total assets, Novo Nordisk is along with Eli Lilly and Bristol-Myers-Squibb the one with highest costs. There is a tendency that Novo Nordisk is having between 3% and 5% higher R&D costs relative to the total assets than their peers.

The D/E-ratio in the industry has shown to be very low, and Novo Nordisk is operating with the lowest D/E-ratio of all their peers. I conclude that it is not necessarily good to have a low amount of debt, but the risk of operating in the pharmaceutical industry is the reason for the low debt. The low debt can remove some of the operating risks, and make it more attractive to invest in the industry.

5 Strategic analysis

I have chosen to split up my strategic analysis into four sub-analyses: 1) a PESTEL analysis to focus on the macro-environment that Novo Nordisk act within, 2) a Porter's Five Forces analysis to determine the intensity in the market, and Novo Nordisk's position in the market, 3) the GE/McKinsey Model that focus on Novo Nordisk on the company specific level and determines the attractiveness of their products and, finally 4) I will sum up my conclusions in a SWOT analysis to give an overview of Novo Nordisk's competitiveness.

The PESTEL and the Porter's Five Forces are chosen because they complement each other very well, taking both the macro environment and the market structure into consideration. However, I have chosen to adjust the PESTEL analysis to make it fit better into Novo Nordisk. Some of the topics I find relevant for Novo Nordisk can be put within both legal factors and political factors, and I have therefore chosen to merge these two factors. I will use the GE/McKinsey Model, to determine the future earnings potential of Novo Nordisk's products. This is done through analyses of the future market shares, market development, expirations of patents, etc. to get the best possible basis in the budgeting.

The SWOT analysis is meant as the important link between the strategic analysis and the budgeting. It can be hard to quantify the positive and negative sides of every company, but the SWOT analysis will help me, and the reader, to sum up the conclusions of the strategic analysis, which should make it easier to estimate the future cash flows.

5.1 PESTEL

The PESTEL analysis is an important framework for analysing the macro-environment in which Novo Nordisk act. Laws, demographic changes, changes in governmental policies, etc. can have a huge impact on Novo Nordisk's possibilities in the different markets.

5.1.1 Political and legal factors

Decisions made by governments and governmental organisations have an important impact on the business of Novo Nordisk. These factors could be decisions to change prices of drugs or decisions to approve drugs for being marketed.

During the financial crisis, countries have experienced budget deficits. When trying to minimize the public spending governments have minimized the support for purchase of drugs. This has been seen in many parts of the world, from USA to Germany and Greece, where the governments are reviewing the healthcare policies.

In May 2010, the Greek government decided to temporary cut down prices on all drugs with up to 27%. This price cut made Novo Nordisk temporarily pull out some of their

products from the Greek market. Novo Nordisk decided to keep only the human insulin in vials on the Greek market. Novo Nordisk found it necessary to take this dramatic step, in order to keep the Greek market profitable.

"The proposed price reductions for patented products would not have allowed us to continue running a profitable business in Greece. In the long term, if we cannot maintain profitability, we will be unable to continue to provide and improve treatment for the people who most need it." Lars Rebien Sørensen, CEO of Novo Nordisk, quote from Novo Nordisk annual report 2010, p. 5

This is a proof of the huge impact the political decision can have on running a business. Barrack Obama's health care reform was another political decision that will have an impact on Novo Nordisk. However, the total impact the health care reform in the US will have on Novo Nordisk is hard to determine and will only become apparent over the next years[19]. Novo Nordisk is considering similar health care reforms to be significant threats to reaching their long-term financial targets[20].

Governmental organisations such as Food and Drug Administration (FDA) in USA and the European Medicines Agency (EMEA) in Europe are examples of organisations that approve drugs to be marketed. Approvals from these (or the respective organisations from other regions) are needed; otherwise you are not allowed to launch new drugs in the regions. Novo Nordisk are in on-going dialogue with EMEA and FDA about their R&D projects, and the late phases in the development are planned and designed with help from and in cooperation with FDA and EMEA.

Liraglutide, the GLP-1 analogue that Novo Nordisk have developed and marketed as Victoza as a once-daily drug, has shown to have the positive side effect that the patients are losing weight (see also "3.5 Pipeline" for more info about Liraglutide in obesity). However, the FDA is setting higher standards for drugs against lifestyle diseases such as obesity, which can affect the possibility for Novo Nordisk to have Liraglutide approved for launch negatively. During 2010 and early 2011 FDA has rejected three of three

[19] Novo Nordisk annual report 2010, p. 13
[20] Novo Nordisk annual report 2010, p. 13

applications of anti-obesity drugs[21] due to possible links to heart problems and cancer, one of the drugs was even already approved for treating alcohol and cocaine addictions. These are also lifestyle diseases, but needs acute treatment whereas overweight easier can be treated without medication. This can be the reason why FDA chooses to accept it to use in alcohol and cocaine addiction but not in obesity. This shows that even though Liraglutide is already approved for diabetes care and hence have shown high safety, it can be difficult for Novo Nordisk to have it approved as a drug against obesity.

5.1.2 Economic factors

Novo Nordisk is acting in several markets all over the world. This means that they are exposed to financial risks when currencies are appreciating or depreciating against the DKK. Novo Nordisk is reporting in DKK but their sale is in a number of various currencies. Most of Novo Nordisk's sale is in EUR, USD, JPY, CNY and GBP while they carry most of their costs for R&D and production in DKK[22]. In figure 9 I have pictured the fluctuations of the USD, JPY, CNY and GBP against the DKK to fit it into one graph I have rebased the CNY and the JPY. I have multiplied the CNY/DKK exchange rate with factor 10 and the JPY/DKK exchange rate with factor 100. The EUR rate is not included because the DKK is pegged to it, and therefore the appreciations and depreciations against DKK are too small to have any severe impact on the earnings. Therefore, I will not include the EUR in my analysis of the impact currency rates have on Novo Nordisk's earnings.

[21] http://thechart.blogs.cnn.com/2011/02/01/fda-rejects-another-obesity-drug/
[22] Novo Nordisk annual report 2010, note 27, p. 80

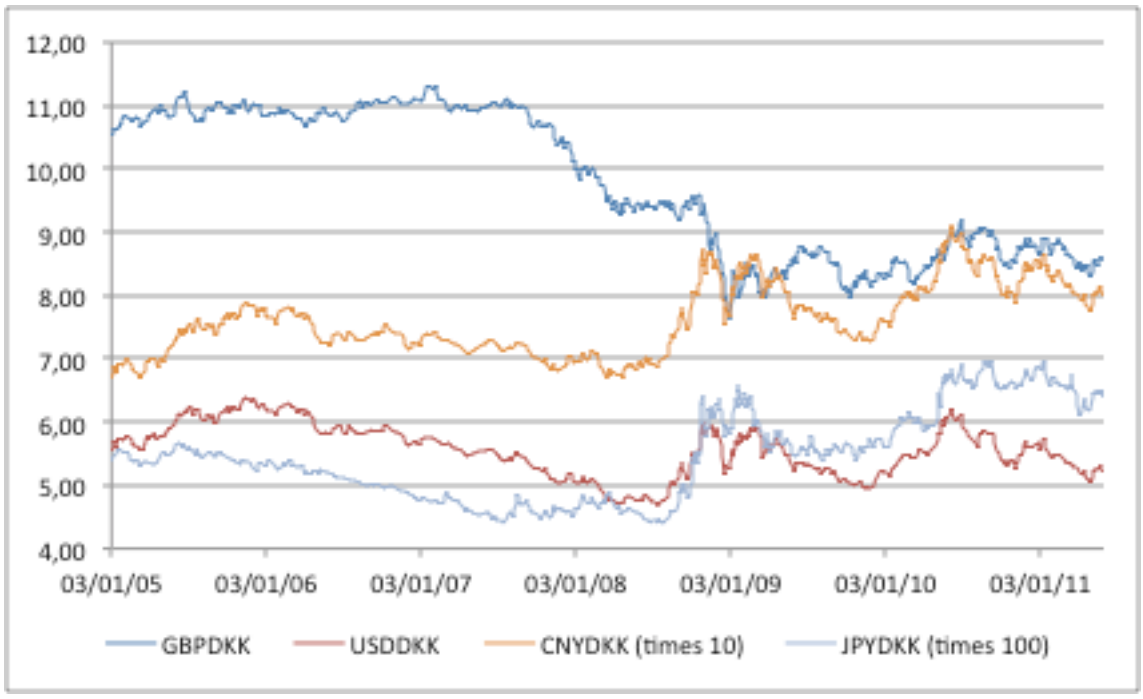

Figure 9 – Exchange rated 2005 – 2011 – Source: Factset

The changes in the rates are significant, and have a huge impact on Novo Nordisk's earnings. Novo Nordisk estimate a 5% appreciation/depreciation of the four currencies will have the following impact on the operating profit:[23]

- USD: DKK 620m
- JPY: DKK 155m
- CNY: DKK 120m
- GBP: DKK 85m

5.1.3 Social factors

During the last century there has been a tendency for people to urbanize, moving from the rural areas into the cities. This tendency is expected to continue[24], especially in the developing countries where the population has started moving from primary industries to the secondary and/or tertiary industries. This makes people sit behind desks instead of working in the fields, and therefore getting less exercise from the work. Furthermore, the developing countries are affected and influenced by the western culture, and fast food chains such as McDonalds and Burger King are opening in all parts of the world.

[23] Novo Nordisk Annual Report, Note 27, p. 80
[24] http://www.un.org/esa/population/publications/WUP2005/2005wup.htm

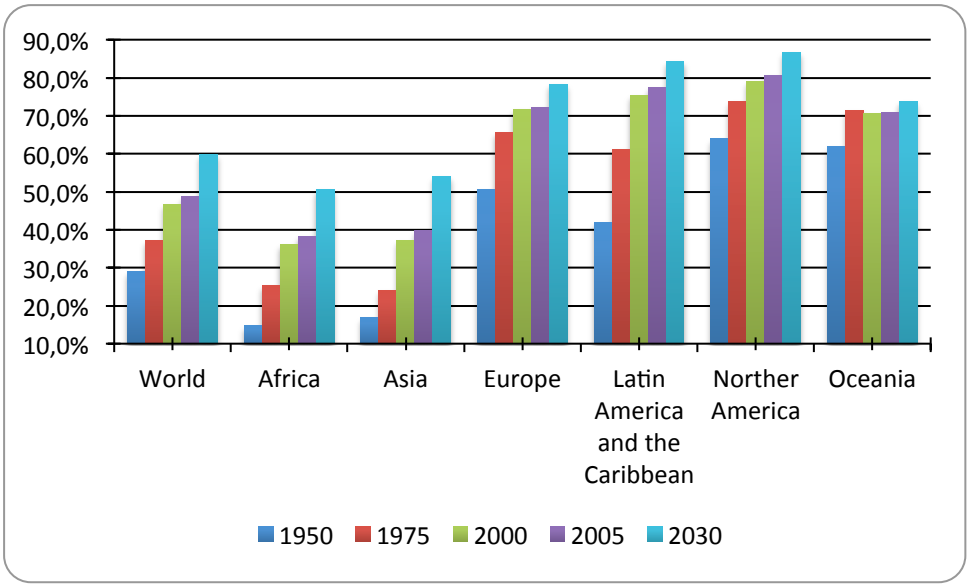

Figure 10 – Development in the urban population on geographic areas – Source: Own creation based on UN data

According to WHO[25] more than half of the world population are living in cities, and 60% are in 2030 expected to be living in cities and 70% by 2050. The development in the urban population can be seen in figure 10 above. Especially the developing regions (Africa, Asia and Latin America and the Caribbean) are experiencing high growth rates due to less exercise and more unhealthy food. The urban environment are discouraging physical activity from motorised transportation, poor air quality, and lacking sporting facilities. This along with unhealthy food is increasing the average BMI and the numbers of overweight and obese persons.

[25] http://www.who.int/bulletin/volumes/88/4/10-010410/en/index.html

	BMI > 25		BMI > 30		Mean BMI	
	2002	2010	2002	2010	2002	2010
China	27.5%	35.0%	1.0%	4.1%	23.3	24.6
Japan	25.3%	29.8%	1.5%	2.3%	23.0	23.3
Republic of Korea	32.8%	51.5%	2.3%	8.3%	23.7	25.2
India	15.0%	20.1%	0.9%	1.7%	21.4	22.0
Australia	69.7%	75.7%	21.2%	28.4%	27.0	27.8
USA	72.2%	80.5%	32.0%	44.2%	27.8	29.3
Brazil	43.4%	54.0%	6.9%	12.4%	24.5	25.5
Denmark	50.7%	55.0%	9.6%	12.0%	25.2	25.6
Germany	63.7%	67.2%	19.7%	22.9%	26.6	27.0
United Kingdom	62.5%	67.8%	18.7%	23.7%	26.4	27.0

Table 12 – BMI data for selected countries – Source: own creation based on WHO data[26]

All countries included in table 12 have experienced an increasing number of overweight persons. This is a tendency that is expected not to change during the years to come, and the world is facing severe costs due to more overweight people. There are the personal "costs" such as higher blood pressure, insulin resistance and higher cholesterol, and there are financial costs. These cost are not only direct cost to hospitalizations and treatment with anti-diabetic products; it is also lower working ability because overweight persons need more breaks, and in general are working more slowly.

5.1.4 Technological factors

The technological factors are extremely important for every biotech and pharma company. The future earning is depending on the ability to develop new products as the patents on the present products are expiring. Companies are seeking new technologies to be able to outperform their competitors. Biotech- and pharma companies are all seeking technological advantage compared to their competitors primarily through research and development. Every year Novo Nordisk is spending substantial amounts of money on research and development, to secure their status as leading within diabetes treatment. As can be seen in table 13 Novo Nordisk have increased their spending on R&D, but relative to sales the R&D costs are more stable.

[26] https://apps.who.int/infobase/Comparisons.aspx

	2005	2006	2007	2008	2009	2010
R&D (indexed)	100	124.2	141.8	148.1	154.7	188.8
R&D/Sales	15.1%	16.3%	17.2%	16.5%	15.4%	15.8%

Table 13 – Development in R&D in absolute terms and relative to sales – Source: own creation

In 2010 Novo Nordisk spent DKK 9.6bn on R&D, and that figure is not expected to decline in the coming years.

