# Master Thesis

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# Valuation of Tesla Motors, Inc.


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# Abstract

The purpose of this thesis is to determine the intrinsic share price of the electric vehicle manufacturer Tesla Motors, Inc. as of February 24, 2016.By comparing the intrinsic share price with the actual market price, it is assessed, if investing in shares of Tesla is an attractive opportunity. Tesla is an interesting case company with a high share price despite not a single year of net profits. In 2015, the company even had a loss of $892 million. A fundamental analysis and a valuation using the residual income model show that the price is still more than warranted.

The thesis first introduces the reader to the case company followed by a justification for choosing the residual income model. The weighted average cost of capital is then thoroughly estimated before the financial statements are reformulated in preparation for analysis. The financial statements are reformulated to separate the primary value-generating operating activities from the financing activities. A simple valuation shows that Tesla has to turn profitable very quickly for the market share price to be fair. By using the analysts' consensus estimate of EPS of $1,38 for 2016 and of $3, 14 for 2017, a simple residual income model shows that the market share price of $179 is $8,29 book value, $27,83 of fairly certain value from consensus short-term earnings forecasts, and $142,88 from speculative growth. The section that follows first explains why the residual operating income model can be used to find the intrinsic share price. This model requires estimates of future operating income and net operating assets. In section 10, various analyses are carried out with the focus of discovering factors that can improve the accuracy of the forecasted operating income and net operating assets.

By applying all the acquired knowledge of Tesla's situation in pro forma income statements, and subsequently discounting future residual operating income, the resulting intrinsic share price is found to be $407, 15. The share price is highly dependent on the discount rate and terminal growth rate, so a sensitivity analysis checks the effect on the valuation from changing these and other inputs. Finally, an assessment of the quality of Tesla's financial statements is carried out to make sure that the forecast is not based on current financials that have been manipulated.

It is concluded that Tesla's shares provide an attractive investment opportunity. However, the value depends on numerous uncertainties in the future.

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# 1 Introduction

Tesla Motors, Inc. (hereafter Tesla) is a fully electric vehicle manufacturing company based in Silicon Valley in the U.S, with the mission of accelerating the advent of sustainable transport (Annual Report, 2014, p. 15). The company was incorporated on July 1, 2003, and went public on June 29, 2010, with an offering price of $17 per share. On February 24, 2016, right after Tesla's Annual Report of 2015 was released (Yahoo Finance 2016b), the shares were trading at $179 per share with 131.425.000 shares outstanding and a market capitalization of $23.5 billion.

The purpose of this thesis is to assess whether the market price of $179 is fair based on an in-depth fundamental analysis of the current financial statements of Tesla and of the prospects of the company. The analysis is performed using only the publicly available information that a regular retail investor has access to.

Fundamental analysis is the method of analyzing information, forecasting payoffs based on that information, and arriving at a valuation based on those forecasts (Penman 2013, p. 98). It is about basing the valuation on what is known rather than on speculation. The analysis takes an activist approach by assuming that markets are not efficient and that it is possible to earn exceptional returns from trading with other investors, who has not "done their homework." The fundamental analysis is also based on a belief that in the long run, the market price will reflect the fundamentals of the company, but in the short-term, it is possible for the market price to deviate from the fair intrinsic price due to market sentiment and speculation. An investor, who has performed a fundamental analysis of a share, will, therefore, have better prospects for the long run.

The motivation for choosing Tesla as the case company is a personal belief that Tesla's share price might have been pushed up above the fair intrinsic price by investors, who are investing without performing fundamental analysis. Instead of substantiating the investment with a sound analysis of the actual financials of the company, many perhaps instead rely on the positive publicity of the company in the media and choose to invest. However, a good company is not always a good investment. The stock market tends to get overexcited about growth prospects, and a risk in investing is the risk of paying too much for growth (Penman 2013, p. 155).

Tesla is indeed an interesting company with appealing products using cutting edge technology, especially within lithium-ion batteries used for the Powerwall and electric cars (Vance 2015, pp. 158-159). The company is at the forefront of changing an entire industry and is investing heavily in supercharging stations around the world (teslamotors.com

2016), a necessary step in moving away from the conventional carbon-dioxide emitting vehicles. With the current amount of attention given to global warming and sustainability, the future of a company like Tesla for sure does look bright. Especially if the company can keep growing revenues with the same exceptional rates, as it has done so far. The company went from $117 million in 2010 to $3.74 billion in 2015. Furthermore, the company is being managed by the eccentric Elon Musk, one of the wealthiest persons in the world, also well-known from the companies SpaceX, Solar City, PayPal, and Zip2. He has even been called the real world Iron Man (Smith 2014).

Interesting company aside, do the fundamentals and future growth prospects actually warrant a market price of $179, or are investors paying too much for growth and should have invested in other assets instead? The growth prospects depend on future levels of government subsidies on sustainable vehicle manufacturers, future levels of environmental consciousness of comsumers, and a lot of other factors.

The valuation is not an easy task. Valuing young startups is perhaps the most difficult exercise in valuation, and even more daunting if the firm is publicly traded (Damodaran 2012, p. 639). Because of Tesla's consistently negative earnings, one cannot simply apply a growth rate to the earnings, but they must instead be carefully forecasted. The higher difficulty in valuing a company like Tesla must arguably also increase the chance that investment banks' valuations of Tesla are less consistent than their valuations of more mature firms with steady earnings. The possibility of earning exceptional returns after analyzing the share price of a company like Tesla and investing based on the analysis is therefore possibly higher.

With the author's keen interest in corporate finance, this thesis also presents an excellent opportunity to apply the theories learned throughout the years of studying and to delve deep into the process of equity analysis, which is useful both for personal investing or future jobs within investment banking.

## 2 Problem Statement

The overall purpose of this thesis is to determine the intrinsic share price of Tesla as of February 24, 2016, and to evaluate whether the actual share price of $179 on that day is too high, too low, or justified by the facts and figures in the annual statements.

The valuation technique applied is the residual income model. A difficult but essential part of valuation is to make estimations about the future. In order to make as qualified an estimate about Tesla's future as possible, several factors are considered. First of all, the return on net operating assets is broken down into its value drivers, and Tesla's current sustainable earnings are identified. Secondly, the electric vehicle market and the competition are briefly analyzed with a focus on discovering important points that can be incorporated in the forecast of earnings. By combining those analyses with Tesla's own projections of the future from the Annual Report 2015 in the valuation, a true and fair value of the company should be achieved.

The valuation is complemented by a sensitivity analysis in which the effect of changing different valuation inputs are analyzed.

Finally, the valuation models rely on accounting numbers, so an accounting quality analysis is also performed.

## 3 Methodology

The approach in this paper is empirical. Inputs in the estimation of the fair value of Tesla's share price are derived from empirical data, e.g. the annual reports. In an empirical study a thorough analysis based on relevant theories and models is expected (MSc Student Guidelines 2015, p. 11). A comprehensive analysis of Tesla's share price based on relevant valuation theories is in fact, what this paper is all about.

The approach to valuation in this paper follows the process of fundamental analysis. Fundamental investors differ from intuitive investors, who rely on their instincts, and from passive investors, who simply assume that markets are efficient and that the market price is the fair price for the risk taken (Penman 2013, p. 3).

The Efficient Market Hypothesis theory contends that shares are accurately priced and reflect all available information. So if markets are efficient, it is impossible to benefit from under- or overpriced shares (Investopedia 2016). Fundamental investors do not assume that markets are efficient, but assume that they will become efficient (Damodaran 2012, p. 5), since prices tend to converge to fundamentals over time (Penman 2013, p. 10). Because fundamental investors believe that prices are not efficient, they try to discover under- or overpriced shares to get higher returns on their investment.

In order to discover mispriced shares the fundamental investor challenges the market price by asking questions, such as, what future sales and profits would support a market capitalization of $23.5 billion? Tesla's P/B ratio is 21,6[1]. Why is its market value so

[1] (131.425.000*179)/1.088.944.000=21,6. Calculated from Tesla's Annual Report 2015.

much more than its book value, and why is the P/B ratio so much higher than the historical average P/B of 2,5 (Penman 2013, p. 150)? Tesla's P/S ratio is 5,8[2]. Why is its P/S ratio so much more than the historical P/S ratio of just 1 (Penman 2013, p. 9)?

The fundamental investor then goes on to make his or her own valuation that results in an "intrinsic" share price, which is what the share is worth based on forecasted payoffs. Payoffs are forecasted using information so the intrinsic price can be referred to as the price justified by the information (Penman 2013, p. 23). If the intrinsic price is higher than the market price, the investor will buy shares of Tesla with the belief that the market price will converge to the intrinsic price over time. If the intrinsic price is lower than the market price, the investor will short sell Tesla's shares to benefit from the market price converging towards the "lower" intrinsic price.

## 3.1 Data Collection

The valuation in this paper is primarily based on Stephen H. Penman's book "Financial Statement Analysis and Security Valuation", which has won several awards for its notable contributions to equity analysis (Penman 2013, p. v). The entire course International Financial Accounting II on the MSc in Finance & International Business program at Aarhus University – BSS is covered by this book. Since the students were expected to do a share price valuation using only this book and the annual reports of a given company in the 48-hour exam, the book is considered sufficient for the purpose. When additional valuation and other finance theory were needed, it was mainly taken from acknowledged authors such as Aswath Damodaran (2012) and Tim Koller et al. (2010).

Tesla's annual reports are used extensively in the analysis. Annual reports must be prepared according to the framework set out by the Financial Accounting Standards Board in the U.S. The framework contains quality characteristics like faithfulness, neutrality, free from error, etc. (Cotter 2012, p. 13), so the information in the annual reports can be relied on, also after the auditing by PWC (Annual Report, 2015, p. 46 & 129). The information in Tesla's financial statements is thus not wrong, but some information can be left out of the reports, and the wording in the reports can be subjectively biased, so some precaution was taken, when analyzing the annual reports. As financial statements are revised with retrospective effect to facilitate comparison in multi-period financial statements, the most recent financial statements were used for historical numbers. Tesla's financial statements after the initial public offering in 2010 are the only ones considered, due to the higher

[2] (131.425.000*179)/4.046.025.000=5,8. Calculated from Tesla's Annual Report 2015.

disclosure requirements of a public company (Berk, DeMarzo 2014, p. 813).

In order to improve the forecast of residual earnings, external information in addition to the annual reports was also used. All the data used in this paper is secondary, which means that it was originally created for another purpose than the valuation here (Jensen, 2011, p. 48). As the data was originally made for another purpose, its credibility and objectivity was evaluated before use.

Databases used in retrieving historical share price data and market index data etc. were recommended by the AU library and is considered credible.

## 3.2 Delimitations

The thesis is subject to the following delimitations to keep the analysis and discussions relevant for answering the problem statement and for meeting the requirements within the given time frame:

- The thesis must be considered written for a potential outside investor of Tesla and is thus based on the publically available information such as annual reports, newspaper articles, and website information. Publically available material is believed to be sufficient for making a fair value assessment of the share price, and it is deemed unlikely that potential investors will obtain additional information for their analysis. Also, data acquired from employees of Tesla is not entirely objective, since they have a stake in the company.
- All incidents happening later than February 24, 2016, are not included in the analysis. This is because the investment decision is assumed to be taken immediately following the analysis of the Annual Report, which was released on February 24, 2016.
- Future tax-rate changes will not be considered.
- The conclusion is not validated by applying other valuation techniques. This is due to the emphasis and benefits of using the residual income model as explained by Penman (2013), and because a multiple valuation, for instance, is not practicable.
- The strategic analysis of Tesla is only made with the purpose of improving the accuracy of the forecast of residual earnings in the valuation. Extensive strategic analysis that is not even used in the forecasts has thus been avoided.
- Lastly, the stock-based compensation item is not reformulated in the equity statement, because the stock option loss cannot be imputed from the tax benefit of exercised options (see Penman 2013, p. 269).

"Valuation is not an objective exercise, and any preconceptions and biases that an analyst brings to the process will find its way into the value" (Damodaran 2012, p. 9). The analysis was for that reason tried to be made as objective as possible.

## 3.3 Thesis Outline

The thesis is organized in a structured and clear manner to facilitate the understanding for the reader.

First, an introduction to Tesla is given to familiarize readers with the company in question, and for the reader to be better able to reflect upon the forecast and analysis later.

Next, the residual income model is introduced along with pros and cons of using that model over other commonly applied valuation methods.

Valuation methods use a "cost of capital" to discount future earnings or cash flows. This cost of capital will be estimated following the introduction of the residual income model.

The other inputs needed to calculate residual earnings are earnings forecasts and forecasts of book value of common equity. In order to find these values the financial statements must first be reformulated. The reasons for reformulating the financial statements, and the explanation of how they have been reformulated, follow the cost of capital estimation.

After that, a simple residual earnings valuation is performed to show that it does not make much sense to apply a constant growth rate to Tesla's negative residual earnings. More detailed earnings forecasts are needed for a company like Tesla.

A reverse engineering approach then calculates the required residual earnings growth rate to justify a valuation of $179.

In order to perform a more comprehensive residual earnings valuation, it is not enough to just assume a constant growth rate in residual earnings. Instead, future financial statements have to be forecasted, and individual growth rates in various statement items must be analyzed. Before these forecasts can be made, a few different analyses need to be made. This includes a profitability analysis and a separation of Tesla's current "core" earnings from temporary earnings, because only the core earnings should be the basis for the forecast of future earnings. The electric vehicle market and competition are also briefly analyzed with a focus on discovering important points that can be incorporated in the forecast of earnings. These important points will be used along with Tesla's own projections about the future from the Annual Report 2015 in the forecast of earnings.

The comprehensive residual earnings valuation is then ready to be carried out. It relies on many assumptions, so a sensitivity analysis is naturally also performed to evaluate the effect of changing some of the key inputs and assumptions used in the valuation.

Finally, the valuation models rely on accounting numbers, so an accounting quality analysis is also performed.

In the end, results are discussed, and the thesis is concluded.

# 4 Company Profile

This section introduces the reader to Tesla with an emphasis on describing relevant aspects of the company for a valuation.

Tesla was incorporated on July 1, 2003, by Martin Eberhard and Marc Tarpenning (Vance 2015, p. 152). With an early investment of $6.5 million from Elon Musk, who later became the CEO, the company could develop a prototype vehicle based on the powertrain from AC Propulsion's tzero and the body of a Lotus Elise (Vance 2015, pp. 154-157). On January 27, 2005, the Tesla Roadster prototype was ready and they "just" had to produce it for the masses (Vance 2015, p. 158).

The electric vehicle portfolio currently consists of the Model S Sedan and the Model X SUV. The Tesla Roadster is no longer in production. About 2.500 Roadsters were sold between 2008 and 2012 (Vance 2015, p. 271). In late 2017, the company expects to start deliveries of the next model, Model 3 (Annual Report, 2015, p. 5). For a description of Tesla's products, see Appendix A.

## 4.1 Key Financials

To get a quick overview of Tesla's financials, the table below summarizes some of the most important numbers:

TABLE 1: KEY FINANCIALS

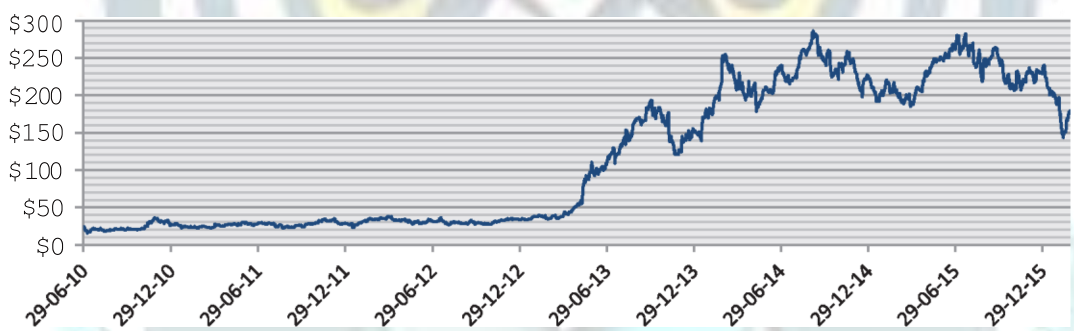
| (In USO Thousands, except car data) | Dec. 31, 2015 | Dec. 31, 2014 | Dec. 31, 2013 | Dec. 31, 2012 | Dec. 31, 2011 | Dec. 31, 2010 |
|---|---|---|---|---|---|---|
| Total revenues | 4.046.025 | 3.198.356 | 2.013.496 | 413.256 | 204.242 | 116.744 |
| Total cost of revenues | 3.122.522 | 2.316.685 | 1.557.234 | 383.189 | 142.647 | 86.013 |
| Gross profit | 923.503 | 881.671 | 456.262 | 30.067 | 61.595 | 30.731 |
| Total operating expenses | 1.640.132 | 1.068.360 | 517.545 | 424.350 | 313.083 | 177.569 |
| Comprehensive loss | -892.197 | -294.062 | -74.014 | -396.210 | -254.414 | -154.328 |
| | | | | | | |
| Total assets | 8.092.460 | 5.830.667 | 2.416.930 | 1.114.190 | 713.448 | 386.082 |
| Total liabilities | 6.961.471 | 4.860.761 | 1.749.810 | 989.490 | 489.403 | 179.034 |
| Total stockholders' equity | 1.088.944 | 911.710 | 667.120 | 124.700 | 224.045 | 207.048 |
| | | | | | | |
| # Model S cars sold | 50.366 | 31.655 | 22.477 | 2.650 | | |
| # Model X cars sold | 208 | | | | | |

Compiled by author. Sources: (annual reports), (Cobb 2016a), (Hirsch 2014), (Lienert 2013)

## 4.2 Historical Share Price Development

Just to have Tesla's recent share price development in mind, before making an investment decision based on the valuation, the price development is shown graphically here:

FIGURE 1: SHARE PRICE DEVELOPMENT




Compiled by author. Source: Datastream

The price of the IPO in 2010 was $17, and the price has since risen to $179 per share on February 24, 2016. The highest price the share has ever traded at was $286,65 on September 4, 2014. The sharp increase in 2013 is due to better than expected quarterly earnings, very high Model S safety ratings, supercharger network expansions, and early repayment of Department of Energy loans (Tesla Motors 2016d).

## 4.3 Strategy

"Tesla's mission is to accelerate the world's transition to sustainable transport" (Tesla Motors 2016a). This may not seem so, when Tesla currently only produces high-end cars that few can afford. However, it is a necessary step on the way. A start up understandably has high unit cost of production, until production volume is increased and optimized, which drives down unit costs. For that reason, Tesla started by entering the premium market, but will drive down prices with new models (Musk 2006). Mass-market electric vehicles have been the goal of Elon Musk since the beginning of Tesla (Vance 2015, p. 269). Part of this goal will be realized in late 2017, when Model 3, a sedan for the mass market will be introduced at a price of $35,000. This car will be produced in higher volumes than Model S and X (Annual Report, 2015, p. 5). According to Vance (2015, p. 326), this car will be the real measure of Tesla's impact on the world.

Tesla produced and sold 50.574 vehicles in 2015 (Cobb 2016a). The company plans to deliver 80.000 to 90.000 new Model S and Model X vehicles in 2016 (Annual Report, 2015, p. 32). The company is more constrained by supply than demand (Grinshpun 2014) and has relatively low advertising costs to generate demand (Annual Report, 2015, p. 8). In 2020, the goal is to produce 500.000 vehicles a year (Randall 2015), which is the amount previously produced at the factory in Fremont, when it was owned by GM and Toyota (Kane 2010). In 2020, Tesla also expects its Gigafactory, which is described below, to reach full production capacity and be able to produce batteries for 500.000 cars and for Tesla's energy storage products (Annual Report, 2015, p. 9). The growth rate needed to reach 500.000 vehicles in 2020 is very similar to Ford's Model T from 1909 to 1916, which originally changed the industry (Randall 2015). It would require a CAGR of 58,13% in cars sold[3]. Production after 2020 could be increased by building factories in China and Europa for the local markets depending on Model 3 demand (Loveday 2015). In 2016, Tesla anticipates aggregate capital expenditures of $1.5 billion (Annual Report, 2015, p. 40), including preparation costs for the production of Model 3 in late 2017.

## 4.4 Supercharger Network

"To remove a barrier to the broader adoption of electric vehicles, caused by the perception of limited vehicle range" (Annual Report, 2015, p. 7), Tesla has invested heavily in a network of supercharger stations. At these stations, the electric cars can be recharged for free in minutes instead of the hours it takes to recharge at home. The stations are strategically placed along well-travelled highways allowing for longer travels. As of December 31, 2015, there are 584 supercharger stations globally, and in 2016 Tesla will open around 300 more and plan to continue to expand (Annual Report, 2015, p. 33). Tesla

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[3] Compound annual growth rate: (500.000/50.574)A(1/5)-1=58,13%

also has set up more than 3.100 wall connectors for faster recharging in 1.800 hotel and other popular locations around the world (Annual Report, 2015, p. 7).

As this network of supercharger stations grow in the coming years, the perception of limited vehicle range ought to be less of an obstacle for possible customers and thereby increase demand.

## 4.5 The Gigafactory

In June 2014, Tesla started building their Gigafactory in Nevada (Annual Report, 2015, p. 34). The factory will be the second biggest building in the world by volume and allow Tesla to produce more battery cells in 2020 than the combined battery cell output of all other manufacturers in the world in 2013 (Thompson 2015). This should allow Tesla to keep up with demand. By using economies of scale, the factory is estimated to reduce the cost of batteries by 30% a year after beginning the production of Model 3 (Annual Report 2014, p. 14).

