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Which valuation method yields the most accurate value in the valuation of companies in different stages of their life cycle?

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Contents

1.0 Introduction 5
1.1 Motivation 6
2.0 Literature Review 7
3.0 Theory 9
3.1 Company Stages 10
3.1.1 Startups and Young Companies 10
3.1.2 High-Growth Firms 11
3.1.3 Steady-State Companies 12
3.2 Discounted Cash Flow (DCF) 13
3.3 The First Chicago Method 15
3.4 Option Valuation 16
3.4.1 Valuing Flexibility 16
3.4.2 Real-Option Valuation (ROV) 17
3.4.3 Black-Scholes Option Pricing 18
4.0 Methodology 20
4.1 Framework 21
4.1.1 Stage 1: Sample Selection 21
4.1.2 Stage 2: Data Collection 22
4.1.3 Stage 3: Modeling 23
4.1.4 Stage 4: Testing the hypotheses 23
4.2 Assumptions 24
4.2.1 True Values 24
4.2.2 Growth 24
4.2.3 Discount Rate 25
4.2.4 Financial Statements 26
4.2.5 Probabilities 27
4.2.6 Volatility 28
4.3 Valuation Models 29
4.3.1 News 55 29
4.3.2 The DCF Model 30
4.3.3 The First Chicago Method 32
4.3.4 Option Valuation 34

5.0 Results and Discussion 35
5.1 The Valuation of Startups 35
5.2 Valuation of High-Growth Companies 37
5.3 Valuation of Steady-State Companies 39
6.0 Conclusion 40
6.1 Critique and Future Research 42
7.0 Bibliography 44
8.0 Appendix 48
8.1 Appendix A – Assumptions 48
8.2 Appendix B – Income Statement 53
8.3 Appendix C – Balance Sheet 54
8.4 Appendix D – Discounted Cash Flow 56
8.5 Appendix E – Option Valuation 57
8.6 Appendix F – Results 58

Abstract

This thesis investigates how different valuation techniques - the DCF, the First Chicago Method, and option valuation - perform on companies at different stages in their life cycle. We compare the results of each of these valuation techniques on three groups of companies: startups and young companies; high-growth firms; and steady-state companies.

We have used Excel to create models for each of the valuation methods, meaning that a number of assumptions had to be made. The assumptions include, for instance, a benchmark for probabilities in the First Chicago Method, how to forecast the financial statements, and how to obtain reasonable discount rate and volatilities. Also, we compare our values to the true values, that is, the acquisition price or the enterprise values of publicly traded companies.

By comparing the yielded values to the true values, we find that the standard discounted cash flow method is the most accurate method when considering the sample as a whole. However, the First Chicago Method is way more accurate than the DCF when separating the group of startups and young companies, with an average error of 0.95% and 18.10%, respectively. Option valuation, on the other hand, is the least accurate for all the groups of companies. Still, we find it to yield more accurate values when the debt ratio is low, which coincides with it performing worst on the steady-state companies.

1.0 Introduction

In the period between 2004 and 2013 there was established 101 582 stock based companies, so-called “aksjeselskap”, only in Norway. In our thesis, we aim to examine how valuation of these companies differ from high-growth and steady state companies. We group startups and young companies together, and therefore include both startups without any, or minimal, historical cash flows to base our forecast on and young companies with up to five years of historical accounting information. We find that these young companies in most cases provide the same challenges as startups do, due to the lack of operating detail in the young companies’ financial statements (Damodaran, 2009). As the main bulk of a startup’s expenses are related to other things than generating revenue, a few years of accounting information is of little use in forecasting. As such, we categorize them as one group in this thesis.

In recent years, we have seen multiple cases where companies, often within social media or technology, are valued at enormous amounts. Google announced that they were buying the video-sharing website YouTube on October 9th 2006. The first video uploaded to the site found place late April the year before. Kafka (2010) has found the monthly accounting numbers for YouTube prior to the acquisition, which show that the total revenue, from January 2005 until August 2006 accumulated to roughly 5 million USD (MUSD), while the profit in the same period accumulated to -3 MUSD. Google (2006) reported that they acquired YouTube and paid 1.65 billion USD, in a stock-for-stock transaction. It is clear that this value is based more on the expected future cash flow, and hence, profit, than on historical performance.

We will investigate not only the valuation of startups and young companies, although it is the main empirical problem, but also the valuation of high-growth firms and steady-state companies. We use three valuation methods: the standard discounted cash flow (DCF) model; the First Chicago Method; and option

valuation to evaluate the performance of these models against each of the company stages. In the final comparison and discussion, we will explain how the standard DCF model is the practical, and most accurate, allrounder, while the First Chicago Method is more accurate in valuations that involve great uncertainty. On the other hand, option valuation yielded disappointing and rather imprecise values, and we will explain these results in detail.

1.1 Motivation

In today's ever-changing world, where some are able to found a company and sell it only one and a half year later for over one and a half billion dollar, the rapid value creation is a common interest for both of us. There are several examples of companies being valued above what is reasonable. For instance, Ghosh (2017) reports that Snapchat's valuation numbers do not add up, and that the stock is overvalued, even compared to the likes of Facebook, Google and Twitter. Titcomb (2017) even reports that Snap Inc lost $515m last year, with already slowing user growth. Similarly, Ravon (2017), on behalf of Techcrunch, claims that unicorns such as Uber and Airbnb are massively overvalued, by 23.5% and 54% respectively. The uncertainty revolving valuations and the different ways they might be calculated for potential investors is a practical problem that always can be improved. Being able to contribute is a motivating factor in choosing this topic for the thesis. It also seems that the problem of valuing startups is somewhat unanswered, and we seek to gain insight about the reasons behind this. In this thesis, we will aim to describe both the advantages and disadvantages with the different methods in regards to the company stages in question. Our research question is therefore as follows:

Which valuation method yields the most accurate value in the valuation of companies in different stages of their life cycle?

2.0 Literature Review

Understanding company valuation is an essential part of corporate finance and various actors can value a company differently (Fernandez, 2002). The importance of valuations is underlined by the fact that every major resource-allocation decision a firm makes is made on the basis of some calculation of the move's worth (Luehrman, 1997). There are a number of valuation methods that are appropriate in different situations and Fernandez (2002) find that there are six main groups of valuation methods: balance sheet methods; income statement methods (which includes multiples); mixed methods; DCF; value creation; and options. The emphasis, however, will be put on discounted cash-flows (DCF), the First Chicago Method, and option valuation. The choice of DCF is due to it being a solid, popular and basic method (Koller et al., 2010), and it should therefore be used as a starting point and as a comparison to the other methods. The First Chicago Method is an extension of the DCF in that it uses the same approach, but with several scenarios. In that way, it incorporates more of the uncertainty as it weights the different scenarios. Hence, it is likely to yield more accurate values than the DCF for companies with high uncertainty (Desaché, n.d.; Schumann, 2006). The final method, option valuation, is chosen due to its inclusion of flexibility (Damodaran, 2009), which, in turn, should be able to provide precise valuations for startups that are dependent on being flexible throughout the first years. Moreover, how to value startups and young companies is an essential question within corporate finance - a question that has gone unanswered or only partly answered for a long period.

There is a great amount of uncertainty related to startups in general, and when considering technology startups, the uncertainty further increases. For instance, Steffens and Douglas (2007) claims that ventures with disruptive technology are typically subject to high mortality risk, that is, if the venture can survive through consistently renewing, innovating and staying on top of competitors (Douglas, 2006; Schwartz and Zozaya-Gorostiza, 2003). Also, Steffens and Douglas (2007)

claim that technology ventures are subject to high firm-specific risk, in addition to an average level of market risk.

Savage (2005) argues that the problem with many of the standard valuation methods is that they do not take flexibility into account. For instance, the DCF method assumes that the investment has to be made now, without the opportunity to making a decision in the future. This is supported by Koller, Goedhart and Wessels (2010), who claim that company-wide valuation models rarely include flexibility, that is, they do not describe the possible future actions managers could respond with, and therefore underestimates the uncertainty. On basis of this argument, Savage (2005) further finds that the real options method is better suited to value a startup than other models, such as the discounted cash-flow model. This is because startups face great future uncertainty, much greater than an older firm with steady cash-flows, which in turn requires flexibility. Steffens and Douglas (2007) underline the advantages of real options valuation by describing that real options provide a framework for how to make decisions under uncertainty. Furthermore, the value of the investment is increased due to the flexibility of future options, which, according to Savage (2005) is the main reason why the real options method is a good alternative for valuing startups. However, Steffens and Douglas (2007), despite agreeing with Savage on the advantages of real options, have a slightly different take on its use in valuation.

Instead of using real options as the valuation method, Steffens and Douglas (2007) argue that real options rather should be used as an analytical tool in order to provide a valuation for new technology companies. That is, using managerial flexibility to take advantage of opportunities while minimizing the impact of threats. Still, they find that real options valuation is inferior to traditional decision tree analysis when attempting to value new technology ventures. They argue that there are two reasons for this: First, real options valuation techniques do not deal with firm-specific risk, which is important for technology ventures. Second, the first step of real options valuation is to value the company as if there were no real

options, which makes no sense when dealing with technology ventures, as real options are an integral part of the venture.

While Savage (2005) finds that the discounted cash-flows method is inadequate in the valuation of start-ups, Hudson (2015) argues that one approach is not sufficient due to different methods being useful in different situations. Furthermore, Hudson highlights the main problem related to the valuation of startups: The lack of history, revenue, and earnings. Thus, she proposes to find historical clues about similar startup deals, and use these clues as parameters in the startup valuation in question. On the other hand, Steffens and Douglas (2007) argue that valuation of new technology ventures is difficult and underlines that traditional valuation techniques each have significant shortfalls. Yet, finding similar startups to compare is, Steffens and Douglas argue, rarely an optimal solution, as even though a comparable company is identifiable, it is unlikely that the technology development and sales process is identical. Damodaran (2009) also acknowledges the lack of revenues and earnings as a problem. He argues that most young companies are dependent upon private capital, which makes the standard techniques used to estimate cash flows, growth rates and discount rates irrelevant: They either do not work, or they yield unrealistic numbers. He also finds that most startups do not make it through the first years, and hence fail to succeed, adding to the problem of uncertainty, which in turn enhances the need for flexibility.

3.0 Theory

In this section, we will present a deeper view of the theory relevant to answering our research question: Company stages (3.1); discounted cash flow (3.2); the First Chicago Method (3.3); and option valuation (3.4). Also, we will present our hypotheses grounded in the economic theory presented in the following.

3.1 Company Stages

3.1.1 Startups and Young Companies

Despite the variations in industries, sectors, products, and innovations, one factor attributable to most startups is that they do not face only risk, but also future uncertainty (Sommer, Loch, and Dong, 2009). That is, being able to identify all future performance-related variables is impossible, and hence, the startups' futures are uncertain. Byers, Dorf, and Nelson (2010) argue that modern startups arise as a result of entrepreneurs' ability to identify opportunities, and as today's opportunities and innovations mostly stem from new technologies, we find new technology ventures to be a logical starting point when discussing startups. Elg (2015) supports this by claiming that successful innovation requires actors who capitalize on change and technology, in addition to facilitating long-term learning.

New technologies are often referred to as 'disruptive', or 'radical', in a way that it challenges and disrupts an existing market by creating a new market (Byers et al., 2010). As a result, there is a great deal of uncertainty related to technology companies (Steffens and Douglas, 2007; Damodaran, 2009; Hudson, 2015). For instance, Steffens and Douglas (2007) highlights that companies who rely on disruptive technology are subject to a high level of mortality risk, as other firms can invent a better solution overnight. This uncertainty makes most firms unable to survive the early years and end up as stable and profitable companies, and therefore, projecting future cash flows, growth rates and discount rates is troublesome (Damodaran, 2009). In fact, Damodaran (2009) finds that only 25% of firms in the information sector, which includes technology, survive seven years.

As a possible solution, many venture capital (VC) investors include some control mechanisms in the contracts that allow them to change the venture's course of actions, for instance by focusing on markets or products other than what was initially intended (Sommer, Loch, and Dong, 2009). In fact, Drucker (1985) argue that successful startups more often than not become profitable in other markets

than planned. For instance, the telecom giant Nokia originally sold paper, while Hasbro started selling textile remnants before making the leap to toys after the introduction of Mr. Potato Head in 1952 (Trex, 2013)

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There are many typical characteristics of startups and young companies. For instance, they have no, or little, history, making it difficult to predict future cash flows and thus valuing them (Damodaran, 2009). Also, the revenues are usually small, with operating losses, which means that if these companies actually do have some accounting history, it is less useful in forecasting than what would be the case with older companies. Essentially, it lacks operating detail, as the expenses often are associated with getting the company up and running instead of generating revenues. As a result, many young companies are dependent on private equity, often from venture capitalists.