The focus on R&D is not only needed to grow larger in term of income and reputation, it is also needed if you don't want to fall behind your competitors. New products do not have to be revolutionary; improvements of already known drugs are just as important. If you can develop insulin with less side effects or insulin with better control of your blood sugar it can also improve your market share, and hence your income. Due to the modifications of the drugs this will also prevent the patents from expire and therefore extend the life cycle.

The GLP-1 analogues are good examples of the development of new products. Amylin and Eli Lilly had their GLP-1 analogue Exenatide (marketed as Byetta) approved in 2005, and Novo Nordisk followed up with Liraglutide (Victoza) in 2010. Victoza is a once-daily drug while Eli Lilly is a twice-daily drug, which obviously makes it more advantageous for the patient to use Victoza. The sale of Byetta declined 11% in 2010[27], presumably due to the new competition from Victoza, and indicates the difficulties that suddenly can appear for a product in the pharmaceutical industry.

5.1.5 Environmental factors

Novo Nordisk is also focusing on the more soft side of the company, an important thing in a modern world with still more emphasis on corporate social responsibility (CSR). Social and environmental performances are important measures in the non-financial statement Novo Nordisk include in the annual report. This report includes everything from the donations Novo Nordisk have made to different foundations, number of animals purchased for early phase trials to the energy consumption.

[27] Eli Lilly Annual Report 2010, page 22.

Novo Nordisk has to live up to certain requirements from the very different stakeholders, ranging from environmental organisations to shareholders and governments. Otherwise they can end up getting bad publicity. To give an example Lundbeck (a Danish pharmaceutical company) have been criticised because one of their products is being used to execute death penalty in the United States. Even though they are against the use of their product as a part of the death penalty, the media has kept focus on it, and it is a clear disadvantage for Lundbeck.

Another important feature for Novo Nordisk is that they should keep focusing on lowering energy consumption, hazardous and non-hazardous waste, etc. both for environmental reasons and to lower their costs. This can help them retain their good image and improving their margins due to lower costs.

5.2 Porter's Five Forces

Another important non-financial model is Porter's five forces that is used to analyse and determine the degree of competition in an industry. Michael E. Porter argues that the four surrounding forces: threat of potential entrants, buyers bargaining power, suppliers bargaining power and threat of substitutes, determine the fifth force – the industry competition. Depending on companies' position against the four forces, the industry can be attractive (and create high profits) or not (high competition and low profits).

For the case of Novo Nordisk I have chosen to focus on the market for anti-diabetics. Porter's five forces is made to analyse one market and I will focus on the anti-diabetics rather than haemophilia or growth hormones as it is Novo Nordisk's largest business area and due to the limitation of pages in this thesis. However, parallels can be drawn to both the haemophilia market and the market for growth hormones.

5.2.1 Threat of new entrants

Biotech and pharma are two very special industries in terms of protection from new entrants. In this chapter I have chosen to focus my attention on the patents that protects companies from copies of their product, what happens when a patent expires, and the heavy investments companies make in production facilities and sales forces to secure and improve their market position.

Patents are a necessity in the biotech and pharma industry; if they did not exist then companies would have no incentive to develop new drugs. If there were no patents, competitors could produce the drugs very cheaply right after the approved, because they had no costs related to development of the drug. They would only have the production costs, and the company that developed the drug would have no possibility to earn the R&D costs back. Patents usually give 20 years of protection (can be extended with up to five years), but that includes the clinical trials, so the actual patent, when the product has been marketed, is usually only seven to twelve years, depending on the time it takes to develop the drug. The length of the protection differs from country to country, but in US it is 20 years[28]. The patent situation is of course an important entrance barrier, and makes the business much more attractive.

Novo Nordisk has a huge number of patents; at the end of 2010 they had 817 patents, which was a decrease from 905 in 2009[29]. Patents on some of Novo Nordisk's products have already expired. An example of this is NovoSeven, where the patent has expired in US, Japan and China and in some European countries, and will expire in the last European countries during 2011. In table 14 I provide an overview of the patent expiries of some of Novo Nordisk's selected products.

Product	Europe	US	Japan	China
Levemir	2018	2019	2019	2014
NovoRapid (NovoLog)	2011	2014	Expired	Expired
NovoMix 30 (NovoLog Mix 70/30)	2014-15	2014	2014	Expired
NovoNorm	Expired	Expired	2011	Expired
PrandiMet	Pending	2018	Pending	N/A
Norditropin	2017	2015	2017	2017
NovoSeven	2010-11	Expired	Expired	Expired
Victoza	2022	2022	2022	2017

Table 14 – Expiration of patents – Source: own creation based on Novo Nordisk Annual Report 2010

[28] http://www.fda.gov/Drugs/DevelopmentApprovalProcess/ucm079031.htm# How many years is a patent granted for?
[29] Novo Nordisk annual report 2010, p. 97

The years mentioned are the years the patent expires on the active ingredient. Patents on the actual formulation can be longer, and the current formulation on NovoRapid (NovoLog) will not expire until 2017.

When a patent expires a new situation arises. So-called generic drugs (generics) are marketed. These are defined by FDA as: "A drug product that is comparable to a brand/reference listed drug product in dosage form, strength, route of administration, quality and performance characteristics, and intended use"[30]. These drugs are priced significantly below the original drugs, because the company that market the generic have had no R&D costs related to the product and, hence, they only need the production costs covered. The drugs still need to fulfil the high level of safety and efficacy requirements, and the drug should be as good as the original one. These generics and biosimilars have been on the European market for several decades, and Novo Nordisk is used to compete with them. Novo Nordisk finds it possible that expirations of patens could impact the sales within the next five years[31]. However, there is a transition from human insulin to modern insulin where Novo Nordisk has longer patents which will help to keep the sales on a high level.

Heavy investments in production and R&D facilities are other barriers that make it hard to enter the pharma industry. For Novo Nordisk the item Property, Plant and Equipment accounts for almost 50% of the total assets. These production facilities are not created overnight, and hence it takes time for new entrants to be able to produce the same amount of e.g. insulin as Novo Nordisk.

These heavy investments in fixed asset are not only keeping new entrants away because of the capital that is needed to start the production, but also because of the exit barriers. When the potential entrants know it can be hard to leave the industry again, because of the many fixed assets that cannot (or hardly cannot) be sold. The new entrants still have the opportunity to outsource the production to one of the large companies, but that would lower their margins because they would have to pay other companies to produce

30 http://www.fda.gov/downloads/Drugs/DevelopmentApprovalProcess/SmallBusinessAssistance/ucm127615.pdf

31 Novo Nordisk Annual Report 2010, page 43

the products. They would have to sell the product at a higher price that would be closer to the price of the original producers' products. First of all the lower spread between the original price and the price of the generics would lower the incentive to switch from the known product that the patient might have used for several year to a new one. Secondly, it gives other producers of generic drugs the possibility to produce the drug at a lower cost, and compete on the price with the first generic producer.

5.2.2 Threat of substitute products

In general, when new technology enters a market, old products get less valuable to customers and they start buying the new technology due to new or better functions. In this matter, the pharma industry is not different. When a new and better product is marketed, users quickly switch to buy the new one. If a competitor develops a product that is better or with fewer side effects, the patients can switch from their usual drug to the new one. Within anti-diabetics we have seen this development many times. A hundred years ago insulin were subtracted from pancreas from pigs, then human insulin made in laboratories were invented, and today there is also modern insulin and GLP-1 analogue. This shows the development of new products covering the same need – lowering blood sugar.

The development in anti-diabetics is of course putting the old products under a price pressure, making them less profitable than the newer drug (that might even still be patented). Novo Nordisk's anti-diabetic Victoza and Byetta (marketed by Amylin Pharmaceuticals and Eli Lilly & Co.) are the only two GLP-1 analogues in the market today, and even though GlaxoSmithKline and Roche are developing other GLP-1 analogues, Novo Nordisk and Eli Lilly are taking market shares from their competitors.

However, the threat of substitute products is something that can be foreseen by the pharma companies. Novo Nordisk know what products their competitors are developing years before they are marketed (their competitors' pipelines are public known), and Novo Nordisk can follow the development and be ready to act in a way that is best for them. Novo Nordisk and Eli Lilly know that GlaxoSmithKline and Roche are developing GLP-1 analogues, and can be ready if/when competing products are launched. Other times, it can be a race to be the first to launch a new product. Eli Lilly was the first to get

a GLP-1 analogue approved and Novo Nordisk had to make a better product to be able to compete. They launched Victoza that only have to be taken once a day, while Byetta have to be taken twice a day. Eli Lilly are trying to compete by developing Bydureon that have to be taken once a week. These substitutes are very important in the pharmaceutical sector, and you need to be able to develop a new and better product to make market shares or maybe even just to keep you market share at a current level.

5.2.3 Threat of buyers' bargaining power

The threat of buyers' bargaining power is hard to determine. The end-users are not really the ones that decide what product to buy. The patient gets diagnosed with diabetes by a doctor, who typically gives the patient a prescription for a drug and then the patient buys the drug at a pharmacy. This way, the doctor is actually the one to decide if you should have a GLP-1 analogue, modern insulin, etc. For the pharma companies, this means that they have to direct their marketing towards the doctors, convincing them that their drug is the best to treat diabetes.

The fact that it is doctors that decide what anti-diabetic the patients buy makes the buyers bargaining power higher. If a pharma company persuades a doctor that their product is the best, a not insignificant number of patients could switch from one product to another. Therefore, it is important to keep a good relationship with doctors and doctors' associations around the world. The relative high bargaining power makes competition fiercer, and increases the rivalry between the large pharma companies.

It is even more important that the governments often pay a part of the final price, and hence have an influence on the buyers' bargaining power. When a government decides to remove or lower the financial support to drugs (like in the case with Greece), pharma companies could be pressured to remove one or more of the drugs from the particular market. Furthermore, the governments make recommendation lists and other actions to guide doctors to what they see as the best product. The amount of which the governments will subsidise the products is important, because some people cannot afford the full price without the subsidiary.

Thus, the end-users bargaining power is very small. The real power lies both with the doctors (they make the prescriptions) and the governments (decide the amount of subsidiaries). The end users can ask the doctors to get a prescription for a certain drug (Victoza vs. Byetta), but I think that it is the fewest patients that will ask for another drug than the one the doctor recommends.

5.2.4 Threat of suppliers bargaining power

The pharma business relies on two types of suppliers, raw materials for the production and people and the knowledge they bring. The main raw materials for the production are starches, sugar, chemicals, water and energy. None of those are currently scarce resources, and can be bought from a number of suppliers. This means that the suppliers have very low bargaining power. The active ingredients in the drugs are most often made from a mixture of different ingredients instead.

Novo Nordisk is trying to lower the inputs, where energy consumption, water consumption and raw materials have been lowered during the last years. This will first of all make their margins higher, but it will also make the company less dependent on these suppliers. When buying input to the production you will usually get a larger discount when you buy more. This is not a problem with input like water and energy, because it is usually a fixed price you pay per unit, no matter how much you use.

Innovation and development of new and better drugs is the important part of being a pharma company; this innovation comes from scientists and other human resources. Novo Nordisk have more than 30,000 employees in 74 countries[32], and are spending DKK 18.5bn on remuneration to the employees[33], which all are contributing to the development of the company.

The knowledge that scientists and other employees at pharma companies possess is an important value generator in every company relying on R&D. Knowledge is a very scarce resource and is nothing that can easily be obtained. This means that there is a competition between pharma companies to recruit and keep the most skilled personnel.

[32] Novo Nordisk annual report 2010, p. 1
[33] Novo Nordisk annual report 2010, non-financial statement note 9, p. 98

Today, it is not enough only to pay a good salary to keep the employees, other values such as the possibility for personal development, good working hours, maternity leave, the general image of the company, etc. are important for keeping the employees from leaving for a competitor. The loyalty to the employer is not as it was a few decades ago, when people could work the same place all their life. Today people move from one workplace to another if they are offered something better, or for personal advantages.

Today, "Øresundsregionen" is called Medicon Valley because of the clustering of Danish and Swedish pharma and biotech companies. This makes the competition for the best employees tough because there are a lot of companies looking for employees in this area. However, for the company with the best package for the employees it can be an advantage, since it might be easier to attract the best people, since they do not need to move residence to start in the new job.

Partnerships between biotech- and pharmaceutical companies are often seen. Small biotech companies do not have the capital to make expensive late phase trials and are often making agreements with large pharmaceutical companies. These deals often include agreements, where the large company are in-licensing the products and are taking the products through the last phases. If the product reaches the market there is a profit sharing agreement. This is beneficial for both companies, because it is possible to use the expertise of both, and the small biotech company would have no possibility to make the last trials and the large company would not have the product without the agreement. Other times, the in-licensing agreement can include deals, where one company gets the rights to market the product in some specific geographic regions, again with some kind of profit sharing agreement.

5.2.5 Industry competition

In general, the pharmaceutical industry is an attractive industry. Due to the high entrance and exit barriers the industry will be dominated by a few large competitors, which make the industry much more attractive, since you can act like a monopolist due to the patents. Some of the products might have competition from similar products, which can make the market an oligopoly, e.g. Victoza and Byetta are highly competitive, even though they are patented and Novo Nordisk and Eli Lilly cannot act as monopolists.

The development of new products through research and development helps the companies to maintain high income, because they are able to charge high prices due to the patents.

When diagnosed with diabetes, you start the treatment with an anti-diabetic, and it is hard to substitute away from the product. There will always be a risk that a new and better treatment is developed, and all companies are trying to keep improving their existing products and develop new products to stay ahead of their competitors. All in all, the threats from substitute products are high, because of the significant decrease in sales a new competing product can cause.