Tesla might build more of these factories in the future depending on demand and wants the Nevada factory to be called Gigafactory 1 (Lanaria 2016). The Gigafactory will ensure battery supply for Tesla and provide Tesla with a huge competitive advantage if Model 3 turns out to be a success. In that case, the other auto manufacturers will have to come up with an alternative, for which battery supply is uncertain and costs of the batteries are higher than Tesla's. According to Vance (2015, p. 331), the other manufacturers are probably seven years behind.

## 4.6 Ownership Structure

Tesla has since the IPO in 2010 only had common shares outstanding. Out of the 131.450.000 shares outstanding (Annual Report, 2015, p. 47), 22% are held by insiders and 5%-holders, leaving more than 100 million shares in the free float available for public trading (Yahoo Finance 2016c). The shares held by insiders are assumed to be held for very long terms and for that reason not traded. With more than 100 million in free float, it is assumed that a large number of shares can be sold or bought without heavily affecting the share price (investinganswers.com 2016). Also, with an average daily trading volume of more than 5 million shares (Nasdaq.com 2016) the valuation will not consider any illiquidity discount (Damodaran 2005). In conclusion, it is believed that the shares can be sold or bought easily following the valuation.

# 5 Corporate Valuation Theories

The purpose of an equity valuation is to obtain the intrinsic value of equity and challenge the market price of the equity. There are different ways to find the intrinsic value. Damodaran (2012, p. 11) categorize valuation techniques into three broad groups.

The first, discounted cash flow models, values assets by summing up the present value of its expected future cash flows. Securities are acquired for the cash flows, they are expected to generate, so the value must equal the present value of those cash flows (Berk, DeMarzo 2014, p. 271, Damodaran 2012, p. 1).

The second, relative valuation, values assets by applying a multiple like P/E from comparable firms to the denominator of the multiple for the target firm.

The third, contingent claim valuation, uses option pricing techniques to value assets with option characteristics. The valuation technique used in this paper is the residual income model. Below, the model is described along with reasons for choosing that model. It should be mentioned that it is assumed that Tesla is a going concern and is expected to continue operating indefinitely.

## 5.1 Residual Income Model

This valuation technique falls under Damodaran's first group of valuation techniques, but instead of focusing on cash flows to the equity holder, the focus is on the earnings flowing to the equity holder. The residual income model finds the intrinsic value by adding future "residual earnings" to the book value of common equity. The equity investment is expected to earn a required rate of return, so it is only worth more than book value if the actual return is higher than the required rate. These earnings in addition to the required earnings are called residual earnings and are calculated as follows (Penman 2013, p. 142):

$$\text{Residual earnings}_t = \text{Comprehensive earnings}_t - (\text{Required return} \times \text{Investment}_{t-1})$$

The total equity value in the residual income model is calculated by forecasting residual earnings, discounting them at the required rate of return to equity holders and adding them to the book value of equity:

Value of common equity = Book value + Present value of expected residual earnings

$$V_0^E = B_0 + \frac{RE_1}{\rho_E} + \frac{RE_2}{\rho} + \frac{RE_3}{\rho} + \ldots$$

PE is 1 + the equity cost of capital

and the ellipsis indicates that the value comes from all future residual earnings.

For practical reasons, the residual income should only be forecasted until a realistic horizon, because it is unrealistic to believe that the residual earnings way out in the future can be accurately estimated. The residual earnings from the forecast horizon to infinity will, therefore, be included in the intrinsic premium at the forecast horizon:

$$V_0^E = B_0 + \frac{RE_1}{\rho_E} + \frac{RE_2}{\rho_E^2} + \frac{RE_3}{\rho_E^3} + \cdots + \frac{RE_T}{\rho_E^T} + \frac{V_T^E - B_T}{\rho_E^T}$$

where V.f - BT is the intrinsic premium at the forecast horizon.

If the residual earnings after the forecast horizon are forecasted to be zero, the horizon premium will be zero and drops out of the model.

If it is assumed that the residual earnings will be the same amount in each period to infinity, the intrinsic premium can be calculated as a perpetuity:

$$y{:}E_T - B_T = \frac{RET+l}{PE-1}$$

Finally, if it assumed that the residual earnings will grow at the same rate each period to infinity, V.f - BT can be calculated as a perpetuity with growth:

$$y{:}E_T - B_T = \frac{RET+l}{PE-g}$$

where g is 1 + the growth rate of residual earnings

Which method to use depends among other things on, to what extent competition comes in and erodes profitability. Regarding the choice of growth rate, Penman writes (2013, p. 155) "growth up to the forecast horizon gives some information about long-term growth, but it is unwise to extrapolate – even worse to assume a rate. Rather we should investigate the information that informs about the growth rate." The investigation is done in section 10.

There are several reasons for using the residual income model in the valuation of Tesla instead of other commonly applied valuation models.

Reasons for not using relative valuation:

- Identifying similar firms is difficult and especially so for Tesla. Many of the big car manufacturers either have plans to produce and sell electric vehicles or already have electric cars available (Annual Report, 2014, p. 14), but their electric vehicle divisions are only a small part of the total business. Those companies are also much bigger in size and more mature than Tesla, which is still in the growth phase. An attempt was made to find similar companies in the Orbis database within the same industry classification as Tesla, but the companies with revenue size and number of employees similar to Tesla were all Chinese car manufacturers using traditional internal combustion engines. The Orbis search strategy and results can be seen in Appendix B.

- Multiple analysis is not rooted in fundamentals of the company, but instead on the market price of similar firms. This assumes that markets are efficient for the comparable firms, but not for the firm that is being valued. The model does not give any reason for, why this should be true.
- Different multiples give different valuations.
- Even if it was possible to find companies similar to Tesla, it would not be possible to apply their P/E multiples in valuing Tesla, due to Tesla's negative earnings.
- The multiples approach can result in wrong valuations if an entire industry is overvalued (Berk, DeMarzo 2014, p. 291).

Reasons for not using contingent claim valuation:

- In order to use a real-option approach, it is necessary to be able to "describe the set of specific decisions managers could make in response to future events, and include cash flow implications of those decisions" (Koller et al. 2010, p. 680). As no specific set of decisions and its underlying cash flow estimates and variance are known, the use of a real-option approach cannot be justified.

Reasons for not using the discounted cash flow model:

- The discounted cash flow model only works for mature companies with stable cash flows and by using very long time periods to capture the return from R&D.
- Tesla can be expected to have negative cash flows in the coming years, because "all free cash flow is plowed back into R&D to drive down the costs and bring the follow on products to market as fast as possible" (Musk 2006). A discounted cash flow valuation of Tesla is forced to rely on cash flows that may turn positive many years in the future. Those cash flows are hard to predict, so a discounted cash flow valuation of Tesla will be speculative.
- Free cash flow does not measure value added from operations (Penman 2013, p. 110, p. 118). The cash flow is reduced, when a firm makes investments, but this is

wrong in terms of value generation. Value is not reduced, when a firm makes positive net present value investments. The value added will be a part of cash flow from operations later, but the forecasting horizon will have to be very long to capture the value added. By increasing the forecasting horizon, too much speculation about the long run is added. We know more about the near future than the long-term, so an estimation that gives weight to the near future is preferred to those that speculate about the long run (Penman 2013, p. 119). In the residual income method, investments do not reduce value, because they are not expensed in the income statement. An exception is investments in R&D, which reduce the comprehensive earnings (Penman 2013, p. 124). Damodaran discusses a solution to this problem by using normalized earnings or by backing out R&D expenses of the income statement. For young start-up companies with similar characteristics to Tesla, he does not recommend that though. Instead high growth rates in sales and improving operating margins should be assumed (2012, p. 932 & 611). This method is used in section 11.

- Forecast horizons in the residual income model do not need to be as long as in the discounted cash flow model, because earnings are recognized before cash flows in the financial statements. The value recognition is moved forward in time. This better acknowledges the matching principle and better represents value additions in individual periods (Penman 2013, p. 49)

Other reasons for choosing the residual income model:

- When starting from the book value of equity, the valuation more clearly shows how much of the value that comes from future growth. If these growth rates have to be extremely high to get to the market price, the price is likely too high. This cannot be seen in other valuation methods, so this method offers protection from paying too much for growth. See also section 8 and 9.
- A smaller part of the total equity value comes from the continuing value in the residual income model than from the continuing value in the discounted cash flow model, because a considerable part of the value is captured by the book value of equity in the residual income model. The model puts more weight on "what we know" rather than speculation.
- The literature generally recognizes that value estimates using different models give the same result if forecasts are to infinity, but once the forecast is truncated and a

terminal value is applied, the theoretically equivalent valuations actually differ empirically. For that reason, the value estimates of the discounted cash flow model and the residual income model have been compared to the actual share price in a number of studies to see which model is most accurate in estimating the actual price. The value estimates of the residual income model generally show the least error and the model is often concluded superior to the discounted cash flow model, see for instance Penman & Sougiannis (1998), Francis, Olsson, & Oswald (2000), and Dittmann & Maug (2008).

# 6 Weighted Average Cost of Capital (WACC)

The residual income model as described above uses a cost of capital to equity-holders to discount future residual earnings to their present value. Later in this paper, the residual income model will be adjusted to the residual operating income model, in which future residual operating income should be discounted using a weighted average cost of capital for both equity- and debt-holders to find the present value. This is because the future residual operating income belongs to both debt- and equity-holders, while the future residual income only belongs to the equity-holders, as interest payments have been deducted in the calculation. The weighted average cost of capital is calculated as follows (Koller et al., 2010, p. 236):

$$\text{WACC} = \frac{E}{V} * r_E + \frac{D}{V} * r_0 * (1 - T)$$

where E/V = target level of equity to enterprise value using market-based values

rE= cost of equity

DIV = target level of debt to enterprise value using market-based values

$r_0$ = cost of debt

T = Tesla's marginal income tax rate

The following sections will first calculate the equity cost of capital and then the WACC by including the after-tax cost of debt and capital structure.

## 6.1 Cost of Equity

The equity cost of capital is a measure of investors' required return from investing in shares. The most commonly used model to estimate the equity cost of capital is the Capital Asset Pricing Model (CAPM) (Penman 2013, p. 96, Damodaran 2012, p. 65), which will also be used in this paper. Other models, such as multifactor models and Arbitrage Pricing Theory will not be elaborated on. The CAPM model estimates the cost of equity as explained below:

Required return on equity = Risk-free rate + 13 * market risk premium

or

$$r_E = r_F + 13 * (r_{Mkt} - r_F)$$

Using the CAPM model to calculate the required return to equity investors involves estimating three parts; a risk-free rate, a beta, and a market risk premium. The model calculates the required return by estimating the return from a risk-free investment and adds an additional return measured by beta*market risk premium to account for the risk of the investment. The market risk premium is the premium for holding systematic risk that cannot be eliminated by holding a diversified portfolio.

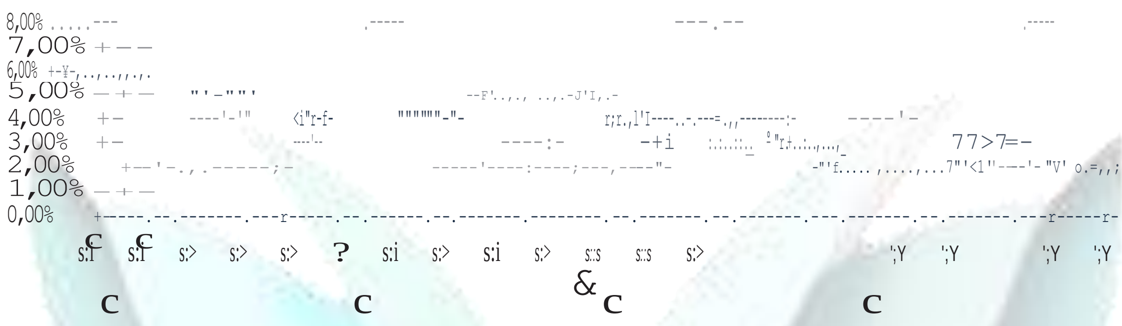
The required return should compensate the investor for both the time value of money and the risk of the investment, and is essentially the opportunity cost of forgoing another investment with the same risk. The CAPM was developed by Harry Markowitz, William Sharpe, John Lintner, and Jack Treynor in the late 1950s and 1960s. Each part of the model will now be briefly explained and estimated.

### 6.1.1 Risk-Free Rate

The risk-free rate of return is what the investor can get in return for investing in securities that are considered to be risk-free. A risk-free security is a security, for which the expected payoff always equals the actual payoff. This can only be the case, when there is no default risk. This rules out corporate bonds, because even the largest corporations have some risk of default. Government bonds can be considered risk-free, because it is often the government that controls the printing of money.

The risk-free rate should reflect the security that an investor in Tesla's shares would have invested in, if the investor had no appetite for risk. Since the majority of the investors in Tesla are American (Nasdaq.com 2016), the U.S. Treasury rate will be used. The 10-year U.S. Treasury rate is the most commonly used risk-free rate (Penman 2013, p. 96). However, the maturity should ideally be equal to the investment horizon. The choice between a 30-year and 10-year rate is not critical, because the yields only differ slightly (Bruner et al. 1998, p. 16).

FIGURE 2: 10-YEAR U.S. TREASURY NOTE YIELDS




Compiled by author. Source: (U.S. Department of Treasury 2016)

Since the purpose of this thesis is to determine the intrinsic share price of Tesla as of February 24, 2016, the closing rate of the 10-year U.S. Treasury rate quoted on that date will be used as the risk-free rate used in the calculation of the equity cost of capital. This rate was 1.75% (U.S. Department of Treasury 2016). From figure 2 it can be seen that 1,75% is historically relatively low, which also necessitates the sensitivity analysis in section 12.

### 6.1.2 Market Risk Premium

The market risk premium is the average additional return the investor would expect from investing in risky shares rather than the risk-free Treasury notes. The market risk premium has been estimated using the arithmetic average of historical premiums of two indices over the 10-year Treasury note rate since January 2, 2001. Damodaran (2012, p. 162) discusses the choice between using the arithmetic average or geometric average of the risk premiums. Here the simple arithmetic average will be taken.

Practitioners use different lengths of time period in the calculation of the historical risk premium. An argument for using shorter time periods is that the average risk-aversion changes over time, and that more recent data better represents current required returns for given risk levels. An argument for using longer time periods is that the standard error of the risk premium estimate decreases by using more data (Damodaran 2012, p. 162). As suggested by Damodaran, a relatively long time period is used.

A market portfolio is needed, before its historical excess return over the risk-free rate can be calculated. The market portfolio is essentially the total supply of securities, weighted by the proportion of the total market that each security represents (Berk, DeMarzo 2014, p. 402). Because of the impracticalities of creating this market portfolio, and because market indices are readily available, these will be used as proxies for the market portfolio. The S&P 500 is an index of 500 of the largest U.S. shares and is a popular proxy for the market portfolio (Berk, DeMarzo 2014, p. 402). Even though it only consists of 500 shares, it represents more than 70% of the U.S. market capitalization. The choice of proxy index of course depends on, how well the returns of the index represent the returns from the entire market portfolio. For instance, the DJIA only consists of 30 large industrial shares and is not considered representative (Berk, DeMarzo 2014, p. 403).

The S&P 500 only represents the US market. So to take into account the additional return an investor would require from investing in risky shares outside of the US, the market premia of the MSCI World Index was also calculated. The MSCI World covers more than 1.600 securities in 23 developed countries (MSCI World 2016).

The NYSE Composite and MSCI World All Cap indices were also considered, but RI[4] data from Datastream was only available since 2007 and 2012 for the two indices respectively. This time period was deemed to be too short, so the MSCI World and S&P 500, which had historical RI data since 2001, were used. For the calculations of the market risk premia see Appendix C. It can easily be seen from the calculations that market risk premia differ depending on time period and index used. Average market risk premia since 2007 compared to average market risk premiums since 2001 are very low due to the financial crisis. Average market risk premia of the S&P 500 index are much higher than those from the MSCI World index.

Finally, the average of the market risk premium calculated using S&P 500 and the MSCI World indices was calculated to be 4,73%. This is within the risk premium range from 3% to 9,2% and fairly close to the average of 5,5 % (Penman 2013, p. 108).

### 6.1.3 Beta

The equity beta is a measure of the riskiness of a share relative to the riskiness of the market. It measures, how sensitive the return on Tesla's share is to the return on the market. If a share is riskier than the market, a beta of more than one will be multiplied onto the market risk premium and result in an increase in the required return to reflect the increase in risk. The formula for beta is as follows:

$$\text{Beta} = \frac{\text{Covariance(return on Tesla's shares, return on the market)}}{\text{Variance(return on the market)}}$$

A beta of one indicates that the return on the share will go up or down on average with the same magnitude as the return on the market. A beta of more than one indicates that the return on the share is expected to move up more than the market, when the return

[4] Instead of using daily price data on the indices to calculate daily returns, the return index (RI) from Datastream was used. RI assumes that dividends are reinvested to purchase additional units of the index security.

on the market moves up, and decrease more than the market, when the market goes down. An argument in favor of Tesla's equity beta being higher than one is that demand for high-end cars is very sensitive to the general state of the economy, unlike personal and household products.

Tesla's equity beta was estimated using the conventional way of regressing the company's daily returns on the daily returns of a market index. The formula is as follows:

$$r_{i1} = a_i + i(r_{mkt}),$$

where $r_{i1}$ is the return on a Tesla share on day t,

$r_{mkt}$ is the return on the proxy index for the market portfolio on day t,

$a_i$ is the regression constant, and

$i$ is the equity beta for Tesla

Regressions were performed using different market indices. It is common to use 2-5 years of data (Bruner et al. 1998, p. 20), so daily dividend-adjusted data from the last two years was used. If more than two-year-old daily returns are used, the returns might be unrepresentative of the future returns of a rapidly growing company like Tesla (Berk, DeMarzo 2014, p. 433). Also, if including data from earlier years, market returns during the abnormally behaving stock market during the financial crisis would have been included and resulted in a biased beta. Since only two years of data was needed, the MSCI World All Cap Index could be used instead of the MSCI World Index in addition to the S&P 500.

The All Cap Index includes around 4500 more securities also from Small and Micro-cap segments and is considered more representative of the market portfolio (MSCI World 2016). The betas were averaged to get as accurate a measure as possible. The equity beta for Tesla was calculated to be 1,49 (see Appendix C).

Some data providers like Bloomberg use an adjusted beta to account for evidence that the beta tends to regress toward 1,0 over time (Berk, DeMarzo 2014, p. 434). As the firm matures, its risk parameters change to become more like the average firm. This should be reflected in the beta and the cost of equity (Damodaran 2012, p. 654). The beta has therefore also been adjusted in this paper using the Bloomberg formula:

$$adj. = \frac{2}{3} * \quad + \frac{1}{3} * (1,0)$$

$$1,33 = \frac{2}{3} * 1,49 + \frac{1}{3} * (1,0)$$

When using the historical beta as an estimate of the future beta, it should also be mentioned that Tesla is expected to stay in the same industry, so the overall risk level is not expected to change dramatically.

Tesla's equity cost of capital can then be calculated from the inputs above:

Required return on equity = Risk-free rate + 13 * market risk premium

Required return on equity = 1,75% + 1,33 * 4,73% = 8,04%

## 6.2 Cost of Debt

For investment-grade companies with long-term option-free bonds, Koller et al. (2010) suggests using the yield to maturity on those bonds as the cost of debt. Tesla only has short-term convertible bonds outstanding, and since the yield to maturity is distorted on bonds with options, their yield to maturity should not be used (Koller et al. 2010, p. 262). The cost of debt is instead approximated by using the suggested indirect method, where Tesla's credit rating is first determined, before the average yield to maturity on a portfolio of long-term bonds with the same rating is found. "Using the company's bond ratings to determine the yield to maturity is a good alternative to calculating the yield to maturity directly" (Koller et al. 2010, p. 263).

Tesla was rated Aa3 by Moody's on May 1, 2014, and B- by S&P on May 27, 2014. If ratings differ, the most recent rating should be used (Koller et al. 2010, p. 263), so S&P's B- rating is used. The big difference in the two rating agencies rating of Tesla accentuates the uncertainty underlying the company. The average credit spread over the 10-year U.S. Treasury rate for U.S. corporates rated B- is 5,25% (Damodaran 2012, p. 213). The cost of debt to be used in the WACC calculation is hence 5,25% + the risk-free rate of 1,75% as found in section 6.1.1 for a total cost of debt of 7,00%.

### 6.2.1 Tax Rate

"The tax benefit that accrues from paying interest makes the after-tax cost of debt lower than the pretax cost" (Damodaran 2012, p. 211), so the cost of debt must be on an after-tax basis, however only in years when interest expenses reduce the tax liability. "Firms that have operating losses will not get a tax benefit from interest expenses, at least in the year of the loss" (Damodaran 2012, p. 214).

Tesla has global operations, so its income is taxed at different rates around the world, which makes it slightly more complicated to determine the company's marginal tax rate. In this paper, the second approach as suggested by Damodaran (2012, p. 252), in which the statutory rate in the country of incorporation is used. If using the weighted average approach, the U.S. statutory tax rate would still be dominating, since around 50% of the revenue is created in the U.S. The U.S. statutory tax rate of 40% (KPMG 2016) reduces the cost of debt to 4,2% (7% * (1 - 40%)) in years, when interest expenses reduce the tax liability. This is not until Tesla reports a net profit and after all tax loss carryforwards have been exploited.