3.1.2 High-Growth Firms

First, we need to establish what constitutes a high-growth firm. We follow OECD’s guidelines in which a high-growth company is an enterprise with average annualized growth greater than twenty percent over a three-year period, and with ten or more employees at the start of this period (Audretsch, 2012). Young companies often experience high growth as well, often even higher, but there are other criteria that separate young companies and high-growth firms in our sample.

First, the uncertainty attached to what we define as high-growth firms are significantly lower than the uncertainty of startups. These firms are more experienced, that is, they are more or less incorporated in the market in which they operate, as opposed to startups who are merely challengers hoping to enter the market.

Second, as the high-growth firms are older, they no longer have operating expenses related to getting the company up and running, meaning that more of their expenses are directly linked to the generation of revenue. For valuation

purposes, this means that their operating accounting history is more trustworthy. In addition, high-growth firms with a substantial market share might generate economies of scale or first mover advantages that could enhance their profitability.

However, growth must be combined with return on invested capital (ROIC) relative to its cost in order to determine the value creation (Koller et al., 2010). For instance, high growth combined with a ROIC lower than the cost of capital destroys value. Also, sustaining the high growth over time requires a significant competitive advantage, which in most cases will be imitated or neutralized in other ways by competing companies unless the company is constantly innovating its products (Cho and Pucik, 2005). The value creation also depends on which type of growth the company utilizes: While growth from creating new markets through new products generates a lot of value, growth from making large acquisitions creates much less value (Koller et al., 2010).

Contrary to the belief that high growth and profitability is minimally or negatively correlated (Hoy, McDougall, and D'Souza, 1992; Covin and Slevin, 1997), Markman and Gartner (2002), while investigating firms with extraordinary high growth, found that growth rate is unrelated to profitability. On the other hand, they found that firm age was significantly, and inversely, related to profitability in that younger firms have slightly higher profitability rates.

3.1.3 Steady-State Companies

Steady-state companies are, in our research, categorized as stable firms, most likely older than the other firms in our sample, without any excessive growth, and with minimal risk of bankruptcy. In turn, this means that there is much less uncertainty regarding future performance than what is the case when predicting the future of startups and high-growth firms.

3.2 Discounted Cash Flow (DCF)

When valuing a company, one of the most used theories applied is the Discounted Cash Flow method (DCF-method). This method is widely examined amongst academics and practitioners. The method consists, as its name implies, of the expected future cash flow discounted at the cost of capital.

$$Value\ of\ Business = \sum_{t=1}^{\infty} \frac{E(CF_t)}{(1+r)^t} = \sum_{t=1}^{t=N} \frac{E(CF_t)}{(1+r)^t} + \frac{Terminal\ Value_N}{(1+r)^N}$$

(Damodaran, 2010)

This method can be used on companies, shares and bonds, to name some. The terminal value term in the equation from Damodaran (2010) is a sum of the cash flows, which could be challenging to estimate. Damodaran (2010) has also re-written the equation to:

$$Value\ of\ Business = \sum_{t=1}^{t=N} \frac{E(CF_t)}{(1+r)^t} + \frac{E(CF_{N+1})}{(r-g_n)(1+r)^N}$$

In this thesis, where the focus is on different company stages, a problem might arise in estimating the future cash flows of startups. For startups and young companies, the most significant cash flows are expected to be in the future, and one have to make decisions on two variables. The first, how much of the earnings are to be reinvested. One could expect that a company that reinvests 80 % of its earnings would generate more future positive cash flows than a similar company that reinvests 20 % of its current earnings. The second decision is the quality of reinvestments, measured by excess return, as investing in an investment that will generate returns of 10 % will add value as long as the cost of capital is below 10 %. In other words, a company should not invest only for the cause of investing (Damodaran, 2010).

The variables in the formulas described above are easy to observe in the past, but estimating their future value may be difficult. The first variable to be estimated is often the cash flow (CF), either as free cash flow to equity (FCFE) or as free cash flow (FCF). The way of calculating these and its pitfalls will be further examined later in the paper. There is also a need for the cost of equity, noted *r* in the formula above. One way that this can be done is by the following formula:

$$Cost\ of\ Equity = (Risk - Free\ rate) + (Beta\ x\ Equity\ Risk\ Premium)$$

Even the risk-free rate could be difficult to estimate correctly, as a 3-month t-bill is not risk-free when the time horizon is several years. The *r* can also be considered as the required rate of return, which an investor demands for the chosen investment. These numbers differ between investors, and Plummer (1987) lists these required rates of return for venture capital companies when investing:

Stage of Development of Company	Required Rate of Return
Seed-capital stage	50-75%
1st stage	40-60%
2nd stage	35-50%
3rd stage	30-50%
4th stage	30-40%

Table 1: Required Rate of Return

Morris (1988) agrees on the first stage, but writes that investors require a rate of return of at least 50%, and slightly disagree on the second stage. Here Morris writes that investors require a 30 - 40% return. The more common way of discounting in the DCF method is by calculating the weighted average cost of capital (WACC), which takes into account the firm's capital structure. However, the WACC is lower than what would be considered the required rate of return for most startups, which could pose a problem.

The discount rate, which earlier is mentioned as cost of equity and required rate of return, is also expected to be constant over time, which is not necessarily the truth, as an investment over several years also impose a time-varying risk, which is typical for startups (Steffens and Douglas, 2007). It seems likely that the DCF

works better for companies with low uncertainty in future performance, and hence we propose the first hypothesis:

Hypothesis 1: The DCF method will yield the most accurate values for steady-state companies, and the least accurate values for startups.

3.3 The First Chicago Method

According to Desaché (n.d), the First Chicago Method could be seen as a compromise between the Venture Capital Method, in which a very unlikely success outcome is discounted heavily, and real options, which takes flexibility into account and will be discussed further in the next chapter. The approach is an extension of the standard DCF as it basically runs three (or even more) separate DCFs with slightly different assumptions, before weighting the values into one total enterprise value based on the probabilities of each outcome. It is a multiple scenario approach that encourages the one behind the valuation to think about possible and probable outcomes for the firm. Thus, probabilities are assigned to a number of scenarios, which also points to one of the flaws of the method: It is highly subjective and judgmental (Schumann, 2006).

Fowler (1990) cites a survey by Venture Economists, which have calculated the outcomes for over two hundred venture capital investments. The results show that 40% of the investments lost money, while 30% went sideways or was classified as "living dead". 20% of the investments yielded a return between 2 to 5 times the invested capital. 8% of the companies returned 5 to 10 times the invested capital, while only 2% gave a return on invested capital at a multiple above 10.

While the standard DCF, as proposed in hypothesis 1, is likely to work better on stable firms with little risk and a solid accounting history, the First Chicago Method, if logical probabilities are assigned, is likely to better account for the uncertainty. More so, it seems well suited for startups due to their normally massive upside, compared to their current value, which could be accounted for by

adding a scenario where the company succeeds. At the same time, the higher probability of default will be accounted for. Hence, we propose another hypothesis:

Hypothesis 2: The First Chicago Method is the valuation technique in our research that yields the most accurate values on startups.

3.4 Option Valuation

We will also entertain the idea of valuing the shareholders' equity of a levered company as a call option. For option valuation, the value of the debt equals the strike price, while the maturity is the time until the debt is payable. When this time is up, the shareholders exercise their call option on the operating assets and repay the debt outstanding if the value of the operating assets exceeds the amount of debt to be repaid. The main advantage of option valuation is that it includes flexibility, as will be thoroughly discussed in the following.

3.4.1 Valuing Flexibility

The standard discounted cash flow (DCF) approaches do not consider the value of managerial flexibility (Koller et al., 2010). Instead, the DCF techniques assume that the investment must be made now, without the possibility of making or changing the decision in the future (Savage, 2005). Yet, managerial flexibility is not a synonym of uncertainty, but rather *"choices between different plans that managers may make in response to events"* (Koller et al., 2010, 679). That means that the process of starting up a company can be divided into several stages, and the manager will have to decide whether or not to proceed at each stage. As such, option valuation is more thorough than the DCF and the First Chicago Method, and therefore more challenging and time consuming. Keeping this in mind, we propose the third hypothesis:

Hypothesis 3: Option valuation is a good alternative to the other two models, and is likely to yield rather accurate values for all the company stages.

In order to model flexibility, you have to identify the set of specific decisions managers could make to respond to future events (Koller et al., 2010). In real life, flexibility can be hard to define, and is dependent on the management's recognition of opportunities for creating value from flexibility. First, the events have to be identified, that is, finding the events that will provide new information. Second, it is important to consider what decisions the management can make in response to the events, and third, estimate the payoffs related to these decisions.

3.4.2 Real-Option Valuation (ROV)

Real-option valuation (ROV) uses a replicating portfolio or risk-neutral valuation in order to value a project or a company and is one of few valuation techniques that accounts for flexibility. According to Koller, Goedhart and Wessels (2010, 690), *"the ROV approach lets you correctly value complex, contingent cash flow patterns"*. The replicating portfolio includes the option to defer, and if the priced securities in the portfolio have the same payouts as an option, the portfolio and option should have the same price. The ROV approach hence recognizes that the managerial flexibility to delay decisions is important and can be linked to financial options (Steffens and Douglas, 2007).

The mentioned managerial flexibility is the option, and is included in all real-option valuations (Steffens and Douglas, 2007). Also, the technique uses market-based price information to value the volatility of the investment without accounting for the option. The original ROV approach therefore requires historical price movements (Steffens and Douglas, 2007), which offers a problem when dealing with startups without historical data such as revenues and earnings (Damodaran, 2009; Hudson, 2015). These situations are normal in the application of real options, and Steffens and Douglas (2007) propose that the prevailing ROV

approach is to use a traditional NPV analysis in order to establish a value of the underlying project. For instance, when dealing with new disruptive technology, finding a replicating portfolio is not feasible. The volatility of this value is then estimated based on historical clues from similar startup deals, as is supported by Hudson (2015).

3.4.3 Black-Scholes Option Pricing

The breakthrough in option pricing came in 1973 when Fisher Black and Myron Scholes published their paper “The Pricing of Options and Corporate Liabilities”. In our thesis, as we are considering the companies’ equity to be an option with an expected lifetime of ten years, we must also consider dividends.

When valuing a company as an option, the face value of debt is considered as the strike, whereas the underlying asset value, or in option pricing known as the stock price, is the company’s market value (Ødegaard, n.d.).

The reason behind considering the debt as the strike is that an investor is protected from the downside in a limited responsibility firm. Following this line of thought, the only loss an investor may incur is the initial investment. If a company is liquidated, the residual is distributed to investors.

When calculating the option price, i.e. the company value, some modifications are needed to the standard Black-Scholes option pricing model, namely Merton’s formula. This is a generalization to the Black-Scholes in order to consider the dividend yield. Since our thesis focuses on the long-term price of the company, the dividend is unknown, thus our best estimate is the current dividend yield.

The model is based on four main assumptions. First, that the underlying, which in our case is the company value, satisfies a stochastic differential equation. This equation is basically a Wiener process with drift. Second, that the price of the option is twice differentiable function of t and S, C(S,t). The third assumption is that one can trade continuously and take immediate large long and short positions without transaction costs. The last assumption is that one is able to invest in risk

free assets with a known rate of return (Weatherall, 2017).

The input needed in a Black Scholes option valuation is as follows: The price of the underlying assets; the strike; the time to maturity; the continuous interest rate (Benninga and Sarig, 1997); and the volatility.

Yalincak (2005) lists several criticizes the Black Scholes model through six specific cases. The model assumes constant volatility throughout the period. As seen by both the VIX index and the NOVIX, this is clearly unrealistic over long periods. The original model did not consider dividends at all, but when applying Merton's formula this is included as a continuous dividend yield that is assumed constant which might not be the case. Lastly, Yalincak (2005) criticizes the ignorance of transaction costs, perfect liquidity and constant trading. Normally this assumption is breached by investment banks not letting you sell and buy fractions of a share.

3.4.3.1 - Calculation of company value with options

When calculating the value of a company using Merton's formula, the following formulas are used (Ødegaard, n.d.). First, we calculate d_1:

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + (r - q + \frac{1}{2}\sigma^2)(T - t)}{\sigma\sqrt{T - t}}$$

Where *S* is the asset value and *X* is the strike. As the underlying asset value, we have chosen to use the company's value as calculated in the DCF-approach. The strike is the recognized debt in the last available balance sheet from the company. *r* is the continuous risk free interest rate for a time period equal to time to maturity, and *q* is the dividend yield. The last term in the numerator is the time to maturity. In the denominator one multiplies the standard deviation of the stock returns with the square root of time to maturity.