The end-users of Novo Nordisk's products have very little bargaining power towards Novo Nordisk, because they are given a certain drug against their disease. They can ask the doctor to get a prescription on a different insulin product, but the doctor has the final word, and most people would not ask their doctor to prescribe another product when he recommended a certain one. Also the governments have an impact on the sales due to subsidiaries. If they remove or lower the subsidiary to a product or a group of products, the end users might not be able to afford the product, or the doctor will choose to prescribe a different product.

5.3 GE / McKinsey Matrix

To analyse Novo Nordisk's product portfolio, I have chosen to use the GE / McKinsey Matrix (GE/M Matrix). I will use it to analyse the potential of Novo Nordisk's different business areas, to help me estimate the future sale of their products. This is done through GE/M Matrix's two drivers: Business Unit Strength and Market Attractiveness. Business Unit Strength takes internal factors, such as market share, change in market share, brand strength, management strength, etc. into account, while Market Attractiveness take the external factors such as market size, market growth, pricing trends, entry/exit barriers, etc. into account.

When the product is analysed, you plot it into a 3x3 matrix with one bubble for each product split into two parts. Each bubble represents one market, while the number within the bubble represents the current market share. Finally there is an arrow that

represents the direction in which the product is moving. The matrix is illustrated below in table 15 followed by the analysis explaining the reasoning behind the placement of the bubbles. To make it easier to refer to the different squares I have given them numbers from 1 to 9.

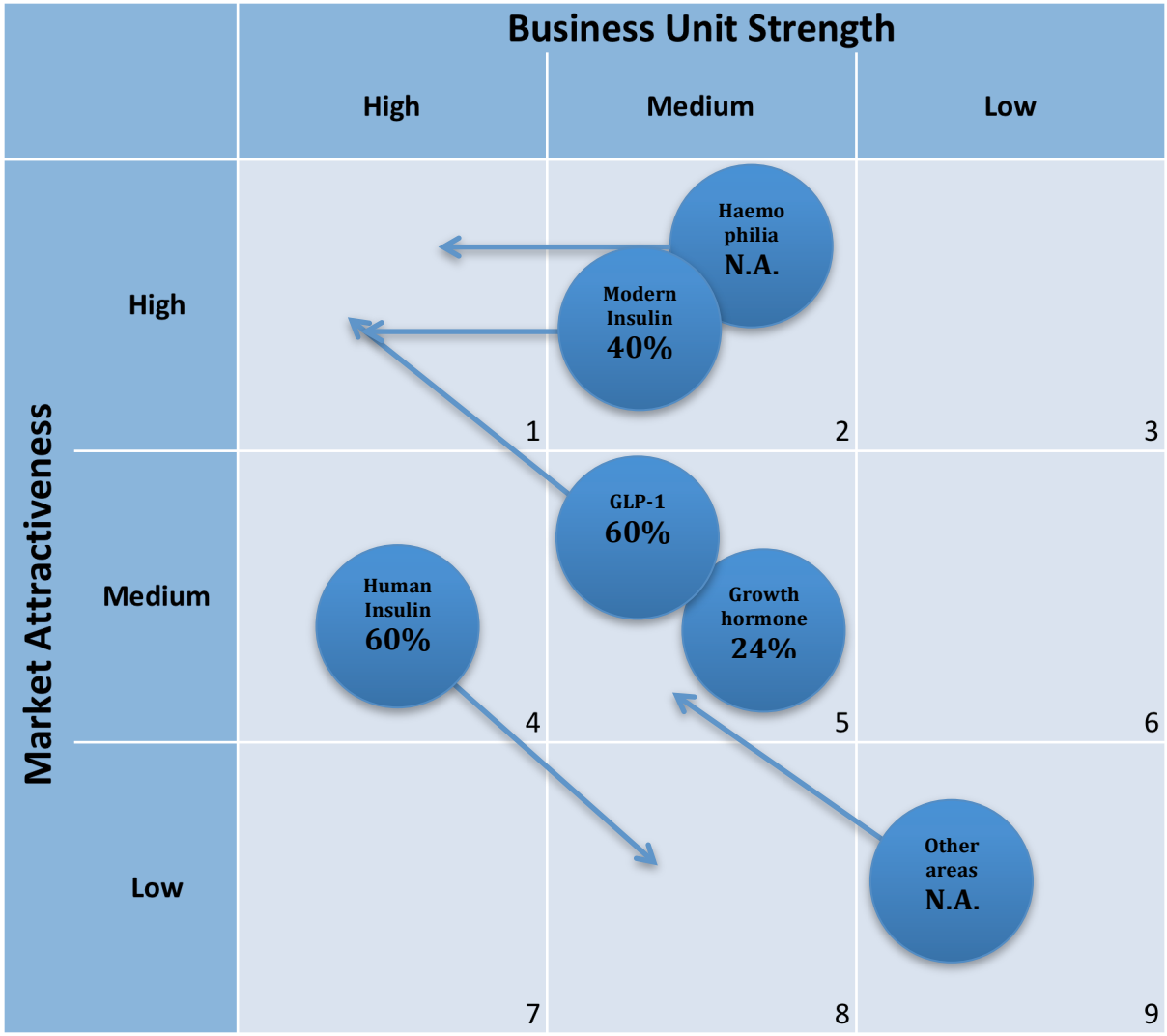

Table 15 – GE / McKinsey Matrix – Source: Own creation

5.3.1 Modern insulin

In the group modern insulin, Novo Nordisk is producing three different drugs: NovoRapid (called NovoLog in the US), NovoMix (called NovoLogMix in the US) and Levemir. The total sales of modern insulin have experienced a huge increase during the last years. In 2004 it accounted for about DKK 4.5bn while in 2010 it was more than DKK 26bn. The reasons for this increase are both increasing market share and total market growth. Furthermore, Levemir was not launched until 2004, and has improved the market share since. In 2004, Novo Nordisk had just about 16% of the global market

share on modern insulin, making the total market size to be around DKK 28bn. In the later annual reports the market share has not been reported on the total modern insulin market, but on the three sub-markets (rapid-acting, long-acting and a mixture of those). From 2008 to 2010, the development in Novo Nordisk's market share in the modern insulin has been around zero. The market share of NovoRapid has increased with one percentage point each year, the same with Levemir, while NovoMix decreased three percentage points from 2008 to 2009 and the raised one from 2009 to 2010. In the same period, the total market size has grown from DKK 43.4bn to more than DKK 66bn, which corresponds to a CAGR of 23%. In table 16 below, I have shown how Novo Nordisk's sales and market share have changed in modern insulin over that past three years.

	2008	2009	2010
NovoRapid Market Share	54%	55%	56%
NovoRapid Sales	7830	9749	11900
Total Rapid-acting Market	14500	17725	21250
Levemir Market Share	19%	20%	21%
Levemir Sales	3850	5223	6880
Total Long-acting Market	20263	26115	32762
NovoMix Market Share	65%	62%	63%
NovoMix Sales	5637	6499	7821
Total Mix Market	8672	10482	12414
Novo Modern Insulin Sales	17317	21471	26601
Total Modern Insulin Market Size	43435	54323	66426
Modern Insulin Market Growth		25%	22%
Novo Market Share Modern Insulin[34]	40%	40%	40%

Table 16 – Sales and market share in modern insulin market – Source: own creation based on Novo Nordisk annual reports

The aforementioned Novo Nordisk's total market share is not changing, but the market keeps increasing with a rapid speed. If Novo Nordisk can keep the market share, or maybe even improve it, then they can increase their yearly sale with a high percentage. More patients switch from human insulin to modern insulin, and the global number of diabetics keeps on increasing. I estimate that yearly growth rates of the total market size between 15% and 25% can be expected over the next 5-8 years.

[34] The market shares during the three years are not exactly the same, but are all rounded to 40%

The patent on Levemir expires in 2018/2019 (2014 in China), on NovoRapid it expires in 2017 (the active ingredient in 2014) and on NovoMix in 2014/2015. They can be supplemented by the ultra-long-acting new generation known as ultra-modern insulin Degludec (and Degludec+) during 2013 if they get the application approved. Degludec gives higher control of the patients' blood sugar, while the risk of hypoglycemia is significantly lower than the competing products[35].

With the 2010 annual report Novo Nordisk published positive results from the Degludec and DegludecPlus studies (will be evaluated together in this part). According to the CEO, Lars Rebien Sørensen, Novo Nordisk expects to file for approval during second half of 2011. If Degludec gets approved, it will take a substantial chunk of Levemir's market share, as they are both long-acting modern insulin. However, I estimate that Degludec can also capture market share from Sanofi-Aventis' counterpart to Degludec, insulin glargine (marketed under the name Lantus). The reason it could capture market shares from Lantus, is due to stronger safety profile. Studies have shown[36] that Degludec, with statistical significant proof, lowers the risk of hypoglycemia. The study was conducted with 629 patients who were either treated with Degludec or Lantus once daily in a 52-week period. The risk of the severe side effect, nocturnal hypoglycemia was 24% lower with Degludec than Lantus. Later publications from Sanofi-Aventis[37] have confirmed, that Lantus has a weaker safety profile than Degludec, but it was not published until June 2011 (after my deadline for information) and hence I will not include it in my valuation.

DegludecPlus is primarily seen as the replacement for NovoMix, where the patent expires in 2014/2015. It is a mixture of Degludec (basal treatment) and NovoLog (bolus treatment), and will be used to treat diabetes type 1 patients. If marketed, I expect it to capture NovoMix's patients but I do not expect it to take a huge market share from competitors due to NovoMix's significant market share. The reasoning behind my

[35] http://www.drugs.com/clinical_trials/degludec-significantly-reduces-risk-hypoglycaemia-during-night-compared-insulin-glargine-two-long-10937.html
[36] http://www.drugs.com/clinical_trials/degludec-significantly-reduces-risk-hypoglycaemia-during-night-compared-insulin-glargine-two-long-10937.html
[37] http://www.medscape.com/viewarticle/745249

expectation that the market share will be taken from Novo Mix is, that Novo Nordisk in their 2010 annual report states that DegludecPlus has better control of the blood sugar, by reducing the blood sugar to just above 7%. Furthermore, it has shown lower risk of hypoglycemia than NovoMix, including a 70% reduction in the nocturnal hypoglycemia.

Based on the aforementioned studies and the annual report 2010, I estimate a launch around the summer of 2013. There is still a risk of it not getting approved by FDA, but due to its strong safety profile, especially compared to Lantus, I include it in my budgets with an 80% chance of approval. I estimate that it will capture a significant market share over time, being the preferred long-acting insulin in the market.

Based on the above, I find Novo Nordisk to be in a good position in the market, but it can improve even further if Degludec and DegludecPlus get approved. Furthermore, during the last years, the market has shown impressive growth rates, and I see no reason that it will slow down significantly down during the coming years. Therefore, I choose to place the modern insulin bubble in the matrix in the left part of square number 2, with the possibility to go into square 1 if Degludec and DegludecPlus will be approved.

5.3.2 Human insulin

Today, human insulin is primarily sold in the poorest countries of the world, where the patients cannot afford expensive drugs. It is sold here at a price of only 20% of the average price in the western world[38]. It is one of the drivers behind the increase in the sale in the geographic area called International Operations, but during the last years, in Novo Nordisk's largest markets (Europe and US) there have been a decrease in sales.

On a global basis, I estimate Novo Nordisk's market share to be between 60% and 65%, but I estimate this will fall during the coming years, mainly due to more generics and biosimilars in the low-income countries. In 2010, Novo Nordisk sold for DKK 11,827m human insulin on a global basis, making the total market size to be between DKK 18bn and 20bn. The conversion from human insulin to modern insulin will continue globally during the years to come, and the total market size will be stable, measured on volume,

[38] Novo Nordisk Annual Report 2010, p. 5

but I estimate that the prices will fall as a consequence of the higher number of new low-price entrants making the market size fall, measured in value.

I have chosen to place the human insulin bubble in square number four, moving towards square 8. High current market share justifies the high business unit strength, and a market of DKK 18-20bn in yearly sales still makes it interesting. However, the higher price pressure, and lower market size (measured in value) will make the market less interesting in the future, and along with Novo Nordisk's declining market share this will make the business unit less strong. Due to Novo Nordisk's strong brand, I have not put it into square number 9, because I think Novo Nordisk in the coming years, still can maintain a sale, primarily in the developing markets.

5.3.3 GLP-1 analogues

Insulin Liraglutide, marketed under the name Victoza, is Novo Nordisk's GLP-1 analogue that works by stimulating the beta cells in the pancreas to release insulin when blood sugar is high. Other types of anti-diabetics have a risk of hypoglycemia and are often associated with weight gain, but the risk of hypoglycemia is significantly lowered with Victoza and patients often experience a weight loss.

Victoza was launched in late 2009 in Europe and in multiple countries in 2010, including USA, Russia, Argentina, Mexico and the Middle East. In 2010 it had sales of DKK 2,317m compared to the competitor Byetta's sale of DKK 3,692m (calculated from USD 710m, using a DKK/USD rate of 5,2), which was a decline of 11% compared to 2009. This shows the fast penetration of the GLP-1 market Novo Nordisk has been able to make, taking market share from Byetta. As mentioned earlier in my thesis, one of the differences between Byetta and Victoza is that Byetta is a twice-daily drug while Victoza is a once-daily drug. This makes Victoza much easier to use for the patient. I expect the GLP-1 market to increase substantially over the coming years. This is mainly due to the extra focus Victoza has put on the opportunity to use GLP-1 in treatment of diabetes. Now both Novo Nordisk and Eli Lilly have an incentive to market the drugs, and it will undoubtedly help increasing the total market size both measured in value and volume. I estimate Novo Nordisk to increase their market position, and Victoza will take Byetta's position as market leader during 2011, both measured in volume and value.

One of the risks for Novo Nordisk regarding the GLP-1 analogues is that Eli Lilly, if they get it approved, will launch the once weekly GLP-1 analogue Bydureon. This can make Victoza less attractive to the patients, and it might take a large part of the market share from Victoza. Novo Nordisk has a similar product called Semaglutide in the pipeline. It is currently undergoing phase II trials, but it will not be launched before 2017, if it gets approved. Due to the high risk of failing in the last phases, I have chosen not to include it in my budget.