## 6.3 Long-Term Capital Structure

The third component needed in the WACC estimation is the company's target capital structure (Koller et al. 2010, p. 236). The WACC is the weighted average of the expected returns of different investors, including investors in equity, debt, and hybrid securities. By using the target weights of equity and debt, the equity cost of capital and after-tax cost of debt can be blended into a single number (Koller et al. 2010, p. 265). The hybrid securities are treated as suggested by Damodaran (2012, p. 216) and (Koller et al. 2010, p. 270), and broken down into their respective straight bond (debt) component and convertible option (equity). The 7% cost of debt is then applied to the bond component, while the equity component has the same cost as the rest of the equity of 8,04%.

"For mature companies, the target capital structure is often approximated by the company's current debt-to-value ratio" (Koller et al. 2010, p. 238), but Tesla's current ratio is not assumed to reflect the long-term capital structure. The reason that Tesla only has equity and convertible bonds merely reflects that straight debt would be too expensive for a company with operating losses and a sub-investment grade credit rating. The interest rate discount on convertible bonds made those bonds a better choice at the time. Instead of using the current capital structure, the capital structure is expected to approach the capital structure of similar companies (Koller et al. 2010, p. 268) as the company grows and straight debt becomes cheaper. The capital structure rebalancing is expected to happen over time with the target reached in 2024, when the company is expected to be in a steady state (see also section 11). When the capital structure changes over time, the required returns actually also change due to increased default risk and higher betas (Koller et al. 2010, p. 266), but in the residual operating income model, "one can ignore changes in required returns that are due to changes in financial leverage" (Penman 2013, p. 468).

In order to calculate the current equity-to-value ratio and debt-to-value ratio, the equity and debt values must first be determined. The true market value of equity is unknown, so it is instead approximated using market values. "The market value of equity is generally the number of shares outstanding times the current stock price" (Damodaran

2012, p. 219); however the equity component of the convertible bonds is added. Ideally, "management options and warrants are also valued and added to the value of the equity", but this is a limitation of the paper.

The equity value solely from the shares is $23.525.075.000 ($179*131.425.000). Tesla has by accounting guidance valued the option feature on their convertible bonds and recorded the option value in stockholder's equity. The option values of $82.800.000, $188.100.000, and $369.400.000 (Annual Report, 2015, p. 64) are added to the equity value of shares for a total current equity value of $24.165.375.000.

In the calculation of debt value, only interest bearing items in the balance sheet should be included (Damodaran 2012, p. 217), and since "in most cases, book value reasonably approximates the current market value" (Koller et al. 2010, p. 267), the book values are used. According to Damodaran (2012, p. 220) the debt used should be the net debt, so cash and cash equivalents of $1.196.908.000 are subtracted from the straight debt component of the convertible bonds of ($660.000.000-$82.800.000) + ($920.000.000-$188.100.000) + ($1.380.000.000-$369.400.000) for a total current debt value of $1.122.792.000. The resulting current EIV and DIV ratios are 95,56% and 4,44% respectively.

The current average EIV ratio of 42% and DIV ratio of 58% of similar companies is calculated from market capitalization and net debt data obtained from the Orbis database (see Appendix D). For lack of better capital structure information, the EIV ratio and DIV ratio are assumed to approach the average ratios of similar companies linearly. For the WACC calculation in each of the forecast years see Appendix E.

The weighted average cost of capital is calculated using several assumptions, so the valuation will be followed by a sensitivity analysis that uses different discount rates.

## 7 Reformulated Financial Statements

This section explains why the financial statements have been reformulated. In order to apply the residual income model, the business activities that drive value must first be identified in the financial statements. The published financial statements do not highlight those activities, and it is therefore necessary to reformulate the published financial statements. The reformulation will be done in accordance with Stephen H. Penman's teachings in "Financial Statement Analysis and Security Valuation" (2013).

The annual reports have been downloaded from Tesla's website under investor relations (2016), and the financial statements in Excel have been downloaded from the SEC EDGAR database of company filings (2016). The most recent statement did not include enough years for the analysis, so earlier statements were also downloaded. An Excel file with the equity statement, balance sheet, and income statement, which included all years back to the IPO of 2010, was created to facilitate analysis over more years. It was made sure that more recent statements had not made any changes in accounting policies with retrospective application. The Excel file is uploaded under extra material.

## 7.1 The Reformulated Statement of Changes in Shareholders' Equity

The statement of changes in shareholders' equity shows the difference in equity from the beginning balance sheet to the ending balance sheet. The change during the year comes from adding the comprehensive income and capital contributions from share issues and from subtracting the dividend payouts and share repurchases.

It is possible to do a simple residual income valuation only based on the reformulated equity statement. However, the income statement and balance sheet are needed for a more detailed valuation. The statement of changes in shareholders' equity has been reformulated with a focus on uncovering comprehensive income, because value will be lost in the valuation if net income is used instead of comprehensive income. The reformulated equity statement and a list of considerations made in the reformulation are presented in Appendix F.

The reformulated statement reveals the growth in common shareholders' equity over the years from 2011 to 2015. It also clearly distinguishes between growth from operations (comprehensive income) and growth from share issues and other financing activities that do not add value, when assuming markets are efficient.

## 7.2 The Reformulated Balance Sheet

The balance sheet has been reformulated with a focus on distinguishing operating activities from financing activities. Published balance sheets are typically grouped into current and long-term categories. However, for the valuation purpose, they are better reformulated into operating and financing activities. It is the operating activities that generate the value and financing activities are simply the investment in financial assets of excess cash from operations, which is not to be used immediately, and the transactions with shareholders' and debtholders. All balance sheet items have been evaluated individually and allocated to the operating or financing part of the reformulated statement after careful judgment. The reformulated balance sheet and a list of considerations made in the reformulation are presented in Appendix G.

The reformulated balance sheet shows that Tesla conducts business by investing equity and net financial obligations in 2012, 2014, and 2015 in net operating assets. In 2013, 2011, and 2010 additional equity was invested in net financial assets. In those years, Tesla was a net lender rather than a net borrower. Operating assets primarily consist of property, plant and equipment, and inventory, which is not very surprising for a heavy industry firm. However, also the operating lease vehicles item has in recent years become a significant part of operating assets, suggesting that the finished cars sold under the lease agreement have a higher value than the whole inventory. A large proportion of the operating assets are financed by operating liabilities or the operating credit that mainly comes from accounts payable and the resale value guarantee, but also a number of other operating liabilities. Tesla had more than a billion dollars in cash and cash equivalents in 2015, and almost all of the financial obligations consist of long-term debt (convertible bonds) and capital leases.

### 7.3 The Reformulated Income Statement

The traditional income statement combines income and expenses from the operating activities with income and expenses from the financing activities. In the reformulated statement the two activities has to be separated to identify the value generated by the activities the firm is put in place to do. In Tesla's case that is the value generated from manufacturing electric vehicles, electric powertrain components, and stationary energy storage systems (Annual Report, 2014, p. 4). The operating income is therefore separated from the income and expenses from financing activities, which is not the main business of Tesla. The operating income (expense) is supposed to be separated further into operating income (expense) from sales and other operating income (expense) to facilitate the forecasting of sales revenue. However, Tesla has not had any other operating revenue (expense) like restructuring charges, merger expenses, and gains or losses on asset sales in the years from 201O to 2015. Operating income from sales is therefore the same as total operating income.

The reformulated income statement is on a comprehensive basis. It therefore includes items from the separate statement of other comprehensive income, and dirty-surplus income items that are reported directly in the statement of changes in shareholder's equity. Tesla's statement of other comprehensive income does only consist of unrealized net loss on short-term marketable securities, a reclassification adjustment for gain included in net loss, and a foreign currency translation adjustment. These three items have been allocated to the net financial expenses in the reformulated statement.

The reformulated statement also allocates taxes so that income in each part of the statement is net of the taxes it attracts. Taxes on operating income would have been higher if the company had no debt. The tax benefit of having debt must therefore be allocated to operating income. Since Tesla has had losses in each year from 2009 to 2015, the company has not been able to get the tax benefit from the debt. In fact, the company has not paid any taxes, so the tax allocation cannot be done for Tesla. All income statement and comprehensive income statement items have been evaluated individually and allocated to the different parts of the reformulated statement after careful judgment. The reformulated income statement and a list of considerations made in the reformulation are presented in Appendix H.

The reformulated income statement clearly shows the total operating loss, total net financial expenses, and how the two add up to the total negative comprehensive income available to common shareholders.

The cash flow statement has not been reformulated since the valuation is not done using discounted cash flows. The residual income model is concerned with profitability rather than cash flows, so the balance sheet and the income statement is the primary focus. Reformulation of the cash flow statement is also unnecessary, because the free cash flow "falls out" from the reformulated balance sheet and income statement. The free cash flow is simply the operating income minus the change in net operating assets (Penman 2013, p. 344).

# 8 A Simple Valuation Model

From the reformulated financial statements, the valuation of Tesla's shares can be made using the residual income model from section 5.1. First, without doing any forecasting it can be shown, how the model works, by trying to calculate the total value of common stockholder's equity in the beginning of 2015. Tesla had a comprehensive loss of $892.197.000 in 2015 on a beginning of period book value of common equity of $911.710.000. With the required return to equity holders of 8,04% as calculated in section 6.1, the 2015 residual earnings was -892.197.000 - (8,04%*911.710.000) = $-965.498.484. With Tesla's huge loss in 2015, there was of course not an 8,04% return on the investment. In fact, the 8,04% was "lost" in addition to the comprehensive loss of $892.197.000 resulting in the rather extreme negative residual earning number in 2015 of $-965.498.484.

The equity value in the beginning of 2015 is found by adding the present value of forecasted residual earnings to the book value of equity in the beginning of 2015:

$$V^E_{2015} = B_{2015} + \frac{RE_1}{PE} + \frac{RE_2}{PE^2} + \frac{RE_3}{PE^3} + \ldots$$

When applying the 2015 numbers and not doing any forecasting yet, the model is as follows:

$$V^E_{2015} = 911.710.000 + \frac{-965.498.484}{1,0804} + \frac{?}{1,0804^2} + \frac{?}{1,0804^3} + \ldots$$

The beginning-of-the-year book value of 2015 + the discounted residual earnings for 2015 is 18.060.903 (911.710.000 + (-965.498.484/1,0804)). If the total equity value of $18.060.903 is divided by the 125.687.607 shares outstanding in the beginning of 2015 (Annual Report, 2015, p. 47), a share price of $0,14 is found. It can easily be seen that residual earnings after 2015 quickly has to turn positive for the equity value not to be negative, which is not possible, and for the intrinsic share price to be just somewhat close to the market price of $179.

The market capitalization or total equity value was $23.525.075.000 ($179*131.425.000) on February 24, 2016. So the market believes that the present value of future residual earnings is the astounding difference of $22.436.131.000 between the market capitalization of $23.525.075.000 and the beginning of 2016 book value of equity of $1.088.944.000 even though the present value of the residual income in 2015 was almost a negative $900 million (965.498.484/1,0804). If the market price is correct, the residual earnings in the following years cannot be similar to the 2015 residual earnings number. This requires Tesla to become very profitable soon.

The P/B ratio of 21,6 (23.525.075.000/1.088.944.000) is also much higher than the average P/B ratio of 2,5 for the S&P 500 over the last 30 years and the average P/B ratio of 6,68 for the 5% highest P/B firms (Penman 2013, p. 146 & 150). The market is clearly expecting a bright future for Tesla, which is reflected in the share price.

For residual earnings to turn positive, the comprehensive earnings must turn positive and higher than the required return charge on beginning-of-the-year book values. The reason for Tesla's huge loss in 2015 is due to the substantial investments in total operating expenses (R&D and SG&A) that are needed to facilitate future growth. The company actually had a gross profit of $923 million (see section 4.1), so further analysis is required to determine if comprehensive earnings can turn positive in the near future.

It is not easy to make a valuation of a firm that loses money in its early stages, because a growth rate cannot just be applied. Applying a growth rate to the negative residual earnings in 2015 does not make much sense. Instead, earnings must be carefully estimated to turn positive at just the right time. Tesla, for instance, has a lot of investments in its network of supercharger stations and in its Model X and Model 3 developments, which are only temporary. The firm may be having large losses, but the investments also increase the barriers to entry of competitors (Damodaran 2012, p. 637). Later, the forecasts of earnings will be added to the model, but first, the implied earnings growth rate in the market price will be analyzed.

## 9 Reverse Engineering

Before an attempt to find the intrinsic price is made, it should be acknowledged that investing is a game against other investors, and that the models are applied to challenge the other investors perception of value embedded in the share price. For that reason, it is unnecessary to calculate intrinsic value, which can easily be manipulated by changing the cost of equity or the long-term growth rate anyway. Instead, the market price can be challenged by determining the earnings growth rate that is implicit in the share price and accept or reject it as reasonable. This process is called reverse engineering the share price (Penman 2013, p. 212) "Rather than inserting inputs into a valuation formula to get a V, set V equal to P and ask what inputs explain the current market price, P" (Penman 2013, p. 214).

If this very simple residual income model is applied, the growth rate in residual earnings can be implied:

$$V^{E}_{2016} = B_{2016} + \frac{RE_{2016}}{\rho_E - g}$$

$$179 = 8{,}29 + \frac{0{,}71}{1{,}0804 - g}$$

The share price of $179 is equal to the book value per share of $8,29 in the beginning of 2016 (1.088.944.000/131.425.000) + the present value of future residual earnings per share, which is the first year residual earnings per share capitalized as a perpetuity with growth. The residual earnings forecast of 0,71 for 2016 is calculated by using the consensus forecast of EPS for 2016 (Yahoo Finance 2016a) and subtracting the required return charge on book value (1,38-(8,04%*8.29)). By using goal seek, the market's implied residual earnings growth rate of 7,62% was found. So for the share price of $179 to be justified, the EPS in 2016 must be $1,38, and the residual earnings must grow by 7,62% every year to infinity after 2016.

If the analysts' consensus forecast of EPS for both 2016 and the of course even more uncertain 2017 is applied in a two-stage residual earnings model without growth:

$$V^E_{2016} = B_{2016} + \frac{RE_{2016}}{\rho} + \frac{RE_{2017}}{\rho(\rho - 1)} + \text{value of speculative growth}$$

$$179 = 8{,}29 + \frac{0{,}71}{1{,}0804} + \frac{2{,}36}{1{,}0804(1{,}0804 - 1)} + \text{value of speculative growth}$$

The residual earnings number for 2017 is calculated by subtracting the required earnings charge on the beginning of 2017 book value of equity from the analysts' consensus forecast of EPS of 3,14 for 2017. The book value of equity in the beginning of 2017 is calculated by adding the consensus EPS of 2017 and subtracting 0 net dividends per share from the 2016 book value of equity.

The share price is now split into three components; the book value, the value from short-term residual earnings capitalized as a perpetuity without growth, and the more speculative value of growth. These three components can be summarized as what is known, what is fairly certain, and what is rather uncertain.

The calculations show that the share price of $179 is $8,29 book value, $27,83 of fairly certain value from consensus short-term earnings forecasts, and $142,88 from speculative growth.

This no-growth residual earnings model can easily be changed to a model with residual earnings growth by changing the -1 to -g and solving for g. The residual earnings after 2017 then need to grow by 6,76% each year for the share price to be $179.

The residual earnings growth rate can be converted to a growth rate in EPS, which may be easier to grasp (Penman 2013, p. 219). If the residual earnings grow by 6,76% for each year after 2017, the residual earnings can be forecasted, and the EPS forecasts can then be calculated by isolating the EPS from the residual earnings formula:

$$RE_t = EPS_t - (r_E * B_{t-1})$$

to

$$EPS_t = (r_E * B_{t-1}) + RE_t$$

When EPS forecasts for the following years have been calculated, the implied growth in EPS for the share price to be $179 can also easily be calculated. The EPS growth from 2017 to 2018 needs to be 13,13% The EPS growth rate for each of the subsequent years is slightly waning, but still above 11% for the next many years. If the investor believes the actual EPS growth rate will be higher than these rates, he should buy shares of Tesla. If he believes the actual growth in EPS will be lower, he should sell (or sell short). With Tesla's historical negative and volatile earnings per share, it is hard to use historical EPS growth rates to predict, what the EPS growth rates will be. According to Penman: "one might expect that all firms will look like the average firm in the very long run, with growth at the 4% GDP growth rate. This accepts the view that exceptional growth is ultimately eroded away" (2013, p. 220).

In this reverse engineering section, the analysts' consensus forecast of EPS for 2016 and 2017 was used. If these EPS numbers do not hold, the implied EPS growth rate will of course also change.

The residual income model can be applied on a per share basis like above or for all shares jointly and then divide by the number of shares outstanding. In the valuation using full-information forecasting and pro forma analysis, the latter method will be used, and author's own earnings forecast will of course be utilized.

## 10 Residual Operating Income and Pro Forma Analysis

In order to do the valuation, a forecast of comprehensive earnings and a forecast of future book values of common shareholders' equity must be made.

The comprehensive earnings number in the reformulated income statement was calculated by subtracting net financial expenses from operating income after tax. The book value of common shareholders' equity was calculated by subtracting net financial obligations from net operating assets. However, the net financial expenses and the net financial obligations do not need to be forecasted according to Penman (2013, pp. 434-469), if net financial obligations in the balance sheet are measured at market value. This simplifies the task and leaves only the operating income after tax and the net operating assets to be forecasted.

The reason is that balance sheet items measured at fair market value do not produce residual earnings. Remember that residual earnings only are different from zero if future earnings are different from the required return on the investment. The net financial expenses are not different from the required return on net financial obligations if net financial obligations are measured at market value. So the net financial obligations and net financial expenses do not contribute to the premium over book value that comes from residual earnings. To find the value of the common shareholders' equity, it is then enough to value the net operating assets and subtract the book value of net financial obligations. For a more detailed explanation see Penman chapter 14 (2013).

The valuation of net operating assets follows similar logic as the residual income model and is called the residual operating income model. The value is book value of NOA plus the present value of future residual operating income generated by the NOA:

$$V_0^{NOA} = NOA_0 + \frac{ReOI_1}{\rho_F} + \frac{ReOI_2}{\rho_F^2} + \frac{ReOI_3}{\rho_F^3} + \dots + \frac{ReOI_T}{\rho_F^T} + \frac{CV_T}{\rho_F^T}$$

where

$$ReOI_t = OI_t - (\rho_F - 1) * NOA_{t-1}$$

or

$$ReOI_t = (RNOA - (\rho_F - 1)) * NOA_{t-1}$$

and

$\rho_F$ is 1 + WACC,

RNOA is the return on net operating assets ($OI_t / NOA_{t-1}$)

So how should the forecasts of OI (operating income after tax) and the net operating assets (NOA) be made?

In a simple valuation, the residual operating income numbers could have been calculated by assuming that RNOA would continue at the current level. $OI_t$ could then be forecasted by multiplying $NOA_{t-1}$ by $RNOA_{t-1}$. This is not really a possibility in a valuation of Tesla's shares, since the historical RNOA is negative (see Appendix I) and future OIs and ReOIs would then also be negative. Penman also writes: "simple valuations will not work for a start-up firm with losses and most of its prospects based on speculation", and that simple valuations only are relevant for "relatively mature firms where the past is a reasonable indication of the future" (2013, p. 488). The past cannot be a reasonable indication of the future for Tesla, since Tesla's history is very volatile, and since no company can continue making losses of $800 million a year, while shares are selling at $179.

So instead of making simple forecasts of operating income, future operating income must be forecasted by making pro forma income statements that incorporate a broad range of information and forecasts operating income to turn positive at just the right time. These pro forma income statements will be made by analyzing one item at a time from revenue down to operating income after tax in the reformulated income statement. As mentioned, only the operating components of comprehensive income and not the net financial expenses need to be forecasted. In order to predict each of those items in the future reformulated income statements accurately, a few different analyses will help.

First, a profitability analysis will identify individual profit and cost margins in the reformulated income statement. Future margins can then be forecasted based on historical margins and approach the industry averages. The forecasted margins will be multiplied by forecasted sales in each year to make pro forma income statements.

Second, an identification of sustainable earnings will be made. Operating income from sales will be split into core operating income from sales, core other operating income, and unusual items. If the historical values for individual items in the reformulated income statement are to be used as the basis for the forecast, these values must be core values. This means that current costs and revenues that are considered not to persist in the future are excluded from the core numbers, and only those core numbers will be used as the basis for the forecast.

Third, the market for electric vehicles will be analyzed. What are the market growth rates? How long can Tesla keep growing? What is the effect of government incentives? What are the industry margins?

Fourth, who are the competitors and what are their plans for eroding Tesla's market share. When will the competitors introduce new cars? Has Tesla created barriers to entry for new competitors? Does Tesla have a sustainable competitive advantage that makes it possible to earn positive residual earnings?

Fifth, Tesla's most recent annual reports will be read to find the company's own belief about future cost savings and estimated car sales, etc. The insiders have more information, and their estimate for the future is assumed to be better than the estimate of an investor with no access to inside information.

Lastly, historical growth rates in the different "core" items will be considered, but this is not crucial, because growth rates can change.

