Valuation Report: Novo Nordisk

17th May 2024

Context

Novo Nordisk is taking the world by storm. In September 2023, it overtook LVMH to become Europe's most valuable company by market capitalization (then USD 428 billion). The company has had so much success, that it is considered to now be a key catalyst behind the Danish economy; both in growth and in employment (around 180 thousand Danes are considered to be employed or in some form benefitting from Novo Nordisk). Through releasing patented *Ozempic* and *Wegovy* medications that pioneer in providing both effective and relatively side-effect-free treatment of obesity, Novo Nordisk has tapped into an enormous new market and demand for its medications is skyrocketing. Fierce demand, grand projections about market expansion, and competitive protection from patents guarantee optimistic cash flows in the near future. For now, Novo Nordisk is the first mover in the weight-loss market. But through establishing its competitive position, gaining the trust of governments and regulators worldwide, and continuing a stream of innovation, many analysts endow Novo Nordisk with the potential to become the world's first trillion-dollar pharmaceutical company. This report uses a discounted cash flow (DCF) as well as relative valuations to determine whether Novo Nordisk's current share price of DKK 912 is justified.

Findings

Market Price	DCF Valuation	Relative Valuation
DKK 912	DKK 683	DKK 550
	(34% overvalued)	(56% overvalued)

Recommendation: Sell

The Valuation Anatomy

All units are in millions of DKK (except percentages and per-share items). A Free Cash Flow to the Firm (FCFF) model was adopted as to account for both debt and equity holders in Novo Nordisk, thereby providing a more representative valuation of enterprise value. Valuation inputs taken as most recent were extracted from balance sheets and income statements for 2023 published on January 31st 2024.

Figure 1: High-Growth FCFF Projection

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Period	0	1	2	3	4	5	6	7	8	9	10	Terminal year
Revenue growth rate	31.0%	26.0%	20.0%	15.0%	10.0%	7.0%	5.0%	5.0%	4.1%	3.2%	3.0%	2.2%
Revenues	232261	292649	351179	403855	444241	475338	499105	524060	545702	563016	579906	592757
Market Share	87%	96%	97%	98%	95%	89%	82%	75%	69%	62%	56%	
EBIT (Operating) margin	44.8%	50.0%	46.0%	45.0%	45.0%	44.0%	44.0%	43.0%	42.0%	41.0%	40.0%	40.0%
EBIT (Operating income)	103988	146324	161542	181735	199908	209149	219606	225346	229195	230836	231962	237103
Tax rate	21.0%	21.0%	21.0%	21.0%	21.0%	21.0%	21.2%	21.4%	21.6%	21.8%	22.0%	22.0%
EBIT(1-t)	82151	115596	127618	143571	157928	165227	173050	177122	179689	180514	180931	184940
- Reinvestment		17420	15678	12020	9255	7073	24955	21642	17314	16890	12851	27322
FCFF		**98177**	**111941**	**131551**	**148673**	**158154**	**148094**	**155480**	**162375**	**163624**	**168080**	**157618**
Cost of capital		6.04%	6.04%	6.04%	6.04%	6.04%	6.14%	6.24%	6.34%	6.44%	6.55%	6.55%
PV(FCFF)		**92585**	**99552**	**110328**	**117585**	**117959**	**104065**	**102836**	**100990**	**95605**	**92175**	

Figure 2: Valuation

Value of operating assets =	3029930
- Debt	20824
+ Cash	30230
+ Non-operating assets	1663
Value of equity in common stock	3040999
Number of shares	4454.8
Estimated value /share	**683 kr.**

Market Price per share	912 kr.
% Overvalued	33.6%

Figure 3: Business Environment in 2023/24

10-year bond YTM	2.46%
- CDS Sovereign Default Spread	0.24%
= Risk Free Rate	2.22%
Weighted Average Equity Risk Premium	4.60%
Unlevered Beta	0.94

Figure 4: Company Specifics in 2023/24

Levered Beta	0.92
S&P Credit Rating	AA-
Default Spread	0.77%
+ Risk Free Rate	2.20%
= Cost of Debt	2.99%
Marginal Tax Rate	22.0%
Long-Term Debt/Equity	16.9%
Total Book Debt/Equity	27.2%
Current Ratio	70.3%

