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# EQUITY VALUATION: BMW AG

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**Abstract**

The main objective of this project is to evaluate the BMW AG. Therefore, the fair value of the company's shares is calculated in order to produce an investment recommendation of either holding, buying or selling stocks.

Initially, an introduction and explanation of the business valuation methods used in this dissertation is provided. Supported by scientific articles, the literature review provides an excellent basis for the development and conclusion of the project. Based on the literature review developed, the methodologies selected to evaluate the company are the Discounted Cash Flow - Free Cash Flow to the Firm and the Relative Valuation (Multiples), since both methods use different perspectives and assumptions about the group, they complement each other.

Secondly, after the valuation methods are elected, the industry in which BMW AG operates is presented in order to analyse the market and its main trends. Additionally, an analysis is made of the BMW Group and its business model in the different segments.

At the end of the valuation, the decision using the DCF model is to buy since the price is above the market reference value (28-12-2018). Through the Multiples method, the share value is below the reference value in all three elected multiples, and the peer group median of the three multiples is lower than the values recorded by BMW AG, which indicates that the market places BMW above average, complementing the conclusion reached through the DCF method.

**Resumo**

O principal objetivo deste projeto passa por avaliar o grupo BMW AG. Para tal, é calculado o justo valor das ações da empresa, com o intuito de produzir uma recomendação de investimento, existindo três hipóteses: manter as ações, comprar ou vender.

Inicialmente é facultada uma introdução e explicação sobre os métodos de avaliação de empresas utilizados neste projeto. Sustentada em artigos científicos, a revisão de literatura fornece uma excelente base para o desenvolvimento e conclusão da tese. Baseado na revisão literária desenvolvida, as metodologias selecionadas para avaliar a empresa são o Discounted Cash Flow – Free Cash Flow to the Firm e os Múltiplos, visto que, os dois métodos utilizam perspetivas e pressupostos distintos sobre o grupo, complementando-se reciprocamente.

Em segundo lugar, depois de eleitos os métodos de avaliação, apresenta-se a indústria onde se insere a BMW AG, de forma a analisar o mercado e as suas principais tendências. Adicionalmente, efetua-se uma análise do Grupo BMW e do seu modelo de negócio nos diferentes segmentos.

 No final da avaliação, a decisão através do modelo DCF é de comprar, uma vez que o preço se encontra acima do valor de referência (28-12-2018). Através do método dos múltiplos, o valor da ação é inferior ao valor de referência nos três múltiplos eleitos, sendo que, a mediana do *peer group* dos três múltiplos se encontra abaixo dos valores registados pela BMW AG, o que indicia que o mercado coloca a BMW acima da média, complementando a conclusão alcançada através do método DCF.

**Agradecimentos**

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**Glossary**

APV - Adjusted Present Value

CAGR - Compound Annual Growth Rate

CAPEX – CAPital EXpenditure

CAPM - Capital Asset Pricing Model

COS – Cost of Sales

CRP – Country Risk Premium

DCF – Discounted Cash Flow

DDM - Dividend Discount Model

EBC - Expected Bankruptcy Costs

EBIT - Earnings Before Interest and Taxes

EBITDA - Earnings Before Interest, Taxes, Depreciation and Amortization

EBT – Earnings Before Taxes

EQV – Equity Value

ERP – Equity Risk Premium

EV – Enterprise Value

FCFE - Free Cash Flow to Equity

FCFF - Free Cash Flow to the Firm

FR - Financial Result

GDP – Gross Domestic Product

GGM – Gordon Growth Model

IA – Intangible Assets

ISE – Interest and Similar Expenses

ISI – Interest and Similar Income

IT – Information Technology

LP – Leased Products

LR – Literature Review

MRP - Market Risk Premium

NOA – Non Operating Assets

OFR – Other Financial Result

OOE – Other Operating Expense

OOI – Other Operating Income

PD - Probability of Default

PER – Price Earnings Ratio

PP&E – Property, Plant & Equipment

PVITS - Present Value of Interest Tax Shield

REAI – Result from Equity Accounted Investments

ROCE – Return on Capital Employed

ROE – Return on Equity

ROIC – Return on Invested Capital

RV – Relative Valuation

TGR – Terminal Growth Rate

TV – Terminal Value

WACC - Weighted Average Cost of Capital

WC - Working Capital

## Introduction

In a world where people are increasingly tempted to invest in projects in many different areas, it is crucial to convey confidence to investors by conducting careful and reliable analysis of the true value of a company. Hence the main objective of this project is to estimate the value of BMW's equity and the respective value per share and produce an investment recommendation, taking into account the share price and the expectation of appreciation or depreciation.