The other item that needs to be forecasted to calculate future residual operating income is future levels of net operating assets. Future levels of net operating assets could be forecasted by extrapolating past growth rates in NOA, but as mentioned in section 5.1 that is unwise. "NOA is driven by sales and net operating asset turnover" (Penman 2013, p. 489), so future NOA will be calculated by dividing future levels of sales with future levels of net operating asset turnover. Future levels of sales and future levels of net operating asset turnover will be carefully forecasted in section 11.

## 10.1 Profitability Analysis

This section identifies individual profit and cost margins in the reformulated income statement. Future margins can then be forecasted based on historical margins and approach the industry average. The forecasted margins will be multiplied by forecasted sales in each year to make pro forma income statements. For all the calculations in this section see Appendix I.

The operating profit margin is calculated by dividing operating profit after tax by sales. This margin has fluctuated between -3% and -126% over the last five years and with no consistency. These historical margins are also not very useful in a forecast. The net operating asset turnover is calculated by dividing sales by net operating assets. The net operating asset turnover was around 1 in 2010 to 2012, increased to almost 5 in 2013, and dropped down to 1,57 in 2015. These numbers are also clearly less consistent than the net operating asset turnover of a more mature firm. For that reason, Damodaran emphasizes using the most recent numbers when making forecasts for a firm like Tesla (2012, p. 648).

The operating profit margin can be separated into the individual items that make up the operating profit margin. For Tesla in 2015 the operating profit margin of -18% came from a gross profit margin of 23%, when subtracting the cost margins of R&D/sales of 18%, SG&A/sales of 23%, and provision for income taxes/sales of 0,3%. If Tesla is to be profitable, it must increase its gross profit margin or decrease its cost margins. Damodaran also writes that it will be "reasonable to argue that Tesla's margins will approach those of other automobile manufacturers" (2012, p. 650). This can also be seen from the figures on pp. 509-512 in Penman's Financial Statement Analysis and Security Valuation (2013). The rate at which those margins approach industry averages depends, among other things, on the factors analyzed in section 10.3 to 10.5. The industry averages are found in section 10.3.3. Tesla's gross margin, R&D cost margin, and SG&A cost margin has over the last three years been relatively stable. The gross margin has been around 25%, the R&D cost margin around 15% and the SG&A cost margin around 19%. The R&D cost margin and the SG&A cost margin have both increased from 2013 to 2015 by around 3-5 percentage points per year.

The net operating asset turnover can also be separated into the individual turnover drivers. The most important operating assets and operating liabilities for Tesla's net operating asset turnover are inventory, operating lease vehicles, property plant & equipment, accounts payable, and resale value guarantee. These items will be further analyzed, before the forecast of future net operating asset turnover levels is made in section 11.

## 10.2 Identification of Sustainable Earnings

If historical values of different items in the reformulated income statement are used as a basis for the forecast, these historical values must first be analyzed. The historical values should be analyzed to identify sustainable values. If historical values of revenue, R&D expenditures, SG&A expenditures, etc. come from temporary events that are not expected to persist in the future, these values should be excluded from the historical values that the forecast will be based on. So each item in the reformulated income statement down to operating income after tax has been examined and split into core values from sales, core other values, and unusual items. The current and historical values that the forecast will be based on are then only core values from sales and other core values. Below, one item at a time has been examined to find core values:

- Core sales revenue: Revenue from new car deliveries, sales of regulatory credits, etc. were all considered core and persistent in the future (Annual Report, 2015, p. 38).
- Core cost of sales: Also, none of the costs of automotive revenue or costs of development services (Annual Report, 2015, p. 38) were considered unusual items or core other operating income.

Operating expenses:

- Research and development: Are Tesla's high levels of R&D expenditures temporary? Start-up costs are usually one-time events, but for a company that continues to grow like Tesla, R&D expenditures may be persistent (Penman 2013, p. 398). The R&D costs primarily consisted of "personnel costs for our teams in engineering and research, supply chain, quality, manufacturing engineering and manufacturing test organizations, prototyping expense, contract and professional services and amortized equipment expense" (Annual Report, 2015, p. 39). At least the prototype development here is an unusual item, but the prototype developing costs are not distinguished from the aggregated R&D expense number anywhere in the financial statement.

There is some disclosure, however, about the changes in R&D expenditures from year to year. In 2015, $93.9 million was due to Model X development and Model S improvement, 30.6 million was due to an increase in facilities, and further $20.1 million was related to design and testing activities of the Model X. These costs have been allocated to unusual items that are not expected to continue in the future. In 2014, $60.7 million, $50.9 million, and $3.3 were considered temporary R&D expenses (Annual Report, 2015, p. 39). The 2012 R&D expenditures were higher than the 2013 expenditures due to $18.2 million expensed materials, $7.8 million Model S design and testing, $6.6 million Model S shipping charges for prototype materials, and $4.9 million office costs, which have been considered unusual items in 2012. The 2012 R&D expenditures were also $21.1 million plus $3.3 million higher than the 2011 expenditures due to items considered unusual (Annual Report, 2013, p. 80). The 2011 expenditures were increased from 2010 by $38.1 million of prototype expenses and $30.9 million design and testing expenditures, which were also considered unusual (Annual Report, 2011, p. 91). $10.5 and $10.7 million in 2010 were also considered unusual.

- Selling, general & administrative: None of the costs in the Annual Report 2015 (p. 39) are considered unusual.

The examination of the different items did not reveal much, and the identification of core values was ultimately not an easy task from the aggregated financial statement items. Only the R&D expenditures could be separated from the limited information in the Annual Report. The separation showed that around 20%-30% of R&D expenditures were spent on developments of new car models, and those costs cannot be expected to persist in years, where Tesla is not about to come out with a new model. Even after removing the identified temporary R&D costs, the core operating income was still negative in all years. This also proves that the more comprehensive valuation that includes pro forma income statements needs to be used. A simple growth rate in core operating income cannot just be applied.

Like in section 10.1, where the operating profit margin was separated into the individual items that make up the operating profit margin, the core sales profit margin can be split into the individual items that make up the core sales profit margin. This analysis showed that core R&D expenditures as a percentage of core sales were 12%-14% in each of the last three years instead of the 12%-18% total R&D expenditures of total sales found in the profitability analysis.

## 10.3 The Current and Future Market for Electric Vehicles

Knowledge of the electric vehicle market is also necessary, when one is to make a usable forecast about the performance of one of the market players. If the market is declining it must, for instance, be well-argued if a high terminal growth rate is applied in the forecast. Damodaran (2012, p. 649) mentions three important points, when estimating revenue growth: First, as the firm increases in scale, "it will become more and more difficult to maintain very high growth rates." Second, "it is far easier for firms to maintain high growth rates in markets that are themselves growing at high rates". And third, "for a firm to be able to sustain high growth rates, it has to have some sustainable competitive advantage". The second point about the market growth will be analyzed below. The analysis of sustainable competitive advantages is included in section 10.4.3.

### 10.3.1 Market Growth Analysis

By using the industry research function in the Orbis database and searching for industry data for Tesla and Tesla's SIC code "3711 – Motor Vehicles and Passenger Car Bodies", a global car industry report and a global hybrid & electric vehicle report by Marketline were found (Marketline 2015a, Marketline 2015b). These reports will be used as sources for the industry information.

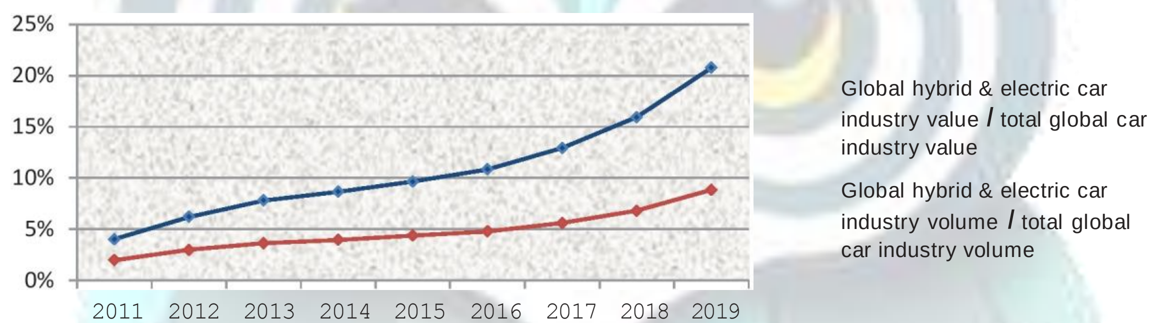
The global car manufacturing industry value was $891 billion in 2014 with 64.6 million cars produced (see Appendix J). The market value is forecasted to grow by 5,6% annually until 2019, and the number of cars produced is forecasted to grow by 5,3% annually until 2019. Volkswagen is the leading player with 14% market share followed by Toyota (9,9%), GM (7,5%), and Hyundai (4,7%). With Tesla's production of 50.574 cars in 2015 out of the global production of more than 64 million cars, its market share in 2015 was only around 0,08%.

The global hybrid & electric car industry value was $77 billion in 2014 with 2.55 million cars produced (see Appendix J). The market value is forecasted to grow by 25,9% annually until 2020, and the number of hybrid and electric cars produced is forecasted to grow by 23,5% annually until 2020. The hybrid car volume makes up 88,4% of the market, while only 11,6% of the volume is from fully electric vehicles equivalent to 295.284 fully electric vehicles. Tesla's share of the global hybrid & electric vehicle market was around 1,2% in 2014, and its share of the fully electric vehicle market was around 10,7%. Based on Marketline's 2015 forecast and Tesla's actual 2015 numbers, Tesla's share of the global hybrid & electric vehicle market was 1,7% in 2015, and its share of the fully electric vehicle market was 14,8%. Toyota is the leading player in the hybrid & electric vehicle market with 41,5% market share followed by Honda (10,7%), Nissan (1,3%), and then Tesla (1,2%).

The global car manufacturing industry value was calculated using manufacturer selling prices, and the hybrid & electric vehicle industry value was calculated using retail selling prices, but by dividing the hybrid & electric car industry value by the global car industry value the approximate market share of the hybrid & electric vehicles could be found. Because of the difference in measurement, the percentages are slightly overstated, but the trends would be similar if both industries were measured using retail prices.

The following graph shows the development of the hybrid & electric vehicle industry value and volume out of the total car industry value and volume from 2011-2019. The 2015-2019 percentages are calculated from forecasted numbers.

FIGURE 3: HYBRID & ELECTRIC VEHICLE INDUSTRY DEVELOPMENT




Compiled by author. Sources: (Marketline 2015a, Marketline 2015b)

The hybrid & electric vehicle industry currently makes up only around 9,6% of the total car industry value and 4,4% of the volume. With the forecasted higher growth rates for the hybrid & electric vehicle industry, this segment is forecasted to make up around 20,8% of the total car industry value and around 8,8% of total car industry volume by 2019. The hybrid & electric vehicle market is indeed growing at high rates, and it will thus be easier for Tesla to maintain the company's own high growth rates according to Damodaran (2012, p. 649).

Marketline's forecasted value and volume of the hybrid & electric vehicle industry shows increasing annual growth rates in the industry from 2014-2019 before the growth rate declines in 2020. So there is no indication from the market growth rates that Tesla should not be able to maintain or even increase its own growth rates at least until 2020, when market growth rates start declining. If the people of the world become more environmentally conscious, and if technological advancements in battery cell production remove the obstacles like perception of limited range, more trouble with refilling, and higher prices, there is potentially no reason as to why sustainable energy vehicles could not take over the whole car industry. If this is the case, it will take many years as the hybrid & electric car volume is only forecasted to make up around 8.8% of the total car industry volume in 2019, and if so, Tesla will be able to maintain its high growth rates even longer.

### 10.3.2 Government Incentives

Governments and local authorities all over the world use various incentives to promote both production and purchases of the more environmentally-friendly hybrid and fully electric vehicles. This section takes a look at the incentives and analyzes, what changes in those regulations could mean for future Tesla sales.

To promote the production of environmentally-friendly vehicles, Tesla receives sales tax exclusions on purchases of manufacturing equipment from a Californian authority shortened CAEATFA. Tesla also receives tax abatements until 2034 in connection with the construction of the Gigafactory, although the abatements are subject to investment requirements in Nevada. Currently, Tesla also earns revenues from selling ZEV credits, GHG credits, and CAFE credits. These are credits that can be traded among manufacturers to comply with standards set by state legislators, the Environmental Protection Agency, and the National Highway Traffic Safety Administration. For instance, from 2018 at least 15,4% of the cars sold by all the large-volume manufacturers in California must be zero-emission vehicles, and those not complying must buy credits from manufacturers with excess credits like Tesla (Annual Report, 2015, p. 10).

In order to promote purchases of environmentally-friendly vehicles by the final consumers, governments must "carry out some financial incentives to convince consumers that EVs are not only environmentally-friendly, but also economical." Consumers "are not willing to pay for social benefits that would not directly benefit themselves in the short time" (Zhang et al. 2014, p. 8061). "Government incentives have played a vital role in the development of the industry" (Marketline 2015b, p. 14). In the U.S. "all-electric and plug-in hybrid cars purchased in or after 2010 may be eligible for a federal income tax credit of up to $7.500. The credit amount will vary based on the capacity of the battery used to power the vehicle. State and/or local incentives may also apply" (U.S. Department of Energy 2016). All Tesla car purchases receive the full credit. State incentives are often rebates of

$1.000 - $2.500 and carpool lane access. China has run a pilot program in 5 cities since 2010 offering a rebate of 60.000 yuan ($8.785) for fully electric vehicles and 50.000 yuan for plug-in hybrids (Motavalli 2010), but existing incentives will be gradually phased out and replaced by a credit-trading system like the one in the U.S. to ensure government neutrality on the market development (Spring 2016). In Norway, electric vehicles have become very popular, and it is also a market that has received significant incentives. In that market, "the purchase of electric vehicles is not currently subject to import taxes, taxes on non-recurring vehicle fees, the 25% value added tax or the purchase taxes that apply to the purchase of gas-powered vehicles" (Annual Report, 2015, p. 19).

A reduction or elimination of incentives could have a severe negative impact on demand. Around half of all Tesla cars are sold in the U.S. (Annual Report, 2015, p. 72), so changes in incentives in the U.S. will have the biggest effect on Tesla. However, also incentive changes in the smaller markets can have an impact. For instance in Denmark, the registration fee exemption for electric vehicles is gradually being phased out from 2016 to 2020. This means that the price of electric vehicles has increased in 2016 by 20% of the 180% registration fee. This policy change has had a huge effect on the Tesla sales in Denmark. In fear of the price increases, 1.248 Model S cars were sold in December 2015 up from around 50 - 200 cars sold monthly throughout 2015 (Kane 2016). From January to April 2016, only 41 Tesla cars have been sold in Denmark compared to 285 for the same period in 2015 (De Danske Bilimport0rer 2016).

In forecasting total revenues, the forecasted unit sales will though not account for possible future changes in incentives, as this is dependent on decisions made by the future governments in all of Tesla's markets, and since the exact impact on sales numbers from different incentives are not available. However, possible government incentive changes are another uncertainty in the valuation of Tesla, which can have a huge effect on the intrinsic price, and that should be acknowledged.

### 10.3.3 Industry Margins

If Tesla's margins over time will approach industry averages, which it is reasonable to assume according to Damodaran (2012, p. 650), these margins must first be found. The margins needed for the valuation are gross profit margin, R&D cost margin, SG&A cost margin, operating profit margin, and also the net operating asset turnover. These values were found using Orbis for Tesla's competitors (see Appendix K). The averages of the competitors' margins were used as an approximation of the industry margins. The competitors included here are the ones mentioned in the Annual Report, 2015 (p. 12 & 18), and the biggest players in the abovementioned Marketline reports.

The average gross profit margin for the competitors for the last available financial year was found to be 25,36%, and the average over the last five years was found to be 25,01%.

The R&D cost margin is the R&D expenditures/revenues, the SG&A cost margin is the SG&A expenditures/revenues, and the operating profit margin is the operating income/revenues.

The average R&D cost margin for the competitors for the last available financial year was found to be 4, 15%. The number has slightly increased over the last five years with the average being 3,97%.

The average SG&A cost margin for the competitors could not be found in Orbis. It was instead calculated from the income statements of General Motors (General Motors 2015), Toyota (Toyota 2015), and Nissan (Nissan 2014). The average of those three competitors was 10,34% over the last three years, so an industry average SG&A cost margin of 10% will be assumed.

The average operating profit margin for the competitors for the last available financial year was found to be 6,54% with the average of the last five years being 6,02%.

The net operating asset turnover is the amount of revenue per dollar of net operating assets. This value can only be found by reformulating the financial statements of the competitors and taking the average. For that reason, the forecasts of net operating asset turnover will not be assumed to approach the industry average.

## 10.4 Competitive Analysis

### 10.4.1 Current Competitors

This section looks at Tesla's competitors to find out, what the alternatives to buying a Tesla car are now and in the near future. If the competitors plan to come out with a new model and in particular a new fully electric vehicle, the possible effect on Tesla's sales should be included in the forecast.

In Tesla's Annual Report (2015, p.12) they mention Audi, BMW, Mercedes, and Toyota's premium brand Lexus as the primary competitors to the Model S. The BMW i3 captured 5% of the market for fully electric vehicles in the US in January 2016 with 182 vehicles sold compared to 1.300 of Model S. Of the Mercedes B-Class Electric only 58 units were sold (Cobb 2016b). Among hybrids and plug-in hybrid vehicles, these four brands are featured on the top-selling lists in January 2016 with the Audi A3 Plug-In, BMW XS, BMW iS, Mercedes 8550 Plug-In, Lexus RX 400/450, Lexus CT200h, Lexus ES Hybrid, and Lexus NX Hybrid (Cobb 2016b). These four competitors may though of course also have been mentioned due to their traditional combustion engine models.

Perhaps more relevant for the forecasts in the valuation is the release of new models by the competitors in the near future. It is stated in the Annual Report, 2015, that "Porsche, Lexus, Audi, Volkswagen, and Volvo, as well as a number of prospective automobile manufacturers, are developing electric vehicles" (p. 12), so this was investigated.

Porsche is developing an all-electric sedan to challenge Tesla's Model S (Karkafiris 2015). Its Mission E "will be on the road at the end of the decade", be able to recharge in half the time it takes to recharge a Model S currently, and will have a range of more than 310 miles (Ziegler 2015) a bit more than the Model S. The acceleration will be from 0-100 km/h in 3,5 seconds, a bit slower than the Model S' 3,0 seconds. The Mission E even comes with inductive charging (Porsche AG 2016), but nothing about the price has been revealed yet, except that "it will be competitive" and "the Porsche is always worth its price" (Cole 2015).

Although Tesla writes in the Annual Report that Lexus is developing electric vehicles, it looks like Lexus is focusing on hybrids under "future" at www.lexus.com and in their controversial ads that slam fully electric vehicles on charging time and range (Atkinson 2014).

After releasing the Audi RS e-tron supercar, Audi might also come out with other new fully electric vehicles shortly (Halas 2015). The RS e-tron supercar comes at a price of £119.500 or $173.927 (Betters 2015), so it is not really in direct competition with the Model S passenger car. Audis head of engineering has made this announcement: "in early 2018, we will launch a battery-powered sports activity vehicle in the large premium segment with a range of more than 500 kilometers (+310 miles), according to John Halas (2015). The name will be Audi Q6 e-tron quattro and could cost $87.000 and be a rival to the Tesla Model X (Sheehan 2016).

VW is also taking on the Model S with its fully electric Phaeton coming out around 2020. It will share battery technology with the upcoming Audi Q6 e-tron, and have a range of 250-500 km (155-31O miles) (Moss 2015). The Phaeton has historically been sold for $S5.000 or more (Fountain 2015).

Volvo also has plans for a new full electric vehicle in 2019 similar in size to Tesla's

Model 3 and "will head up a wider plan to electrify the entire Volvo range by 2020" (Ingram 2015).

It is evident that many of Tesla's competitors are developing their own fully electric vehicles and that competition will tighten in 2018-2020 as new models are introduced on the market. Tesla will, of course, have a few more years before then to further develop their own technologies to continue being ahead of the competition. If Tesla has sustainable competitive advantages, it will be easier to stay ahead, so this is analyzed in section 10.4.3.

### 10.4.2 New Competitors

New competitors could also enter the market and make it harder for Tesla to sustain the high growth rates, but this is not easy if entry barriers are high. On the other hand, "the most attractive segment is one in which entry barriers are high" (Kotler et al. 2009, p. 304), and with government incentives and high forecasted growth rates new competitors are encouraged to try to enter, even though entry barriers are high. According to the hybrid and electric vehicle industry report, "it is relatively difficult for new players to directly enter the market due to the importance of brand strength, reputation within the new cars market and huge prior entry financial expenses. Those cars that are succeeding are more often than not simply the brands of existing car manufacturers" (Marketline 2015b, p. 18), as seen in the previous section. Capital requirements for entry are high, but "as consumers become more receptive to alternative fuel vehicles, incumbents may face more threat from new entrants offering innovative products" (Marketline 2015b, p. 15). So Tesla must be wary of new competitors with innovative products, but at the same time, Tesla has open-sourced their patents in consistency with their mission to accelerate the world's transition to sustainable transport (Annual Report, 2015, p. 12), which perhaps only help potential entrants.