Descriptive Decomposition

Summary

This report might seem pessimistic in its conclusion about Novo Nordisk stock. In reality, however, it is far from that. It is worth remembering that just 10 years ago, the market capitalization of Novo Nordisk was little more than DKK 612 billion (USD 89 billion). Today, taking the above fair value of DKK 683 would imply a valuation of DKK 3.04 trillion, or 441 billion USD. That is a growth of market capitalization of 496% in 10 years. Novo Nordisk provides strong cash flow expectations and particularly impressive operational fundamentals that are at the heart of this valuation. Nevertheless, the firm is unable to justify the 30-40% growth rates that some analysts ascribe to it – that would spring the company into far more than just the largest company in Europe, but indeed a multi-trillion-dollar behemoth in the stable growth period. I made sure to account for a more realistic growth landscape rooted in competitive dynamics.

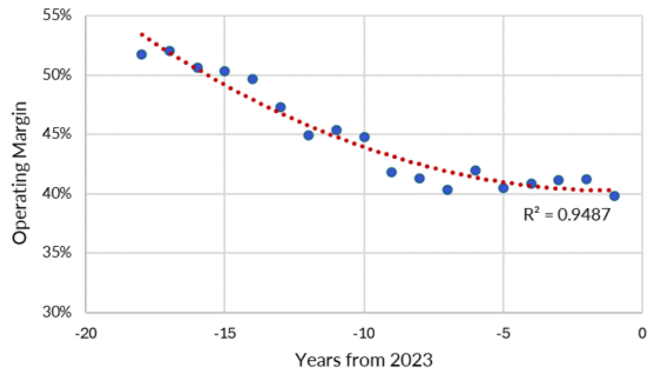
High Growth Phase

- I assume a high growth rate phase of 10 years, anchored in the expiry date of key Novo Nordisk patents (more information in ***A Discussion on Growth***). The growth rate in revenue is high all throughout this phase, starting at a predicted 26% for this year's results down 5% from last year's realized growth rate. The growth rate continues to decline, though revenues continue to increase at healthy levels through to the stable growth period. Ultimately, revenue in 2033 will be DKK 347 billion (USD 52 billion) greater than it was in 2023.

Profitability and Returns

- Novo Nordisk displays exceptional operational efficiency, manifested through an impressive **return on invested capital (ROIC)** of 30.9% compared with a ~13% industry standard. The DCF forecasts yields a forecasted growth of invested capital of DKK ~133 billion, or USD 20 billion over the high-growth period.
- I have been optimistic about Novo Nordisk's **operating margin** over time, with it gradually decreasing albeit not severely (from 44% to 40% in perpetuity). Novo Nordisk is a mature company, which might suggest that it's operating margin is unlikely to shrink severely. Scrutinizing information on the company's financial data from the last 20 years, however, reveals that the operating margin has decreased considerably, illustrated in figure 5. Still, modelling this evolution seems to conclude that the firm's operating margin is stabilizing at 40%, with an R^2 of 95%. In fact, the average operating margin in the recent 9 years is 41%. This horizon precedes the high-growth phase.

Figure 5: Operating Margin (Historical Trend)



Debt and Risk

- Novo Nordisk's strong market position as a first-mover in weight-loss medications and its sustainable competitive advantage provides a low initial **cost of capital** for the valuation of 6.04%, which is lower than the pharmaceutical industry standard of 9.23%. This lower cost of capital reveals that investors perceive the company as less risky. In the long run, the firm's **cost of capital** approximates the sum of the risk free rate and 4.5%, typical for mature companies.
- At present, Novo Nordisk is in a healthy position with regard to debt, with a **debt-to-equity ratio** of 27.2%. The large difference against the **long-term debt to equity** ratio of 16.9% makes sense, considering the company has been taking on more short-term debt in recent years as a way of financing rapid supply expansions. Though this may raise some analysts' eyebrows, long-term debt to equity is likely to approach total debt-to-equity as the firm's productive capacity expands. Additionally, Novo Nordisk exhibits a healthy **current ratio** of 70.3%, and it has a healthy S%P **credit rating** of AA-. I do not see a cause for concern.
- As Novo Nordisk scales up production, it actively expands into new foreign markets and increases its global operations. This is a much needed process, since ~80% of the company's revenues are currently tied to the United States. By diversifying its revenue streams, the firm can guarantee itself more favorable long-term risk assessments, and reduce its cost of capital and levered beta. The firm's revenues currently sway much to the side of diabetes and weight loss medications (92%), with the remainder coming from rare disease treatment.
- Where in the high growth phase the tax rate used for the valuation was Novo Nordisk's **effective tax rate**, this gradually approaches the **marginal tax** rate of 22% in perpetuity.