To achieve these objectives, it seems important to master the internationally accepted methodologies, both in academia and in the field of investment professionals, which are based on the financial theory explored by the most diverse authors. In addition, it is relevant to understand the dynamics and perspectives of market evolution in which the company operates, which together with the strategy of the management team, support the preparation of the business plan based on which the company's financial assessment is carried out.

In this sense, this project begins with the literature review, in which the various methodologies of financial evaluation of companies proposed by several authors are analysed. The second point is based on industry analysis, not only the automotive segment but also the motorcycle and financial services sector. After exploring the industry, it is time to proceed to a more detailed analysis of the BMW Group (third point), which describes its history, the company nowadays, the evolution of the company's rating and market share, and its current/future strategy.

Today BMW AG is one of the world's largest industrial companies, it is represented in over 140 countries, it employs 134,682 people, it has 31 production and assembly plants and 16 research and development locations and it holds an extremely diverse range of three segments (automotive, motorcycle and financial services). In the year 2018, it registered a number of 2.5 million cars sold, BMW, MINI and Rolls Royce, the brands belonging to the BMW Group. In terms of revenues, in 2018 the company reached a value of € 97,480 million, an EBIT of € 9,121 million and a net profit of € 7,240 million. One of the company's strategies is to focus on technology, autonomous driving, driver assistance, battery research, electrical mobility and software development and connectivity. BMW AG's strong focus on digital services, autonomous driving, futuristic design, electric cars and the opening of new research and development centers in China means that the brand's future is viewed positively and confidently.

The fourth topic is related to the definition of assumptions, analysis of the market values of some elements, estimation of share price through the defined methods and, lastly, elaborating a recommendation for investors (hold shares, buy or sell). Finally, for the DCF method, a sensitivity analysis is produced to understand the impact of the inputs (terminal growth rate and weighted average cost of capital) in the final price.

# 1. Literature Review

The attempt to predict the future consequences of a decision made at present is a universal characteristic in humans. In this way, investors, managers and other stakeholders in a company also have this standard. It is from this assumption that the importance of valuation emerges in several financial areas, since understanding the mechanism of this analysis is essential to present solid and reliable results, which will be fundamental in the decision making process.

Valuation is important in buying and merging businesses, for example, when a company is interested in acquiring or merging with another company. In this process (where there is a buyer and a seller), the buyer will conduct a valuation of the other company and set the maximum price that he is willing to offer, on the opposite side, the seller will perform exactly the same. However, from the opposite perspective, that is, it will set the minimum price that he is willing to accept. Typically, the business will be closed at an intermediate point, namely, between the minimum amounts that the seller is disposed to accept and the maximum value that the buyer is disposed to offer.

For listed companies (such as BMW AG), valuation is equally significant for comparing companies in the same industry, determining the price of shares and comparing them with the market price. This comparison seems fundamental for making the decision to buy, sell or hold the share on the market. It is also crucial to decide in a case of a portfolio of securities if a dealer should increase or decrease a position.

As Damodaran (2002) claims every asset has a value. However, the key to success relates to the sources of this value and not to the value itself. If the objective in corporate finance is the maximization of the firm value, the relationship between financial decisions, corporate strategy, and firm value has to be delineated.
The value of a firm can be directly related to the decisions it makes. Understanding this relationship is key to making value-increasing decisions and sensible financial restructuring.