A potential new entrant, which has attracted a lot of media attention lately is the electronics giant Apple. Tesla's CEO Elon Musk calls Apple's plans to make an electric car an open secret. He also mentions electrification and autonomy as the two main innovations in the car industry, so companies working on autonomous driving might also be a threat of a new entrant (Cellan-Jones 2016). Apple has hired 50 employees, who previously worked at Tesla (Colt 2015) and the shipping date might be 2019, though Apple is quiet about the project (Wakabayashi 2015).

Google is another giant with the capital requirements to overcome that entry barrier. The company is working on a self-driving car, which could be a future competitor to

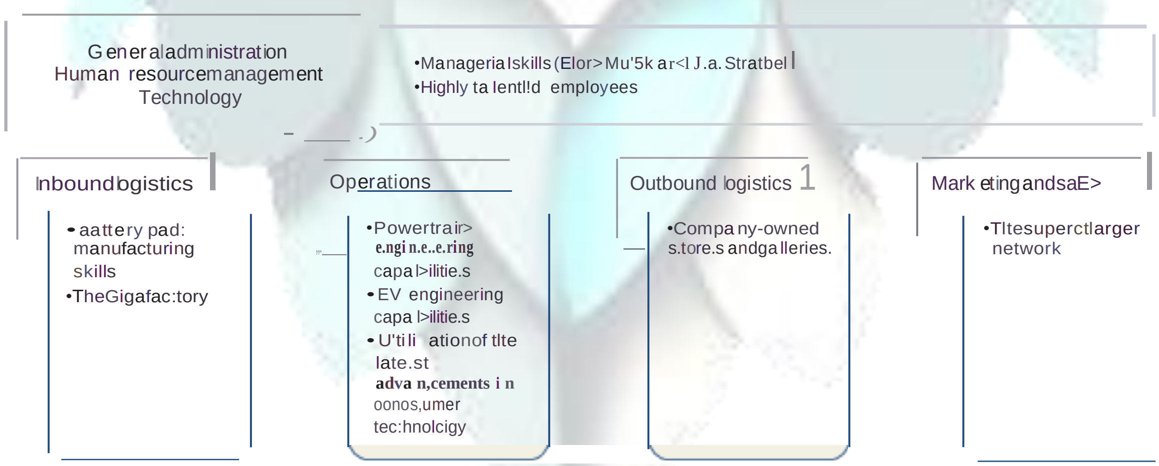
Tesla. According to Thomas Halleck, Google and Tesla are racing to come out with an autonomous vehicle first, but it will not be until somewhere between 2020-2023 (2015). Overall, the threat of new entrants is considered weak to moderate, although the open-source patent policy intensifies the threat a bit. If Tesla is unable to sustain their high growth rates, it is rather due to competition from other well-established car manufacturers than from new entrants, at least in the short-term.

### 10.4.3 Sustainable Competitive Advantage

If Tesla has sustainable competitive advantages that competitors or new entrants cannot easily imitate or substitute it will be easier for Tesla to sustain the high growth rates. Profits are also more likely to be sustainable (Dess et. al. 2006, p. 86). So this section analyzes if Tesla has sustainable competitive advantages.

Barney (1991, p. 102) defines a firm with a sustainable competitive advantage as a firm that "is implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy". For other firms to be unable to duplicate the benefits of the strategy, the firm resources underlying the strategy must be valuable, rare, imperfectly imitable, and unsubstitutable. Tesla's most value creating resources has been identified from the Annual Report and by using Porter's value chain analysis (1985), and each has been assessed for its sustainable competitive advantage characteristics. Tesla's value chain as analyzed can be seen in the following graph:

FIGURE 4: TESLA'S VALUE CHAIN




Compiled by author

Tesla's value chain is vertically integrated, which contributes to quality control and cost reductions. The battery pack manufacturing skills and the Gigafactory are considered as inbound logistics, because they are upstream in the value chain, but they could as well have been considered under operations. The general administration, human resource management, and technology support activities add significant value through important relationships with the primary activities, especially operations and inbound logistics. The summary of the sustainability assessment of the individual competitive advantages can be seen in the following graph, while the analysis is included in Appendix L.

TABLE 2: TESLA'S RESOURCES & COMPETITIVE IMPLICATION

| Resource | Valuable | Rare | Difficult to imitate | Without substitutes | Competitive Implication |
|---|---|---|---|---|---|
| Battery pack manufacturing skills | Yes | Yes | Yes | Yes, but see appendix | Sustainable competitive advantage |
| The Gigafactory | Yes | Yes | No | Yes | Temporary competitive advantage |
| Powertrain engineering capabilities | Yes | Yes | No | No | Temporary competitive advantage |
| Electric vehicle engineering capabilities | Yes | No | No | No | Competitive parity |
| Utilization of the latest advancements in consumer technology | Yes | Yes | No | No | Temporary competitive advantage |
| Company owned stores and galleries | Yes | Yes | No | No | Temporary competitive advantage |
| The supercharger network | Yes | Yes | No | Yes | Temporary competitive advantage |
| Managerial skills (Elon Musk & J.B. Straubel | Yes | Yes | Yes | Yes | Sustainable competitive advantage |
| Highly talented employees | Yes | Yes | Yes | No | Temporary competitive advantage |

Compiled by author

Tesla's battery pack manufacturing skills and managerial skills were the only resources or capabilities considered to give rise to a sustainable competitive advantage. Several other resources or capabilities allow Tesla to stay ahead of competitors temporarily until those resources or capabilities are eventually imitated or substituted by the competition.

The battery pack manufacturing skills make it possible to develop battery packs with similar performance as competitors at a lower price or develop better performing battery packs at the same price as competitors and not only temporarily. It is hard to measure the effect of managerial skills, but one could argue that the right strategic choices, vision, and drive of the managers infuse the whole organization and improves performance throughout. For that reason, it is assumed that margins can stay slightly above industry averages. As long as Elon Musk and J.B. Straube! still work at Tesla, the company will enjoy this competitive advantage. For a description of their importance and contribution to Tesla see also Vance (2015).

## 10.5 Tesla's Own Estimates of the Future

The information found by the four analyses above will be combined with information from Tesla's Annual Report 2015 to forecast the different income statement items. Here, the main points from the Annual Report about future expectations are listed:[5]

- Tesla expects "that demand for our vehicles will continue to increase worldwide as more people drive and become aware of our vehicles, as we grow our customer sales and service infrastructure, and as we continue to develop our products" (p. 32).
- The battery pack system has been designed with flexibility that allows for future development and cost reductions (p. 6).
- The operating costs (R&D and SG&A) are expected to increase significantly while developing Model 3, increasing production capacity, developing the Gigafactory and opening new supercharger locations and service centers around the world (p. 22).
- Tesla expects that "annual production will increase considerably each year for the next several years" (p. 32).
- The cost of revenues is expected to decrease as a percentage of sales "over the next several quarters" as production is ramped, thereby improving the gross margin, which was at 23% in 2013, 28% in 2014, and at 23% again in 2015. Those previous profit margins were depressed by manufacturing inefficiencies related to new product introductions (p. 33) (see Appendix I).
- Tesla expects that their gross margin will increase in 2016, and that they will be profitable by the fourth quarter of 2016 (p. 33).
- Their operating expenses (R&D and SG&A) are expected to grow by about 20% in 2016 (p. 33).
- They "expect SG&A expenses to decline over time as a percentage of revenue" and "total operating expenses to decrease as a percentage of revenue" (p. 33).
- The lower gross margin in 2015 compared to 2014 was primarily due to more vehicles being sold with a lower selling price (p. 39). In 2017-2018, when the lower priced Model 3 is introduced, the gross margin must then also gradually decrease as more of the lower priced Model 3 cars are sold.

[5] Only points not already mentioned in the company profile in section 4 are listed here

Before combining the information from the different analyses above into forecasted income statements needed for the future residual operating income calculations, it should be noted that forecasts are no more than a thorough estimate about the future and especially so for a relatively young, high-growth company like Tesla. It is not without reason that 14 pages in the Annual Report are describing currently known risk factors that could adversely affect Tesla's business. These include factors within Tesla's control such as cost control, meeting delivery deadlines, and that products perform as expected with zero defects. They also include factors partly within Tesla's control such as perception about limited range and access to charging stations, but also factors outside the control of Tesla such as economic development, the market's adoption of electric vehicles, the development of gasoline prices, etc.

# 11 Forecasting and Valuation

The first item in the reformulated income statement that needs to be forecasted is the total revenues. Total revenues are the sum of revenues from automotive sales and revenues from services & other.

Revenues from automotive sales comprise revenues from deliveries of new cars, regulatory credits and leasing revenue (Annual Report, 2015, p. 38). Ideally, these would have been forecasted separately, but the majority of the revenue is from deliveries of new cars (Annual Report, 2015, p. 35), so the forecast is based on future unit sales of the three different models and their average selling prices. This way is still more detailed than the recommended approach by Damodaran though (2012, p 296). Tesla's sales are more constrained by supply than demand, so the forecasted number of cars sold will be driven by the production capacity.

TABLE 3: REVENUE FORECAST

| Revenue forecast | 2010A | 2011A | 2012A | 2013A | 2014A | 2015A | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit sales | | | | | | | | | | | |
| Model S units | | | 2.650 | 22.477 | 31.655 | 50.366 | 65.000 | 65.000 | 60.000 | 60.000 | 60.000 |
| Growth | | | | 748% | 41% | 59% | 29% | 0% | -8% | 0% | 0% |
| Model X units | | | | | | 208 | 20.000 | 65.000 | 58.000 | 58.000 | |
| Growth | | | | | | | 9515% | 225% | -11% | 0% | 0% |
| Model 3 Units | | | | | | | | 10.000 | 60.000 | 190.000. | 382.000 |
| Growth | | | | | | | | | 500% | 217% | 101% |
| Total units | | | 2.650 | 22.477 | 31.655 | 50.574 | 85.000 | 140.000 | 178.000 | 308.000 | 500.000 |
| Growth | | | | 748% | 41% | 60% | 68% | 65%"4 | 27%"4 | 73%"4 | 62%"4 |
| Avg. price/unit (t) | | | | | | | | | | | |
| Model S | | | | | 95' | | | 90 | 90 | 90 | go' |
| Model X | | | | | | | | 103 | 103 | 103 | 103 |
| Model 3 | | | | | | | | 45' | 45' | 45' | 45' |
| Automotive revenues (t) | | | | | | | | | | | |
| Model S | | | | | | | 5.850.000 | 5.850.000 | 5.400.000 | 5.400.000 | 5.400.000 |
| Model X | | | | | | | 2.057.120 | 6.685.640 | 5.965.648 | 5.965.648 | 5.965.648 |
| Model 3 | | | | | | | | 449.995 | 2.699.970 | 8.549.905 | 17.189.809 |
| Total automotive revenue | 116.744 | 204.242 | 413.256 | 1.921.877 | 3.007.012 | 3.740.973 | 7.907.120 | 12.985.635 | 14.065.618 | 19.915.553 | 28.555.457 |
| Growth | | 75% | 102% | 365% | 56% | 24% | 111% | 64% | 8% | 42% | 43% |
| Services and other revenue | | | | 91.619 | 191.344 | 305.052 | 781.026 | 1.523.068 | 1.916.605 | 3.107.105 | 5.049.000 |
| % of total revenue | | | | 4,55% | 5,98% | 7,54% | 9,0% | 10,5% | 12,0% | 13,5% | 15,0% |
| Growth in %-points of total revenue | | | | | 1,43% | 1,56% | 1,5% | 1,5% | 1,5% | 1,5% | 1,5% |
| Total revenues | | | | 2.013.496 | 3.198.356 | 4.046.025 | 8.688.146 | 14.508.703 | 15.982.223 | 23.022.658 | 33.604.457 |
| Growth | | | | | 59% | 27% | 115% | 67% | 10% | 44% | 46% |

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Tesla's own estimate of the production for 2016 is 80.000-90.000 Models S and X. With 20.000 reservations made for the Model X at the end of 2014 (Annual Report, 2014, p. 47), and with an increase in production of Model S cars of around 20.000 the first year after its introduction, the Model X unit sales for 2016, when it is introduced in Europe and Asia, is estimated to be 20.000. 65.000 Model S cars must then be sold in 2016 for the 80.000-90.000 estimation to hold. The maximum production capacity of the Fremont plant is 500.000, which Tesla expects to achieve by 2020. The explicit forecast is due to this fact made until 2020. If demand for Model 3 surges in Europe and China, new factories to supply local markets might be build, so an explicit forecast longer than 2020 would also be very uncertain. The 500.000 will be from all three Models, but since Model 3 is going to be the high-volume production car targeted at the mass market, the production of the two other Models are expected to stay level after the introduction of the Model 3, as the focus is turned to ramping production of that Model. Until Model 3 deliveries start in the 4th quarter of 2017 in the US, the Model X is estimated to reach a production level similar to the Model S. In 2018 the unit sales of Model S and X is estimated to drop by 5.000 from the 2017 level due to cannibalism from the Model 3. Model X is estimated to drop by a further 2.000 units due to competition from the Audi Q6 e-tron quattro.

In 2018, Model 3 deliveries start in Europe and Asia and the production level is expected to reach a level similar to Model S and Model X within the first year. In 2019 and 2020, the production of Model 3 is speeded up rapidly to reach a total production of 500.000 cars in 2020. The competition is intensified in 2018-2020 by Volvo, VW, and Porsche, but the increased brand awareness from Model 3 sales, will enable Tesla to keep unit sales of Model S and X at 2017 levels despite pressure from competitors. Tesla's own production plan is nowhere to be found, but the estimations above are not too far from those based on comments from Tesla's management in a Bloomberg article by Daniel Sparks (2015).

The Model S was introduced at a price of $70.000, but with the different battery packs and other additional purchase options, the average selling price is higher. The average selling price was estimated by dividing automotive sales revenue in 2013 and 2014, when Tesla only sold Model S, with the number of Model S units sold in those years. The average price was $86.000 and $95.000 in the two years respectively. Estimations of future Model S revenues have been calculated using an average selling price of $90.000. This is 28,57% above the starting price of $70.000. The average price estimate of Model X of $103.000 is also 28,57% above the Model X starting price of $80.000, and the average price estimate of Model 3 of $45.000 is also 28,57% above the Model 3 starting price of $35.000. The total automotive revenue and growth rates can be seen from table 3.

Revenues from "services and other" are revenues from repair and maintenance, merchandise, powertrain components to Daimler and Toyota, and Tesla Energy products (Annual Report, 2015, p. 38). Ideally, these items would also have been forecasted individually, but since they in total only made up 7,54% of the total revenues in 2015, more attention was given to forecasting revenues from automotive sales. The 7,54% in 2015 is an increase from 5,98% in 2014 and 4,55% in 2013. This is around a 1,5 %-points increase per year. The forecast extrapolated this %-point growth, since the production can be ramped after it moved to the Gigafactory in 2015 (see Appendix A). In 2020, revenue from services and other will then make up 15% of total revenues, which is not unrealistic.

The income statement items below total revenues can then be estimated by multiplying forecasted margins by forecasted total revenues in each year.

TABLE 4: PRO FORMA INCOME STATEMENTS

| Pro forma income statements | 2010A | 2011A | 2012A | 2013A | 2014A | 2015A | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total revenues | 116.744 | 204.242 | 413.256 | 2.013.496 | 3.198.356 | 4.046.025 | 8.688.146 | 14.508.703 | 15.982.223 | 23.022.658 | 33.604.457 |
| - *Expenses* to *generate soles:* | | | | | | | | | | | |
| Costs of automotive sales | | | | | | | | | | | |
| Costs of services and other revenue | | | | | | | | | | | |
| Gross profit | 30.731 | 61.595 | 30.067 | 456.262 | 881.671 | 923.503 | 2.432.681 | 3.191.915 | 4.794.667 | 7.137.024 | 10.753.426 |
| Gross margin | 26,32% | 30,16% | 7,28% | 22,66% | 27,57% | 22,82% | 28% | 22% | 30% | 31% | 32% |
| Research and development | 92.996 | 208.981 | 273.978 | 231.976 | 464.700 | 717.900 | 861.480 | 1.033.776 | 639.289 | 920.906 | 1.344.178 |
| Selling, general and administrative | 84.573 | 104.102 | 150.372 | 285.569 | 603.660 | 922.232 | 1.106.678 | 1.328.014 | 1.462.373 | 2.106.573 | 3.074.808 |
| Total expenses to generate sales | 263.755 | 456.219 | 807.675 | 2.077.367 | 3.394.449 | 4.762.654 | 8.223.624 | 13.678.579 | 13.289.218 | 18.913.114 | 27.270.017 |
| Operating income from sales (before tax) | -147.011 | -251.977 | -394A19 | -63.871 | -196.093 | -716.629 | 464.523 | 830.125 | 2.693.005 | 4.109.545 | 6.334.440 |
| - tax as reported | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 294.559 | 1.371.230 | 2.135.899 |
| - tax benefit from net financial expenses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62.771 | 272.588 | 397.877 |
| Operating income from sales (after tax) | -147.011 | -251.977 | -394.419 | -63.871 | -196.093 | -716.629 | 464.523 | 830.125 | 2.335.674 | 2.465.727 | 3.800.664 |
| Operating income after tax | -147.011 | -251.977 | -394A19 | -63.871 | -196.093 | -716.629 | 464.523 | 830.125 | 2.335.674 | 2.465.727 | 3.800.664 |

Compiled by author

The next two items to be forecasted are the costs of automotive sales and the costs of services and other revenue, which when subtracted from the total revenues gives the gross profit.

The average gross profit margin of the competitors is around 25%, and Tesla's own gross profit margin has been 23% in 2013 and 2015 and 28% in 2014. As earlier mentioned, previous gross profit margins were temporarily depressed due to manufacturing inefficiencies related to new product introductions. The gross margin is estimated to improve as production is ramped. When production volume is increased, it is reasonable to assume that the unit costs of the direct parts decrease due to economies of scale. The sustainable competitive advantage in battery pack manufacturing is also assumed to lead to lower costs of automotive revenues and improved gross margins in the future. Tesla estimated the battery costs to decrease by 30% a year after the production of Model 3 is initiated, which will be in 2018. The gross profit margin in 2016 is estimated to be similar to the high 2014 level, when no new models were introduced. The 2017 margin is estimated to be at a level similar to 2015, when Model X was introduced. In 2018, the battery cost reductions are estimated to improve the margin up to 30%, which is similar to the highest level Tesla has historically had, and even after the company has started selling a lower priced model with a lower profit margin than the more expensive models. In 2019 and 2020, economies of scale are estimated to improve the gross margin further, and Tesla is assumed to be able to retain a higher margin than the industry average due to the sustainable competitive advantage in battery pack manufacturing.

The next item to forecast is the R&D expenses. Tesla's core R&D cost margin was 12% in 2013, 11% in 2014, and 14% in 2015, while competitors average R&D cost margin is around 4%. Tesla expects these expenses to increase by 20% in 2016, so the 2016 forecast uses Tesla's own expectations. The R&D forecast for 2016 out of the total revenue forecast for 2016 is 9,92% As the R&D and SG&A expenses are expected by Tesla to increase significantly, while developing Model 3, the R&D forecast for 2017 is also estimated to increase by 20% from 2016. The R&D forecast for 2017 out of the total revenue forecast for 2017 is then 7,13%. After 2017, when Tesla is no longer developing the Model 3, the R&D expenses out of total revenue is expected to drop down and be similar to the industry average of 4%.

SG&A expenses out of total revenues were 14% in 2013, 19% in 2014, and 23% in 2015, while the competitor average is around 10%. Tesla also expects these expenses to increase by 20% in 2016, so the 2016 SG&A expenses forecast also uses Tesla's own expectations. The SG&A forecast for 2016 out of the total revenue forecast for 2016 is 12,74%. SG&A expenses are also estimated to increase by 20% in 2017, while Model 3 is still under development. The SG&A forecast for 2017 out of the total revenue forecast for 2017 is then 9,15%, slightly below the industry average. Tesla expects SG&A to decrease over time as a percentage of total revenues (Annual Report, 2015, p. 33), which it does with the 20% increases. After 2017, the ratio is estimated to stay at 9,15%, slightly below the industry average.

This forecast results in a positive operating income from sales before tax each year from 2016 and onwards. In order to forecast future tax payments, the result from operations in the original income statement was adjusted for interest income, interest expense, and other income to find the result before income taxes. Interest income was in 2015 and 2014 0,04% of total revenues, so interest income was forecasted also to be 0,04% of total revenues in the future. In a similar way, interest expenses were forecasted to be 3% of total revenues each year in the future. Other income is currency translation gains and losses, which cannot be forecasted, so they were assumed to be zero each year in the future. The taxable income was adjusted for tax loss carryforwards, before the tax rate was applied. In the U.S., federal tax losses can be carried forward for 20 years to offset future taxable income. State tax losses in California can also be carried forward for 20 years, so Tesla is not estimated to pay taxes until 2018, when all of the company's tax loss carryforwards are used up. The tax estimations are shown in Appendix M.

The forecasted reformulated income statements also allocate taxes so that income in each part of the statement is net of the taxes it attracts. Taxes on operating income would have been higher if the company had no debt. The tax benefit of deducting net interest expense before paying taxes is therefore also allocated to operating income. In the reformulated income statement for Tesla there are no "other operating items", so the operating income from sales (after tax) is also the total operating income after tax.