Stable Growth Phase

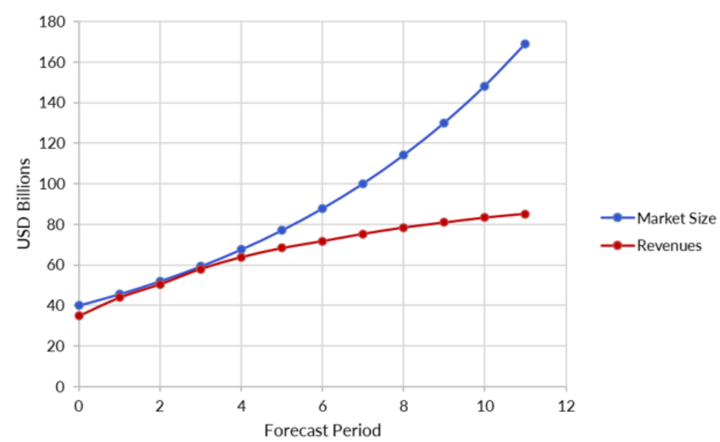
- In the stable growth period, Novo Nordisk's **growth rate** equals the risk free rate of the Danish economy. This is feasible, seen as the Danish economy is already closely tied to the performance of Novo Nordisk, and this dependence is likely to increase in the coming years as the firm's valuation and scale of operations increases.

A Discussion on Growth

Market Conditions

At present, the **global market** for weight loss medications is estimated as USD 40 billion with ~12 million global customers, and is forecasted to reach USD 100 billion in 2030 with ~43 million global customers. By comparison, the antidepressant market that emerged around Eli Lilly's *Prozac* in 1987 is estimated to reach USD 21 billion in 2030. It is with this key perspective that I approached my DCF valuation, not allowing Novo Nordisk to surpass global revenues above DKK 690 billion (USD ~100 billion). I have noticed that many analysts' valuations of Novo Nordisk rest on particularly bullish assumptions that the firm will be able to exceed this number in 2030. This does not make sense neither from a competitive nor an economic sense.

Figure 6: Market Share Forecast



Bullish forecasts on the weight-loss medication market suggest that Novo Nordisk and Eli Lilly are still only at the tip of the iceberg. Figure 6 outlines my implied forecast for Novo Nordisk's market share in the weight loss medication market over the course of the **high growth period**.

- Since Novo Nordisk is the first mover in this market, I do expect the firm to gain **short-term control of market share**, as Eli Lilly and other potentially-emerging competitors seek to approve their medications and invest in alternative treatment solutions.
- In the moderate term, Eli Lilly will inevitably catch up with competitive medications of its own. Some forecasts even project Eli Lilly eventually surpass Novo Nordisk in market share. I made sure to gradually lessen Novo

Nordisk's revenue growth rate so as to diverge from the rapidly-growing market.

In the long run, it is plausible that weight-loss and diabetes treatments akin to *Wegovy* will become widely available ("over-the-counter"). Parallel to this will be a massive change in **profit margins** for the drugs as suppliers multiply. Today, the purchase price of the drug is ~940 USD (a yearly cost is 16 thousand USD), while estimates show that each capsule might cost between 0.89 to 4.73 USD to produce.

Assumptions about **cash flows** thus have to adjust according to a lessened **market share** and **profitability**. Nevertheless, estimates project that there are about a billion people in the world with obesity. If Novo Nordisk establishes itself as a stable provider of weight-loss and diabetes treatment, its future will be secure even in a competitive market. Generating brand recognition over the course of the high-growth period could be another way to guarantee that.