Second, d_2 must be calculated, as shown below. This is done by subtracting the shares' standard deviation multiplied with the square root of time to maturity from d_1.

$$d_2 = d_1 - \sigma\sqrt{T - t}$$

When both d_1 and d_2 are calculated, they are put into the following formula

$$c = Se^{-q(T-t)}N(d1) - Xe^{-r(T-t)}N(d_{2)}$$

This formula gives us the price of the call option. It is done by raising minus the dividend yield multiplied with time to maturity in the power of e multiplied with the asset value. This is again multiplied, but now with the normal distribution of d_1 with mean zero and standard deviation one. Then we multiply the strike with minus the risk-free interest rate multiplied with the time to maturity in the power of e. This is then multiplied with the normal distribution of d_2 with average zero and standard deviation one.

4.0 Methodology

According to Halvorsen (2008) and Johannessen, Christoffersen and Tufte (2011), the purpose of the methodology is to examine the reality, and then provide a guideline on how to proceed to obtain or test knowledge. With our research question and the theoretical framework as a starting point, this section will present the framework for our research. More specifically, we will present our research design and explain how we will investigate the issue.

In our master thesis, we are going to use a quantitative deductive approach due to the lack of agreement among the limited existing literature regarding the valuation of companies in different stages of their life cycle. More specifically, our approach is mainly deductive, as it is grounded in testing the validity of existing theory, but also partly inductive in that it lets us apply potential findings to the

existing theory along with the new acquired insight (Bryman and Bell 2011). In deductive research, hypotheses based on existing literature are empirically tested before being either accepted or rejected.

4.1 Framework

The framework we will use, explaining how we will go about investigating the issue, consists of four stages: sample selection; data collection; modeling; and testing the hypotheses.

4.1.1 Stage 1: Sample Selection

In order to answer our research question, we have to determine some criteria for the companies interesting for our research:

As our research focuses on the valuation of companies in three different stages of their life cycle, we needed to find companies that fit into one of the three categories, being startups and young companies, steady-state companies, and high-growth companies. For the startups and young companies, only companies that have a maximum of five years of accounting history are relevant. The steady-state companies are older firms that have a solid and stable position in the market, without any excessive growth. In order to find companies that fit into the last category – high-growth companies – we use Bloomberg as a tool to find enterprises with average annualized growth greater than twenty percent over a three-year period, in addition to having ten or more employees at the start of this period.

Hence, the selection of companies is based on both growth and age, but does not include geographical or industry restrictions, although the majority of companies in our sample is Norwegian. The full list of companies in our sample is found below.

Startups	Steady-state	High-growth
Mytos AS	Kongsberg Automotive	Aker BP ASA
Dwellop	Norsk Hydro ASA	Next Biometrics
HAG Anlegg	Schibsted ASA-A	Norway Royal Salmon
OncoInvent	Telenor	NRC Group ASA
News55 AB	Totens Sparebank	Pareto Bank ASA

Table 2: Companies in the sample

4.1.2 Stage 2: Data Collection

Once we have identified the companies that fit into our research, we collect the data, that is, we must collect the accounting history where possible. For companies that lack accounting history, we will look at historically similar startup deals in order to identify clues that will help us make assumptions about future revenues, earnings, growth rates, etc. There are a number of tools that can be used to obtain the accounting history from some of the companies, and we will mainly use “ProffForvalt” and “PureHelp”.

Finding the accounting history is only one of the challenges in terms of collecting the data. We also need an acquisition price, or some other value that can be used in comparison with our valuations. For publicly traded companies, knowing the share price and the total number of shares will give us this value. For private companies, on the other hand, that is not an option. Instead, we use Bloomberg and other tools to find companies that have been acquired in recent years, using the acquisition price as the company value, conditional on knowing the proportion of the company acquired.

4.1.3 Stage 3: Modeling

Using Excel, we create models that allow us to value all the companies in our sample. These models are grounded in the theoretical framework presented earlier, and hence use the DCF model, the First Chicago method, and option valuation as the valuation techniques. Besides being constructed to fit the valuation methods, the input from the second stage is imported into the models, leaving us with values that are compared to the buyout amounts in the fourth stage.

4.1.4 Stage 4: Testing the hypotheses

In the final stage, comparing the values of the three valuation techniques to the real buyout values tests the hypotheses. One important aspect to consider is the possibility that some companies may benefit from synergy effects not taken into consideration in our models. Thus, the price may be higher in reality than we find reasonable. However, it is near impossible to take this into account, and as this will affect all the models, we choose to ignore this aspect.

In order to measure the difference between the estimator and what is estimated we use the mean squared error (MSE), which is a quadratic loss function (Brooks 2014). We argue that due to the difficulty of modeling the exact same value as the real price is difficult, and values that are close are seen as satisfying. Therefore, large forecast errors should be seen as disproportionately more serious than small forecast errors, which is an advantage of MSE. The MSE is calculated by:

$$\text{MSE} = \frac{1}{T - (T_1 - 1)} \sum_{t=T_1}^{T} (y_{t+s} - f_{t,s})^2$$

Using these measures, we will conclude on which of the valuation techniques that is the best for valuing each of startups, high-growth firms, and steady-state companies, why that is, and whether different situations require different

valuation methods.

4.2 Assumptions

When valuing a company, or as in this thesis, several companies, one crucial determiner is the chosen assumptions. In the following we will present the assumptions that make up our forecast, and therefore valuation, of the companies.

4.2.1 True Values

Levin (2004) uses bidding theory to illustrate how company valuation is subjective, as a bidder does not necessarily know the true value of the company. While the publicly traded companies' values could be considered accurate in that we know the share price as well as the number of shares, valuation of private companies depends on too many factors and assumptions to claim that a blueprint exists. As the 'true values' of the private companies in our sample depends on the purchase price at some point in time, it is important to recognize the possibility of mispricing and synergy effects only available to the acquirer. As these synergy effects are impossible for us to measure accurately, we assume there are no such effects, meaning that the acquisition price is in fact the true value or due to mispricing.

4.2.2 Growth

One crucial assumption when valuing companies, publicly traded or not, is the growth, and especially the terminal, or long-term, growth, as this has the greatest effect on the total enterprise value. On the publicly traded companies, growth for the first two years are analysts' consensus downloaded from Bloomberg. For the three years later the growth is gradually converging towards the terminal growth

reported by the companies in their annual reports. In situations where the target terminal growth is not reported, or we deem it unrealistic, we use the expected rate of inflation as a benchmark before analyzing the companies. According to Rotkowski and Clough (2013), companies that are expected to improve their economic position should be given a long-term growth rate higher than the rate of inflation – and vice versa. The inflation is likely to be approximately 2% in both Norway and Sweden during the next years, maybe even less, according to Hegnar (2017a; 2017b).

Estimating growth for startups is challenging, and the chosen growth is seen in accordance with earlier growth as well as growth for more than a thousand listed biotech companies around the world. The reason for this is because biotech companies and startups face many of the same uncertainties and are often listed on stock exchanges rather quickly.

4.2.3 Discount Rate

In order to calculate the discount rate, we chose the well-known CAPM-model to find the cost of equity. First off, we started with data from Aswath Damodaran, which is publicly available on his website. This splits up levered and unlevered betas on companies in different industries in Europe. The unlevered beta was then relevered with the appropriate tax rate and debt ratio for the company in question.

We found the risk-free rates from official sites, like Norges Bank, and chose the 10 years' government bonds. Following CAPM's formula:

$$\underline{r_a} = r_f + \beta_a(\underline{r_m} - r_f) = r_f + \beta_a(MRP)$$

The implied market risk premium is also reported by Damodaran on a monthly basis.

In order to complete the discount rate, we calculated the cost of debt by dividing the historical interest costs by the total long-term debt in the corresponding years.

This was then used to calculate the weighted average cost of capital. If we saw a large deviation in interest cost or long-term debt, we chose those years that we expected to be representative for the company in the current situation.

4.2.4 Financial Statements

The companies' balance sheets are first and foremost a result of their earnings, and hence it is important to understand the relationship between the balance sheet, income statement, and cash flow statement. If the companies are profitable, their retained earnings increase, as net income is added, while dividends are subtracted. First, consider the income statement and how we project future earnings. Most of the companies in our sample have at least a few years of accounting history, which makes the projection much simpler. However, there are still work to be done as there is a need to investigate how much of the revenues can be counted on in the future. Hence, any revenues, costs or other items deemed non-recurring are filtered out, meaning that only recurring revenues are used for further forecasting of the balance sheet and cash flow statement.

As mentioned in the previous chapter, we use historical growth as a benchmark for predicting future growth whenever possible. Furthermore, high-growth companies, which often include startups and young companies, will struggle sustaining the high growth for many years. According to Koller et al. (2010), only companies that have a constant competitive advantage will manage to sustain the high growth, which in turn requires constant renewals and innovation. Therefore, a decrease in growth for the high-growth companies seems reasonable in most cases. While the same is true for the startups, they are also likely to increase growth quite heavily if the company is successful in the early years.

When forecasting the balance sheet, there are several subjective decisions that have to be made. In many cases, especially for companies in steady state, we project the historical growth in each of the balance sheet line items and look for

trends. For instance: Telenor's fixed assets increase gradually every year with sales, from 47,6 % of sales in 2013 to 54,6 % of sales in 2016. As a result, we forecast a similar growth in the years to come. Other examples of how we calculate ratios looking for trends are forecasting inventories and accounts payable as a percentage of cost of goods sold (COGS), and accounts receivable (AR), current assets and current liabilities as a percentage of revenues. Basically, most items connected to the operations of the firm are forecasted as a percentage of sales.

Further, a combination of items from the balance sheet and the income statement make up the cash flow statement, which shows the cash inflows and outflows of the company in question. The cash flow statement is organized using the indirect method, that is, starting with net income and adding or subtracting cash inflows and outflows in operations, investing activities and financing activities.

4.2.5 Probabilities

There are a number of assumptions that have to be made when considering the First Chicago Method, and mainly the probabilities assigned to the various scenarios. When dealing with all of startups, high-growth companies, and steady-state companies, there is no 'one-suit-fits-all'. Instead, we pre-determine probabilities for each of startups, high-growth firms and steady-state companies, which of course can be altered when analyzing specific companies. The pre-determined probabilities are presented in table 3, and explained below.

	Startups	**High-growth**	**Steady-state**
Success	25 %	20 %	5 %
Expected	50 %	70 %	90 %
Failure	25 %	10 %	5 %

Table 3: First Chicago Method probabilities

For startups, failure is equal to default. That is, there is a 25 % probability that the EV will equal zero. On the other hand, there is also a 25 % probability that the EV will skyrocket due to a successful development. In these cases, the scenario of success will be the main contributor to a high EV, despite of it being weighted by 25 %.

High-growth firms are difficult to assign probabilities to, as it is difficult to define what they would constitute as success. We argue that success for a company that already has reached immense growth is a long-term growth above the normal level, despite it being a significant decrease from current levels. Therefore, the success scenario and the expected scenario are much closer in terms of long-term growth and ultimately EV than what is the case for startups. Also, failure is not default in this case, but a growth level lower than, or close to, average, while the expected scenario is still likely to mean rather high growth.

Steady-state companies are somewhat boring in this respect, as there is a reason why we refer to them as being in a steady state. The uncertainty is at a minimum, meaning that the differences between the three scenarios are not as great as they are for the other company stages. For instance, failure in terms of default is not taken into consideration due to the minimal chance of it happening. Nevertheless, there are possibilities for higher or lower than expected growth, and these are assigned with a 5 % chance each.

4.2.6 Volatility

The chosen volatility plays an important role in option valuation, and obtaining a reasonable volatility for unlisted startups and young companies can prove challenging. In accordance with Hudson (2015), we decided to find comparable companies in order to retrieve historical clues regarding the volatility of these firms. Due to the great, and comparable, uncertainty revolving both startups and

BioTech companies, the volatilities of thirteen BioTech companies were used to estimate the average volatility for different time periods. As such, the volatility of the startups is based on the volatilities of similar, in terms of uncertainty faced, companies. On the other hand, the volatilities for all the publicly listed companies in our sample are calculated from stock prices easily retrieved from Netfonds.

4.3 Valuation Models

Our results, presented in the following chapter, are all rooted in the three valuation models used in our research: The DCF method, the First Chicago method, and option valuation. This section will provide a detailed explanation of how we arrived at these results, one model at the time. In order to illustrate how the models work, the valuation of News 55 will be used as an example throughout this chapter. Also, we highlight the main decisions that difference startups to high-growth companies and steady-state companies.

4.3.1 News 55

News 55 is a Swedish online platform that offers news, entertainment, and media content (Nyemissioner, 2017). It was founded in 2015, and is listed on Nordic MTF as of July 21st, 2017. It is a news platform that specializes on content for the Swedish senior citizens, that is, for those above 55 years old. As the company was only two years old at the time of the listing, and therefore at the time we obtained the price, it falls into the group of startups and young companies.