Luehrman (1997) sustains that valuation is the "financial analytical skill" that managers and investors want to control. According to Copeland et al (2000), to make good decisions it is necessary to have reliable and complete information, and value continues to be the performance

metric that uses the best and most complete information. As for Young et al (1999), "different approaches make different aspects of the valuation problem clear at the expense of obscuring other aspects". This is one of the main reasons to understand the importance of the many methods that must be considered and analysed and what are the characteristics of the company that each of them prefers. Young et al (1999) argue that although there are many similar points among different valuation approaches, it is crucial to understand the assumptions made. Despite this consistency, it is likely that different methods provide different final values, although it is possible to compare the different values and to understand the main causes of these differences.

As Fernandez (2013) states, the valuation process stands quite complex and can be done through different models, each of them can be considered correct to evaluate the company's performance (depending on assumptions and justifications). In fact, people cannot conclude that one model is clearly better than another, it can only be said that the assumptions used in some models are closer to the reality than others. In this study, the three models that are most commonly used to value a company, Discounted Cash Flow (DCF), Dividend Discount Model (DDM) and Multiples, will be introduced.

**1.1 Discounted Cash Flow Model (DCF)**

One of the main methods used among analysts is the Discounted Cash Flow method. This method is considered as the standard one for the past 20 years according to Luehrman (1997). The main objective of this method is to forecast future cash flows and discount these same cash flows to the present at a given rate. This discount rate reflects the risk associated with the company. The higher the associated risk, the higher the discount rate on the cash flow, the lower the risk the lower the discount rate.

The theory described above seems quite simple and easy to execute, but in practice it prevails much more complex and deserves to be analysed rigorously (Gilbert, 1990). The first step in defining this model is to try to predict future cash flows over a predefined period. Typically, the period analysed is five years, since, more than five years would create a high uncertainty relatively to the

future performances and future investments, which would conduct to an increase in the level of bias. This method of valuation is focused on the future, so it does not take into account any present or past performance of the company.

As reported by Damodaran (2006), the Discounted Cash Flow has two different valuation perspectives, the firm and the equity valuation. The equity valuation evaluates only the value corresponding to the shareholders, whereas, the firm valuation values the entire business (enterprise value). These two perspectives are also defended by Gilbert (1990), who states that the cash flow which should be used is the free cash flow. So, in this model, two different approaches are used to obtain the share value, the Free Cash Flow to the Firm (FCFF) and the Free Cash Flow to Equity (FCFE). The first uses as a discount rate the weighted average cost of capital (WACC), while the second uses the cost of equity (Re).

The FCFF is computed by adding after tax income, amortizations and depreciations and subtracting capital expenditures and working capital increases.

$$FCFF = EBIT \times (1-t) + Amortizations\ and\ Depreciations - CAPEX - Net\ Working\ Capital\ Variation\ (1)$$

Formula 1: Free Cash Flow to the Firm

According to Pinto et al (2010), the FCFE is the cash flow from the operations minus the investments in CAPEX and minus payments to debt holders. Free Cash Flow to Equity represents the cash flows generated by the company after remunerating the financial creditors and repaying the debt or issuing new debt and can be determined from the Free Cash Flow to Firm if the set of assumptions remains the same.

$$FCFE = FCFF - Interest * (1 - t) + Net\ debt\ variation - Preferred\ Dividends\ (2)$$

Formula 2: Free Cash Flow to the Equity

Pinto et al (2010) argue that these two types of cash flow are the most used by analysts and companies, since they can be used directly in the valuation of equity or the company. For example, cash flows calculated from EBITDA do not present a reliable value since it does not take into account the capital structure, taxes and the investment made in working capital. Therefore, the question that emerges at this point is: what kind of cash flow should be used? As stated by Pinto et al (2010), the FCFF should be used when, firstly, the FCFE is negative and the company is levered. Secondly, when the company is levered with a changing capital structure. However, there is a rationale for these two assertions, the fact that equity may be more sensitive in changes in capital structure when compared with WACC. The cash flow that will be used in the DCF valuation for BMW is the FCFF.

As it was mentioned before, the greater the number of years in which the cash flows will be estimated, the greater the difficulty and the loss of quality of the predictions. In order to circumvent this, the future cash flows, after the estimation period, should be computed using the terminal or continuing value.