History of Break-through Patents

Looking at **past history** of market-piercing drugs may help to gain perspective on Novo Nordisk's future. Eli Lilly's pioneering antidepressant *Prozac* was released in 1988 and similarly took the world by storm. However, almost immediately after the expiration of the firm's patent for the drug in 2001, competitors flooded the market with **rival medications**. Within just the first 20 weeks after the expiration of Eli Lilly's patents, the firm lost about 70% of its market share to generic competitors. Novo Nordisk is looking at a similar time horizon of protection under its patents:

- In 2021, Novo Nordisk launched **patents** for *Ozempic* and *Wegovy* after approval from the U.S. Food and Drug Administration. These **patents** are set to expire in 2032/33, which is one criterion behind the high-growth period of 9 years chosen in the DCF valuation. Novo Nordisk's **patents** provide a **competitive advantage**, but the company may face a fate similar to Eli Lilly in the long run; it's **market share** and **profitability** will be severely depleted, and the adjusted fundamentals in the **terminal year** seek to illustrate this.

Innovation

Innovation may prove Novo Nordisk's antidote to an eventual **deterioration of growth**. If the firm continues to innovate and address novel medical needs, it may generate new streams of income and capture infant markets. Eli Lilly provides a good template: despite losing its **competitive advantage** in antidepressant medications with the turn of the millennium, the company managed to follow **research efforts** into weight-loss medications, and as such was ready for the emergence of the weight loss medication market. Though the emergence of this market can be plausibly attributed to Novo Nordisk, Eli Lilly was well equipped to quickly follow the industry trend and unleash a new spell of growth. Novo Nordisk is exploring additional indications for its semaglutide-based drugs, including treatments for chronic kidney disease and cardiovascular conditions. Positive trial results in these areas could generate additional sources of **growth**.

Extraneous Boosts to Demand

What is interesting is that the positive results of active clinical trials of weight-loss drugs may not only prompt governments around the world to open up their domestic markets to the drugs, but it may also start a conversation about the potential **moral responsibilities** of governments providing potentially life-saving treatment to patients. This is a further reason to be bullish about Novo Nordisk. The economic cost of obesity worldwide is estimated to reach USD 2.5 trillion by 2025; there is a macroeconomic – not just a moral – interest to eradicating obesity.

Sensitivity Analysis

The valuation outlined in this paper assumes a 14% **market CAGR**, obeying popular projections for market size in 2030. Figure 7 provides a good overview of the interplay between the CAGR of the **weight-loss medication market**, and the **operating margin** for the firm in stable growth. Notice that the share price would be undervalued in two instances, under a particularly high market **CAGR** as well as 41-44% **operating margin**. A 4% higher growth rate in market size (of 18%) would forecast a 2030 weight loss market of 131.5 billion USD; this is particularly bullish and likely infeasible.

Figure 7: Sensitivity to Operating Margin and Market Growth Rate

Operating Margin in Perpetuity	CAGR of Total Weight-Loss Market				
	10%	12%	14%	16%	18%
20%	364 kr.	408 kr.	459 kr.	516 kr.	581 kr.
30%	442 kr.	502 kr.	571 kr.	649 kr.	739 kr.
40%	520 kr.	596 kr.	683 kr.	782 kr.	897 kr.
41%	528 kr.	605 kr.	694 kr.	796 kr.	913 kr.
44%	552 kr.	633 kr.	727 kr.	836 kr.	960 kr.

Figure 8: Sensitivity to High-Growth Revenue CAGR and Cost of Capital in Perpetuity

WACC in Perpetuity	Revenue CAGR (Periods 1-10)				
	6.6%	8.6%	10.6%	12.6%	14.6%
4.6%	839 kr.	987 kr.	1,160 kr.	1,361 kr.	1,595 kr.
5.6%	624 kr.	728 kr.	849 kr.	990 kr.	1,153 kr.
6.6%	509 kr.	589 kr.	683 kr.	790 kr.	915 kr.
7.6%	436 kr.	502 kr.	578 kr.	665 kr.	766 kr.
8.6%	387 kr.	442 kr.	506 kr.	580 kr.	664 kr.

Figure 8 shows the interaction of the weighted average cost of capital (**WACC**) and the **revenue CAGR** in the **high-growth period**. Results leave more room for an undervaluation than the previous test, with undervaluation being feasible under a **WACC** of ~4.6%, holding the current **revenue CAGR** constant. If current assumptions about the **WACC** were to be maintained, undervaluation would only be possible under a ~14.6% growth rate in revenues; but this in turn would drastically increase Novo Nordisk's **market share forecast** for 2030 from

75% at present to 91%. I am not confident enough that Novo Nordisk will be able to maintain this grave a **competitive advantage** against Eli Lilly and others.