The other item that needs to be forecasted before the residual operating income each year in the future can be calculated is the net operating assets. "As net operating assets are put in place to generate sales, sales are a driver of net operating assets" (Penman 2013, p. 410). In 2015, sales were 1,57 times net operating assets. To find future levels of net operating assets, the forecasted total revenues in each year has been divided by 1,57. This is perhaps a bit conservative, since the revenue is expected to increase greatly, while operating assets like property, plant, and equipment are not to the same extent. New factories do not need to be built until after the company reaches the max capacity of 500.000 at the Fremont plant.

TABLE 5: RESIDUAL OPERATING INCOME MODEL

| RESIDUAL OPERATING INCOME MODEL (thousands) | 2015A | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E |
|---|---|---|---|---|---|---|---|---|---|---|
| Operating income (01) | | 464.523 | 830.125 | 2.335.674 | 2.465.727 | 3.800.664 | 4.723.354 | 4.637.475 | 4.147.964 | 3.436.884 |
| Net operating assets (NOA) | 2.584.994 | 5.550.832 | 9.269.570 | 10.210.997 | 14.709.112 | 21.469.793 | 25.763.752 | 29.628.315 | 34.368.845 | 39.867.860 |
| RNOA (%) | | 18% | 15% | 25% | 24% | 26% | 22% | 18% | 14% | 10% |
| Residual operating income (ReOI) | | 259.482 | 393.271 | 1.669.742 | 1.755.492 | 2.811.167 | 3.328.113 | 3.022.051 | 2.357.921 | 1.439.092 |
| Discount rate (l+WACC't) | | 1,08 | 1,16 | 1,23 | 1,31 | 1,38 | 1,46 | 1,53 | 1,60 | 1,66 |
| PV of ReOI | | 240.413 | 337.979 | 1.355.997 | 1.341.483 | 2.030.079 | 2.281.046 | 1.974.344 | 1.474.745 | 865.456 |
| Total PV of ReOI | 11.901.542 | | | | | | | | | |
| Continuing value (CV) | | | | | | | | | | 67.376.157 |
| PV of CV | 40.519.341 | | | | | | | | | |
| Enterprise value | 55.005.877 | | | | | | | | | |
| Book value of net financial obligations (NFO) | 1.496.050 | | | | | | | | | |
| Value of common equity | 53.509.827 | | | | | | | | | |
| Value per share (on 131425000 shares) | $ 407,15 | | | | | | | | | |
| | | | | | | | | | | |
| The CV calculation: | | | | | | | | | | |
| CV;(l.439.092*1,036)/(1,0581-1,036); | $ 67.376.157 | | | | | | | | | |
| PV of CV; 67.376.157/1,66; | $ 40.519.341 | | | | | | | | | |

Compiled by author

The residual operating income is calculated by subtracting the required return charge on book value of NOA from the operating income. The ReOI in 2020 of 2.811.167 is for instance 3.800.664 – 6,73% * 14.709.112 (see Appendix **E** for WACC).

As described on p. 188 (Koller et. al. 2010) the continuation value must not be applied in a valuation, before the company has reached a steady state. Tesla has clearly not reached a steady state in 2020 with residual operating income growing at 60%. The recommended solution by Koller is applied, by using a simplified forecast for the remaining years until the company has reached a steady state. As it can be seen on the fade diagram on page 509 (Penman 2013), the RNOA is reverting to the industry average in approximately four years, so the operating income in the simplified forecast for the remaining years is found by multiplying the decreasing RNOA by $NOA_{t-1}$. The simplified forecast of NOA for the remaining years is just like in the explicit forecast obtained by dividing total revenues by 1,57. The total revenues were from 2020 to 2024 forecasted to grow by the average sales growth rate fade diagram on p. 511 (Penman 2013). The WACC estimation is explained in section 6, and the WACC in each year can be found in Appendix E.

The residual operating income is forecasted to grow at the global GDP growth projections of 3,6% by IMF (2016) after the company has reached the steady state in 2024, similar to the approach on p. 441 (Penman 2013). The continuing value is calculated as a perpetuity with growth of this 3,6% rate. The resulting intrinsic share price after dividing the intrinsic equity value of $53.509.827.000 by the 131.425.000 shares outstanding is $407,15 (see table 5). As the shares sell at $179, it can be recommended to buy shares of Tesla, because of the belief that in the long run, the market price will converge towards the price of $407,15 that reflects the fundamentals of the company.

## 12 Sensitivity Analysis

The valuation above is dependent on a lot of assumptions about the future, and although inputs are well-reasoned, they are subject to uncertainty. If the above forecast does not hold, the share price will be different, so this section analyzes, how the share price changes, when changing inputs in the forecast and valuation. The sensitivity analysis especially focuses on changes in the inputs, which the share price is most sensitive to changes in.

The continuing value accounts for 74% of the total enterprise value, so a change in the continuing value affects the share price a lot. The continuing value is often calculated in one of the three different ways explained in section 5.1, and the valuation above used the perpetuity with growth approach, which is very sensitive to the applied growth rate. If the long-term growth rate in residual operating income is only 3% instead of 3,6%, the share price drops down to $ 340, so even small changes in the growth rate have a huge impact.

As all the future ReOI's are discounted using the WACC, changes in WACC will also have a large impact on the share price. The WACC estimation itself was dependent on a lot of assumptions as explained in section 6, so a slightly differing WACC could easily be estimated by changing a few assumptions. The table below shows the resulting share price from changing WACC and the long-term growth rate simultaneously, while still assuming that the capital structure approaches that of similar companies linearly.

TABLE 6: PRICE SENSITIVITY TO GROWTH AND WACC

| WACC \ Growth | 3,0% | 3,2% | 3,4% | 3,6% | 3,8% | 4,0% | 4,2% |
|---|---|---|---|---|---|---|---|
| +0,75% | 236 | 245 | 255 | 267 | 280 | 296 | 313 |
| +0,50% | 265 | 277 | 290 | 305 | 322 | 343 | 367 |
| +0,25% | 300 | 314 | 331 | 351 | 374 | 401 | 435 |
| | 340 | 359 | 381 | | 438 | 477 | 524 |
| -0,25% | 389 | 413 | 443 | 478 | 522 | 576 | 647 |
| -0,50% | 448 | 481 | 521 | 571 | 633 | 715 | 826 |
| -0,75% | 522 | 567 | 624 | 695 | 789 | 919 | 1109 |

Compiled by author

The table shows price levels from $236 at a terminal growth rate of 3% and a 0,75% higher WACC in each year to $1109 at a terminal growth rate of 4,2% and a 0,75% lower WACC in each year. All prices are higher than the market price of $179, so even with a 0,75% higher WACC, and a terminal growth of 3% it is recommended to buy shares of Tesla. If the WACC is as estimated in section 6, it can still be recommended to buy shares even with a terminal growth rate of 0%, as the intrinsic share price is then $212. If it is assumed that the company does not need to reach a steady state before the continuing value is applied, the continuing value can be based on the more accurately forecasted ReOI from 2020. If the ReOI is assumed to level off at the 2020 value and the continuing value is calculated as a perpetuity, the intrinsic share price is $278. If the continuing value in 2020 is calculated as a perpetuity with the 3,6% growth rate, the intrinsic share price is $560. So also without using a simplified forecast from 2020-2024 it can still be recommended to buy shares in the company.

The share price is highly dependent on the success of Model 3, which the company has not even started producing yet. In 2020, the revenue from Model 3 is estimated to make up 51% of the total revenues, and since the simplified forecast in 2020-2024 extrapolates from the 2020 total revenue number, a lower revenue, especially from Model 3, will have a large effect on the valuation. The substantial revenue from Model 3 is dependent on successful production scaling with no delays or other production interruptions. However, ceteris paribus, lowering the Model 3 unit sales in 2019 from 190.000 to 60.000 and in 2020 from 382.000 to 60.000 "only" reduces the share price from $407 to $241, which is still much higher than the market price of $179.

If it is assumed that Tesla will maintain its current capital structure of 4,44% DIV and 95,56% E/V instead of approaching that of similar companies, the WACC will be higher and reduce the intrinsic share price to $151. As the company grows and turns profitable, issuing debt is likely to become cheaper and become a more attractive financing choice than it has historically been for the company. Future equity issues to new shareholders also reduce the ownership of the current shareholders, why it is assumed that the capital structure is more likely to approach that of similar more mature companies than stay as it is currently.

Several other inputs in the forecast and valuation can be modified although with a smaller change in the intrinsic share price than by changing the inputs already explained. The unit sales of each model, the average selling prices, the gross profit margin, R&D and SG&A cost margins, etc. can all be adjusted to reflect the investor's individual expectation about the future if it differs from the expectation based on the analysis in this paper. The price sensitivity to changes in those inputs will though not be further elaborated on here.

## 13 Accounting Quality Analysis

To the extent that the forecasts in the valuation anchor on the financial statements, the financial statements must be assured to be of good quality. A forecast based on low quality historical financial statements will also be of low quality. A financial statement of low quality is one in which earnings are a poor indicator of future earnings. Tesla's financial statements are made in accordance with the U.S. Generally Applied Accounting Principles, but these principles require judgments and estimations in the booking of certain items, and these judgments and estimations can make the statements look better or worse than they actually are. If financial statements have been subject to "window-dressing" to make them look better than they actually are, the reversal property of accounting will make sure earnings in future statements will reverse. For instance, if depreciation is underestimated, current earnings are high, but will likely be lower in the future. Firms can also time transactions to make earnings in one period better than the next, but this is difficult to measure without access to monthly data.

Firms are more likely to manipulate earnings in certain situations like during the initial public offering process, or if debt covenants are likely to be violated. More situations are listed on p. 601 (Penman 2013). The only situation that applies to Tesla is that inside management dominates the board of directors. However, with Tesla's huge losses, their mission of accelerating the transition to sustainable transport, and an extremely wealthy CEO, the company has somehow given the impression that what the financial statements say is of less importance, as long as the mission is being executed. In that case, there has been no reason for manipulation of the statements.

So far, much of the analysis has also helped to assure quality of the historical financial statements, which the forecast is based on. The reformulated statements made sure that earnings was on a comprehensive basis, and separated operating items from financing items, so the future value-generating operating items could be forecasted. Section 10.2 identified core items from unusual items in the statement, but core financial statement items could still be a poor indicator of the future, if the judgments and estimations in the accounting have temporarily improved the core items. This section analyses, if that is the case.

If items have been temporarily improved, a simple forecast that extrapolates current high RNOA will overestimate future earnings, but the valuation in this paper instead of extrapolating current RNOA used the more comprehensive forecast of future pro forma income statements, so each item in the statements should ideally be analyzed for its quality. The forecast of total revenues was not based on historical values, so only the income statement items below total revenues and the balance sheet items above NOA is analyzed.

The income statement is grouped into a few line items, so the disclosure quality is rather low. If individual R&D and SG&A costs that make up these aggregated numbers were separated in the income statement, perhaps a more precise forecast could be made for the individual items. The accounting is more prone to manipulation, when estimations are involved. In the income statement, the historical gross profit as a percentage of sales is used as the basis for forecasting future gross profit levels. The gross profit is found by subtracting cost of automotive sales from total revenues. As the cost of automotive sales includes estimations of warranty expenses, the gross profit, which the forecast is based on, could possibly be too high, if warranty expenses are underestimated. This does not seem to be the case, as estimated costs to replace parts under warranty are based on claims incurred to-date (Annual Report, 2015, p. 59). The aggregated R&D item includes amortized equipment expenses, (Annual Report, 2015, p. 39), but the amortization period is not disclosed, so the quality of the accounting for the current R&D costs cannot be accurately assessed.

The forecasted ReOI uses forecasted NOA in the calculation, which is based on historical net operating asset turnover, so the valuation could also be affected, if the historical NOA levels have been manipulated. Vehicle leases are depreciated using the straight-line method over the expected operating lease term, and PPE is also depreciated using the straight-line method over the estimated useful lives of the assets, which does not seem to be unusual (Annual Report, 2015, p. 57). Tesla could also reduce deferred revenue to increase current revenues. Deferred revenue is the amount of revenue from cars sold under the resale value guarantee that Tesla is required to defer, because these transactions must be booked as operating leases (Annual Report, 2015, p. 53). Deferred revenue does also not seem to have been manipulated.

Overall, no evident conservative or liberal accounting practices were discovered, and the part of the forecast that is based on current accounting data is also not considered biased. Accounting quality analysis is though not an easy task, so the analyst must also have faith in the auditors and in the company to not commit outright fraud, and that the financials express a true and fair view of the company.

## 14 Conclusion

This study was set out to find the intrinsic share price of Tesla immediately after the release of the 2015 Annual Report on February 24, 2016, and to evaluate whether the actual share price of $179 on that day provided an attractive investment opportunity.

By using the residual income model, the intrinsic share price was found to be $407,15 based on a thorough fundamental analysis. With the fundamental investor belief that in the long run the share price will reflect the fundamentals of the company, it is believed that over time, the share price will converge towards the $407,15, and shares bought at $179 will hence yield an abnormally high return. For that reason, it is recommended to buy shares of the company.

However, only $8,29 of the share price is from the current book value of equity, so all of the share value in excess of $8,29 is from expectations of future earnings. For a growth company like Tesla, much of the share value is dependent on numerous uncertainties about the future, which makes it difficult to determine the intrinsic share price accurately.

The valuation in this paper was based primarily on Tesla's own expectations of the future, which might be a bit optimistic. For the intrinsic share price of $407,15 to be valid, Tesla is required to meet their own delivery targets of 500.000 cars in 2020 of which 382.000 are of the Model 3, which is not even on the market yet. Tesla is more constrained by supply than demand, so reaching the delivery targets depend to a large extent on successful ramping of production, which is not easy to assess for an outside investor. The sensitivity analysis though showed that even with deliveries of only 60.000 Model 3 cars in 2019 and 2020, the intrinsic share price was still higher than the market price. Inputs in the valuation not directly taken from Tesla's projections were based on careful analysis, but although well-reasoned, the inputs are merely estimates of an uncertain future and could all turn out to be different from estimations. For the valuation to not result in a buy recommendation, several inputs will though simultaneously have to be worse for Tesla than expected.

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## Appendices

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**A) Description of Tesla's products:**

The electric vehicles are powered by a small battery pack and a small silent electric motor, instead of the traditional noisy engine. The electric motor only has a fraction of the hundreds of moving parts of a traditional engine, which means less wear and tear, and no need for tune-ups and oil-changes. The light battery and electric motor in the bottom center of the car also give better weight distribution, handling, safety, and leaves room for two trunks (Vance 2015, pp. 264-265). Because of the two trunks, the cars have best in class storage space (Annual Report, 2015, p. 5).

The cars have zero emissions and can be recharged by plugging the power cord in almost any electrical outlet (Annual Report, 2015, p. 4). The recharge can be done overnight at home, saving the trips to the gas station. For faster recharging, Tesla's Supercharger network can be used for free (Annual Report 2015, p. 6). One of the major drawbacks of electric cars is the relatively short range they can go, before a recharge is needed. To increase the range, Tesla's cars are the first to be made of lightweight aluminum instead of steel, except for one car by Audi and some Jaguars (Vance 2015, p. 265, 281). The cars come with a 17-inch touchscreen instead of the traditional dashboard, and the door handles have senses, so they pop out, when the driver gets close to them

(Vance 2015, p. 264). They also come without a clutch and gearshift, leaving extra space inside the cars.

**Model S:**

The Model S sedan was introduced in June 2012. 107.000 Model S cars have been delivered between June 2012 and 31. December 2015 (Annual Report, 2015, p. 32). The customer can choose between Model S 70, Model S 70D, Model S 90D, and Model S P90D, where D is short for dual motor or all-wheel drive, and 70 or 90 is the kWh battery capacity. The Model S P90D has extra performance with the ludicrous speed upgrade enabling acceleration from 0-100 km/t in 3.0 seconds instead of 3.3 without the ludicrous mode, making it one of the quickest accelerating cars in the world. The range of the different batteries goes from around 420 km to around 550 km, before a recharge is needed. The price in Denmark ranges from DKK 844.397 to DKK 1.280.547 before fuel savings and "gnzm ejerafgift" savings. On Tesla's website, fuel savings over five years are calculated to be DKK 34.000, and "gnzm ejerafgift" savings are calculated to be DKK 20.600 over a five-year period for the average driver.

Customers can choose additional options and accessories like carbon fiber spoiler, colored brake pads, and autopilot functions, which all increase the price (Tesla Motors 2016b). These prices make the Model S compete in the premium/luxury sedan market (Annual Report, 2015, p. 12). The prices in Denmark will gradually increase until 2020, when electric vehicles are no longer exempt from the registration fee. High-end electric cars are harmed much more than cheap electric cars by this policy change (Redder 2015). Tesla sometimes introduces new versions and new features without notice. The all-wheel dual drive has been a possible option since October 2014, and in 2015 the battery capacity was increased from 60 kWh to 70 kWh and from 85 kWh to 90 kWh for the respective models (Annual Report, 2015, p. 6). The car has been given the highest safety rating in history and has won several awards including the prestigious Motor Trend's Car of the Year 2012 (Vance 2015 pp, 265-268)

**Model X:**

In September 2015, Tesla started deliveries of the Model X SUV in the US (Annual Report, 2015, p. 32) and plan to start deliveries in Europa and Asia in 2016 (Annual Report, 2015, p. 5). "Elon Musk expects the SUV to sell at least as well as the Model S and wants Tesla's factories to be capable of making 100.000 cars per year by the end of 2015 to keep up with demand for both vehicles" (Vance 2015, p. 325). The Model X offers exceptional safety with the absence of the front engine, its automatic emergency braking, and side collision avoidance technologies, and offers air quality in the car similar to a hospital operating room due to the special HEPA air filters. It offers automatically opening and closing doors using sensory technology.

There is seating for seven adults, and falcon-wing doors that offer better access to the two rear rows of seats. Like the Model S, the Model X comes in different versions, though with all-wheel drive as standard. The versions are 700, 900, and P90D. The range goes from around 400 km. to around 470 km., before a recharge is needed. The 0-100 km/t acceleration is between 3,4 to 6 seconds on the different versions (Tesla Motors 2015). The price in DKK is not public yet, but the price in USO ranges from 80.000 to 150.000 (King 2015), whereas the Model S 70 started at $70.000 (Annual Report, 2015, p. 32). New versions and functionality are also expected to be introduced over time for the Model X (Annual Report, 2015, p. 32).

**The energy storage products:**

In addition to the cars, Tesla has from its energy management technology developed products that can store power generated by e.g. by solar panels in homes and commercial sites. The Powerwall and Powerpack can be used as backup power, and make it possible to store and use the power generated by solar panels during the day, after the sun goes down. They also make it possible to detach from the power grid, and only use the grid, when electricity prices are low (Tesla Motors 2016c).

The revenue from energy storage products is grouped with revenue from repair and maintenance services, service plans and merchandise, sales of pre-owned Tesla vehicles, sales of powertrain components and systems, and net sales of non-Tesla vehicle trade-ins (Annual Report, 2015, p. 38). This item is called "revenues from services and other" in the income statement and made up 7,54% of the total revenues in 2015, an increase from 5,98% in 2014 and 4,55% in 2013. 92,46% of the revenue came from the deliveries of new Model S and Model X vehicles, leasing revenue, and sales of regulatory credits, (Annual Report, 2015, p. 38). Also, the increase in revenue from 2014 to 2015 was primarily driven by an increase in Model S deliveries (Annual Report, 2015, p. 32), so it is more crucial to get the estimations of automotive sales revenue accurate in the valuation than the revenue from energy storage products. The production of the energy storage products has been moved from the car factory in Fremont to the Gigafactory in Nevada in the last quarter of 2015. This enables Tesla to ramp production of these products (Tesla Motors 2016c).