Liraglutide has shown to have a positive effect on the patients' weight, and Novo Nordisk has initiated phase III trials to see if it reaches the targets for efficacy and safety. According to chapter "5.1.3 Social Factors", there are a growing number of overweight and obese people in the world, and more than 80% of the American population are overweight.

In chapter "5.1.1 Political and Legal Factors", I comment on the possibility of getting an approval, which is lower when the drug is against a lifestyle disease such as overweight. This has a negative effect on Novo Nordisk's possibility of getting the approval of Liraglutide in obesity. I assign a probability of 55% of getting a launch early in 2015. In the first phase III trials it showed ability to lower the patients' weight by more than 6 kg more than the placebo group[39]. The phase III trials will begin in first half of 2011, and about 5,000 patients will be enrolled in the trials.

I have chosen to include Victoza and Liraglutide in obesity in square number 5, with a view to going into square number 1. However, two things are needed before it can go into square 1. First of all, the market has to increase in size over the next years, which I think is plausible. I estimate the current global market size of DKK 6bn in 2010, to increase with an impressive speed during the coming years due to the higher focus on the possibility of treatments with GLP-1 and the increasing number of patients. This alone could put it into square number 2, but to go to square number 1 Semaglutide needs to be approved to improve Novo Nordisk's GLP-1 portfolio to be able to compete with primarily Eli Lilly in the future. Finally Liraglutide in obesity could be another

[39] Novo Nordisk Q3 interim report 2010, p. 9

blockbuster, but it would create a whole new market and it would not be fair to compare it to Byetta and Bydureon even though it would improve Novo Nordisk's GLP-1 portfolio substantially.

5.3.4 Haemophilia

More than 400,000 people worldwide are diagnosed with different types of haemophilia[40], a disease where they lack the body's ability to clot blood either completely or partially. Novo Nordisk produces the drug NovoSeven for treatment of lack of factor VIIa, a disease where about 4,000 patients worldwide have developed antibodies to their normal treatment. It helps the blood clotting after severe traumas. It is also used to treat patients without factor IX, another disease where the blood will not clot, it is also known as Haemophilia B and is less common than Haemophilia A (factor VIII). Haemophilia B is only occurring in one of 25,000 male births and affects today around 3,300 people is the US[41].

In 2010, NovoSeven had a sale of DKK 8,030m, which were 14% more than 2009 sales. An impressive growth rate for a product, 14 years after market launch. During 2010, it was launched in new 8 mg vials that now can supplement the 1, 2 and 5 mg vials to give a faster control of the bleeding.

The patent on the active ingredient in NovoSeven will expire in Europe during 2011 and has already expired in the rest of the world. Novo Nordisk is, however, developing new and better formulas, new vials, etc. to keep the generics from taking the market shares. This will keep Novo Nordisk as a significant actor in the haemophilia market.

Furthermore, Novo Nordisk is having a very promising haemophilia pipeline, consisting of nine products, with two in phase three, three in phase two and four in phase one. It is a very broad pipeline, reaching several of the sub-markets within the haemophilia market. They can supplement NovoSeven and keep Novo Nordisk as a market leader within haemophilia.

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[40] Novo Nordisk annual report 2010, p. 37

[41] http://www.hemophilia.org/NHFWeb/MainPgs/MainNHF.aspx?menuid=181&contentid=46

However, NovoSeven is not only a story of success, because it has been used off-label. This off-label use has been on hospitals to stop bleedings not related to haemophilia, e.g. in operations and after traffic accidents. This is even though studies have shown[42], that patients do not have high chance of survival if they are treated off-label with NovoSeven.

I have chosen to position the haemophilia business in square number 2 with a view to go into square number 1. However, I find it very hard for Novo Nordisk to improve a lot in this area, and I find it most likely that it will stay in square 2. It is positioned in the part with high market attractiveness due to the size of the haemophilia market, with over 400,000 potential patients. Novo Nordisk will, however, have to improve their portfolio of products in the haemophilia market, so they do not rely on a single product to get a higher score in business unit strength.

5.3.5 Growth Hormones

Norditropin is Novo Nordisk's growth hormone product, and is the market leader with Norditropin being the only liquid hormone drug that does not require refrigeration after first use[43]. If the pituitary gland is not producing enough growth hormone, children's growth will be slower than normal. Teenagers and adults need growth hormone to keep a high quality of life. If not, some metabolic complication can occur with severe consequences.

In 2010, the sale of Norditropin was up 9% compared to 2009, and Novo Nordisk had a market share of 24% measured in volume. The market share has kept pretty stable during the past years (22% in 2006, 23% in 2007 and 2008, 24% in 2009 and 2010). I expect the market share to remain stable over the coming years. The market size is around DKK 20bn, and I expect this to increase at a slow but stable pace over the coming years. The patent will expire in 2017, but improved formulas and new, patented injection systems can help Novo Nordisk maintain their market share.

[42] http://epn.dk/brancher/medicin/article2406287.ece
[43] Novo Nordisk Annual Report 2010, p. 39

On the negative side, there are no products in Novo Nordisk's pipeline within the growth hormone business area. This can make the long-term future, within the market for growth hormone, hard for Novo Nordisk, if they cannot keep developing new and better formulas for Norditropin or better injection systems. I have chosen to place the growth hormone business area in square number 5, without any arrows. The market size is very stable and so is Novo Nordisk's market share. I do not see any triggers within the next 6-10 years that can have a significant influence.

5.3.6 Other products

Besides different injected insulin products, and treatment of haemophilia and growth hormone deficiency, Novo Nordisk is having products within hormone replacement therapy, and oral anti-diabetic products (OAD), while products for treatment of inflammatory diseases are in the pipeline.

Treatment of inflammatory diseases will not be included in my model, because Novo Nordisk has no products in the market, and in 2010 the first phase II studies was initiated. There is still a substantial risk that the products will never be approved, and if they do, it is hard to estimate when and what their market share and sales will be.

Hormone replacement therapy had a 6% increase in sales from 2009 to 2010 to DKK 2,233m, and I expect the future to be tough due to higher competition from generics, and hence a drop in the market share and the sale will occur. The OAD had reduced sales in Europe due to higher competition from generics, but it was offset by higher sales in China and the total increase in sales from 2009 to 2010 was 4%.

I have chosen to place the category called "Others" in square number 9 with a view to go into square number 5. However, I find it very hard for Novo Nordisk to move away from square number 9 in markets that are dominated by generics and where Novo Nordisk's market share is declining due to the low-price competition. For Novo Nordisk to move up in square number 5, they need to launch the inflammatory products, which would enable Novo Nordisk to penetrate the market with a patented product. This could give Novo Nordisk a substantial market share in a growing market.

5.4 SWOT analysis

My SWOT analysis will work as a conclusion to my strategic analysis. I have chosen to use it because it provides me with a good framework for taking out positive and negative sides relevant for Novo Nordisk's business.

5.4.1 Strengths

Novo Nordisk has during the last years experienced an increase in sales and an improvement of most of the business. A lot of the sales have moved from human insulin to modern insulin, which has higher margins and a better outlook for the future. The market for modern insulin has been increasing for the last couple of years, and Novo Nordisk has improved their position significantly. This is mainly due to a better portfolio of drugs that covers all of the three sub-markets (rapid-acting, long-acting and a mixture), and growing market share in all geographic areas. The modern insulin business now accounts for almost 70% of Novo Nordisk total sales.

The newly launched product Victoza is also an important strength for Novo Nordisk, and can help developing the GLP-1 market along with Eli Lilly's product Byetta. Victoza has during 2010 experienced an impressive growth, and I estimate it to have a higher market share than Byetta in 2011. Novo Nordisk can really push this product to be a blockbuster in 2012 and just below blockbuster status in 2011. However, the increasing competition from Eli Lilly's coming product Bydureon will put the market share under pressure, and in my point of view most of the market share will be taken from Byetta, ending up as an insignificant actor on the market.

The haemophilia market is also one of Novo Nordisk's strong markets, with high sales of NovoSeven. This product has shown to be a market leader, and I expect it to continue to bring high and stable sales to Novo Nordisk. In my point of view, as long as Novo Nordisk can keep it patented through new formulas or better options for injection, Novo Nordisk will have a product that is superior to their competitors'.

The last important strength of Novo Nordisk's business is the pipeline. There are several late phase products that can help to develop Novo Nordisk even more. Especially Degludec and DegludecPlus are two products that can help Novo Nordisk to gain higher

market shares within the modern insulin market. Especially on the long-acting insulin, Degludec can take market shares from the market leader Lantus, while DegludecPlus is supposed to be the replacement for NovoMix. Furthermore, insulin Liraglutide in obesity can be a potential new blockbuster in a large and globally increasing market.

The aforementioned three products in the pipeline are the only ones that I include in my model, but 18 other products are between phase 1 and 3, which shows the huge focus Novo Nordisk have on improving the business by securing future earnings from new and innovative drugs and products against different diseases.

5.4.2 Weaknesses

The two business areas: human insulin and growth hormones are the weakest parts of Novo Nordisk's business. Human insulin is a dying market, with low margins and a declining market size measured in value. In the developed countries, most of the patients have switched from human insulin to modern insulin, due to better blood sugar control and lower risk of hypoglycemia. Most of Novo Nordisk's sales of human insulin have moved to low-income countries and the product is sold for only 20% of the price in the western world. Finally, more generic producers are today producing and selling low-priced human insulin, and have taken market shares from Novo Nordisk especially on the large European and American markets.

Within growth hormone therapy Novo Nordisk have the product Norditropin that is a market leader and with a patent that will not expire until 2017, enabling it to generate a stable income in the coming years. However, Novo Nordisk has no products in the pipeline to complement Norditropin in the coming years. They are having few other products within growth hormone therapy, but none of them can compete with Norditropin or competitors' products. Based on this, the future for the growth hormone business seems weak if Novo Nordisk is not increasing their focus on that area.

5.4.3 Opportunities

There are huge opportunities for Novo Nordisk in the years to come. The world demographics are developing in favour of Novo Nordisk, with higher average BMI, more overweight people, and urbanisation in the developing countries. The higher average BMI and the higher number of overweight people are a direct cause of a higher number

of diabetics on a global basis. In the developing world, with people moving to the cities, they tend to get overweight from less exercise, and unhealthier food. Furthermore, the urbanisation makes it easier to diagnose patients with diabetes due to shorter distance to doctors and better-educated doctors in the cities. Lastly the availability of insulin is lower in the rural areas of the developing countries, and hence less people get the correct medication than in the cities.

The high entry and exit barriers in the pharmaceutical industry are other opportunities Novo Nordisk have to take advantage of. The protection from patents and the high fixed assets will prevent a lot of small actors in a high-margin market.

5.4.4 Threats

Governmental decision can affect Novo Nordisk in a negative direction. Decisions like the one we saw in Greece can be more common and Novo Nordisk will have to make decisions on how to act on those markets. The government is the largest threat to Novo Nordisk, due to the subsidiaries. Approvals from FDA (and EMEA) can also have an impact on Novo Nordisk's sales, and focus on lifestyle diseases can affect the chance of getting Liraglutide in obesity approved.

Other risks are the threat of competitors being able to develop new and better products, making Novo Nordisk's products unattractive. If Novo Nordisk cannot develop a (equally good or) better product, they will lose market shares and sales. Novo Nordisk will also face difficulties from generic products when patents expire. Hence, Novo Nordisk will have to take patent on new and better formulations of existing products or new and improved products to be able to compete.

Finally, Novo Nordisk are exposed to different financial risks; mainly changes in the exchange rate will have an influence on Novo Nordisk's reported sales. This is one of the threats you need to cope with as a global company, and Novo Nordisk are hedging some of their exposure to minimize the risk.

6 Budgeting

I have chosen to divide my budgeting up into two parts, with the first being about the income statement and the second about the balance sheet. They are both divided further into sub-chapters to give the reader an easy overview of how I have estimated the budget.

I have chosen a budget period of 12 years, which I have done this for two reasons:

1. As I discussed I chapter "4.1 Choice of period for the financial statement analysis" historically seen, there has been 6 years cycles in the development in sales. Therefore, I have chosen a period of 12 years that will cover two cycles
2. To be able to include the full effect of the products in the pipeline, that I have chosen to include in the budget, a 6-year period would not be sufficient. This I primarily because I estimate Liraglutide not to be launched until 2014, if approved by FDA. The market penetration process will take some time to complete, and hence much of the growth in the sale of Liraglutide would not be included in the budget if I had selected a 6-year budget

6.1 Income statement

I have chosen also to divide this chapter into two sub-chapters with the budgeting of the sales being the first and the budgeting of the costs being the latter one.

6.1.1 Sales

What is general in this chapter is that I have chosen to estimate a total market size for each of the products in 2010, by taking the 2010 sales and divide them by their market share. Then I estimate a growth for the coming years, both through the market fundamentals I analyses previously in my thesis and through the previous years' market growth. Finally I finish estimating the future market share, primarily based on my GE / McKinsey Matrix. The full budgeting of the sales and the income statement can be found in appendix 5 and 6 resepctively.

Levemir

I think that the modern insulin market will keep increasing through the coming years; both through the patients' switch from human insulin to modern insulin, but also through the increasing number of people diagnosed with diabetes worldwide. The long-

acting market showed a 29% increase from 2008 to 2009 and a 25% increase to 2010, and I expect a similar increase in 2011. I estimate the increase to slow down, but a total global market size of DKK 100bn will be reached as early as in 2018 driven by higher BMI and the urbanization in the emerging markets. I expect Levemir's market share will increase until 2012 where it will reach a market share of 23% but the peak sales will probably not be reached until 2015, where I expect Levemir to sale of more than DKK 14bn. The market share is expected to keep decreasing and in 2022 it will be as low as 8%. This expected decrease in market share is mainly due to new products such as Novo Nordisk's own Degludec.

NovoRapid

The rapid-acting modern insulin market has during the past years shown slower increase than the long-acting market. I expect this to continue, even though it will still show double-digit growth rates the first four years of my budget period. This along with peaking market share in 2013 of 60% help increasing the sales from DKK 11,900m in 2010 to a peak sale in 2022 of DKK 27.5bn. The reason for this late peak sale is that I expect Novo Nordisk to maintain a high global market share along with an increase in the market that is higher than the decrease in the market share. When NovoRapid is reaching its peak sale in 2022, I expect a market share of 49% compared to 56% in 2010.