From 2015 to 2016, News 55 increased its sales from approximately 2.6 million to 4.5 million SEK, which equals an increase of 72%. Considering its young age, we find it likely that the sales will continue to increase in the years to come, however at a slowing rate. Therefore, we estimate a sales growth from 2016 to 2017 of 50%, before gradually decreasing to 15% in 2021. Although there are endless

innovation possibilities for technology ventures, News 55 seems determined to continue its aim toward the senior citizens, which in our opinion has a somewhat dampening effect on future growth.

Despite the sales growth, News 55 reports an EBIT of -5.2 million in 2015 and -4.6 million in 2016. However, as described by Damodaran (2009), the high operating expenses of startups are of little use in forecasting due to it being more related to getting the company up and running than to generate revenues. The declining operating expenses in 2016 supports this claim, and we believe that the cost margins will continue to improve in the coming years. As a result of sales growth and improving cost margins, we estimate that News 55 will reach a positive net income in 2019, which will further increase in both 2020 and 2021.

In contrast, a steady-state company such as Norsk Hydro ASA is forecasted under different assumptions. The reason for this can be explained by its name: It is in a steady state, meaning that sales growth and margin costs do not fluctuate as much. Of course, there may be variations from year to year, but they are likely to cancel each other out and on average remain stable. Therefore, our forecast is colored by the stability of such firms, resulting in modest growth increases, often within the range of 1 to 2 percent, as is the case for Norsk Hydro.

From 2015 to 2016, News 55 also nearly tripled its balance sheet, meaning that it took up loans to buy assets. We do not expect this to be a continuing trend – at least not of that magnitude. While assets and liabilities increased from 3.4 to 9.7 million the first year, we expect it to increase to almost 14 million by 2021, allowing News 55 to continue its growth due to its young age, without taking up too many loans.

4.3.2 The DCF Model

Using the cash flow statement as a starting point, the DCF model calculates both the present value of the free cash flows and the present value of the terminal

value. Added, these numbers represent the enterprise value that is compared against the true value later.

The DCF model is the simplest of our models, as it merely extends the cash flow statement by discounting the free cash flows by the appropriate discount rate, thereby calculating the present values of each of the free cash flows. For News 55, we calculated the discount rate to be 6.41%. These free cash flows are then added together, resulting in the sum of the present value of free cash flows for the firm. In News 55's case, this equals SEK 5.967.523:

Free Cash Flow	2012	2015	2016	2017	2018	2019	2020	2021
Free Cash Flow								
Cash from Operations	-	**-3 628 606**	**343 136**	**-1 866 225**	**-54 476**	**2 335 956**	**5 027 370**	**2 151 206**
Less: Capital Exenditures	-	-254 548	-449 630	-768 795	-6 695	17 408	235 006	268 747
Free Cash Flow	-	**-3 374 058**	**792 766**	**-1 097 430**	**-47 781**	**2 318 548**	**4 792 364**	**1 882 459**
Discount rate (*WACC*)				6,41%	6,41%	6,41%	6,41%	6,41%
Present Value of Free Cash Flow				-1 031 289	-42 195	1 924 094	3 737 346	1 379 566
Sum of PV of FCF's	**5 967 523**							

Figure 1: Present value of FCF

Furthermore, the sum of the present value of the free cash flows needs to be supplemented by the present value of the terminal value in order to find the total enterprise value. As mentioned earlier, the long-term growth plays an important role in this respect, as the main bulk of the value is represented in earnings beyond the first five years. Choosing the long-term growth (LTG) rate is subjective and thus needs to be thoroughly considered before making a decision. In the case of News 55, we see a company with a specific target group and high initial growth. This leads us to believe that the expected long-term growth will stabilize around the targeted inflation, which for Sweden is 2% (Sveriges Riksbank, n.d.). The formula used to calculate the terminal value (TV) is as follows:

$$\text{TV} = \frac{FCFt+1}{WACC-LTG}$$

Using the final free cash flow from our initial forecast, the one in 2021, and increasing it with the long-term growth rate, we calculate FCFt+1, which in this case equals SEK 1.920.108. By inserting the required numbers into the formula above and discounting it, we end up with a PV of the terminal value of SEK

28.155.900. Hence, the enterprise value according to the DCF is

$$SEK\ 5.967.523 + SEK\ 28.155.900 = SEK\ 34.123.422$$

Growth in perpetuity method	
Long Term Growth Rate	2,00%
WACC	6,41%
Free Cash Flow t+1	1 920 108
Terminal Value	43 505 646
Present Value of Terminal Value	28 155 900
Enterprise Value	34 123 422

Figure 2: Terminal value

For steady-state companies, we use the DCF method similarly. The lack of differences between startups, high-growth firms, and steady-state companies in the application of the DCF model is an issue that will be discussed further in Chapter 5.

4.3.3 The First Chicago Method

The First Chicago Method is in many ways similar to the DCF. Yet, it allows for more differencing between companies at different stages and a way to account for uncertainty. In short, our First Chicago Method is the weighted average of three DCFs, one for each scenario. These growth rates assigned to these scenarios differ from company to company, depending on several factors. First, what would constitute success in terms of performing greater than expected for this particular company? Second – and this is equal to the standard DCF presented above – how do we *expect* the firm to perform? And finally, what constitutes failure for the company?

In terms of success, we argue that a long-term growth greater than the targeted inflation would be a magnificent achievement for News 55 – a company in a very competitive market with a rather specific target group. As a result, we set the

long-term growth to 4%. The expected case is equal to the scenario entertained under the DCF model, and therefore long-term growth is set equal to the expected inflation: 2%. The final question concerning failure consistently differs startups and steady-state companies in our sample, as we believe the worst-case scenario for the startups and young companies is bankruptcy. As such, failure for News 55 means losing it all, which equals an enterprise value of zero. On the other hand, the pessimistic scenario for Norsk Hydro is not nearly as damning, due to the extremely low probability of them going bankrupt. Instead, we have set the long-term growth rate to 1% in Norsk Hydro's worst-case scenario.

Naturally, due to the difference in terms of uncertainty, the probabilities of each scenario also differ. While the expected scenario in the case of Norsk Hydro is given a probability of 90%, with 5% on each of the best- and worst-case scenarios, it is more challenging to assign probabilities for companies that face high uncertainty. As goes without saying, the expected scenario will always be the scenario that is assigned the highest probability. Earlier, we presented a benchmark of 25%, 50%, and 25% for the three scenarios of how startups and young companies will perform. However, these are merely starting points, as is the case for News 55. Within technology and media, there are potentially great opportunities for successful firms. As a startup, limiting the content to senior citizens could be smart. However, it also means that for a growing business, there are plenty of opportunities to extend the business, for instance to include other markets. As a result, we slightly increase the probability for success, while adjusting the probability of failure in the opposite direction. A summary of the First Chicago Method is presented in figure 3:

	Probability	Long Term Growth	WACC	EV
Best Case	30%	4,00%	6,41%	61 832 231
Expected Case	50%	2,00%	6,41%	34 123 422
Worst Case	20%	0,00%	6,41%	-
Weighted EV				35 611 381

Figure 3: First Chicago Method

As visible, the enterprise values derived from the DCF and the First Chicago

Method is fairly equal – and fairly accurate. The true value, that is, the acquisition price, is SEK 35 million. It is also worth noting that the DCF yields a value slightly below the true value, while the First Chicago Method yields a value slightly above the true value, which will be further discussed in the next chapter.

4.3.4 Option Valuation

In order to value News 55's equity as a call option, we need several parameters, including the risk-free rate, volatility, dividend yield, and underlying option value. The risk-free rate is collected from Norges Bank by using 10-year government bonds, meaning that we also have a time to maturity of 10 years.

As proposed by Hudson (2015), the volatility of the value is estimated based on historical clues from similar firms. We use BioTech companies when estimating the volatility due to the high uncertainty surrounding both startups and BioTech companies. Hence, the volatility of News 55 is estimated to 64.65%. On the other hand, the publicly traded companies, such as Norsk Hydro, do not require such an estimation of volatility, as the historic volatility is given. As such, we use 46.35% as Norsk Hydro's volatility. We follow Steffens and Douglas (2007) and Koller et al. (2010) in that, due to the lack of better solutions, a traditional DCF needs to provide the value of the underlying asset. The dividend yield is calculated using the latest available share prices and dividends from Nordnet.

Following the Black-Scholes formula, we are given the option value as a function of d_1 and d_2, as presented in the theory section, yielding values of 30 847 719 SEK and 53 250 519 521 NOK for News55 and Norsk Hydro, respectively. Hence, both values, and especially that of Norsk Hydro, are lower than what is considered the true value. It is also worth noting that the option valuation is the valuation method that misses by the most in the valuation of these two companies.

5.0 Results and Discussion

This chapter will present the results of our research regarding which of the valuation techniques, being DCF, First Chicago method, and option valuation, that is best suited for valuing companies in different stages of their life cycles, namely startups, high-growth companies, and steady-state companies. Our findings can be divided into, and thoroughly discussed in, three sub-chapters: The valuation of startups; the valuation of high-growth companies; and the valuation of steady-state companies.

5.1 The Valuation of Startups

The valuation of startups proved challenging due to the lack of accounting history, as warned by, among others, Damodaran (2009). Yet, the analysts' estimates of expected growth in biotech companies for the next two years helped serve as a benchmark. After comparing the true values to the ones we achieved through our valuations, the difference between the two is presented, in percentage, in table .4

Valuation Technique	Error (%)
DCF	18.10 %
First Chicago Method	0.50 %
Option Valuation	19.45 %

Table 4: Error (%) for startups

As visible, the First Chicago Method is, without a doubt, the most accurate valuation technique for startup valuation purposes. These results confirm our second hypothesis; that the First Chicago Method yields the most accurate values for startups. There are several possible reasons why this is the case:

The First Chicago Method is more flexible than the DCF model in that it accounts

for different scenarios. Startups, as discussed by Steffens and Douglas (2007), are subject to high mortality risk among other risk factors. More so than companies in other stages of their life cycle are. This further increases the uncertainty, as supported by Damodaran (2009), and underlines the importance of including both the risk of default and the hope of success.

Another finding is that both the DCF and the option valuation yields values consistently lower than the true values, meaning that these models underprice the companies. One possible explanation for the constant underpricing by the DCF method is the failure to account for the possible upside. Startups have both a higher probability of excessive growth and a higher probability of default than companies that have already found their place in the market. The DCF method will not be able to account for this uncertainty sufficiently as it only entertains one scenario – more specifically, the expected scenario in our research.

By using probabilities such as 25 %, 50 %, and 25 %, for success, expected, and pessimistic outcomes respectively, the final value is weighted among the possibilities. On the other hand, the DCF only accounts for the expected scenario and will therefore weigh it by 100 %. In other words, as long as the possible upside outweighs the possible downside, the enterprise value will be higher. As previously discussed, a startup's most significant cash flows are believed to be in the future. A model that is not able to account for the probability of success is likely to yield lower values than what their true value is. This is because, as opposed to in the valuation of steady-state companies, being able to incorporate the probability of success, if ever so little, will have a huge impact on the enterprise value. That is why, as predicted, the First Chicago Method is a better fit when valuing startups and young companies compared to DCF and option valuation.

More disappointingly, the option valuation is way off, and not even close to respectable results, contrary to what we hoped and believed. As option valuation incorporates the flexibility, which is believed to be of great importance when valuing startups (Koller et al., 2010; Savage, 2005), we had reasons to believe that

using options as a valuation tool would prove an accurate method in valuing startups – much more accurate than the DCF.

Another discussable subject is that the true value we have chosen – the acquisition price – is very much dependent on the optimistic scenario actually happening. If not, the value will be lower, meaning that the acquirer has paid overprice for the company. One can therefore argue that acquirers of startups are willing to take a calculated risk in that the upside is so great compared to the present value of the company. They pay for the optimistic, and not the expected, scenario, and therefore pay little attention to what could be considered the fundamental value of the company. This factor is one of the reasons why valuation of startups is so difficult: The purchase price is often the result of a gamble, and not necessarily the result of as accurate or likely predictions as in valuations of older, stable companies.

5.2 Valuation of High-Growth Companies

High-growth companies are interesting in that they share some characteristics with both steady-state companies and startups. First, high-growth firms experience, obviously, very high growth currently. This is similar to what startups hope to achieve, and will if successful, within a relatively short period of time. High growth comes with uncertainty, as the competitive advantage that allows for the high growth in most cases will be imitated or neutralized in other ways, as described by several authors (Cho and Pucik, 2005; Koller et al., 2005). Second, although there is uncertainty related to sustaining the high growth, the mortality risk in high growth firms is more similar to steady-state companies than it is to startups. The high-growth companies have found their place in the market and are solid, without much risk of default. As a result of these characteristics, success for these companies might mean maintaining a long-term growth higher than average, even if it probably means a significantly lower growth than in recent years.