B) Orbis search results for multiple analysis:

| | |
|---|---|
| Product name | Orbis |
| Update number | ""144 |
| Software version | 129.00 |
| Data update | 19/02/2016 (n° 14410) |
| Username | Aarhus Business School-20131 |
| Export date | 22/ 02/ 2016 |

| | Step result | Search result |
|---|---|---|
| 1. All active companies and companies with unknown | 149,776,794 | 149,776,794 |
| 2. Code search: USSIC(3711) | 50,391 | 42,757 |
| 3. Status: Active | 128,440,520 | 32,289 |
| 4. Year of incorporation: on and after 1990 up to and | 46,310,214 | 10,042 |
| 5. All companies with overview information | 2,590,117 | 1212 |
| 6. Listed/ Unlisted companies: Publicly listed | 65,863 | 49 |
| Boolean search : 1And 2 And 3 And 4 And 5 And 6 | | |
| | TOTAL | 49 |

| | Company name | Country ISO code | NACE Rev. 2 Core code (4 digits) | Last avail. year | Operating revenue (Turnover) th USD Last avail. yr | Number of employees Last avail. yr |
|---|---|---|---|---|---|---|
| 1. | DAIMLER AG | DE | 2910 | 2014 | 159.736. 788 | 279.972 |
| 2. | DONGFENG MOTOR GROUP COMPANY LIMITED | CN | 2910 | 2014 | 13.369.832 | 122.159 |
| 3. | NAVISTAR NTERNATIONAL CORP | US | 2910 | 2015 | 10.140.000 | 13.200 |
| 4. | ANHUI JIANGHUAI AUTOMOBILE CO.,LTD. | CN | 2910 | 2014 | 5.483.676 | 20.763 |
| 5. | FAW CAR CO.,LTD. | CN | 2910 | 2014 | 5.260.414 | 7.067 |
| 6. | ZHENGZHOU YUTONG BUS CO.,LTD. | CN | 2910 | 2014 | 4.179.395 | 14.965 |
| 7. | JIANGLING MOTORS CORPORATION LIMITED | CN | 2910 | 2014 | 4.034.135 | 14.036 |
| 8. | DRB-HICOM BERHAD | MY | 2910 | 2014 | 3.812.335 | 60.000 |
| 9. | GUANGZHOU AUTOMOBILE GROUP CO.,LTD. | CN | 2910 | 2014 | 3.712.019 | 45.819 |
| 10. | TESLA MOTORS NC | US | 2910 | 2015 | 3.000.000 | *17.500* |
| 11. | DONGFENG AUTOMOBILE CO.,LTD. | CN | 2910 | 2014 | 2.799.954 | 10.560 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12. | **LIFAN INDUSTRY (GROUP) COMPANY LIMITED** | CN | 2910 | 2014 | 1.838.560 | 8.359 |
| 13. | **GHABBOUR AUTO** | EG | 2910 | 2014 | 1.732.833 | 4.739 |
| 14. | **CHINESE UNIVERSE PUBLISHING AND MEDIA CO., LTD.** | CN | 2910 | 2014 | 1.712.102 | 6.708 |
| 15. | **H-ONE CO., LTD.** | JP | 2910 | 2014 | 1.546.499 | 7.242 |
| 16. | **INTER CARS S.A.** | PL | 2910 | 2014 | 1.130.691 | 1.730 |
| 17. | **CHONGQING DIMA INDUSTRY CO., LTD.** | CN | 2910 | 2014 | 1.102.519 | 1.995 |
| 18. | **CHINA AVIONICS SYSTEMS CO., LTD.** | CN | 2910 | 2014 | 1.077.415 | 14.287 |
| 19. | **SOLLERS PJSC** | RU | 2910 | 2014 | 851.819 | n.a. |
| 20. | **HUALING XINGMA AUTOMOBILE (GROUP) CO., LTD.** | CN | 2910 | 2014 | 814.749 | 5.547 |
| 21. | **IRAN KHODRO INVESTMENT DEVELOPMENT COMPANY PUBLIC SHAREHOLDING COMPANY** | IR | 2910 | 2014 | 674.613 | 8.261 |
| 22. | **TIANJIN FAW XIALI AUTOMOBILE CO., LTD.** | CN | 2910 | 2014 | 515.515 | 8.780 |
| 23. | **ZHONGHANG HEIBAO CO., LTD.** | CN | 2910 | 2014 | 411.601 | 4.745 |
| 24. | **HONDA ATLAS CARS (PAKISTAN) LIMITED** | PK | 2910 | 2014 | 370.974 | 866 |
| 25. | **YANGZHOU ASIASTAR BUS CO., LTD.** | CN | 2910 | 2014 | 240.290 | 1.748 |
| 26. | **RABA JARMUIPARI HOLDING RT.** | HU | 2910 | 2014 | 187.096 | 1.839 |
| 27. | **VIETNAM MANUFACTURING AND EXPORT PROCESSING (HOLDINGS) LIMITED** | KY | 2910 | 2014 | 177.846 | 1.833 |
| 28. | **KANDI TECHNOLOGIES GROUP, INC.** | US | 2910 | 2014 | 170.229 | 516 |
| 29. | **NEFTEKAMSKII AVTOZAVOD** | RU | 2910 | 2014 | 150.950 | 6.310 |
| 30. | **SICHUAN CHENGFEI INTEGRATION TECHNOLOGY CORP. LTD.** | CN | 2910 | 2014 | 149.396 | 2.161 |
| 31. | **XUZHOU HANDLER SPECIAL VEHICLE CO., LTD.** | CN | 2910 | 2014 | 93.599 | 727 |
| 32. | **HWA AG** | DE | 2910 | 2014 | 78.683 | 277 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 33. | **ANSHAN SENYUAN ROAD AND BRIDGE CO., LTD** | CN | 2910 | 2014 | 77.919 | 377 |
| 34. | **AEON MOTOR CO., LTD.** | TW | 2910 | 2014 | 77.145 | n.a. |
| 35. | **CHENG DU TIANXING INSTRUMENT AND METER CO., LTD.** | CN | 2910 | 2014 | 44.598 | 714 |
| 36. | **SAZGAR ENGINEERING WORKS LIMITED** | PK | 2910 | 2015 | 24.319 | 692 |
| 37. | **SPECTRA INDUSTRIES LTD.** | IN | 2910 | 2014 | 17.587 | 109 |
| 38. | **INDUSTRIJA MOTORA RAKOVICA U RESTRUKTURIRANJU** | RS | 2910 | 2014 | 6.031 | 849 |
| 39. | **CHASIVOYARSKIY REMONTNIY ZAVOD OAO** | UA | 2910 | 2014 | 3.505 | 143 |
| 40. | **SONG LIAO AUTOMOBILE CO., LTD** | CN | 2910 | 2014 | 1.695 | 32 |
| 41. | **IKARBUS** | RS | 2910 | 2014 | 1.677 | 274 |
| 42. | **FAMOS A.D.** | BA | 2910 | 2014 | 1.466 | 240 |
| 43. | **MZT FOP A.D.SKOPJE-VO STECHAJ** | MK | 2910 | 2001 | 1.428 | 188 |
| 44. | **DEWAN FAROOQUE MOTORS LIMITED** | PK | 2910 | 2015 | 540 | 88 |
| 45. | **VIDKRITE AKTSIONER NE TOVARISTVO SIMFEROPOLSKIY AVTOREMONTNIY ZAVOD IM KUYBISH OAO** | UA | 2910 | 2013 | 205 | 6 |
| 46. | **SBM HOLDING BEOMEDICINA** | RS | 2910 | 2012 | 46 | 0 |
| 47. | **GLOBAL ENVIRO SOLUTIONS, INC.** | US | 2910 | 1996 | 37 | 11 |
| 48. | **FLUID UTVA** | RS | 2920 | 2013 | 33 | 21 |
| 49. | **ANDOVER HOLDINGS, INC.** | US | 2910 | 2010 | 0 | n.a. |

C) Calculation of the market risk premium and equity beta:

| | NYSE COMPOSITE | S&P 500 COMPOSITE | MSCI WORLD | MSCI ALL CAP | TESLA RI |
|---|---|---|---|---|---|
| Yearly average MRP: | | | | | |
| Since 28-02-2012 | 8,01% | 14,10% | 8,29% | 8,20% | 75,46% |
| Since 29-06-2010 | | 17,60% | 12,10% | 12,19% | 68,48% |
| Since 03-12-2007 | | 8,27% | 2,75% | 3,10% | |
| Since 02-01-2001 | | 5,51% | 3,94% | | |
| Since 05-01-1988 | | 10,31% | | | |

An Excel file named 'Cost of capital calculations' has been uploaded as extra material.

D) Industry ENand *DN* calculation:

| | Company name | Current market capitalisation th USD | Net Debt th USD Last avail. yr | E/V | D/V |
|---|---|---|---|---|---|
| 1. | VOLKSWAGEN AG | 30.311.044 | 119.459.739 | 20% | 80% |
| 2. | TOYOTA MOTOR CORPORATION | 172.808.176 | 114.577.556 | 60% | 40% |
| 3. | DAIMLER AG | 69.835.260 | 91.538.949 | 43% | 57% |
| 4. | GENERAL MOTORS COMPANY | 47.103.258 | 39.710.000 | 54% | 46% |
| 5. | FORD MOTOR CO | 51.233.038 | 118.582.000 | 30% | 70% |
| 6. | BAYERISCHE MOTOREN WERKE AG | 48.940.784 | 88.406.761 | 36% | 64% |
| 7. | NISSAN MOTOR CO LTD | 44.395.638 | 48.859.446 | 48% | 52% |
| | Average | | | 42% | 58% |

E) WACC calculations:

| | 201SA | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E |
|---|---|---|---|---|---|---|---|---|---|---|
| E/V | 95,56% | 89,61% | 83,66% | 77,71% | 71,76% | 65,81% | 59,86% | 53,91% | 47,96% | 42% |
| D/V | 4,44% | 10,39% | 16,34% | 22,29% | 28,24% | 34,19% | 40,14% | 46,09% | 52,04% | 58% |
| r_E | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% | 8,04% |
| r_D | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| T | 0% | 0% | 0% | 40% | 40% | 40% | 40% | 40% | 40% | 40% |
| WACC | 7,99% | 7,93% | 7,87% | 7,18% | 6,96% | 6,73% | 6,50% | 6,27% | 6,04% | 5,81% |

The company is not estimated to pay taxes until the company is profitable and has used up all tax-loss carry forwards in 2018. The pro forma income statements can be found in section 11.

**F) Reformulated equity statement and considerations made in the reformulation:**

| | 2015 | 2014 | 2013 | 2012 | 2011 |
|---|---|---|---|---|---|
| Balance at January 1 | 911.710 | 667.120 | 124.700 | 224.045 | 207.048 |
| Transactions with shareholders: | | | | | |
| Stock issued for stock options, net of repurchases | 69.001 | 72.055 | 82.573 | 16.500 | 6.643 |
| Issuance of common stock public offering | 738.408 | | 353.632 | 221.491 | 172.409 |
| Issuance of common stock private placement | | | 55.001 | | 59.058 |
| Issuance of common stock under employee stock purchase plan | 37.538 | 28.571 | 13 849 | 8.389 | 3.882 |
| **Conversion feature of convertible senior notes** | 16.150 | 548.603 | 82.842 | | |
| Purchase of bond hedges | | -603.428 | -177.540 | | |
| Sales of warrant | | 389.160 | 120.318 | | |
| Reclass from equity to mezzanine equity | | -58.199 | | | |
| Net transactions with shareholders | 861.097 | 376.762 | 530.675 | 246.380 | 241.992 |
| **Comprehensive income:** | | | | | |
| Net income reported | -888.663 | -294.040 | -74.014 | -396.213 | -254.411 |
| Unrealized loss (gain) on short-term marketable securities, net | 7.465 | -22 | | 3 | -3 |
| Foreign currency translation adjustment | -10.999 | | | | |
| **Comprehensive income** | -892.197 | -294.062 | -74.014 | -396.210 | -254.414 |
| Stock based compensation | 208.338 | 162.079 | 86.875 | 50.485 | 29.419 |
| Issuance of common stock upon release of restricted stock units, net of shares withheld for employee taxes | -4 | -189 | -1.116 | | |
| Balance at December 31 | 1088.944 | 911.710 | 667.120 | 124.700 | 224.045 |

- The beginning and ending period balances have been corrected for items that are not part of common equity:

  Preferred stock should be excluded from the beginning and ending balances, because it is a liability for the common shareholders. Tesla has not had any preferred stock outstanding since their IPO on June 29, 2010, so no correction was necessary.

  Non-controlling interests should also be excluded from the beginning and ending balances, since they are not common shareholders' interests. Tesla also did not have any non-controlling interests, so no correction was necessary. Dividends payable is reported under GAAP as a liability, but shareholders cannot owe dividends to themselves. They are part of shareholders' equity, so they should be added to the beginning and ending balances instead. Tesla has never paid any dividends and does not anticipate doing so in the near future (Annual Report 2015, p. 29). Therefore, no dividends have been added to the beginning and ending balances of CSE.

- Net transactions with shareholders must be calculated. Dividends must be cash dividends, which is calculated by subtracting the change in dividends payable from the reported dividends, but that is not relevant for Tesla, since Tesla does not pay dividends. Common equity outstanding has increased, when senior notes have been converted to common shares. When Tesla has hedged against the dilution effect of their convertible bonds, common equity outstanding has been reduced. Common equity has also increased, when warrants have been sold to decrease dilution from the conversion of bonds to common stock. When common equity has been restated to mezzanine equity for accounting reasons in relation to a more likely conversion of the convertible bonds, the amount of common equity outstanding has also been reduced. Further, the amount of common equity outstanding has increased, when common equity has been issued for exercised stock options. Lastly, common equity outstanding has increased, when shares have been issued to employees.

- The reformulated statement of changes in shareholders' equity must include comprehensive income. Tesla's statement already includes comprehensive income, so no change is necessary. Income that goes to non-controlling interests should be excluded, but that is also not an issue in this case.
- Stock-based compensation is included in the statement of changes in shareholders' equity as an increase in equity, when stock options are issued to employees. The same fair value amount of the options are included in the wage expenses item in the income statement, so when the (lower) comprehensive income goes to the statement of shareholders' equity, the (lower) comprehensive income nets out the increase in equity. This is wrong and implies that incurring wage expenses have no effect on equity. Restricted stock is similar to employee stock options, but instead of receiving options, the actual stock is granted, but not until vesting. Tesla's statement of changes in shareholder's equity is reformulated in the form of Exhibit 9.1 (Penman 2013, p. 262), where stock-based compensation and restricted stock is neither part of the transactions with shareholders nor the comprehensive income. It was not possible to calculate the stock option loss for Tesla (Penman 2013, p. 269), because there was no tax benefit from the exercise of stock options in the cash flow statement, so Exhibit 9.2 on p. 271 could not be used (Penman 2013). The form in Exhibit 9.1 is a good approximation though (Penman 2013, p. 276).

## G) Reformulated balance sheet and considerations made in the reformulation:

| Reformulated balance sheet (in USO thousands) | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 |
|---|---|---|---|---|---|---|---|
| **Operating assets:** | | | | | | | |
| Accounts receivable | 168.965 | 226.604 | 49.109 | 26.842 | 9.539 | 6.710 | 3.488 |
| Inventory | 1277.838 | 953.675 | 340.355 | 268.504 | 50.082 | 45.182 | 23.222 |
| Prepaid expenses and other current assets | 125.229 | 76.134 | 27.574 | 8.438 | 9.414 | 10.839 | 4.222 |
| Operating lease vehicles, net | 1791.403 | 766.744 | 382.425 | 10.071 | 11.757 | 7.963 | |
| Property, plant and equipment, net | 3.403.334 | 1829.267 | 738.494 | 552.229 | 298.414 | 114.636 | 23.535 |
| Restricted cash | 31.522 | 11.374 | 6.435 | 5.159 | 8.068 | 4.867 | 3.580 |
| Other assets | 74.633 | 43.209 | 23.637 | 21.963 | 22.371 | 22.730 | 2.750 |
| **Total operating assets (OA)** | **6.872.924** | **3.907.007** | **1.568.029** | **893.206** | **409.645** | **212.927** | **60.797** |
| **Operating liabilities:** | | | | | | | |
| Accounts payable | 916.148 | 777.946 | 303.969 | 303.382 | 56.141 | 28.951 | 15.086 |
| Accrued liabilities | 422.798 | 268.883 | 108.252 | 39.798 | 32.109 | 20.945 | 14.532 |
| Deferred development compensation | | | | | | | 156 |
| Deferred revenue | 423.961 | 191.651 | 91.882 | 1.905 | 2.345 | 4.635 | 1377 |
| Customer deposits | 283.370 | 257.587 | 163.153 | 138.817 | 91.761 | 30.755 | 26.048 |
| Deferred revenue, less current portion | 446.105 | 292.271 | 181.180 | 3.060 | 3.146 | 2.783 | 1240 |
| Resale value guarantee | 1430.572 | 487.879 | 236.299 | | | | |
| Other long-term liabilities | 364.976 | 154.660 | 58.197 | 25.170 | 14.915 | 12.274 | 3.459 |
| **Total operating liabilities (OL)** | **4.287.930** | **2.430.877** | **1.142.932** | **512.132** | **200.417** | **100.343** | **61.898** |
| **Net operating assets (NOA) (OA-OL)** | **2.584.994** | **1.476.130** | **425.097** | **381.074** | **209.228** | **112.584** | **-1.101** |
| **Financial assets:** | | | | | | | |
| Cash and cash equivalents | 1196.908 | 1905.713 | 845.889 | 201.890 | 255.266 | 99.558 | 69.627 |
| Short-term marketable securities | | | | | 25.061 | | |
| Restricted cash and marketable securities | 22.628 | 17.947 | 3.012 | 19.094 | 23.476 | 73.597 | |
| **Total financial assets (FA)** | **1.219.536** | **1.923.660** | **848.901** | **220.984** | **303.803** | **173.155** | **69.627** |
| **Financial obligations:** | | | | | | | |
| Capital lease obligations, current portion | | 9.532 | 7.722 | 4.365 | 1067 | 279 | 290 |
| Long-term debt, current portion | | | | 50.841 | 7.916 | | |
| Convertible senior notes | | 601.566 | 182 | | | | |
| Long-term debt and capital leases | 633.166 | | | | | | |
| Common stock warrant liability | | | | 10.692 | 8.838 | 6.088 | |
| Convertible preferred stock warrant liability | | | | | | | 1734 |
| Capital lease obligations, less current portion | | 12.26[illegible] | 12.855 | 9.965 | 2.830 | 496 | 800 |
| Convertible senior notes, less current portion | | 1.806.518 | 586.119 | | | | |
| Long-term debt and capital leases | 2.040.375 | | | | | | |
| Long-term debt, less current portion | | | | 401.495 | 268.335 | 71.828 | |
| Convertible senior notes (Notes 8) | 42.045 | 58.196 | | | | | |
| Preferred stock | | | | | | | 319.225 |
| **Total financial obligations: (FO)** | **2.715.586** | **2.488.079** | **606.878** | **477.358** | **288.986** | **78.691** | **322.049** |
| **Net financial obligations (NFO) (FO-FA)** | **1.496.050** | **564.419** | **-242.023** | **256.374** | **-14.817** | **-94.464** | **252.422** |
| **Common shareholders' equity (CSE) (NOA-NFO)** | **1.088.944** | **911.710** | **667.120** | **124.700** | **224.045** | **207.048** | **-253.523** |

- *Cash.* Interest bearing investments are financial assets while working cash that has not been invested is an operating asset, but firms often group these together. It can therefore be difficult to identify operating cash. Tesla has three cash items in their balance sheet that needs to be allocated to either operating assets or financial assets.

  Restricted cash has been allocated to the operating assets, while the restricted cash and marketable securities item have been allocated to the financial assets. Both of these items primarily comprise security deposits required by suppliers, when Tesla purchases on credit (Annual Report 2014, p. 71). As such, it sounds like they both are operating items, but with the "marketable securities" in the name, the item must be interest bearing, and has therefore been classified as a financial asset.

  Cash and cash equivalents have been allocated to financial assets. This item primarily comprises money market funds and amounts held in foreign currencies (Annual Report 2014, p. 56). In the Annual Report (2014, p. 59) this item is described as working capital, which is an operating item, however, according to Penman (2013, p. 295), it would be safe to classify it as a financial asset, since it is interest bearing.
- *Operating lease vehicles, net.* Tesla offers a 36-month leasing program after which customers have the option to return the car or buy it at a predetermined residual value. Operating lease vehicles are therefore considered a part of the firm's operations.
- *Accrued liabilities.* Those are liabilities to pay for future operating expenses. Tesla, for instance, offers an eight-year warranty on Model S drive units, and the estimated costs to repair and replace any items under warranty are included in accrued liabilities. Warranty liabilities for items expected to be replaced, but not within the next 12 months are included in other long-term liabilities. Warranties are part of the operations, and accrued liabilities are therefore classified as such.
- *Customer deposits.* When customers place an order, they have to make a deposit and the rest of the price is then paid upon delivery. So customer deposits are part of the operating activities and classified as such.
- *Other assets.* Items included in other assets include emission permits related to the operation of the Tesla factory, debt issuance costs, and loan facility issuance costs

(Annual Report, 2013, p. 106 & 2014, p. 78). These costs are all considered non-interest bearing and classified as an operating asset.

- *Capital lease obligations.* Tesla has financed various equipment using capital leases (Annual Report, p. 89). As Tesla must pay interest on these obligations, they have been classified as financial obligations, also in accordance with Penman's (2013, p. 297) accounting for leases in the reformulated balance sheet.
- *Stock warrant liabilities.* In January 2010 Tesla issued a warrant on convertible preferred stock to the Department of Energy in connection with a loan facility (Annual Report 2013, p.63.) With the IPO in 2010, the warrant became a warrant on common stock instead. It provides the Department of Energy the option, but not the obligation to purchase shares of common equity. It is therefore considered a financing item and classified as a financial obligation.
- *Preferred stock.* From the common shareholder's viewpoint, preferred stock is an obligation that has to be paid first, before anything is left for the common shareholder. As preferred stock was part of the financing in 2009, the 2009 amount has been classified as a financial obligation in the reformulated balance sheet.