NovoRapid is already losing the patent on the active ingredient in 2011, but I think that new and patented formulas and injection systems will keep a high sale in the future that is reflected in the sale.

NovoMix

The market for pre-mixed modern insulin is no near as large as the two previous mentioned. The growth is also lower, but I expect it to be more stable than the market for rapid-acting insulin. In the past, however, Novo Nordisk had a large market share, which I expect they will be able to maintain in the years to come. The reason why I expect the market share of NovoMix will decline over the next years is that I see a shift from NovoMix to DegludecPlus if it is approved. I expect NovoMix to reach the highest market share as well as the peak sale as early as in 2012. A sale of just below DKK 11bn or double blockbuster status can be reached at that time; this is an increase of about

15% of the 2010 sales. I expect, the market share to be rapidly declining from 2013 and forth, primarily due to launch of DegludecPlus. The fact that they are able to keep a market share of 22% in 2022 is primarily due to lower price of NovoMix than DegludecPlus, and hence the sale of NovoMix will not decline as much in the lower income countries and Novo Nordisk's new markets (especially thinking of China and India).

Victoza

The GLP-1 market is a relative new market, and today only Novo Nordisk and Eli Lilly are present in the market. I have calculated the total market size from adding the sale of Victoza to Eli Lilly's sale of Byetta. The sale of Byetta is reported in USD, but I have calculated the sale in DKK by multiplying with an exchange rate of DKK/USD 5.2. I expect, that the fact that two companies are now promoting this new type of anti-diabetic, can increase the market significantly, and already the increase from 2009 to 2010 is substantially higher both in absolute and relative terms than the year before. Compared to the 2010 figures I expect the market to double by 2012, and Victoza can almost present sales good enough to be a blockbuster in 2011. A sale of about DKK 5.1bn is just about the sale of USD 1bn that is needed to be a blockbuster. I expect the peak sale of Victoza to be in 2021 due to the fact that the patent will expire during 2022, and hence I expect the market share to fall more rapidly starting in 2022. I expect the market share to peak in 2012 with a market share of 67%, but it will decline rapidly hereafter mainly due to the increased competition from Bydureon.

Human insulin

The human insulin market is a mature market with very low growth rates. I estimate small growth rates during the next years and from 2017 and forth I expect the growth to be 0%. I still estimate a small increase in the first years, due to the higher number of diabetics in the low-income countries that cannot afford modern insulin. The reason why I estimate the increase to be zero per cent from 2017 is that producers of generics will be more global and will lower the price in the low-income countries making the market more stable measured in value. Due to the increased competition from the generics, I estimate Novo Nordisk's market share on the human insulin market to drop dramatically and the peak in market share has already been reached. However, the peak

sale will happen in 2011, with a sale of DKK 11.9bn, declining to a sale of DKK 4.7bn in 2022.

Haemophilia

NovoSeven is the only haemophilia product I will estimate in my model. The chances of the haemophilia drugs in the pipeline being approved are simply not high enough to include in the model. I estimate the total haemophilia market to have a low but very stable growth rate in the coming years. The reason why I estimate the growth to be high single-digit rates in the first years are due to the urbanization in the emerging markets, which gives better opportunities for the patients to be diagnosed with the disease due to closer distance to a doctor, and availability of the drug is better in cities than in the rural areas. I estimate NovoSeven's market share to peak in 2013 at 20% while the peak sales will be in 2018 with a total sale of DKK 13.5bn. The sale will however not decrease fast, and I estimate a sale of more than DKK 11bn in 2022.

Growth Hormone

Norditropin is the only drug Novo Nordisk is producing within growth hormone therapy, and nothing in the pipeline is coming up. I estimate the market growth rate to be very stable, with a yearly increase between 6% and 9%. That would double the market by 2019, and it would approach DKK 50bn by 2022. I estimate the peak sale to be in 2017 with a market share of 23% and a sale of slightly more than DKK 8bn, while the peak market share will be 25% in 2011, 2012, 2014 and 2015. I expect the sale as well as the market share to decrease hereafter due to the fact that the patent expires during 2017.

Other products

I estimate the sale of other products to decrease sharply during the coming years. This is mainly due to the higher competition from producers of generic drugs both in US, Europe and the smaller emerging markets. This is both within OAD's (oral anti-diabetics) and hormone replacement therapy, while treatment of inflammatory diseases is not included in my model due to high risk of not getting the products in the pipeline approved.

Degludec / DegludecPlus

I have estimated the sale of both Degludec and DegludecPlus with the same possibility of approval within long-acting modern insulin market and pre-mixed modern insulin market respectively. I expect the penetration of the mixed insulin market to be faster than the long-acting market due to better presence today. This will ease the penetration because the largest competitor is Novo Nordisk themselves, and the switch from NovoMix to DegludecPlus can happen easily. I expect Degludec to have a harder time at the long-acting market due to high competition from Lantus where Sanofi-Aventis will try to keep a high market share. I expect peak sale to be outside my budget period, and hence I expect the highest sale for both to be in 2022 where I estimate the market shares to be 27% for Degludec and 31% for DegludecPlus. Both sales are risk adjusted with an 80% chance of approval.

Liraglutide in obesity

I have calculated the potential market size of the obesity market through the number of obese in Novo Nordisk's large markets. I have estimated that 5% of all obese persons in the countries below will be treated for obesity, which is just above 14 million people in my selected countries. The market size is estimated through a yearly cost of 10.000 DKK per patient, which is about the same price as Victoza. The price will of cause vary through countries, which makes the yearly price of 10,000 DKK an average.

Obese	BMI > 30	Population (millions)	BMI > 30 (millions)	Diagnosed	Market size DKKm
China	4.1%	1,338.6	54.9	2.7	27,441
Japan	2.3%	128.1	2.9	0.1	1,473
Republic of Korea	8.3%	48.5	4.0	0.2	2,013
India	1.7%	1,166.1	19.8	1.0	9,912
Australia	28.4%	21.2	6.0	0.3	3,010
USA	44.2%	307.2	135.8	6.8	67,891
Brazil	12.4%	198.7	24.6	1.2	12,319
Denmark	12.0%	5.5	0.7	0.0	330
Germany	22.9%	82.3	18.8	0.9	9,423
United Kingdom	23.7%	61.1	14.5	0.7	7,240
Total		**3,357.3**	**282.1**	**14,1**	**141,054**

Table 17 – Calculation of obesity market size – Source: own creation based on WHO and infoplease.com numbers

In my selected countries there is a market of about DKK 141bn in 2010 as can be seen from table 17, but I have in my budget chosen to include a global market size of 150.000m DKK to adjust for obese people outside my selected countries. This is of cause an approximation that is not accurate, but later in my thesis I make a sensitivity analysis to see the effect on the share price if the obesity market is larger or smaller than I estimate. I estimate a yearly increase in market size of 2% worldwide. I estimate 1% market share in 2014 when it is released, which will increase in the years after. Peak sale is outside my budget period, but I estimate a risk-adjusted sale of DKK 17.7bn in 2022. Liraglutide is included in my budget with a chance of 55% of approval.

6.1.2 Costs

I will have a small chapter about each of the costs, the same way as in my budgeting of sales above. In detail, I will explain the reader how I have estimated the costs, to provide a good understanding of the earnings and to justify the stock price I end up with.

Costs of goods sold

The cost of goods sold is estimated indirectly through an estimation of the gross margin. Novo Nordisk has been increasing their gross margin during the past years, and I expect that it will continue for a few years more. I estimate a gross margin of 84% in 2011, which is 0.2 percentage points higher than in 2010. Hereafter, I estimate a yearly growth in the gross margin of 0.5 percentage point until it in 2013 reaches 85%. After that the gross margin will be stable around the 85%. This is a very high margin, but during the last years Novo Nordisk has showed that they are capable of increasing their gross margin year after year.

Sales and distribution costs

The sales and distribution costs are estimated as a percentage of the total sales. In the past years it has been between 28% and 30%, and I expect it to continue in the coming years. From 2010 to 2011 I estimate a 0.3 percentage point decrease in the sales and distribution costs, and a 0.5 percentage point decrease from 2011 to 2012. Hereafter, I estimate the sales and distribution costs to stay around 29% of the sales.

Research and development costs

As I argue in chapter “4.5.3 Research & Development / Sales” Novo Nordisk is on line with their competitors, and R&D costs as per cent of sales have been around 16% for the

last years, and I expect that to be the same in the future, hence the R&D costs as % of sales is estimated to be 16% in my entire budget period.

Administrative expenses

During the past few years, Novo Nordisk has been able to decrease their spending on administration. In the last three years Novo Nordisk has decreased their administrative expenses as % of sales from 5.6% to 4.9%, and I estimate it to be 4.5% in 2011 and for the entire budget period.

Licence fees and other operating income, net

I have estimated the item to be 1% of sales all years throughout my budget period. This is an income that is not related to the normal business and is hard to estimate, and hence I have chosen to set it in the same range, as it has been the previous years.

Depreciations and amortizations

The depreciations and amortizations are estimated based on the intangible assets and the item property, plant and equipment. The depreciations and amortizations are estimated to be 12.5% of the sum of the intangible assets and property, plant and equipment. This is a number close to the historical amount.

Share of profit (loss) of associated companies, net of tax

I have estimated this to be zero throughout the budget period. This is mainly due to the uncertainty in estimating it, and that traditionally it has been both positive and negative.

Financial expenses, net

I have also estimated the financial expenses to be 0, this is due to the high yearly earnings which will make the cash in bank and in hand higher and the total interest expenses from the loans insignificant.

Income taxes

The income taxes are calculated as profit before income taxes multiplied with the effective tax rate that Novo Nordisk guides in their annual report 2010[44], which is 23%. This is also around the historical effective tax rate that Novo Nordisk has experienced.

[44] Novo Nordisk annual report 2010, p. 11

Net profit for the year

Based on the aforementioned estimates, my budget ends up with a net profit in 2011 of more than 16bn DKK, which is 2.3bn DKK more than in 2010. However, the net profit margin increases with only 0.1 percentage point from 23.7% to 23.8%. In the coming years, there will be an increasing profit margin, and from 2014 and forth I estimate it to be 25.4%. In 2022 I estimate the net profit to be 36bn DKK, or more than double of the net profit in 2010.

6.2 Balance sheet

I have chosen to divide the balance sheet into two parts, the first consisting of intangible assets, property, plant and equipment and the net working capital. These two are summed up to be the invested capital that I am using in my EVA valuation. The other part is consisting of equity and the net interest bearing debt that also sum up to the invested capital. I have chosen only to estimate these items due to uncertainty in estimating every single item. The full budget for the balance sheet can be found in appendix 7.

Intangible assets and property, plant and equipment

Novo Nordisk have continually been able to lower intangible assets and property, plant and equipment compared to the sales, going from 42.65% in 2008 to 36.14% in 2010. I expect this ratio to keep on improving during the coming years, primarily due to better and more efficient use of the facilities. I have estimated this to be 33% in 2011, decreasing 2 percentage points in 2012 and hereafter 1 percentage point each year until 2016 where it will stay the same for the rest of the budget period at 28%.

Net working capital (NWC)

During the last years, the net working capital has dropped from 6,275m DKK in 2008 to 2,425m DKK in 2011, primarily driven by higher liabilities. As % of sales, it has also dropped from 13.78% in 2008 to 9.27% in 2009 and 3.99% in 2010. I expect a similar NWC in 2011 in terms of % of sales, making my estimation to be 4%, hereafter dropping 0.25 percentage point every year until 2013 where it reaches 3.5%. For the rest of the period I estimate it to stay stable on 3.5% of the sales.

Equity

I calculate the equity end-of-year as the equity start-of-year adding the net profit for the year and subtracting the free cash flow to equity, that I expect Novo Nordisk to pay out to the shareholders as either dividends or share buy backs.

Net interest bearing debt

The net interest bearing debt estimated as a percentage of sales has been highly negative the previous years. In 2008 it was -28.31% and -51.56% in 2010, and I estimate it to be -55% for the rest of the budget period.

7 Valuation

The valuation chapter is divided into three parts.

1. The calculation of the WACC
2. The valuation
3. A sensitivity analysis to see what impact marginal changes have on the share price

7.1 WACC

The weighted average cost of capital (WACC) is used as the discount rate, to find the present value of future cash flows in the DCF analysis, and the present value of the economic value added (EVA). The accuracy of the WACC is important for the result of the valuation, because even small changes might mean large changes in the company value. The formula for calculating the WACC is:

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

Where D = net interest bearing debt, E = equity, r_D = required return on debt, T = tax rate, r_E = required return on equity.

Theoretically, it is a good model to estimate the cost of capital, but it is hard to use because it is difficult to estimate the required returns, and especially the required return on equity. The required return on equity is not a number that is observable, and different investors might have different risk profiles and will require different returns. Furthermore, it is changing over time and in good time it will be lower than in bad times because of the risk of investing in equity. Most financial textbooks suggest that you use

the capital asset pricing model (CAPM) to estimate the required return on equity. The idea behind the CAPM is that the investor holds a diversified portfolio, and hence the investor only has to pay for the systematic risk (β). The formula for CAPM is:

$$r_E = r_f + \beta \cdot (r_m - r_f)$$

Where, r_E = required return on equity, r_f = risk-free interest rate, β = the systematic risk on equity, r_m = return on market portfolio.

However, this model is not flawless and the parameters in this equation are also difficult to estimate. During the estimation of Novo Nordisk's required return on equity I will explain how I have made my estimations and the reasoning behind.

The first part of the WACC equation is the debt-part. However, Novo Nordisk are having a largely negative net interest bearing debt and I have chosen not to include this part in my calculations of the WACC. Therefore, the WACC will be equal to the required return on equity.