Hence, the probabilities assigned in the First Chicago Method are different from

both those for startups and for steady-state companies. The results in table 5 show that, quite surprisingly, the DCF is more accurate than the First Chicago Method, while the option valuation is still way off, with an average error of 43.71%.

Valuation Technique	Error (%)
DCF	4.15 %
First Chicago Method	6.13 %
Option Valuation	43.71 %

Table 5: Error (%) for high-growth firms

In our valuations, we took the likelihood of not being able to maintain such a high growth for longer periods of time into consideration, by gradually adjusting growth to more normal levels. The fact that DCF outperforms the other models might point to the accounting history of the high-growth firms being a good indicator of future performance when we consider that high growth eventually converges to normal growth. As the First Chicago Method only yields remotely satisfying results, one might also infer that the uncertainty concerning high-growth firms is lower than what we initially thought. This could have led us to judgmental errors in our analysis of the various outcome probabilities, which in turn leads to imprecise valuations.

Interestingly, the high-growth companies represent the only company stage in which the DCF and the First Chicago Method agree on which companies that are underpriced and which are overpriced, with three and two, respectively. Even the option valuation, which for the exception of Next Biometrics consistently yields lower values than the true value throughout the entire sample, agrees with the other models on four out of the five companies in this stage. Mispricing is a valid possibility as subjective decisions must be made during the entire process, and especially given the nature of high-growth companies. Predicting the exact duration of their competitive advantage, and therefore their higher-than-average growth, is difficult, leaving it open for mistakes. For instance, as can be seen in

Appendix F, Next Biometrics yields similar values for all of our valuation methods, and all point to the company being undervalued at its true value.

5.3 Valuation of Steady-State Companies

Out of the three company stages considered – steady-state, startups and high-growth – the valuation of steady-state companies yields the best results in general. The DCF model performs better on steady-state companies than on any of the other company stages. Even the First Chicago Method can show for a respectable 3 % average error, while the option valuation yields its highest average error among the company groups, as shown in table 6 below.

Valuation Technique	Error (%)
DCF	2.19 %
First Chicago Method	3.00 %
Option Valuation	50.46 %

Table 6: Error (%) for steady-state companies

The values found by the First Chicago Method is once again consistently higher than the ones found by the DCF, due to it factoring in a successful scenario. This time, however, the pessimistic scenario is not as drastic as default, as it is in the valuation of startups. Instead, failure is measured with a lower long-term growth, because of the low mortality risk faced by steady-state companies.

Three out of five steady-state companies are overpriced according to our DCF valuations, but the margins are too tight to draw any general conclusions from it. On the other hand, four out of five companies, with the exception being Telenor, are underpriced according to the First Chicago Method, even with only 5 % probability of the optimistic scenario. The differences in values between the DCF and the First Chicago Method is not nearly as great as when considering the

previous two company stages, and still, the methods disagree on whether the majority of firms in our sample is under- or overpriced. It seems reasonable to credit this disagreement to the precision of the DCF model. Also, the steady-state companies are the biggest, meaning these have the greatest room for error in value. Considering that the First Chicago Method consistently yields higher values than the DCF, we argue that the overpricing is due to putting too much faith in the optimistic scenario. All in all, the First Chicago Method is quite accurate in valuing steady-state companies, but even with only 5 % chance of great success, it changes the conclusion for some of the companies compared to the DCF values.

The option valuation once again fails in finding a similar value to the true value, and if we could not before, there is no doubt that the third hypothesis, that option valuation provides a good alternative to, and better overall results than, the other two methods, can be firmly discarded. At the same time, the first hypothesis, which states that the DCF provides its best values for steady-state companies and its worst values for startups, can be confirmed, with 2.19 % and 18.10 %, respectively.

6.0 Conclusion

All in all, the values derived from the DCF and the First Chicago Method are quite satisfying and in line with what we expected. However, the option valuation model somewhat failed, as it yielded inconsistent values, with the only consistency of them being incorrect compared to the true values. Still, there are a number of consistencies and conclusions to be drawn from our research:

First, the First Chicago Method is the best model for valuing startups. We argue that this is due to it accounting for the uncertainty by allowing us to define appropriate probabilities for three different scenarios before weighting them

accordingly. The DCF, on the other hand, constantly undervalues the startup companies. One probable explanation is that acquirers see the target startup as a possible gold mine with a relatively cheap downside, and therefore takes a gamble on it realizing its full potential, making it hard to justify the purchase price at the time of the acquisition.

Second, and no surprise here either, the DCF performs better the less uncertainty the companies face, making it ideal for steady-state companies. A more surprising observation is that it outperforms the First Chicago Method in valuing high-growth companies. This points to a consensus on the difficulty of maintaining high growth in the future, as our valuations included a gradually decrease in growth with its long-term growth being around normal levels.

Third, the DCF model is the best overall model. It is inaccurate in valuing startups and young companies due to the great uncertainty in future performance, leading to too low valuations, but is consistently better than the other models for the remainder of our sample. This is supported by the MSE, which penalizes large errors. The MSE (and the RMSE) is significantly lower for DCF than it is for the First Chicago Method, and especially than it is for option valuation. This is despite the fact that the First Chicago Method has an average error margin of only 3.36 % compared to DCF's 8.15 %. The shift when considering (R)MSE can be attributed both to DCF being the allrounder with no particularly large errors. Also, its greatest errors in percentage are in the valuations of the startups, which are the smallest companies and therefore require a smaller difference between estimated and actual value to yield high error percentages.

Finally; we find that option valuation yields more accurate values when the debt ratio is low. When calculating d1, we use $\ln(\frac{S}{X})$ to calculate the probability of the option being "in-the-money". This means that a lower strike, i.e. debt, compared to the value of the underlying asset yields a higher probability. The following graph shows how the errors in value are related to the companies' debt ratio.

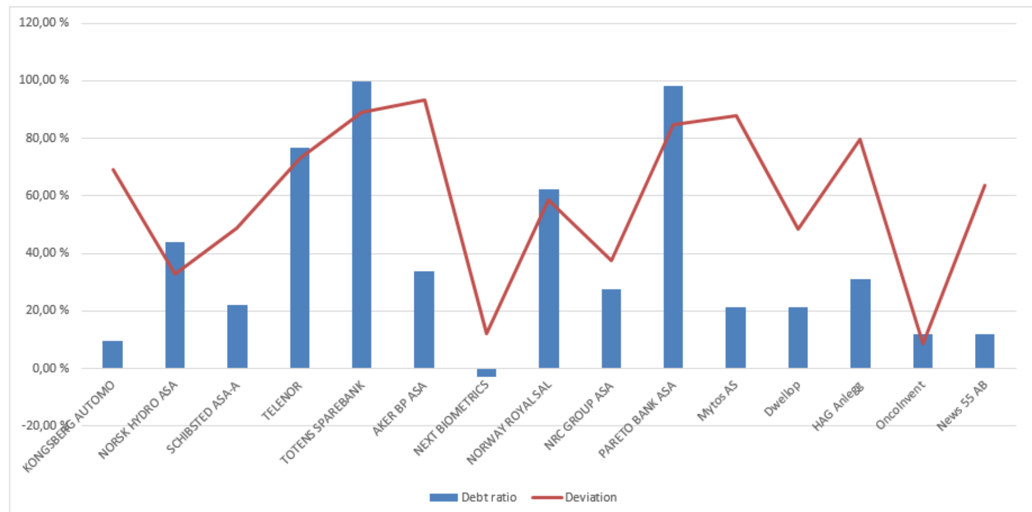

Figure 4: Errors related to debt ratios

To sum up; different companies require different assumptions, which in turn means that there are room for error in every valuation. The DCF model is generally a very popular model, and with good reason. It provides the most accurate valuations throughout our sample, with its only drawback being the valuation of startups, where the First Chicago Method is significantly better. Yet, using the First Chicago Method when valuing any of the other company stages can be argued as a waste, as it merely disrupts the already accurate valuations from the standard DCF.

6.1 Critique and Future Research

The main criticism regarding this thesis revolves around the option valuation. Despite occasionally yielding rather precise values, the overall option valuation results are disappointing. We believe more accurate values could have been obtained by including several periods, in which the flexibility of managers' options would be made better use of.

However, in the valuation of fifteen companies, being able to identify these

managerial options is hard. The detailed analysis required for it to be successful is better suited for an analyst doing a valuation of a firm in which he or she has full access. As such, a possible direction for future research could be focusing on fewer firms and ensuring a higher level of access, meaning that it would be possible to better identify the future managerial options, and hence add more periods.

Another direction for future research would be to investigate why the standard DCF yields more accurate values for high-growth firms than the First Chicago Method does, which we found a bit surprising. High-growth firms share many characteristics with startups, and many are young companies. Therefore, the uncertainty concerning future sales growth, for instance, has a greater resemblance with startups than with steady-state companies.

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8.0 Appendix

8.1 Appendix A – Assumptions

Company	AkerBP					Dwellop					HAG Anlegg					Kongsberg Automotive				
Income Statement	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Operating Income Growth	4,00 %	4,00 %	4,00 %	4,00 %	4,00 %	50,00 %	15,00 %	10,00 %	7,50 %	5,00 %	15,00 %	10,00 %	7,50 %	5,00 %	2,50 %	3,50 %	5,00 %	4,00 %	3,00 %	2,50 %
Total operating expenses	13,00 %	13,00 %	12,75 %	13,00 %	12,75 %	55,00 %	56,00 %	57,00 %	55,00 %	55,00 %	70,00 %	70,00 %	69,50 %	69,25 %	69,00 %	89,00 %	88,00 %	87,00 %	86,50 %	85,00 %
Employee Costs	60,00 %	60,50 %	60,00 %	60,00 %	59,50 %	15,00 %	16,00 %	13,00 %	12,00 %	12,50 %	15,00 %	15,00 %	15,00 %	14,50 %	14,75 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Depreciation	5,00 %	5,00 %	5,00 %	5,00 %	5,00 %	1,50 %	1,75 %	1,50 %	1,50 %	1,50 %	2,50 %	2,25 %	2,00 %	2,00 %	1,75 %	3,00 %	3,00 %	3,00 %	3,00 %	3,00 %
Amortization	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,30 %	1,40 %	1,40 %	1,40 %	1,40 %
Other Operating Costs	13,00 %	13,00 %	13,00 %	13,00 %	13,00 %	10,00 %	9,50 %	8,00 %	8,50 %	7,75 %	9,00 %	9,00 %	10,00 %	10,00 %	10,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Interest Income	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	0,10 %	0,10 %	0,10 %	0,10 %	0,05 %	0,02 %	0,02 %	0,02 %	0,02 %	0,02 %	0,15 %	0,20 %	0,20 %	0,18 %	0,15 %
Financial Income	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	4,50 %	4,25 %	4,00 %	3,50 %	3,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Income	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	4,60 %	4,35 %	4,10 %	3,60 %	3,05 %	0,02 %	0,02 %	0,02 %	0,02 %	0,02 %	0,15 %	0,20 %	0,20 %	0,18 %	0,15 %
Interest Expenses	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,20 %	0,25 %	0,30 %	0,35 %	0,50 %	0,02 %	0,02 %	0,02 %	0,02 %	0,02 %	3,50 %	3,60 %	3,70 %	3,80 %	3,50 %
Financial Expenses	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	2,00 %	2,00 %	2,00 %	2,00 %	2,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Expenses	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %	2,20 %	2,25 %	2,30 %	2,35 %	2,50 %	0,02 %	0,02 %	0,02 %	0,02 %	0,02 %	3,50 %	3,60 %	3,70 %	3,80 %	3,50 %
Tax EBT	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %
Balance sheet	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Deferred Tax	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
R&D	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Goodwill	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total inventories fixed assets	8,25 %	8,50 %	8,75 %	8,50 %	8,31 %	7,00 %	7,50 %	7,00 %	8,50 %	9,00 %	1,00 %	1,25 %	1,50 %	1,75 %	2,00 %	24,00 %	24,25 %	24,50 %	24,75 %	25,00 %
Total fixed assets	67,50 %	68,00 %	68,00 %	68,50 %	69,00 %	14,00 %	13,00 %	14,00 %	15,00 %	17,50 %	0,50 %	1,00 %	1,25 %	1,50 %	2,00 %	14,00 %	13,75 %	13,50 %	13,00 %	12,50 %
Other fixed assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total investments	6,00 %	6,10 %	6,15 %	6,20 %	6,25 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total financial fixed assets	26,47 %	22,34 %	18,64 %	12,47 %	8,87 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	4,00 %	3,75 %	3,50 %	3,25 %	3,00 %	0,10 %	0,10 %	0,10 %	0,10 %	0,12 %
Total inventories	15,00 %	15,00 %	14,75 %	14,50 %	14,59 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	7,80 %	7,70 %	7,60 %	7,50 %	7,40 %
Raw materials and purchased semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Finished goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total receivable	13,00 %	13,50 %	13,56 %	14,14 %	15,00 %	25,00 %	27,50 %	30,00 %	32,50 %	37,50 %	18,00 %	19,00 %	20,00 %	20,00 %	24,00 %	18,00 %	17,50 %	17,25 %	17,00 %	15,00 %
Other inventories	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Bank deposits, cash etc.	50,23 %	51,71 %	47,66 %	46,51 %	47,39 %	10,73 %	10,81 %	10,92 %	10,89 %	10,86 %	3,62 %	3,74 %	3,42 %	3,81 %	3,54 %	5,37 %	5,50 %	5,44 %	5,43 %	5,43 %
Other current assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Minority after accrued equity	6,00 %	5,75 %	5,90 %	6,00 %	6,50 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,00 %	1,50 %	2,50 %	2,50 %	0,00 %	0,35 %	0,33 %	0,30 %	0,30 %	0,30 %
Total provisions for liabilities and charges	20,00 %	20,50 %	21,00 %	20,50 %	20,00 %	7,00 %	5,00 %	4,00 %	4,00 %	4,00 %	0,00 %	0,00 %	0,00 %	0,00 %	5,00 %	4,80 %	4,50 %	4,50 %	4,50 %	4,50 %
Bond loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Convertible loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	-0,92 %	-7,57 %	-16,41 %	-24,36 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total long-term liabilities	149,03 %	146,06 %	130,49 %	118,95 %	115,54 %	10,29 %	9,87 %	9,20 %	9,00 %	8,50 %	-0,92 %	-7,57 %	-16,41 %	-24,36 %	-33,01 %	28,30 %	28,82 %	28,48 %	27,17 %	23,60 %
Total short-term liabilities	20,00 %	20,00 %	20,00 %	21,00 %	20,00 %	3,77 %	3,45 %	3,10 %	2,65 %	2,31 %	16,17 %	15,08 %	14,75 %	14,16 %	14,97 %	14,72 %	13,59 %	12,41 %	11,67 %	10,71 %
Minority intersts (Groups)	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %

Company	Mytos					News55					Next					Hydro					NRS				
Income Statement	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Operating Income Growth	50,00 %	50,00 %	25,00 %	25,00 %	10,00 %	50,00 %	30,00 %	20,00 %	17,50 %	15,00 %	75,00 %	40,00 %	15,00 %	7,50 %	5,00 %	7,50 %	1,00 %	1,50 %	1,75 %	2,00 %	4,50 %	5,00 %	4,00 %	3,50 %	3,00 %
Total operating expenses	10,00 %	10,00 %	10,00 %	10,00 %	10,00 %	65,00 %	40,00 %	30,00 %	20,00 %	15,00 %	65,00 %	50,00 %	45,00 %	40,00 %	40,00 %	55,00 %	55,00 %	55,00 %	54,00 %	54,00 %	65,00 %	64,00 %	63,50 %	65,00 %	65,00 %
Employee Costs	50,00 %	49,00 %	48,00 %	47,00 %	46,00 %	55,00 %	50,00 %	50,00 %	40,00 %	40,00 %	75,00 %	60,00 %	56,50 %	50,00 %	43,00 %	24,50 %	24,10 %	24,20 %	24,75 %	24,25 %	24,30 %	25,40 %	26,15 %	24,40 %	23,90 %
Depreciation	1,50 %	1,25 %	1,00 %	1,00 %	1,00 %	22,00 %	17,00 %	14,00 %	10,00 %	7,50 %	3,50 %	3,50 %	3,00 %	2,50 %	2,00 %	6,00 %	5,90 %	5,80 %	5,75 %	5,75 %	1,70 %	1,60 %	1,60 %	1,60 %	1,60 %
Amortization	1,00 %	1,00 %	1,00 %	1,00 %	1,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,50 %	1,50 %	0,50 %	2,50 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Other Operating Costs	12,50 %	12,75 %	13,00 %	13,00 %	12,00 %	40,00 %	30,00 %	20,00 %	10,00 %	5,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Interest Income	0,05 %	0,04 %	0,03 %	0,02 %	0,02 %	0,00 %	0,00 %	0,00 %	0,50 %	1,00 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	1,75 %	1,80 %	1,85 %	1,90 %	1,75 %
Financial Income	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Income	0,05 %	0,04 %	0,03 %	0,02 %	0,02 %	0,00 %	0,00 %	0,00 %	0,50 %	1,00 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %	1,75 %	1,80 %	1,85 %	1,90 %	1,75 %
Interest Expenses	0,20 %	0,15 %	0,13 %	0,11 %	0,10 %	1,00 %	1,00 %	1,00 %	0,75 %	0,50 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %	0,85 %	0,90 %	0,95 %	1,00 %	1,00 %
Financial Expenses	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Expenses	0,20 %	0,15 %	0,13 %	0,11 %	0,10 %	1,00 %	1,00 %	1,00 %	0,75 %	0,50 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %	0,85 %	0,90 %	0,95 %	1,00 %	1,00 %
Tax EBT	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %
Balance sheet	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Deferred Tax	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
R&D	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	15,00 %	9,00 %	5,50 %	2,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Goodwill	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	88,00 %	51,00 %	29,00 %	13,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total inventories fixed assets	9,00 %	10,00 %	13,00 %	15,00 %	25,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	20,00 %	15,00 %	15,00 %	15,00 %	15,00 %	8,50 %	8,75 %	9,00 %	8,75 %	8,50 %	20,50 %	20,75 %	21,00 %	20,75 %	20,50 %
Total fixed assets	2,00 %	1,50 %	1,20 %	2,00 %	1,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	15,00 %	12,50 %	12,00 %	11,00 %	10,00 %	69,00 %	68,00 %	68,00 %	68,50 %	69,00 %	11,00 %	10,80 %	10,50 %	10,50 %	10,50 %
Other fixed assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	5,00 %	6,00 %	7,00 %	8,00 %	10,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total investments	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,90 %	1,00 %	1,00 %	1,00 %	1,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	6,00 %	6,10 %	6,15 %	6,20 %	6,25 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total financial fixed assets	10,00 %	10,00 %	10,00 %	7,50 %	5,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	34,00 %	33,00 %	32,00 %	31,00 %	30,00 %	6,00 %	6,05 %	6,10 %	6,00 %	6,00 %
Total inventories	0,00 %	0,00 %	0,00 %	2,50 %	20,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	20,00 %	17,50 %	15,00 %	15,00 %	15,00 %	15,00 %	15,00 %	14,75 %	14,50 %	14,59 %	28,00 %	28,75 %	29,00 %	29,25 %	29,00 %
Raw materials and purchased semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Finished goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total receivable	31,74 %	18,42 %	14,90 %	15,20 %	10,00 %	18,00 %	24,00 %	27,50 %	32,00 %	65,00 %	45,00 %	45,00 %	40,00 %	35,00 %	32,50 %	13,00 %	13,50 %	13,56 %	14,14 %	15,00 %	18,80 %	19,00 %	19,20 %	19,75 %	21,00 %
Other inventories	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Bank deposits, cash etc.	25,81 %	25,05 %	25,83 %	25,69 %	25,63 %	0,89 %	0,89 %	0,87 %	0,87 %	0,90 %	25,00 %	22,50 %	20,00 %	17,50 %	15,00 %	9,21 %	9,54 %	9,38 %	9,34 %	9,38 %	3,57 %	3,89 %	3,90 %	4,01 %	4,03 %
Other current assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	10,00 %	10,00 %	10,00 %	10,00 %	10,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Minority after accrued equity	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	6,00 %	5,75 %	5,90 %	6,00 %	6,50 %	2,00 %	2,00 %	1,50 %	1,25 %	1,00 %
Total provisions for liabilities and charges	1,40 %	1,20 %	0,50 %	0,50 %	0,25 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	23,00 %	22,50 %	22,00 %	21,50 %	21,00 %	9,90 %	10,00 %	10,00 %	10,00 %	10,00 %
Bond loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	38,79 %	62,41 %	64,68 %	59,40 %	41,69 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Convertible loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total long-term liabilities	22,23 %	4,63 %	-2,46 %	-1,57 %	2,03 %	45,04 %	30,81 %	-0,86 %	-58,97 %	-68,40 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	15,85 %	10,68 %	6,83 %	4,44 %	2,23 %	16,85 %	17,44 %	17,95 %	17,77 %	17,64 %
Total short-term liabilities	28,74 %	18,34 %	10,86 %	3,15 %	0,00 %	93,00 %	80,78 %	85,62 %	100,28 %	96,01 %	25,00 %	25,00 %	22,50 %	20,00 %	17,50 %	11,71 %	10,51 %	7,79 %	4,35 %	1,13 %	20,79 %	20,28 %	19,28 %	18,60 %	17,84 %
Minority intersts (Groups)	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %

Company	NRC Group					Oncoinvent					Pareto					Schibsted				
Income Statement	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2016*	*2016*	*2016*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Operating Income Growth	18,00 %	15,00 %	10,00 %	6,00 %	2,50 %	50,00 %	1350,00 %	181,00 %	57,00 %	23,00 %	12,00 %	5,00 %	4,00 %	3,50 %	3,00 %	6,00 %	6,00 %	4,50 %	3,50 %	2,75 %
Total operating expenses	42,50 %	42,00 %	41,50 %	40,50 %	39,00 %	40,00 %	30,00 %	30,00 %	25,00 %	15,00 %	19,00 %	19,50 %	19,75 %	20,00 %	21,00 %	55,00 %	54,00 %	53,00 %	52,00 %	51,00 %
Employee Costs	45,00 %	45,00 %	45,00 %	45,00 %	45,00 %	45,00 %	20,00 %	10,00 %	5,00 %	5,00 %	3,00 %	3,00 %	3,00 %	3,00 %	3,00 %	17,50 %	17,00 %	16,50 %	16,00 %	15,50 %
Depreciation	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,00 %	1,00 %	0,50 %	0,20 %	0,75 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	3,00 %	3,00 %	3,00 %	3,00 %	3,00 %
Amortization	2,50 %	2,50 %	2,50 %	2,50 %	2,50 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Other Operating Costs	5,00 %	5,00 %	5,00 %	5,00 %	5,00 %	10,00 %	10,00 %	7,00 %	5,00 %	5,00 %	0,00 %	0,50 %	0,75 %	1,25 %	1,00 %	8,50 %	10,50 %	12,50 %	13,50 %	13,50 %
Interest Income	0,10 %	0,08 %	0,06 %	0,05 %	0,05 %	0,50 %	0,25 %	0,10 %	0,05 %	0,05 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %
Financial Income	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Income	0,10 %	0,08 %	0,06 %	0,05 %	0,05 %	0,50 %	0,25 %	0,10 %	0,05 %	0,05 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %
Interest Expenses	0,65 %	0,70 %	0,75 %	0,75 %	0,75 %	0,05 %	0,03 %	0,03 %	0,03 %	0,01 %	7,00 %	7,00 %	7,00 %	7,00 %	7,00 %	1,50 %	1,50 %	1,60 %	1,55 %	1,55 %
Financial Expenses	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Expenses	0,65 %	0,70 %	0,75 %	0,75 %	0,75 %	0,05 %	0,03 %	0,03 %	0,03 %	0,01 %	7,00 %	7,00 %	7,00 %	7,00 %	7,00 %	1,50 %	1,50 %	1,60 %	1,55 %	1,55 %
Tax EBT	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %
Balance sheet	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2016*	*2016*	*2016*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2016*	*2017*	*2018*	*2019*	*2020*
Deferred Tax	1,50 %	1,40 %	1,30 %	1,20 %	1,15 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
R&D	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	30,00 %	3,00 %	2,00 %	3,56 %	4,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Goodwill	24,00 %	20,00 %	18,00 %	16,50 %	16,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total inventories fixed assets	8,25 %	8,50 %	8,75 %	8,50 %	8,31 %	12,80 %	2,00 %	1,65 %	2,00 %	5,00 %	8,25 %	8,50 %	8,75 %	8,50 %	8,31 %	88,00 %	87,50 %	85,00 %	82,50 %	80,00 %
Total fixed assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,00 %	0,15 %	0,15 %	0,14 %	0,13 %	0,12 %	7,50 %	8,00 %	8,50 %	8,75 %	9,00 %
Other fixed assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	1,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total investments	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	720,00 %	720,00 %	720,00 %	720,00 %	720,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total financial fixed assets	0,30 %	0,30 %	0,30 %	0,30 %	0,30 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	6,00 %	6,00 %	6,00 %	6,00 %	6,00 %	8,35 %	8,25 %	8,15 %	8,00 %	7,50 %
Total inventories	12,00 %	11,00 %	10,00 %	9,00 %	8,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,10 %	0,10 %	0,10 %	0,10 %	0,10 %
Raw materials and purchased semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Finished goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	165,80 %	75,45 %	61,35 %	69,98 %	79,52 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total receivable	13,00 %	14,00 %	15,00 %	15,00 %	15,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	2000,00 %	1975,00 %	1950,00 %	1925,00 %	1825,00 %	18,00 %	18,10 %	18,30 %	18,50 %	18,50 %
Other inventories	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Bank deposits, cash etc.	21,74 %	22,23 %	22,52 %	22,47 %	22,31 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	59,96 %	57,02 %	59,59 %	57,83 %	56,18 %	8,15 %	8,71 %	8,61 %	8,71 %	8,77 %
Other current assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Minority after accrued equity	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	2,00 %	2,00 %	1,90 %	1,75 %	1,80 %
Total provisions for liabilities and charges	7,00 %	7,25 %	7,50 %	7,75 %	8,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	14,50 %	15,25 %	16,00 %	15,00 %	15,00 %
Bond loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Convertible loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total long-term liabilities	1,86 %	-1,86 %	-4,09 %	-9,24 %	-14,30 %	0,00 %	40,00 %	25,00 %	12,00 %	0,00 %	376,47 %	497,43 %	584,90 %	654,62 %	633,96 %	17,50 %	17,50 %	17,50 %	17,50 %	17,50 %
Total short-term liabilities	22,80 %	23,55 %	22,71 %	21,39 %	18,80 %	40,00 %	10,00 %	5,00 %	5,00 %	5,00 %	2002,33 %	1845,38 %	1724,48 %	1615,41 %	1521,07 %	25,42 %	21,96 %	18,30 %	13,40 %	9,73 %
Minority intersts (Groups)	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %

Company	Telenor					Toten Sparebank				
Income Statement	*2017*	*2018*	*2019*	*2020*	*2021*	*2017*	*2018*	*2019*	*2020*	*2021*
Operating Income Growth	3,00 %	2,75 %	2,50 %	2,25 %	2,00 %	4,00 %	4,00 %	3,25 %	2,50 %	2,25 %
Total operating expenses	32,40 %	32,51 %	32,85 %	32,85 %	33,30 %	30,30 %	30,45 %	30,30 %	30,15 %	30,00 %
Employee Costs	28,80 %	28,90 %	29,20 %	29,20 %	29,60 %	15,15 %	15,23 %	15,15 %	15,08 %	15,00 %
Depreciation	3,60 %	3,61 %	3,65 %	3,65 %	3,70 %	1,26 %	1,27 %	1,26 %	1,26 %	1,25 %
Amortization	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Other Operating Costs	7,20 %	7,23 %	7,30 %	7,30 %	7,40 %	3,79 %	3,81 %	3,79 %	3,77 %	3,75 %
Interest Income	0,30 %	0,35 %	0,40 %	0,40 %	0,40 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %
Financial Income	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Income	0,30 %	0,35 %	0,40 %	0,40 %	0,40 %	0,75 %	0,80 %	0,70 %	0,60 %	0,50 %
Interest Expenses	5,00 %	5,50 %	6,00 %	6,25 %	6,25 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %
Financial Expenses	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total Financial Expenses	5,00 %	5,50 %	6,00 %	6,25 %	6,25 %	3,00 %	4,00 %	3,50 %	3,25 %	3,00 %
Tax EBT	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %
Balance sheet	*2017*	*2018*	*2019*	*2020*	*2021*	*2017*	*2018*	*2019*	*2020*	*2021*
Deferred Tax	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
R&D	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Goodwill	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total inventories fixed assets	46,00 %	46,50 %	47,00 %	47,50 %	47,50 %	1,75 %	2,00 %	2,25 %	2,25 %	2,50 %
Total fixed assets	54,25 %	54,00 %	53,75 %	53,50 %	53,50 %	16,00 %	16,25 %	16,50 %	16,50 %	16,50 %
Other fixed assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total investments	1,50 %	1,25 %	1,00 %	1,00 %	1,00 %	340,00 %	342,50 %	345,00 %	347,50 %	350,00 %
Total financial fixed assets	17,50 %	18,00 %	18,50 %	19,00 %	20,00 %	122,50 %	120,00 %	117,50 %	115,00 %	115,00 %
Total inventories	1,30 %	1,40 %	1,50 %	1,60 %	1,75 %	15,00 %	15,00 %	14,75 %	14,50 %	14,59 %
Raw materials and purchased semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Semi-manufactured goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Finished goods	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total receivable	22,00 %	23,00 %	24,00 %	25,00 %	30,00 %	3300,00 %	3200,00 %	3150,00 %	3200,00 %	3125,00 %
Other inventories	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Bank deposits, cash etc.	13,04 %	13,76 %	13,67 %	13,84 %	13,88 %	27,60 %	28,36 %	28,37 %	28,09 %	28,06 %
Other current assets	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Minority after accrued equity	3,30 %	3,20 %	3,05 %	2,95 %	2,75 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total provisions for liabilities and charges	7,00 %	7,25 %	7,50 %	7,50 %	7,50 %	0,50 %	0,75 %	1,00 %	1,25 %	1,50 %
Bond loans	32,00 %	32,00 %	32,00 %	33,24 %	34,72 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Convertible loans	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %
Total long-term liabilities	22,50 %	27,12 %	32,25 %	39,84 %	52,01 %	12,20 %	76,26 %	155,17 %	301,26 %	316,25 %
Total short-term liabilities	50,60 %	47,48 %	43,49 %	38,62 %	32,70 %	3367,53 %	3204,35 %	3071,98 %	2968,41 %	2873,19 %
Minority intersts (Groups)	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %

8.2 Appendix B – Income Statement

	Income Statement							Assumptions						
	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
	0 %	72 %	50,00 %	30,00 %	20,00 %	17,50 %	15,00 %							
Recurring Revenue	2 588 999	4 463 554	6 695 331	8 703 930	10 444 716	12 272 542	14 113 423							
Sales	2 588 999	4 463 554	6 695 331	8 703 930	10 444 716	12 272 542	14 113 423			50,00 %	30,00 %	20,00 %	17,50 %	15,00 %
Other revenue														
COGS	5 608 212	2 909 467	4 351 965	3 481 572	3 133 415	2 454 508	2 117 013	216,62 %	65,18 %	65,00 %	40,00 %	30,00 %	20,00 %	15,00 %
Change in inventory														
Employee Costs	334 978	2 136 087	3 682 432	4 351 965	5 222 358	4 909 017	5 645 369	12,94 %	47,86 %	55,00 %	50,00 %	50,00 %	40,00 %	40,00 %
Depreciation	254 548	704 178	1 472 973	1 479 668	1 462 260	1 227 254	1 058 507	9,83 %	15,78 %	22,00 %	17,00 %	14,00 %	10,00 %	7,50 %
Amortization			-	-	-	-	-	0,00 %	0,00 %					
Other Operating Costs	1 600 938	3 315 222	-	-	-	-	-	61,84 %	74,27 %	40,00 %	30,00 %	20,00 %	10,00 %	5,00 %
EBIT	**-5 209 677**	**-4 601 400**	**-2 812 039**	**-609 275**	**626 683**	**3 681 763**	**5 292 534**							
Interest Income	115	126	-	-	-	61 363	141 134	0,00 %	0,00 %	0,00 %	0,00 %	0,00 %	0,50 %	1,00 %
Financial Income			-	-	-	-	-	0,00 %	0,00 %					
Total Financial Income	115	126	-	-	-	61 363	141 134							
Change in Current Assets														
Depreciation in Current Assets														
Interest Expenses	20 608	43 596	66 953	87 039	104 447	92 044	70 567	0,80 %	0,98 %	1,00 %	1,00 %	1,00 %	0,75 %	0,50 %
Financial Expenses			-	-	-	-	-	0,00 %	0,00 %					
Total Financial Expenses	-20 608	-43 596	-	-	-	-	-	-0,80 %	-0,98 %					
Profit Before Taxes	-5 230 170	-4 644 870	-2 812 039	-609 275	626 683	3 743 125	5 433 668							
Tax EBT			-	-	-	-	-	0,00 %	0,00 %					
Profit After Taxes	-5 230 170	-4 644 870	-2 812 039	-609 275	626 683	3 743 125	5 433 668							
Extraordinary Income														
Extraordinary Costs														
Tax on Extraordinary Profit/Loss														
Tax EBT	-	-	-	-	-	-	-							
Profit After Taxes	-5 230 170	-4 644 870	-2 812 039	-609 275	626 683	3 743 125	5 433 668							
Deferred Tax Assets	**-5 230 170**	**-9 875 040**	**-12 687 079**	**-13 296 354**	**-12 669 671**	**-8 926 546**	**-3 492 878**							
Tax rate	27,00 %	25,00 %	24,00 %	23,00 %	23,00 %	23,00 %	23,00 %							

8.3 Appendix C – Balance Sheet

	2015	2016	2017	2018	2019	2020	2021	2015	2016	2017	2018	2019	2020	2021
Total Non-Current Assets	**2 620 868**	**8 727 959**	**7 291 215**	**5 831 633**	**4 439 004**	**2 945 410**	**1 552 477**							
Total Intangible Assets	1 299 862	8 482 403	6 896 191	5 222 358	3 603 427	1 840 881	-							
R&D	1 299 862	1 221 071	1 004 300	783 354	574 459	245 451	-	50,21 %	27,36 %	15,00 %	9,00 %	5,50 %	2,00 %	0,00 %
Patents			-	-	-	-	-	0,00 %	0,00 %					
Deferred Tax			-	-	-	-	-	0,00 %	0,00 %					
Goodwill		7 261 332	5 891 891	4 439 004	3 028 968	1 595 430	-	0,00 %	162,68 %	88,00 %	51,00 %	29,00 %	13,00 %	0,00 %
Other intangible assets			-	-	-	-	-	0,00 %	0,00 %					
Total Tangible Assets	-	195 556	334 767	522 236	731 130	981 803	1 411 342							
PP&E			-	-	-	-	-	0,00 %	0,00 %					
Machines			-	-	-	-	-	0,00 %	0,00 %					
Ships/Rigs/Planes			-	-	-	-	-	0,00 %	0,00 %					
Other fixed assets			-	-	-	-	-	0,00 %	0,00 %					
Operating Movable Property		195 556	334 767	522 236	731 130	981 803	1 411 342	0,00 %	4,38 %	5,00 %	6,00 %	7,00 %	8,00 %	10,00 %
Total Financial Assets	1 321 006	50 000	60 258	87 039	104 447	122 725	141 134							
Investments in subsidiaries			-	-	-	-	-	0,00 %	0,00 %					
Investments in group companies etc.	40 000	50 000	60 258	87 039	104 447	122 725	141 134	1,54 %	1,12 %	0,90 %	1,00 %	1,00 %	1,00 %	1,00 %
Loan to group companies			-	-	-	-	-	0,00 %	0,00 %					
Investments in associated companies			-	-	-	-	-	0,00 %	0,00 %					
Loans to associated companies and joint venture activities	1 281 006		-	-	-	-	-	49,48 %	0,00 %					
Equities and investments			-	-	-	-	-	0,00 %	0,00 %					
Bonds and other long-term receivables			-	-	-	-	-	0,00 %	0,00 %					
Pension Fund			-	-	-	-	-	0,00 %	0,00 %					
Other non-current Assets			-	-	-	-	-	0,00 %	0,00 %					
Total Current Assets	**760 816**	**927 527**	**2 662 899**	**3 984 004**	**5 143 726**	**6 596 453**	**12 249 568**							
Total Current Assets	**760 816**	**927 527**	**2 662 899**	**3 984 004**	**5 143 726**	**6 596 453**	**12 249 568**							
Total Inventories	-	-	-	-	-	-	-	0,00 %	0,00 %					
Inventory Raw Materials			-	-	-	-	-	0,00 %	0,00 %					
Inventory Work in Progress			-	-	-	-	-	0,00 %	0,00 %					
Inventory Finished Goods			-	-	-	-	-	0,00 %	0,00 %					
Total Receivables	760 816	927 527	1 934 029	3 036 474	4 008 011	5 261 833	10 711 647	29,39 %	20,78 %					
Account Receivables	374 730	284 275	535 626	783 354	1 044 472	1 472 705	4 939 698	14,47 %	6,37 %	8,00 %	9,00 %	10,00 %	12,00 %	35,00 %
Other Short-term Receivables	198 537	451 835	669 533	1 305 590	1 827 825	2 454 508	4 234 027	7,67 %	10,12 %	10,00 %	15,00 %	17,50 %	20,00 %	30,00 %
Other short-term receivables group companies			-	-	-	-	-	0,00 %	0,00 %					
Payments to be received from owners			-	-	-	-	-	0,00 %	0,00 %					
Total Short-term investments			-	-	-	-	-							
Equities in Associated Companies			-	-	-	-	-	0,00 %	0,00 %					
Marketable Shares			-	-	-	-	-	0,00 %	0,00 %					
Marketable Bonds			-	-	-	-	-	0,00 %	0,00 %					
Other Marketable Financial Instruments			-	-	-	-	-	0,00 %	0,00 %					
Other Financial Instruments			-	-	-	-	-	0,00 %	0,00 %					
Cash and Deposits		56 511	59 337	77 138	91 243	107 366	126 579	0,00 %	1,27 %	**0,89 %**	**0,89 %**	**0,87 %**	**0,87 %**	**0,90 %**
Other current Assets	187 549	134 906	669 533	870 393	1 044 472	1 227 254	1 411 342	7,24 %	3,02 %	10,00 %	10,00 %	10,00 %	10,00 %	10,00 %
Total Assets	**3 381 684**	**9 655 486**	**9 954 114**	**9 815 638**	**9 582 730**	**9 541 863**	**13 802 045**							
Total Equity	**327 586**	**3 523 968**	**711 929**	**102 654**	**729 337**	**4 472 462**	**9 906 130**							
Paid-up Equity	5 550 639	13 399 008	13 399 008	13 399 008	13 399 008	13 399 008	13 399 008							
Share Capital	7 117		-	-	-	-	-							
Treasury Stock			-	-	-	-	-	0,00 %	0,00 %					
Retained Earnings	-5 230 170	-9 875 040	-12 687 079	-13 296 354	-12 669 671	-8 926 546	-3 492 878							
Reserve for Valuation Variations			-	-	-	-	-	0,00 %	0,00 %					
Retained Equity			-2 812 039	-3 421 314	-2 794 631	948 494	6 382 162							
Minority Interest			-	-	-	-	-	0,00 %	0,00 %					