## H) Reformulated income statement and considerations made in the reformulation:

| Reformulated income statement (in USO thousands) | Dec. 31, 2015 | Dec. 31, 2014 | Dec. 31, 2013 | Dec. 31, 2012 | Dec. 31, 2011 | Dec. 31, 2010 | Dec. 31, 2009 |
|---|---|---|---|---|---|---|---|
| *Revenues:* | | | | | | | |
| Automotive sales | | 3.192.723 | 1.997.786 | 385.699 | 148.568 | 97.078 | 111.943 |
| Development services | | 5.633 | 15.710 | 27.557 | 55.674 | 19.666 | |
| Total revenues | 4.046.025 | 3.198.356 | 2.013.496 | 413.256 | 204.242 | 116.744 | 111.943 |
| | | | | | | | |
| - *Expenses to generate sales:* | | | | | | | |
| Automotive sales | 3.122.522 | 2.310.011 | 1.543.878 | 371.658 | 115.482 | 79.982 | 102.408 |
| Development services | | 6.674 | 13.356 | 11.531 | 27.165 | 6.031 | |
| Research and development | 717.900 | 464.700 | 231.976 | 273.978 | 208.981 | 92.996 | 19.282 |
| Selling, general and administrative | 922.232 | 603.660 | 285.569 | 150.372 | 104.102 | 84.573 | 42.150 |
| Provision for income taxes | 13.039 | 9.404 | 2.588 | 136 | 489 | 173 | 26 |
| Total expenses to generate sales | 4.775.693 | 3.394.449 | 2.077.367 | 807.675 | 456.219 | 263.755 | 163.866 |
| | | | | | | | |
| Operating income from sales (before tax) | -729.668 | -196.093 | -63.871 | -394.419 | -251.977 | -147.011 | -51.923 |
| - tax as reported | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| - tax benefit from net financial expenses | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| +tax allocated to other operating income | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating income from sales (after tax) | -729.668 | -196.093 | -63.871 | -394.419 | -251.977 | -147.011 | -51.923 |
| | | | | | | | |
| ± *Other operating income (expense) requiring tax a/location:* | | | | | | | |
| | | | | | | | |
| - tax allocated to other operating income | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ± *After-tax operating items:* | | | | | | | |
| | | | | | | | |
| Operating income after tax | -729.668 | -196.093 | -63.871 | -394.419 | -251.977 | -147.011 | -51.923 |
| | | | | | | | |
| *Net financial expenses:* | | | | | | | |
| +Interest expense | 118.851 | 100.886 | 32.934 | 254 | 43 | 992 | 2.531 |
| - Interest income | 1.508 | 1.126 | 189 | 288 | 255 | 258 | 159 |
| - Other income {expense), net | -41.652 | 1.813 | 22.602 | -1.828 | -2.646 | -6.583 | -1.445 |
| Net taxable financial expense before tax | 158.995 | 97.947 | 10.143 | 1.794 | 2.434 | 7.317 | 3.817 |
| +tax benefit from net financial expenses | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net taxable financial expenses aher tax | 158.995 | 97.947 | 10.143 | 1.794 | 2.434 | 7.317 | 3.817 |
| + Unrealized net loss on short-term marketable securities | -7.465 | 22 | | | 3 | | |
| - Reclassification adjustment for gain included in net loss | | | | -3 | | | |
| - Foreign currency translation adjustment | -10.999 | | | | | | |
| Total net financial expenses | 162.529 | 97.969 | 10.143 | 1.797 | 2.437 | 7.317 | 3.817 |
| | | | | | | | |
| Comprehensive income to common shareholders | -892.197 | -294.062 | -74.014 | -396.216 | -254.414 | -154.328 | -55.740 |

- *Other income (expense), net.* This item has been allocated to the net financial expense part of the reformulated income statement. Other income mainly consists of a fair value change in the Department of Energy common stock warrant liability and foreign exchange gains and losses (Annual Report, 2014, p. 55).

## I) Profitability analysis:

| Leve l | Formul a | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 |
|---|---|---|---|---|---|---|---|
| **Level 1-Return on Common Equi Drivers** | | | | | | | |
| Financial leverage | | | | | | | |
| ROCE | RNOA+{FLEV*{RNOA-NBC) | -82% | -32% | -11% | -318% | -114% | -75% |
| RNOA | 01/NOA | -28% | -13% | -15% | -104% | -120% | -131% |
| FLEV | NFO/CSE to common | 1,37 | 0,62 | -0,36 | 2,06 | -0,07 | -0,46 |
| SPREAD | RNOA- NBC | -39% | -31% | -11% | -104% | -104% | -123% |
| F LEV*SPREAD | FLEV*(RNOA-NBC) | -54% | -19% | 4% | -214% | 7% | 56% |
| NBC | NFE/NFO | 11% | 17% | -4% | 1% | -16% | -8% |
| **OQerating liabilit leverage** | | | | | | | |
| OLLEV | OL/NOA | 1,66 | 1,65 | 2,69 | 1,34 | 0,96 | 0,89 |
| **Implicit intereste (after tax) (3% short-term borrowing rate)** | **Short-term borrowing rate * OL** | 128.638 | 72.926 | 34.288 | 15.364 | 6.013 | 3.010 |
| ROOA | Ol+Implicit interest (after tax) (3%)/0A | -9% | -3% | -2% | -42% | -60% | -68% |
| RNOA (CHECK) | ROOA+(OLLEV*(ROOA-3%)) (3% short borrowing rate) | -28% | -13% | -15% | -104% | -120% | -131% |
| ROCE (CHECK) | (01-NFE)/( NOA-NFO) | -82% | -32% | -11% | -318% | -114% | -75% |
| ROCE (CHECK) | **Comprehensive income/CSE** | -82% | -32% | -11% | -318% | -114% | -75% |
| Level 2- Drivers of Operating Profitability | Seperating RNOA | | | | | | |
| RNOA | 01/NOA | -28% | -13% | -15% | -104% | -120% | -131% |
| **Operating profit margin** | 01/ Sales | -18% | -6% | -3% | -95% | -123% | -126% |
| **Asset turnover** | Sales/ NOA | 1,57 | 2,17 | 4,74 | 1,08 | 0,98 | 1,04 |
| RNOA (CHECK) | PM*ATO | -28% | -13% | -15% | -104% | -120% | -131% |
| | | | | | | | |
| **Level 3- Profit margin drivers** | **Seperating operating profit margin and asset turnover** | | | | | | |
| Proftt Margin drivers | | | | | | | |
| PM | 01(after tax)/Saes | -18% | -6% | -3% | -95% | -123% | -126% |
| Sales PM | 01 from saes (after tax) /Saes | -18% | -6% | -3% | -95% | -123% | -126% |
| Other item PM | Otrer operating income after tax/Sales | | | | | | |
| Gross Margin | Gross profit/saes | 23% | 28% | 23% | 7% | 30% | 26% |
| R&D o/o | R&D costs/Saes | 18% | 15% | 12% | 66% | 102% | 80% |
| SG&A | SG&A costs/Sales | 23% | 19% | 14% | 36% | 51% | 72% |
| **Provision for incorre tax** | Prov !Or inc. Tax/Saes | 0,3% | 0,3% | 0,1% | 0,0% | 0,2% | 0,1% |
| PM (CHECK) | | -18% | -6% | -3% | -95% | -123% | -126% |
| | | | | | | | |
| **Turnover drivers** | | | | | | | |
| ATO | Saes/NOA | 1,57 | 2,17 | 4,74 | 1,08 | 0,98 | 1,04 |
| Accounts receivable | Saes/AR | 23,95 | 14,11 | 41,00 | 15,40 | 21,41 | 17,40 |
| Inventory | Saes/Inventory | 3,17 | 3,35 | 5,92 | 1,54 | 4,08 | 2,58 |
| PrepaK:I expenses and other current assets | Saes/prep.. | 32,31 | 42,01 | 73,02 | 48,98 | 21,70 | 10,77 |
| Operating ease vehicles, net | Sales/Oper .. | 2,26 | 4,17 | 5,27 | 41,03 | 17,37 | 14,66 |
| Property , plant and equipment, net | Sales/Prop .. | 1,19 | 1,75 | 2,73 | 0,75 | 0,68 | 1,02 |
| Restricted cash | Saes/Restricted cash | 128,36 | 281,20 | 312,90 | 80,10 | 25,32 | 23,99 |
| Other assets | Saes/other assets | 54,21 | 74,02 | 85,18 | 18,82 | 9,13 | 5,1 |
| Accounts payabe | Saes/AP | 4,42 | 4,11 | 6,62 | 1,36 | 3,64 | 4,03 |
| Accrued liabilities | Saes/Accrued l. | 9,57 | 11,89 | 18,60 | 10,38 | 6,36 | 5,57 |
| Deterred development compensation | Sales/def.. | | | | | | |
| Deterred revenue | Saes/def.. | 9,54 | 16,69 | 21,91 | 216,93 | 87,10 | 25,19 |
| Customer deposits | Saes/cus.. | 14,28 | 12,42 | 12,34 | 2,98 | 2,23 | 3,80 |
| Deterred revenue, less current portion | Saes/def.. | 9,07 | 10,94 | 11,11 | 135,05 | 64,92 | 41,95 |
| **Resa£ value guarantee** | Saes/resal | 2,83 | 6,56 | 8,52 | | | |
| Other long-term liabilities | Saes/other L. | 11,09 | 20,68 | 34,60 | 16,42 | 13,69 | 9,51 |
| | NONSaes | 0,64 | 0,46 | 0,21 | 0,92 | 1,02 | 0,96 |
| 1/ATO | | | | | | | |
| Accounts receivable | AR/Sales | 0,04 | 0,07 | 0,02 | 0,06 | 0,05 | 0,06 |
| Inventory | Inv/Sales | 0,32 | 0,30 | 0,17 | 0,65 | 0,25 | 0,39 |
| PrepaK:I expenses and other current assets | Prep/Sa es | 0,03 | 0,02 | 0,01 | 0,02 | 0,05 | 0,09 |
| Operating lease vehicles, net | Oper../Sales | 0,44 | 0,24 | 0,19 | 0,02 | 0,06 | 0,07 |
| Property, plant and equipment, net | Prop/Sales | 0,84 | 0,57 | 0,37 | 1,34 | 1,46 | 0,98 |
| Restricted cash | Rest/Sales | 0,01 | 0,00 | 0,00 | 0,01 | 0,04 | 0,04 |
| Other assets | Oth/Saes | 0,02 | 0,01 | 0,01 | 0,05 | 0,11 | 0,19 |
| Accounts payable | AP/Sales | 0,23 | 0,24 | 0,15 | 0,73 | 0,27 | 0,25 |
| Accrued liabilities | Accrued VSaes | 0,10 | 0,08 | 0,05 | 0,10 | 0,16 | 0,18 |
| Deterred development compensation | Def/Sales | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Deterred revenue | Def/Sales | 0,10 | 0,06 | 0,05 | 0,00 | 0,01 | 0,04 |
| Customer deposits | Cus/Saes | 0,07 | 0,08 | 0,08 | 0,34 | 0,45 | 0,26 |
| Deterred revenue, less current portion | Def/Sales | 0,11 | 0,09 | 0,09 | 0,01 | 0,02 | 0,02 |
| Resale value guarantee | Resal/Sales | 0,35 | 0,15 | 0,12 | 0,00 | 0,00 | 0,00 |
| Other long-term liabilities | Otrer Vsales | 0,09 | 0,05 | 0,03 | 0,06 | 0,07 | 0,11 |
| 1/ATO (CHECK) | | 0,64 | 0,46 | 0,21 | 0,92 | 1,02 | 0,96 |
| Days in accounts receivable | 365/Accounts receivabe turnover | 15 | 26 | 9 | 24 | 17 | 21 |
| Days in inventory | 365/Inventory turnover | 149 | 150 | 80 | 256 | 128 | 192 |
| Davs in accounts oavabe | 365/Accounts oavable turnover | 97 | 97 | 68 | 184 | 139 | 98 |

## J) Market analysis tables:

| | | Global car manufacturing industry volume (million cars) | % Growth | Global hybrid & electric cars industry volume (million cars) | % Growth |
|---|---|---|---|---|---|
| Actual | 2010 | 55,7 | | | |
| | 2011 | 57,2 | 2,8% | 1,12 | |
| | 2012 | 60,6 | 5,9% | 1,80 | 60,6% |
| | 2013 | 63,1 | 4,2% | 2,28 | 26,4% |
| | 2014 | 64,6 | 2,4% | 2,55 | 11,7% |
| Forecast | 2015 | 67,2 | 4,0% | 2,94 | 15,5% |
| | 2016 | 72,1 | 7,2% | 3,45 | 17,3% |
| | 2017 | 76,7 | 6,4% | 4,29 | 24,3% |
| | 2018 | 80,9 | 5,5% | 5,50 | 28,3% |
| | 2019 | 83,5 | 3,2% | 7,39 | 34,3% |
| | | | | 9,04 | 22,4% |
| Actual | CAGR 2010-2014 | | 3,8% | CAGR 2011-2014 | 31,4% |
| Forecast | CAGR 2014-2019 | | **5,3%** | CAGR 2014-2020 | **23,5%** |

| | | Global car manufacturing industry value ($ billion) | % Growth | Global hybrid & electric cars industry value ($ billion) | % Growth |
|---|---|---|---|---|---|
| Actual | 2010 | 732,5 | | | |
| | 2011 | 773,0 | 5,5% | 31,08 | |
| | 2012 | 834,6 | 8,0% | 51,57 | 65,9% |
| | 2013 | 869,4 | 4,2% | 67,69 | 31,3% |
| | 2014 | 891,3 | 2,5% | 77,10 | 13,9% |
| Forecast | 2015 | 929,3 | 4,3% | 89,64 | 16,3% |
| | 2016 | 997,1 | 7,2% | 108,11 | 20,6% |
| | 2017 | 1061,1 | 6,4% | 137,00 | 26,7% |
| | 2018 | 1124,1 | 5,9% | 179,09 | 30,7% |
| | 2019 | 1172,9 | 4,3% | 243,70 | 36,1% |
| | 2020 | | | 307,75 | 26,3% |
| Actual | CAGR 2010-2014 | | 5,0% | CAGR 2011-2014 | 35,4% |
| Forecast | CAGR 2014-2019 | | **5,6%** | CAGR 2014-2020 | **25,9%** |

Compiled by author. Sources: (Marketline 2015a, Marketline 2015b)

## K) Industry margins:

An Excel file named 'Industry data' has been uploaded as extra material.

**L) Value chain analysis and identification of sustainable competitive advantages:**

**Battery pack manufacturing skills:**

Tesla has "pioneered advanced manufacturing techniques to manufacture large volumes of battery packs with high quality and low cost" (Annual Report, 2015, p. 6). Tesla's "proprietary technology includes systems for high-density energy storage, cooling, safety, charge balancing, structural durability, and electronics management" (Annual Report, 2015, p. 6). They also write that they have "significant expertise in the safety and management systems needed to use lithium-ion cells in the automotive environment, and have actively worked with lithium-ion cell suppliers to further optimize cell designs to increase overall performance." The battery packs have been designed "to permit flexibility with respect to battery cell chemistry and form factor." This enables Tesla to "leverage the substantial investments and advancements being made globally by battery cell manufacturers to continue to improve cost."

This resource or capability is rare, since it is not possessed by most of the other car manufacturers, who have traditionally focused on internal combustion engines. This is unlike Tesla with its history of solely producing electric cars. The battery manufacturing skills cannot be easily imitated, because of "path dependency". The skills have been build-up over time through learning from experience. The resource cannot be easily substituted, but the battery packs are sold along with the hundreds of other parts that make up the car, so its value is not put to use, if customers do not buy the car. The resource is in a way substitutable if customers choose another brand, which can be for many other reasons than the battery. To conclude, the resource gives Tesla a sustainable competitive advantage, but the rest of the vehicle has to be appealing for Tesla to exploit the resource.

**The Gigafactory:**

It is important to own and nurture a company's core competencies (Kotler et al. 2009), and Tesla has indeed nurtured their battery pack manufacturing skills by building the Gigafactory as explained in section 4.5. Once the company is in volume production with Model 3, the Gigafactory will be highly valuable due to the economies of scale unmatched by the competition, and rare, since it is the only one in the world. It will even be an entry barrier for new competitors. No substitutes are readily available, but it can be imitated although it will take many years, perhaps seven as explained by Vance (2015, p. 331). The success of the Gigafactory is of course still uncertain, but if successful, it is possible to build a similar factory by competitors. The Gigafactory is considered a temporary competitive advantage, but for a relatively long period.

**Powertrain engineering capabilities:**

The powertrain in a car is the system of parts that generate power and deliver it from the motor to the wheels. One of Tesla's core competencies is their powertrain engineering capabilities. On page four (Annual Report, 2015) they write: "our design and vehicle engineering capabilities, combined with the technical advancements of our powertrain system, have enabled us to design and develop electric vehicles, that we believe overcome the design, styling, and performance issues that have historically limited broad consumer adoption of electric vehicles." More detail on the powertrain design is provided on page 6: "the primary technological advantages to our designs include the ability to drive large amounts of current in a small physical package." The capability is valuable and rare, since it makes the cars outperform other electric vehicles, but the open-source patent policy makes it possible to imitate or substitute the capability by other manufacturers. The powertrain engineering capabilities are considered a temporary competitive advantage.

**Electric vehicle engineering capabilities:**

Tesla also mentions on page 6 (Annual Report, 2015) that they "have created significant in-house capabilities in the design and engineering of electric vehicles and electric vehicle components and systems. This includes "bodies, chassis, interiors, heating and cooling and low voltage electrical systems". This is considered a competitive parity, because it is valuable, but neither rare, difficult to imitate or impossible to substitute.

**Utilization of the latest advancements in consumer technology:**

On page five (Annual Report, 2015) Tesla writes "our core intellectual property resides not only within our electric powertrain, but also within our ability to design a vehicle that utilizes the unique advantages of an electric powertrain and the latest advancements in consumer technologies such as mobile computing, sensing, displays, and connectivity." This, for instance, includes the sensing in the falcon wing doors in Model X, and in the door handles on all models, and the 17-inch touchscreen. This ability is valuable and rare, since no competitors have made use these technologies to the same extent. However, competitors can copy or substitute these features of the car, if they have skilled employees, who can write the same or similar code. The ability is considered a temporary competitive advantage.

**Company-owned stores and galleries:**

Tesla is selling its cars to the customers through company-owned stores and galleries in major metropolitan areas instead of through traditional car dealerships. This creates a differentiated buying experience, where customers deal with Tesla-employed staff. The company believes it will be better able to "control costs of inventory, manage warranty service and pricing, maintain and strengthen the Tesla brand, and obtain rapid customer feedback" (Annual Report, 2015, p. 7), and "improve the overall customer experience, the speed of product development and the capital efficiency" (Annual Report, 2015, p. 4) from this strategy. In a blog on Tesla's website Elon Musk wrote reasons for the strategy, for instance that it is impossible for franchise dealers "to explain the advantages of going electric without simultaneously undermining their traditional business", and that people often already have decided on, which new car to buy before going to the car dealership (Musk 2012). For these reasons, the strategy is considered valuable. It is also rare, as cars are traditionally sold through dealerships. The strategy is though easy to imitate, and the substitutes of traditional dealerships work for traditional manufacturers. The strategy of having company-owned stores and galleries are only considered a temporary competitive advantage.

**The supercharger network:**

The supercharger network is explained in section 4.4. This network of superchargers creates brand awareness and "provides customers with additional mobility (Annual Report, 2015, p. 6), so it is considered valuable. It is also rare for a car manufacturer to invest in such a network, which is usually done by governments or other charging infrastructure providers. The network can easily be imitated by other manufacturers, although they will probably not receive as much goodwill as Tesla, which was the first mover. No other car manufacturers have a similar network of charging stations, so no substitutes are available, and the resource is considered a temporary competitive advantage.

**Managerial skills:**

Tesla is highly dependent on the services of the CEO Elon Musk and the CTO J.B. Straube! (Annual Report, 2015, p. 20). These are perhaps the two people with the most technical knowledge of electric vehicles in the world (Vance 2015). These two human resources are highly valuable, rare, and difficult to imitate, because of path dependency and physical uniqueness. It is also not really possible for competitors to substitute Tesla's high-quality top management team with a team of similar quality.

**Highly talented employees:**

Tesla is able to attract the most talented people in the world, which of course adds significant value to the company. In a 2016 study of 72.223 students by Universum, Tesla was ranked the 4th most attractive employer among engineering students and 10th among computer sciences students (Universum 2016). No other automobile companies are near the top of the list, so it is a rare ability. There are no copies of the highly talented individuals, but as there are more talented individuals in the world than the amount of people needed by Tesla, it is possible for competitors to substitute or find other skilled employees, as long as they create an attractive workplace. The highly talented employees are considered a temporary competitive advantage.

**M) Tax forecast:**

| Tax forecast | 2010A | 2011A | 2012A | 2013A | 2014A | 2015A | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Result from operations | -146.838 | -251.488 | -394.283 | -61.283 | -186.689 | -716.629 | 464.523 | 830.125 | 2.693.005 | 4.109.545 | 6.334.440 |
| Interest income | 258 | 255 | 288 | 189 | 1.126 | 1.508 | 3.475 | 5.803 | 6.393 | 9.209 | 13.442 |
| Interest expense | -992 | -43 | -254 | -32.934 | -100.886 | -118.851 | -260.644 | -435.261 | -479.467 | -690.680 | -1.008.134 |
| Other income (expense), net | -6.583 | -2.646 | -1.828 | 22.602 | 1.813 | -41.652 | 0 | 0 | 0 | 0 | 0 |
| Result before income taxes | -154.155 | -253.922 | -396.077 | -71.426 | -284.636 | -875.624 | 207.353 | 400.667 | 2.219.931 | 3.428.074 | 5.339.748 |
| Total tax loss carryforwards (end of year) | | | | | | -2.091.554 | -1.884.201 | -1.483.534 | 0 | 0 | 0 |
| Taxable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 736.397 | 3.428.074 | 5.339.748 |
| Taxes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 294.559 | 1.371.230 | 2.135.899 |

Compiled by author