The first variable in the calculation of the CAPM is the risk-free interest rate, but in the reality no such thing exists. Instead I have chosen a 10-year Danish government bond as the risk free rate in my CAPM calculation. As of 4th of February 2011, the interest rate was 3.291%[45] and it is the risk-free rate I will use throughout the thesis.

The next variable in the CAPM is the beta, it can be calculated in many ways, and there is no correct way to do it. One of the most used for calculating the beta is by taking the covariance between the stock's performance and the market's performance divided by the markets variance. I have done this against three indexes: "OMX Copenhagen Cap" (gross index), "OMX Copenhagen Benchmark Cap" (gross index) and "Nordic Health Care". There is no correct time period to make the calculations over, and I have chosen to do it for three different periods: Year-to-date (1st of January 2011 to 4th of February 2011), Last Three Months and finally 1st of January 2010 to 4th of February 2011. However, none of the calculated betas are within a range that is reasonable – the calculations can be found in appendix 8. Therefore I have chosen to estimate it from

[45] http://www.bloomberg.com/apps/quote?ticker=GDGB10YR:IND

different financial sources – table 18 below shows how other financial sources estimate Novo Nordisk's beta.

Source	Beta	Link to source
Bloomberg	0,873	http://www.bloomberg.com/apps/quote?ticker=NOVOB:DC
CNBC	0,51	http://data.cnbc.com/quotes/NVO%2C%20
Smartmoney	0,52	http://www.smartmoney.com/quote/NVO/
Value Line	0,85	http://www3.valueline.com/vlquotes/quote.aspx
Nordea Novo Nordisk analyst Michael Novod	0,81	Novo Nordisk analysis 13th of January 2011
Damodaran Drugs	1,1	http://pages.stern.nyu.edu/~adamodar/

Table 18 – Different betas for Novo Nordisk – Source: own creation

The estimates from Bloomberg, CNBC, Smartmoney, Value Line and Nordea are all on Novo Nordisk while Damodaran's estimate is general for drug companies. Damodaran did not have an updated Novo Nordisk estimate, and therefore I chose to include the general drug beta. Based on these estimates I have adopted a beta of 0.8, a number I find reasonable for a mature pharmaceutical company as Novo Nordisk. Especially because the patients need their drugs no matter how the general market is, and hence the sales are less dependent on the general economic state than most other companies.

The last part of the CAPM calculations is the market premium, or return on market portfolio minus the risk-free rate. This again is a hard variable to estimate, and I have been relying on historic data from Damodaran[46]. Traditionally he has collected data stating that the implied risk premium is between 4% and 8%, primarily being between 5% and 6%. For that reason I have adopted a 6% market risk premium.

That makes my final CAPM calculation to be:

$$r_E = 3.291\% + 0.8 \cdot 6\% = 8.091\%$$

As stated earlier in this chapter, the r_E is equal to WACC because I will not include Novo Nordisk's debt in the WACC calculations, and hence the WACC in this thesis is 8.091%.

[46] http://pages.stern.nyu.edu/~adamodar/

7.2 Valuation

I have chosen to use the two models Discounted Cash Flow (DCF) and Economic Value Added (EVA) as my primary valuation methods. Even though they come up with the same result of my valuation, they show different important measures of the company. While the DCF shows the amount of money that is attributable to the shareholders, the EVA shows the value that is created to the shareholders in excess of what they require to take up the risk of investing in the particular company.

Both valuation methods require a terminal period, as it is not possible to make budgets for eternity. The terminal period is instead used to simulate eternity, by using a perpetuity growth model to determine the value of the on-going business. The perpetuity value is based on the fact that the business is now mature, and will grow by a steady rate in the future. I have estimated that rate to be 2%. I have chosen this to be lower than the growth in the sales each of the previous years, primarily because patents will expire and the uncertainty of Novo Nordisk adding new products to the product portfolio. 2% is also slightly higher than the inflation rate that the G7 countries have experienced from mid-1990s until the late 2000s[47]. Finally it is slightly higher than the increase in the expected inflation in 2011 (expected inflation of 1.5% in the OECD countries) and 2012 (1.4%)[48]. It is hard to determine an expected rate in the inflation or development in GDP further out in the future, why I have adopted a 2% terminal growth rate.

7.2.1 DCF valuation

As I have mentioned before in my thesis, I am using the DCF valuation method as my primary valuation method. As every other method it has its advantages and disadvantages, which I will go through here. First of all it is superior to multiple analyses, in the sense that multiples are not accurate if sectors or markets are over- or undervalued. Furthermore, if a company is growing fast as Novo Nordisk is, they will have higher multiples than their peers due to the higher expected growth. To avoid that, you can use forward multiples, e.g. forward price-earnings, but then you still need to estimate future earnings and the uncertainty that you experience in estimating future

[47] http://www.oecd.org/dataoecd/40/26/42503918.pdf page 3
[48] http://www.oecd.org/dataoecd/41/33/35755962.pdf page 2

cash flows in the DCF analysis is still present. Another advantage is that it is user-friendly, because it is widely used and hence known by the most in the financial world, and gives you a fair value of the analysed company. Finally, it is scalable, and can be used on divisions of a company or even down to one single project. Of disadvantages can be mentioned, that results can fluctuate wildly depending on the inputs that are used. Estimation of future growth rates, and margins are risky and both internal and external factors can make the company unable to reach (or exceed) the estimated cash flows. The DCF valuation follows the "garbage in – garbage out" principle, because wrong or misleading results are obtained when badly estimated inputs are used. Another disadvantage can be the lack of visibility, where the analysed company have not published enough information to make an objective analysis of the company.

The DCF works by finding the present value of the future free cash flow, and then subtracting the net interest bearing debt. The free cash flow for each year is calculated by taking the net operating profit after taxes (NOPAT), adding depreciations and amortizations, and then subtracting the capital expenditure (CAPEX) and the change in NWC.

According to table 19, my DCF analysis gives me a fair price of Novo Nordisk of 435bn DKK or 750 DKK per share. The full model can be found in appendix 9.

Sum of PV for budget period	185,045
PV terminal period	235,821
Enterprise value	**420,866**
Net interest bearing debt	-14,304
Company value	**435,171**
Number of shares (mill)	580
Share price (DKK)	**750.29**

Table 19 – Selected figures from my DCF analysis – Source: own creation

On the 4th of February, the share price closed in 611 DKK, which means that my calculated fair value is above the market value on the day of my deadline. My calculations of a target price is about 22% above the price on the 4th of February, which I think can be due to different approaches to the valuation of the pipeline, or the used chance of getting the products approved.

7.2.2 EVA valuation

My second valuation method is an Economic Value Added (EVA) approach, where the present values of the economic value added for each year are calculated. To be able to calculate EVA you need the invested capital, which is calculated in the budgeting of the balance sheet. It can be calculated by either adding tangible, and intangible assets and the net working capital or by adding the equity with the net interest bearing debt. Then you need to calculate the return on invested capital (ROIC), by dividing the NOPAT with the invested capital, then finally the EVA is ROIC minus the WACC, which is multiplied with the invested capital. This way you calculate how much in excess of the required return, the owners earn. This is what is called economic value added. Pros and cons of using the EVA valuation are close to be the same as for the DCF, because it relies on the same budgets and estimations of WACC. What is different from the DCF model is that EVA focuses more on the return above or below the required return, while the DCF just finds a present value of a future cash flow.

What I find most interesting in my EVA analysis is that my budgeting results in a ROIC are increasing from 68.52% in 2011, to 84.73% in 2015 before declining slightly to 82.28% in the terminal period. I find this a very positive sign, because the invested capital is also increasing at the same time, meaning that the NOPAT is increasing relatively more than the invested capital. For the full EVA model, see appendix 10.

7.3 Sensitivity analysis

I have chosen to back up the results of my valuation with a sensitivity analysis, to see how much the fair value of a share will change, if some of my estimations deviate from the actuals. My sensitivity analysis is actually three analyses, each analysing the impact from two variables. In all of the matrices, the cell with the actual result is marked in green.

The two variables in the first sensitivity analysis that I have chosen to make are WACC and the terminal growth rate. I have chosen to include results of WACC ranging from 7.5% to 8.75%, which make my estimate of 8.091% almost in the middle of those. The analysis can be seen in table 20.

		WACC						
		7.50%	7.75%	8%	8.09%	8.25%	8.50%	8.75%
g	1.25%	782.35	749.69	731.31	709.10	691.56	665.59	641.39
	1.50%	798.77	764.39	745.08	721.79	703.43	676.30	651.09
	1.75%	816,.63	780.31	759.96	735.48	716.22	687.81	661.48
	2%	836.10	797.61	776.11	750.29	730.03	700.20	672.64
	2.25%	857.43	816.49	793.69	766.38	744.99	713.59	684.65
	2.50%	880.90	837.17	812.89	783.90	761.25	728.09	697.63
	2.75%	906.83	859.91	833.96	803.06	778.98	743.85	711.69

Table 20 – Sensitivity analysis of WACC and terminal growth rate – Source: own creation

This table shows that the share price is highly dependent on the WACC as well as the terminal growth rate. A small decrease in WACC to 8% results in an increase in the share price of more than 25 DKK. This is the same case with the terminal growth rate, where a 0.25 percentage point increase results in an increase in the share price of 16 DKK.

The second sensitivity analysis in table 21 is focusing on the chance of getting Degludec/DegludecPlus and Liraglutide approved.

		Chance of getting Degludec and Degludec+ approved					
		0%	25%	50%	75%	80%	100%
Chance of getting Liraglutide in obesity approved	0%	568.79	610.39	651.99	693.58	701.90	735.18
	25%	590.78	632.38	673.98	715.58	723.90	757.18
	50%	612.78	654.38	695.98	737.58	745.90	779.17
	55%	617.18	658.78	700.38	741.97	750.29	783.57
	75%	634.78	676.37	717.97	759.57	767.89	801.17
	100%	656.77	698.37	739.97	781.57	789.89	823.17

Table 21 – Sensitivity analysis of chance of approval of Degludec/DegludecPlus and Liraglutide – Source: Own creation

One of the risks of running a pharmaceutical or biotechnological business is that much of the value of the company is based on the pipeline. Good or bad news about the pipeline can trig the share price in respectively positive or negative direction. The fair value of Novo Nordisk ranges from 568 DKK per share if none of the two products get approved to 823 DKK if both get approved, a variation of more than 250 DKK per share or a total company value of 87bn DKK. Another thing that can be read from this analysis is that Liraglutide accounts for just below 50 DKK of the total fair value, while Degludec and DegludecPlus accounts for more than 130 DKK. This is approximately 24% of the total

value that is based on the products in the pipeline, which can sound as much. However, since I already have risk adjusted the possible sales I find this to be the most accurate result.

My last sensitivity analysis is based on uncertainty about the way I estimated the size of the obesity market and the market growth. In chapter "6.1.1 Sales" under the part about Liraglutide in obesity, I explain the uncertainty about estimating the total market size of the obesity market. This sensitivity analysis is supposed to determine how much impact a change in those estimations would have on the final share price.

		Obesity market size 2010						
		75,000	100,000	125,000	150,000	175,000	200,000	225,000
Growth rate in obesity market	0.5%	722.39	729.22	736.05	742.88	749.71	756.53	763.36
	1.0%	723.56	730.78	738.00	745.22	752.44	759.66	766.88
	1.5%	724.80	732.43	740.06	747.69	755.32	762.96	770.59
	2.0%	726.10	734.16	742.23	750.29	758.36	766.42	774.49
	2.5%	727.47	735.99	744.51	753.03	761.56	770.08	778.60
	3.0%	728.91	737.91	746.91	755.92	764.92	773.92	782.92
	3.5%	730.43	739.94	749.44	758.95	768.46	777.97	787.47

Table 22 – Sensitivity analysis of the obesity market – Source: Own creation

Table 22 shows, that the size and the growth rate in the obesity market does not have a large impact on the share price. A 50% increase or decrease in the market size in 2010 results only in a respectively increase or decrease of 24 DKK per share. Furthermore, the growth rate has even smaller impact on the share price, and a growth rate of changing from 2% to 3.5% only results in an increase of a little more than 8 DKK per share in the fair value.

7.4 Conclusion on Valuation

What I can conclude from this part of my thesis is that the fair value of Novo Nordisk is 750 DKK per share, or a total company value of about 435bn DKK. This is about 22% above the market price, which would make it a buying opportunity, to earn the difference between the market value, and the calculated fair value.

From my EVA valuation I can conclude that Novo Nordisk will keep increasing the ROIC and hence make it more attractive to invest in Novo Nordisk. That increased demand will increase the share price to offset the higher reward for investing in Novo Nordisk.

Furthermore, I can conclude, that the price of Novo Nordisk is highly dependent on the WACC and on the chance of getting Degludec approved. Furthermore, the terminal growth rate and the chance of getting Liraglutide approved is also having a relative large impact on the share price, while the size and growth rate of the obesity market has less impact on the share price.

8 Conclusion

I chose to divide my thesis up into three main parts, a financial statement analysis, a strategic analysis and the final valuation. The first two analyses were used in the valuation to make the estimations as accurate as possible.

Over the last years, Novo Nordisk's financial figures have been improving at an impressive speed, and they are among the best performing companies in the pharmaceutical sector. I can conclude from my analysis that Novo Nordisk has been improving from being an average performing pharmaceutical company, to becoming a top performer improving their financial ratios year after year. This favourable financial performance substantiates the increase in the share price, and makes the company an attractive investment opportunity.

Novo Nordisk finds themselves in a good position in the markets where they are present. They are having a broad product portfolio that offers treatment to a broad range of patients. Their primary strength is within the diabetes care. Especially, modern insulin with Victoza in front is the new growth driver for Novo Nordisk and products in their pipeline, Degludec and DegludecPlus, can secure Novo Nordisk future growth and make it possible to maintain a leading market position within diabetes care. Also within haemophilia Novo Nordisk is well positioned, with NovoSeven being a blockbuster that has the possibility to stay as a market leader for the years to come.

The pharmaceutical sector is in general facing a tough time, with high governmental focus on cutting costs, and hence the subsidies to drugs. This can for Novo Nordisk result in pressure on the margins, which would make it less attractive for investments.