It is important to remember that variables in corporate finance don't change in a vacuum; deviations in revenue CAGR against WACC, for instance, are likely to change a series of variables determining the valuation. Thus, sensitivity analyses should serve as valuation proxies and should not be causally extrapolated.

Relative Valuation

The Regression Model

I took a regression approach to the relative valuation section of this report. I analyzed a sample of **225 global firms** from the NASDAQ Biotechnology Index. Filtering the sample for selected operating statistics, I was left with a sample of **30 firms** for my regression analysis. I chose **EV/ EBITDA** as my pricing multiple because it captures **operational performance** and **profitability** which is crucial for companies in these sectors. Furthermore, **EV/ EBITDA** is particularly useful for comparing companies with different **levels of debt** and **tax rates**, common in capital-intensive industries like pharmaceuticals. Lastly, the pharmaceutical sector includes companies of varying sizes (some exhibiting stable earnings and some heavy early investment into growth), and **EV/ EBITDA** is not skewed by these differences.

My chosen operating statistics that served as independent variables in the regression were the following:

1-year Beta – a measure of volatility relative to the market, this is a good proxy for risk exposure.
EBITDA Margin – a direct measure of operational profitability.
Capital Expenditure as a Share of Revenue – measure's firms' commitment to reinvestment in operations and growth.
Estimated 2-year revenue growth rate – serves as a proxy for investor expectations about growth.

Figure 9 includes a correlation matrix, showing no evidence of multicollinearity between these inputs. *Note: where I used 2023 annual data for the DCF valuation, I have used 2024 data for this pricing analysis, as to justify the current share price.*

Figure 9: Input Multicollinearity Test

	1 Year Beta	EBITDA Mar.	CapEx/ Rev	Est. 2-yr g.r
1 Year Beta	1.000			
EBITDA Margin	-0.414	1.000		
CapEx/ Rev	0.177	-0.202	1.000	
Est. 2-yr g.r	0.253	0.066	0.094	1.000

Figure 10: EV/ EBITDA Regression Results

R^2	63%
Standard Error	28.14
Observations	30

					95% C.I.	
	Coefficients	Std. Error	t Stat	P-value	Lower	Upper
Intercept	36.3	16.6	2.18	0.039	2.0	70.6
1-yr Beta	5.8	9.3	0.62	0.539	-13.3	24.9
EBITDA Margin	-146.5	37.5	-3.91	0.001	-223.6	-69.3
CapEx/ Revenue	246.7	97.5	2.53	0.018	45.9	447.4
Est. 2yr g. rate.	126.3	49.7	2.5	0.0	24.0	228.6

Pricing

Obeying the findings of my regression, the predicted **EV/ EBITDA** multiple should be:

$$\widehat{EV/_{EBITDA}} = 36.2 + 5.8(0.19) - 146.5(0.4820) + 246.7(0.111) + 126.3(0.23) \approx 22.79.$$

Against Novo Nordisk's **actual EV/ EBITDA** multiple of 34.7, the **predicted multiple** of 22.79 suggests that the firm is significantly overvalued. Multiplying the fitted multiple by the **LTM EBITDA** value of DKK 115 billion gives a predicted enterprise value of DKK 2.6 trillion, with the corresponding equity value of DKK 2.4 trillion (USD 380 and 350 billion respectively). Dividing by the number of shares outstanding yields a price of DKK 550 (USD 82). This implies a profound, **66% share price overvaluation** given the current share price of DKK 912.

Final Recommendation

Both the **DCF** and the **relative valuations** indicate that Novo Nordisk's current share price is **overvalued**. This goes against much of the prevailing sentiment amongst equity investors; that the relative valuation is more conservative than DCF means that investors are particularly bullish on Novo Nordisk and is a strong signal to **sell the stock**. Nevertheless, Novo Nordisk offers much to be excited about. Even if the most conservative estimate outlined in this report were to be admitted, a share price of USD 82 still means that the share price grew by ~550% in ten years.