Total Liabilities	3 054 098	6 131 518	9 242 185	9 712 984	8 853 393	5 069 401	3 895 915							
Total Long-term Liabilities	1 416 668	1 312 503	3 015 528	2 681 675	-89 478	-7 237 125	-9 654 010							
Allowances for Liabilities			-	-	-	-	-	0,00 %	0,00 %					
Pension Liabilities			-	-	-	-	-	0,00 %	0,00 %					
Deferred Tax			-	-	-	-	-	0,00 %	0,00 %					
Other Provisions			-	-	-	-	-	0,00 %	0,00 %					
Other Long-term Debt			-	-	-	-	-	0,00 %	0,00 %					
Convertible Debt			-	-	-	-	-	0,00 %	0,00 %					
Debenture Loan			-	-	-	-	-	0,00 %	0,00 %					
Long-term Debt to Financial Institutions	1 416 668	1 312 503	1 081 147	-	-	-	-	54,72 %	29,40 %	16,15 %				
Long-term Debt to Group Companies			-	-	-	-	-	0,00 %	0,00 %					
Subordinated interest-bearing debt			-	-	-	-	-	0,00 %	0,00 %					
Other Liabilities			1 934 381	2 681 675	-89 478	-7 237 125	-9 654 010	0,00 %	0,00 %	28,89 %	30,81 %	-0,86 %	-58,97 %	-68,40 %
Total Short-term Debt	1 637 430	4 819 015	6 226 658	7 031 309	8 942 871	12 306 526	13 549 926							
Debt to Associated Companies			-	-	-	-	-	0,00 %	0,00 %					
Payment on Long-Term Debt			-	-	-	-	-	0,00 %	0,00 %					
Convertible Short-term Debt			-	-	-	-	-	0,00 %	0,00 %					
Certificate Loan			-	-	-	-	-	0,00 %	0,00 %					
Short-Term Debt to Financial Institutions	83 332	187 497	200 860	174 079	208 894	122 725	141 134	3,22 %	4,20 %	3,00 %	2,00 %	2,00 %	1,00 %	1,00 %
Overdraft Facility	314 901	449 457	334 767	435 197	417 789	490 902	705 671	12,16 %	10,07 %	5,00 %	5,00 %	4,00 %	4,00 %	5,00 %
Trade Creditors	724 950	2 443 534	3 012 899	2 611 179	2 088 943	-	-	28,00 %	54,74 %	45,00 %	30,00 %	20,00 %	0,00 %	0,00 %
Tax Payable			-	-	-	-	-	0,00 %	0,00 %					
Value Added Taxes			-	-	-	-	-	0,00 %	0,00 %					
Short-Term Debt to Associated Companies			-	-	-	-	-	0,00 %	0,00 %					
Dividend			-	-	-	-	-	0,00 %	0,00 %					
Other Current Debt	514 247	1 738 527	2 678 132	3 810 855	6 227 245	11 692 899	12 703 120	19,86 %	38,95 %	40,00 %	43,78 %	59,62 %	95,28 %	90,01 %
Liabilities associated with assets held for sale			-	-	-	-	-	0,00 %	0,00 %					
Short Term Debt			-	-	-	-	-	0,00 %	0,00 %					
Minority Interest			-	-	-	-	-	0,00 %	0,00 %					
Total Equity and Liabilities	3 381 684	9 655 486	9 954 114	9 815 638	9 582 730	9 541 863	13 802 045							
Total Assets	3 381 684	9 655 486	9 954 114	9 815 638	9 582 730	9 541 863	13 802 045							
Balance Equation	-	-	0	0	0	0	0							

8.4 Appendix D – Discounted Cash Flow

Free Cash Flow

	2015	2016	2017	2018	2019	2020	2021
Net Income	**-5 230 170**	**-4 644 870**	**-2 812 039**	**-609 275**	**626 683**	**3 743 125**	**5 433 668**
Depreciation, Depletion, & Amortization	-	254 548	704 178	1 472 973	1 479 668	1 462 260	1 227 254
Change in Receivables	-760 816	-166 711	-1 006 502	-1 102 445	-971 537	-1 253 822	-5 449 814
Change in Inventory	-	-	-	-	-	-	-
Change in Prepaid Assets	-	-	-	-	-	-	-
Change in Payables & Accrued Expenses	724 950	1 718 584	569 365	-401 720	-522 236	-2 088 943	-
Change in Necessary Cash	-	-56 511	-2 826	-17 801	-14 105	-16 123	-19 214
Change in Other Working Capital	1 637 430	3 238 096	681 599	603 791	1 737 483	3 180 872	1 059 312
Change in Working Capital	1 601 564	4 733 458	241 636	-918 174	229 605	-178 016	-4 409 716
Change in Deferred Tax	-	-	-	-	-	-	-
Stock-Based Compensation	-	-	-	-	-	-	-
Other Assets/Liabilities							
Net Operating Cash Flow	**-3 628 606**	**343 136**	**-1 866 225**	**-54 476**	**2 335 956**	**5 027 370**	**2 251 206**
Change in PP&E	-254 548	-704 178	-1 472 973	-1 479 668	-1 462 260	-1 227 254	-1 058 507
Investment Purchases/Sales							
Net Investing Cash Flow	**-254 548**	**-704 178**	**-1 472 973**	**-1 479 668**	**-1 462 260**	**-1 227 254**	**-1 058 507**
Change in common stock	5 550 639	7 848 369	-	-	-	-	-
Dividends							
Other Funds	1 637 430	3 181 585	1 407 643	804 651	1 911 562	3 363 655	1 243 400
Net Financing Cash Flow	**7 188 069**	**11 029 954**	**1 407 643**	**804 651**	**1 911 562**	**3 363 655**	**1 243 400**
Exchange Rate Effect							
Net change in cash	3 304 915	10 668 912	-1 931 555	-729 493	2 785 258	7 163 770	2 436 099
Free Cash Flow							
Cash from Operations	**-3 628 606**	**343 136**	**-1 866 225**	**-54 476**	**2 335 956**	**5 027 370**	**2 251 206**
Less: Capital Exenditures	-254 548	-449 630	-768 795	-6 695	17 408	235 006	168 747
Free Cash Flow	**-3 374 058**	**792 766**	**-1 097 430**	**-47 781**	**2 318 548**	**4 792 364**	**2 082 459**

Terminal Value

Growth in perpetuity method	
Long Term Growth Rate	1,00 %
WACC	6,41 %
Free Cash Flow t+1	2 103 283
Terminal Value	38 852 783
Present Value of Terminal Value	26 757 315
Enterprise Value	32 871 408

WACC

Paid Interest	32 102
Total Debt	545 834
Cost of Debt	5,88 %
Tax Rate	24 %
After-tax Cost of Debt	4,47 %
Risk Free Rate	1,67 %
Market Risk Premium	5,69 %
Beta	1,43
Cost of Equity	9,80 %
Total Debt	6 131 518
Total Equity	3 523 968
Total Capital	9 655 486
Debt Weight	64 %
Equity Weight	36 %
WACC	6,41 %

8.5 Appendix E – Option Valuation

Option Valuation	
Time to maturity	10
Underlying asset value	34 123 422
Strike	6 131 518
Risk free rate	1,66 %
Volatility	64,65 %
Dividend Yield	0,00 %
d1	1,9428
d2	-0,1015
Option Value	30 847 719,92

8.6 Appendix F – Results

Company	Category	True Value	Our value: DCF	Our value: First Chicago	Our value: Option	Diff %: DCF	Diff %: First Chicago	Diff %: Option	MSE: DCF	MSE: First Chicago	MSE: Option
KONGSBERG AUTOMO	SS	kr 2 961 271 971,84	2 973 153 725,81	2 977 821 285,00	2 675 147 788,81	-0,40 %	-0,56 %	9,66 %	11 881 753,97	16 549 313,16	286 124 183,03
NORSK HYDRO ASA	SS	kr 95 153 230 437,30	94 366 011 717,58	99 068 972 825,19	53 250 519 521,97	0,83 %	-4,12 %	44,04 %	787 218 719,72	3 915 742 387,89	41 902 710 915,33
SCHIBSTED ASA-A	SS	kr 43 617 259 825,50	45 172 100 062,97	47 362 587 168,80	33 926 218 065,53	-3,56 %	-8,59 %	22,22 %	1 554 840 237,47	3 745 327 343,30	9 691 041 759,97
TELENOR	SS	kr 207 650 541 915,00	202 124 092 073,08	204 670 614 867,31	48 245 781 127,39	2,66 %	1,44 %	76,77 %	5 526 449 841,92	2 979 927 047,69	159 404 760 787,61
TOTENS SPAREBANK	SS	kr 652 262 871,00	629 522 007,59	654 115 691,53	1 963 780,01	3,49 %	-0,28 %	99,70 %	22 740 863,41	1 852 820,53	650 299 090,99
AKER BP ASA	HG	kr 41 541 657 888,00	kr 37 920 056 273,26	36 295 270 556,93	27 501 552 521,34	8,72 %	12,63 %	33,80 %	3 621 601 614,74	5 246 387 331,07	14 040 105 366,66
NEXT BIOMETRICS	HG	kr 1 068 956 820,00	1 116 131 019,85	1 130 994 414,48	1 100 758 343,63	-4,41 %	-5,80 %	-2,98 %	47 174 199,85	62 037 594,48	31 801 523,63
NORWAY ROYAL SAL	HG	kr 5 533 668 384,00	5 187 414 954,71	5 194 289 657,29	2 089 490 999,07	6,26 %	6,13 %	62,24 %	346 253 429,29	339 378 726,71	3 444 177 384,93
NRC GROUP ASA	HG	kr 2 144 459 751,00	2 133 025 049,51	2 107 411 692,86	1 555 354 345,78	0,53 %	1,73 %	27,47 %	11 434 701,49	37 048 058,14	589 105 405,22
PARETO BANK ASA	HG	kr 2 098 584 830,40	2 116 338 108,71	2 190 265 747,77	40 093 922,92	-0,85 %	-4,37 %	98,09 %	17 753 278,31	91 680 917,37	2 058 490 907,48
Mytos AS	SU	121 667 292,48	100 745 048,02	123 043 883,79	95 822 218,39	17,20 %	-1,13 %	21,24 %	20 922 244,46	1 376 591,31	25 845 074,09
Dwellop	SU	255 100 763,44	229 238 584,53	253 200 652,13	200 576 746,60	10,14 %	0,74 %	21,37 %	25 862 178,91	1 900 111,31	54 524 016,84
HAG Anlegg	SU	105 394 917,97	85 378 043,71	103 223 934,18	72 695 054,20	18,99 %	2,06 %	31,03 %	20 016 874,26	2 170 983,79	32 699 863,76
OncoInvent	SU	1 055 890 710,25	653 825 783,07	1 051 627 596,17	931 234 188,31	38,08 %	0,40 %	11,81 %	402 064 927,18	4 263 114,08	124 656 521,94
News 55 AB	SU	35 000 000,00	34 123 422,00	35 611 381,00	30 847 719,92	2,50 %	-1,75 %	11,86 %	876 578,00	611 381,00	4 152 280,08