The obesity market can also become a gold mine for Novo Nordisk as they have the possibility of getting a new blockbuster in Liraglutide. The obesity market is a market that is difficult to enter due to the high requirements from the FDA, but if Novo Nordisk gets Liraglutide approved, it has the opportunity to become a multiple blockbuster. This will be in a market with little competition, and Novo Nordisk has the chance of becoming the market leader.

From my DCF valuation I can conclude that the fair value of Novo Nordisk is 750 DKK per share, which is more than 20% higher than the closing price on the 4th of February. From my sensitivity analysis I can conclude that the share price is highly dependent on the cost of capital as well as the terminal growth rate. Finally about 180 DKK per share of the fair value of Novo Nordisk is attributable to the pipeline of Novo Nordisk.

All in all, I can conclude that Novo Nordisk is undervalued compared to the calculated fair value. However, there are uncertainties about getting new products approved, which can be the reason why the investors are a bit reluctant to invest in Novo Nordisk. I believe that Novo Nordisk can continue to improve their business to stay as one of the leading pharmaceutical companies, and maybe the leading company within diabetes care.

9 Litterature

9.1 Books

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9.3 Webpages

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9.4 Other sources

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Abbott Laboratories annual report 2005-2010

Bristol-Myers-Squibb Co annual report 2005-2010

GlaxoSmithKline plc annual report 2005-2010

Merck & Co annual report 2005-2010

Novartis AS annual report 2005-2010

Appendix 1

Diabetes

Diabetes mellitus (diabetes) often referred to as diabetes, is caused by missing or inadequate production of insulin in the pancreas. The insulin causes the muscles, fat tissue and liver to take up glucose and store it as glycogen. The glycogen is the substance where the cells are storing energy before changing it back to glucose the substance that is used as energy. As a cause of too little insulin in the body, the cells cannot perform its vital function because it is unable to take up the glucose that will remain in the blood. This is why diabetes is measured as the amount of glucose (sugar) in the blood. Too high blood sugar can also lead to slower wound healing and visual impairments (loss of or worse vision).

There are two different types of diabetes, which I will go through shortly:

- Type 1-diabetes. Missing production of insulin in the pancreas causes type 1-diabetes. The reason behind the pancreas not producing insulin is still today not known, but is closely related with hereditary conditions. The disease can develop in genetically disposed persons caused by infections, mental stress, physical stress or a virus. This type is often seen first time before the person is turning 20 years.
- Type 2-diabetes. An endogenous production of insulin is still happening, but the beta cells are less sensitive to the insulin and will not produce enough. The reason behind the disease is today still unknown, but it is often related to an unhealthy lifestyle without exercise and an unhealthy diet. As a natural cause the patients is often overweight or obese. This type is often seen first time after the person is turning 40 years, but a still increasing amount of younger persons are starting to get diagnosed with diabetes type-2.

Untreated diabetes can cause thrombosis, amputation, kidney failure or brain haemorrhage, and it is the reality for many persons who are not diagnosed in time. Half of those who get diagnosed with diabetes are not getting diagnosed before they have developed one or more

complications[1]. The disease is simply not discovered before it is too late, and it has had severe consequences for the diabetic.

Insulin and other drugs

There is several ways to treat diabetes patients. In this chapter I will go through the most important ones.

- Human insulin. Human insulin is identic with the insulin produced in the human body, which is usually released from the beta cells. It is usually injected in the stomach or the thighs with an injection pen (e.g. NovoPen or FlexPen). Injections in thighs is usually long-acting insulin while the rapid acting is injected through the stomach. The main side effect is hypoglycemia (low blood-sugar), which can be everything from dizziness to unconsciousness. The most severe is nocturnal hypoglycemia (low blood sugar while sleeping), which can cause dead because it is not treated immediately.
- Insulin analogues. Insulin analogues are insulin almost identic to the human insulin, where one amino acid is switched compared to human insulin. The amino acid is switched to obtain a better metabolic control. It has the same side effects as human insulin.
- Beta cell stimulating drugs. The beta cells have the function that they are releasing insulin in the pancreas. The drugs are stimulating the beta cells to release more insulin when the blood sugar is too high. It has very low risk of hypoglycemia because the beta cells only release insulin when the blood sugar is too high.

[1] Farmakologi, Inge Olsen, p. 130

Appendix 2

Theray Area	Indication	Name	Phase 1	Phase 2	Phase 3	Filed for approval
Diabetes Care						
Diabetes	Type 1 and 2 diabetes	Degludec				
	Type 1 and 2 diabetes	DegludecPlus				
	Type 2 diabetes	Semaglutide				
	Type 2 diabetes	NN9068				
	Type 1 and 2 diabetes	NN1218				
	Type 1 and 2 diabetes	NN1952				
	Type 2 diabetes	NN9924				
Obesity	Obesity	Liraglutide				
Biopharmaceuticals						
Haemophilia	Congenital FXIII deficiency	NN1841				
	Haemophilia A	NN7008				
	Haemophilia with inhibitors	NN1731				
	Haemophilia with inhibitors	NN7128				
	Cardiac surgery	NN1810				
	Haemophilia B	NN7999				
	Haemophilia with inhibitors	NN7129				
	Haemophilia A	NN7088				
	Haemophilia	NN7415				
Inflamation	Rheumatoid arhritis	Anti-NKG2d				
	Rheumatoid arhritis	Anti-IL-20				
	Rheumatoid arhritis	Anti-C5aR				
	Rheumatoid arhritis	Anti-IL-21				

Appendix 3

DKK million	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Operating income						
Sales	33760	38743	41831	45553	51078	60776
Cost of goods sold	9177	9585	9793	10109	10438	11680
Gross profit	24583	29158	32038	35444	40640	49096
Operating expenses from sales						
Sales and distribution costs	9691	11608	12371	12866	15420	18195
Research and development costs	5085	6316	7213	7531	7864	9602
Administrative expenses	2122	2387	2508	2635	2764	3065
Licence fees and other operating income, net	403	272	321	286	341	657
Total operating expenses from sales	16495	20039	21771	22746	25707	30205
Operating income from sales (before taxes)	8088	9119	10267	12698	14933	18891
Taxes as reported	2370	2712	2449	3050	3220	3883
Tax on financial items	43	-76	-199	-112	223	419
Taxes on income from sales	2413	2636	2250	2939	3443	4302
Operating income from sales (after taxes)	5675	6483	8017	9760	11491	14589
Other operating income (after tax items)						
Share of profit/loss of associated companies, net of tax	319	-260	1233	-124	-55	1070
Other comprehensive income	-551	658	223	-1962	1773	-415
Cost related to AERx discontinuation	0	0	1325	325	0	0
Operating income after tax	5443	6881	8148	7349	13209	15244
Financial income						
Financial income	498	931	1303	1127	375	382
Financial expenses	671	626	507	681	1265	2057
Net financial income	-173	305	796	446	-890	-1675
of which tax effect (at 25%)	-43	76	199	112	-223	-419
Net financial income after tax	-130	229	597	335	-668	-1256
Net comprehensive income	**5313**	**7110**	**8745**	**7683**	**12541**	**13988**

Appendix 4

DKK million	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Net operating assets						
Operating assets						
Intangible assets	485	639	671	788	1037	1458
Property, plant and equipment	19941	20350	19605	18639	19226	20507
Deferred income tax assets	879	1911	2522	1696	1455	1847
Inventories	7782	8400	9020	9611	10016	9689
Trade receivables	4794	5163	6092	6581	7063	8500
Tax receivables	504	385	319	1010	799	650
Other current assets	1308	1651	1399	1504	1761	2195
Marketable securities and financial derivatives	0	0	0	0	145	216
Cash at bank and in hand	169	194	209	228	255	304
Total operating assets	**35862**	**38693**	**39837**	**40057**	**41757**	**45366**
Operating liabilities						
Deferred income tax liabilities	1846	1998	2346	2404	3010	2865
Provision for pensions	316	330	362	419	456	569
Short-term debt and financial derivatives	1444	338	405	1334	418	1720
Trade payables	1500	1712	1947	2281	2242	2906
Tax payables	676	788	929	567	701	1252
Other liabilities	4577	4863	4959	5853	6813	7954
Other provisions (current)	2384	2456	2401	2923	3241	4644
Total operating liabilities	**12743**	**12485**	**13349**	**15781**	**16881**	**21910**
Net operating assets	**23119**	**26208**	**26488**	**24276**	**24876**	**23456**
Net financial assets						
Financial assets						
Investments in associated companies	926	788	500	222	176	43
Other non-current financial assets	169	169	131	194	182	254
Other current assets	147	133	94	200	201	208
Marketable securities and financial derivatives	1722	1833	2555	1377	1385	3818
Cash at bank and in hand	3134	3076	4614	8553	11041	11713
Total financial assets	**6098**	**5999**	**7894**	**10546**	**12985**	**16036**
Financial liabilities						
Long-term debt	1248	1174	961	980	970	504
Other provisions (long-term)	335	911	1239	863	1157	2023
Total financial liabilities	**1583**	**2085**	**2200**	**1843**	**2127**	**2527**
Net financial assets	**4515**	**3914**	**5694**	**8703**	**10858**	**13509**
Common shareholders equity	**27634**	**30122**	**32182**	**32979**	**35734**	**36965**

Appendix 5

Sales DKKm	2008	2009	2010	E2011	E2012	E2013	E2014	E2015	E2016	E2017	E2018	E2019	E2020	E2021	E2022
Modern Insulin															
Long-acting market	20.263	26.115	32.762	40.952	49.143	57.989	67.267	77.357	86.640	95.304	103.881	112.191	120.045	127.247	134.882
Long-acting market growth	N.A.	29%	25%	25%	20%	18%	16%	15%	12%	10%	9%	8%	7%	6%	6%
Levemir market share	19%	20%	21%	22%	23%	22%	20%	19%	16%	14%	12%	11%	10%	9%	8%
Levemir sale	**3.850**	**5.223**	**6.880**	**9.010**	**11.303**	**12.757**	**13.453**	**14.698**	**13.862**	**13.342**	**12.466**	**12.341**	**12.004**	**11.452**	**10.791**
Rapid-acting market	14.500	17.725	21.250	24.438	28.103	31.476	34.623	37.739	40.758	43.611	46.228	48.539	50.966	53.515	56.190
Rapid-acting market growth	N.A.	22%	20%	15%	15%	12%	10%	9%	8%	7%	6%	5%	5%	5%	5%
NovoRapid market share	54%	55%	56%	57%	58%	60%	59%	58%	57%	56%	55%	54%	53%	51%	49%
NovoRapid sales	**7.830**	**9.749**	**11.900**	**13.929**	**16.300**	**18.885**	**20.428**	**21.889**	**23.232**	**24.422**	**25.425**	**26.211**	**27.012**	**27.292**	**27.533**
Mixture market	8.672	10.482	12.414	14.276	16.132	18.068	20.056	22.061	24.047	25.971	27.789	29.456	30.929	32.475	34.099
Mixture market growth	N.A.	21%	18%	15%	13%	12%	11%	10%	9%	8%	7%	6%	5%	5%	5%
NovoMix market share	65%	62%	63%	65%	67%	57%	50%	45%	40%	35%	30%	28%	26%	24%	22%
NovoMix sales	**5.637**	**6.499**	**7.821**	**9.280**	**10.809**	**10.299**	**10.028**	**9.928**	**9.619**	**9.090**	**8.337**	**8.248**	**8.041**	**7.794**	**7.502**
Byetta sales (USDm)	**751,4**	**796,5**	**710,0**												
GLP-1 in diabetes market	3.907	4.229	6.009	9.314	13.971	19.559	26.405	33.006	37.957	42.892	47.610	52.371	57.084	61.651	65.966
GLP-1 in diabetes market growth	N.A.	8%	42%	55%	50%	40%	35%	25%	15%	13%	11%	10%	9%	8%	7%
Victoza market share	0%	2%	39%	55%	67%	65%	60%	55%	50%	45%	43%	41%	39%	38%	35%
Victoza sales	**0**	**87**	**2.317**	**5.123**	**9.361**	**12.714**	**15.843**	**18.153**	**18.979**	**19.301**	**20.472**	**21.472**	**22.263**	**23.427**	**23.088**
Human insulin market	17.359	17.680	18.923	19.869	20.465	20.875	21.083	21.294	21.507	21.507	21.507	21.507	21.507	21.507	21.507
Human insulin market growth	N.A.	2%	7%	5%	3%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%
Human insulin market share	68%	64%	63%	60%	55%	50%	45%	40%	35%	32%	29%	27%	25%	23%	22%
Human insulin sales	**11.804**	**11.315**	**11.827**	**11.922**	**11.256**	**10.437**	**9.488**	**8.518**	**7.528**	**6.882**	**6.237**	**5.807**	**5.377**	**4.947**	**4.732**
Heamophilia market	42.640	44.200	47.235	50.542	54.585	59.498	64.258	68.756	72.881	76.525	79.586	81.974	84.433	86.966	88.705
Heamophilia growth	N.A.	4%	7%	7%	8%	9%	8%	7%	6%	5%	4%	3%	3%	3%	2%
NovoSeven market share	15%	16%	17%	18%	19%	20%	19%	18%	17%	17%	17%	16%	15%	14%	13%
NovoSeven sales	**6.396**	**7.072**	**8.030**	**9.098**	**10.371**	**11.900**	**12.209**	**12.376**	**12.390**	**13.009**	**13.530**	**13.116**	**12.665**	**12.175**	**11.532**
Growth hormone market	16.804	18.338	20.013	21.814	23.777	25.917	28.249	30.509	32.950	35.586	38.433	41.123	43.591	46.206	48.978
Groth hormone market growth	N.A.	9%	9%	9%	9%	9%	9%	8%	8%	8%	8%	7%	6%	6%	6%
Norditropin market share	23%	24%	24%	25%	25%	25%	25%	24%	23%	23%	21%	19%	17%	15%	14%
Norditropin sales	**3.865**	**4.401**	**4.803**	**5.453**	**5.944**	**6.479**	**7.062**	**7.322**	**7.578**	**8.185**	**8.071**	**7.813**	**7.410**	**6.931**	**6.857**
Other product sales	**6.171**	**6.732**	**7.198**	**6.478**	**4.211**	**2.948**	**2.211**	**1.769**	**1.503**	**1.353**	**1.285**	**1.260**	**1.260**	**1.260**	**1.260**
Other product sales growth	**N.A.**	**9%**	**7%**	**-10%**	**-35%**	**-30%**	**-25%**	**-20%**	**-15%**	**-10%**	**-5%**	**-2%**	**0%**	**0%**	**0%**

Sales DKKm	2008	2009	2010	E2011	E2012	E2013	E2014	E2015	E2016	E2017	E2018	E2019	E2020	E2021	E2022
Degludec market share	0%	0%	0%	0%	0%	2%	5%	9%	13%	16%	18%	20%	22%	24%	27%
Degludec sales (non-adj.)	0	0	0	0	0	1.160	3.363	6.962	11.263	15.249	18.699	22.438	26.410	30.539	36.418
Degludec chance of approval	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Degludec sales (risk adj.)	**0**	**0**	**0**	**0**	**0**	**928**	**2.691**	**5.570**	**9.011**	**12.199**	**14.959**	**17.951**	**21.128**	**24.431**	**29.135**
DegludecPlus market share	0%	0%	0%	0%	0%	2%	7%	10%	13%	16%	19%	22%	25%	28%	31%
DegludecPlus sales (non-adj.)	0	0	0	0	0	361	1.404	2.206	3.126	4.155	5.280	6.480	7.732	9.093	10.571
DegludecPlus chance of approval	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
DegludecPlus sales (risk adj.)	**0**	**0**	**0**	**0**	**0**	**289**	**1.123**	**1.765**	**2.501**	**3.324**	**4.224**	**5.184**	**6.186**	**7.274**	**8.457**
Obesity market	144.060	147.000	150.000	153.000	156.060	159.181	162.365	165.612	168.924	172.303	175.749	179.264	182.849	186.506	190.236
Obesity market growth	N.A.	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Liraglutide market share	0%	0%	0%	0%	0%	0%	1%	2%	4%	6%	8%	10%	11%	12%	13%
Liraglutide sales (non-adj.)	0	0	0	0	0	0	1.624	3.312	6.757	10.338	14.060	17.926	20.113	22.381	24.731
Liraglutide chance of approval	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%	55%
Liraglutide sales (risk adj.)	**0**	**0**	**0**	**0**	**0**	**0**	**893**	**1.822**	**3.716**	**5.686**	**7.733**	**9.860**	**11.062**	**12.309**	**13.602**

Appendix 6

DKKm	2008	2009	2010	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E
Sales															
- Levemir	3.850	5.223	6.880	9.010	11.303	12.757	13.453	14.698	13.862	13.342	12.466	12.341	12.004	11.452	10.791
- NovoRapid	7.830	9.749	11.900	13.929	16.300	18.885	20.428	21.889	23.232	24.422	25.425	26.211	27.012	27.292	27.533
- NovoMix	5.637	6.499	7.821	9.280	10.809	10.299	10.028	9.928	9.619	9.090	8.337	8.248	8.041	7.794	7.502
- Degludec	0	0	0	0	0	928	2.691	5.570	9.011	12.199	14.959	17.951	21.128	24.431	29.135
- DegludecPlus	0	0	0	0	0	289	1.123	1.765	2.501	3.324	4.224	5.184	6.186	7.274	8.457
Modern Insulin Total	**17.317**	**21.471**	**26.601**	**32.219**	**38.411**	**43.159**	**47.723**	**53.849**	**58.225**	**62.378**	**65.410**	**69.935**	**74.372**	**78.245**	**83.417**
- Victoza	0	87	2.317	5.123	9.361	12.714	15.843	18.153	18.979	19.301	20.472	21.472	22.263	23.427	23.088
- Human insulin	11.804	11.315	11.827	11.922	11.256	10.437	9.488	8.518	7.528	6.882	6.237	5.807	5.377	4.947	4.732
Total Insulin Business	**29.121**	**32.873**	**40.745**	**49.263**	**59.028**	**66.310**	**73.053**	**80.520**	**84.731**	**88.561**	**92.120**	**97.214**	**102.011**	**106.619**	**111.237**
- Liraglutide	0	0	0	0	0	0	893	1.822	3.716	5.686	7.733	9.860	11.062	12.309	13.602
- NovoSeven	6.396	7.072	8.030	9.098	10.371	11.900	12.209	12.376	12.390	13.009	13.530	13.116	12.665	12.175	11.532
- Norditropin	3.865	4.401	4.803	5.453	5.944	6.479	7.062	7.322	7.578	8.185	8.071	7.813	7.410	6.931	6.857
- Other products	6.171	6.732	7.198	6.478	4.211	2.948	2.211	1.769	1.503	1.353	1.285	1.260	1.260	1.260	1.260
Total sales	**45.553**	**51.078**	**60.776**	**70.292**	**79.554**	**87.636**	**95.428**	**103.808**	**109.919**	**116.794**	**122.738**	**129.262**	**134.409**	**139.294**	**144.487**
Growth	N.A.	12,1%	19,0%	15,7%	13,2%	10,2%	8,9%	8,8%	5,9%	6,3%	5,1%	5,3%	4,0%	3,6%	3,7%
Costs of goods sold	8.278	8.587	9.848	11.247	12.331	13.145	14.314	15.571	16.488	17.519	18.411	19.389	20.161	20.894	21.673
Gross profit	**37.275**	**42.491**	**50.928**	**59.045**	**67.223**	**74.490**	**81.114**	**88.237**	**93.431**	**99.275**	**104.328**	**109.873**	**114.247**	**118.400**	**122.814**
Gross margin	81,8%	83,2%	83,8%	84,0%	84,5%	85,0%	85,0%	85,0%	85,0%	85,0%	85,0%	85,0%	85,0%	85,0%	85,0%
Sales and dristribution costs	12.828	15.377	18.135	20.736	23.071	25.414	27.674	30.104	31.876	33.870	35.594	37.486	38.978	40.395	41.901
Sales and dristribution costs as % of sales	28,2%	30,1%	29,8%	29,5%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%	29,0%
Research and development costs	7.383	7.336	9.142	11.247	12.729	14.022	15.269	16.609	17.587	18.687	19.638	20.682	21.505	22.287	23.118
Research and development costs as % of sales	16,2%	14,4%	15,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%	16,0%
Administrative expenses	2.535	2.635	2.950	3.163	3.580	3.944	4.294	4.671	4.946	5.256	5.523	5.817	6.048	6.268	6.502
Administrative expenses as % of sales	5,6%	5,2%	4,9%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%
Licence fees and other operating income, net	286	341	657	703	796	876	954	1.038	1.099	1.168	1.227	1.293	1.344	1.393	1.445
Licence fees and other operating income, net as % of sales	0,6%	0,7%	1,1%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%	1,0%
EBITDA	**14.815**	**17.484**	**21.358**	**24.602**	**28.639**	**31.987**	**34.831**	**37.890**	**40.120**	**42.630**	**44.800**	**47.181**	**49.059**	**50.842**	**52.738**
Depreciations and amortizations	2.442	2.551	2.467	2.900	3.083	3.286	3.459	3.763	3.847	4.088	4.296	4.524	4.704	4.875	5.057
Dep. and amort. as % of Intangible assets and Property, Plant and Equip.	12,5%	13,7%	12,8%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%	12,5%
Operating profit (EBIT)	**12.373**	**14.933**	**18.891**	**21.703**	**25.557**	**28.701**	**31.372**	**34.127**	**36.273**	**38.542**	**40.504**	**42.656**	**44.355**	**45.967**	**47.681**
Operating margin	27,2%	29,2%	31,1%	30,9%	32,1%	32,8%	32,9%	32,9%	33,0%	33,0%	33,0%	33,0%	33,0%	33,0%	33,0%
Share of profit (loss) of associated companies, net of tax	-124	-55	1.070	0	0	0	0	0	0	0	0	0	0	0	0
Financial expenses, net	-446	890	1.675	0	0	0	0	0	0	0	0	0	0	0	0
Profit before income taxes	**12.695**	**13.988**	**18.286**	**21.703**	**25.557**	**28.701**	**31.372**	**34.127**	**36.273**	**38.542**	**40.504**	**42.656**	**44.355**	**45.967**	**47.681**
Income taxes	3.050	3.220	3.883	4.992	5.878	6.601	7.216	7.849	8.343	8.865	9.316	9.811	10.202	10.572	10.967
Net profit for the year	**9.645**	**10.768**	**14.403**	**16.711**	**19.679**	**22.100**	**24.156**	**26.278**	**27.930**	**29.677**	**31.188**	**32.845**	**34.153**	**35.395**	**36.714**
Profit margin	21,2%	21,1%	23,7%	23,8%	24,7%	25,2%	25,3%	25,3%	25,4%	25,4%	25,4%	25,4%	25,4%	25,4%	25,4%

Appendix 7

Balance Sheet	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E
Intangible Assets and Property, Plant and Equipment	23.196	24.662	26.291	27.674	30.104	30.777	32.702	34.367	36.193	37.634	39.002	40.456
Net Working Capital	2.812	2.983	3.067	3.340	3.633	3.847	4.088	4.296	4.524	4.704	4.875	5.057
Invested capital	**26.008**	**27.645**	**29.358**	**31.014**	**33.738**	**34.624**	**36.790**	**38.663**	**40.718**	**42.339**	**43.878**	**45.513**
Equity, start-of-year	36.965	40.312	42.850	45.505	48.072	52.293	53.668	57.025	59.927	63.112	65.625	68.010
Net profit for the year	16.711	19.679	22.100	24.156	26.278	27.930	29.677	31.188	32.845	34.153	35.395	36.714
Dividends	-13.364	-17.141	-19.444	-21.589	-22.056	-26.556	-26.320	-28.286	-29.660	-31.640	-33.009	-34.179
Equity, end-of-year	40.312	42.850	45.505	48.072	52.293	53.668	57.025	59.927	63.112	65.625	68.010	70.546
Net interest bearing debt	-14.304	-15.205	-16.147	-17.058	-18.556	-19.043	-20.235	-21.264	-22.395	-23.286	-24.133	-25.032
Invested capital	**26.008**	**27.645**	**29.358**	**31.014**	**33.738**	**34.624**	**36.790**	**38.663**	**40.718**	**42.339**	**43.878**	**45.513**

Appendix 8

From 1/1-2010 to deadline	OMX Copenhagen Cap GI	OMX Copenhagen Benchmark Cap GI	Nordic Health Care GI
Covariance	2583,29	2583,29	1081,86
Variance	1171,40	1155,00	181,16
Beta	2,21	2,24	5,97
Last 3 months	OMX Copenhagen Cap GI	OMX Copenhagen Benchmark Cap GI	Nordic Health Care GI
Covariance	408,46	474,56	155,15
Variance	237,07	328,78	28,90
Beta	1,72	1,44	5,37
YTD (25 days)	OMX Copenhagen Cap GI	OMX Copenhagen Benchmark Cap GI	Nordic Health Care GI
Covariance	31,22	14,16	39,63
Variance	13,44	15,47	5,97
Beta	2,32	0,92	6,64

Appendix 9

DCF													
t	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Terminal**
Year	**2011E**	**2012E**	**2013E**	**2014E**	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**	**2022E**	**2023E**
NOPAT	16.711	19.679	22.100	24.156	26.278	27.930	29.677	31.188	32.845	34.153	35.395	36.714	37.448
Depreciations and amortizatio	2.900	3.083	3.286	3.459	3.763	3.847	4.088	4.296	4.524	4.704	4.875	5.057	5.158
Change in NWC	387	172	84	273	293	214	241	208	228	180	171	182	101
CAPEX	4.131	4.548	4.915	4.843	6.193	4.520	6.013	5.960	6.351	6.145	6.243	6.511	5.967
Free cash flow	**15.093**	**18.042**	**20.387**	**22.500**	**23.554**	**27.044**	**27.512**	**29.315**	**30.791**	**32.532**	**33.856**	**35.078**	**36.538**
WACC	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%
Discountfactor	0,925	0,856	0,792	0,733	0,678	0,627	0,580	0,537	0,496	0,459	0,425	0,393	
PV (free cash flow)	13.963	15.442	16.143	16.483	15.963	16.956	15.958	15.732	15.287	14.942	14.386	13.790	
Growth rate													2,00%
Terminal value													599.870
Sum of PV for budget period	185.045												
PV terminal period	235.821												
Enterprise value	**420.866**												
Net interest bearing debt	-14.304												
Company value	**435.171**												
Number of shares (mill)	580												
Share price (DKK)	**750,29**												

Appendix 10

EVA													
t	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Terminal**
Year	**2011E**	**2012E**	**2013E**	**2014E**	**2015E**	**2016E**	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**	**2022E**	**2023E**
NOPAT	16.711	19.679	22.100	24.156	26.278	27.930	29.677	31.188	32.845	34.153	35.395	36.714	37.448
Invested capital, start-of-year	24.390	26.008	27.645	29.358	31.014	33.738	34.624	36.790	38.663	40.718	42.339	43.878	45.513
WACC	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%	8,09%
ROIC	68,52%	75,66%	79,94%	82,28%	84,73%	82,79%	85,71%	84,77%	84,95%	83,88%	83,60%	83,67%	82,28%
EVA	14.738	17.574	19.863	21.781	23.768	25.201	26.876	28.211	29.717	30.859	31.969	33.164	33.766
Discountfactor	0,925	0,856	0,792	0,733	0,678	0,627	0,580	0,537	0,496	0,459	0,425	0,393	
PV (EVA)	13.634	15.042	15.728	15.956	16.108	15.801	15.590	15.139	14.754	14.174	13.584	13.037	
Growth rate													2,00%
Terminal value													554.357
Invested capital, start-of-year	24.390												
Sum of PV for budget period	178.548												
PV terminal period	217.929												
Enterprise value	**420.866**												
Net interest bearing debt	-14.304												
Company value	**435.171**												
Number of shares (mill)	580												
Share price (DKK)	**750,29**												