Typically, a company finances its operations through Debt and Equity, the sum of which prefaces Capital Structure of the Company. In both cases, it is expected that the company manages future income, the shareholders hold a percentage or even the entire company and expect the company to make profit. In the case of debtholders, the situation is different, they have the right to an interest payment on their loan, as well as to receive the nominal amount lent, in the future date. In case of bankruptcy, debtholders have priority.

### 1.1.1   WACC –Weighted Average Cost of Capital

The Weighted Average Cost of Capital for the company is computed as the average of the cost of debt and equity, weighted by its relative weight in the capital structure. According to Luehrman (1997), the main reason behind this choice is, the facility in calculations that WACC yields. This formula is able to capture the tax advantage resulting from corporate borrowing.

$$WACC = \frac{Equity}{Capital} * Re + \frac{Debt}{Capital} * Rd * (1-t) \ (3)$$

Formula 3: Weighted Average Cost of Capital

Re = Cost of Equity; Rd = Cost of Debt; Capital = Equity + Debt; t = effective tax rate

### 1.1.1.1 Cost of Equity

The WACC is made up of different components (as mentioned above), such as the cost of debt, tax rate, equity, debt and the cost of equity. The analysis below will be focused on the last point. There are three possibilities to compute this cost of equity, the arbitrage pricing theory, the Fama and French three factor model and the third (most common) is the Capital Asset Pricing Model (CAPM). This model, which will be follow, takes into account the sensitivity of the risk to the share/company in question.

A very important point to keep in mind is that, investors are risk averse as such, their main objective is to minimize variance and maximize the portfolio return. Goedhart et al. (2010), mentions that the CAPM model is presented using the following formula:

$$E(R) = R_f + \beta * [R_m - R_f] \ (4)$$

Formula 4: Capital Asset Pricing Model

Before presenting the different components of the formula described above, it is important to bear in mind that in this model three assumptions are used, being: the market is perfect, there is no symmetry of information (free access to all available information) and there are no taxes and transaction costs. The parameters used in this model are: the sensitivity of the stock to the market (Beta), the expected return of the market (Rm) and the risk free rate (Rf).

**Risk Free Rate**

The risk free represents the rate of return that an investor is willing to invest by taking on a zero risk business over a certain period of time. This rate is seen as a minimum rate, since any rational investor will not accept a higher risk project unless the rate of return is higher than the risk free rate.

According to Damodaran (1999), the risk free asset has no default risk associated with its current and future cash flows. Usually, when we are evaluating a company (purpose of this thesis), the best estimate for the risk free rate is the government bonds, long term default free zero coupon rate dominated in the same currency as cash flows. Since the company being analysed in this thesis is BMW (a German multinational), it makes perfect sense to use the 10 Year yield Germany Bond as the risk free rate.

**Market Risk Premium**

The market risk premium represents the difference between the expected return of the market and the risk free rate, in other words, the MRP describes the relationship between returns from an equity market portfolio and treasury bond yields.

There are some methods to compute this MRP, dividend discount model, historical average realized returns, bond market implied risk premium and the constant Sharpe ratio method, being the most used method the historical average realized returns, according to Schill (2013). However, this premium varies from investor to investor, since, the investing style and the tolerance risk depends on person to person.

**Beta**

The last component to be analysed of CAPM is beta. Damodaran (2002) says that, beta represents "the covariance of the asset divided by the variance of the market portfolio" as follows:

$$Beta\ of\ an\ asset\ x\ =\ \frac{Cov_{x,m}}{\sigma_m^2}\ (5)$$

Formula 5: Beta of an asset

This parameter represents the risk associated with a specific portfolio rather than the total risk (Damodaran, 1999). There are two alternative ways to choose the most appropriate beta, one of which is to use the following formula:

$$Beta_L = Beta_U * [1 + \frac{D}{E} * (1 - t)] \ (6)$$

Formula 6: Beta levered

Note that this formula assumes that the Beta of Debt is equal to zero. The other alternative concerns unlisted companies, where the beta used corresponds to the beta of a similar company.

### 1.1.1.2 Cost of Debt

After analyzing the cost of equity, we now turn to another component of WACC, the cost of debt. The cost of debt constitutes the effective rate that a company pays due to the debt it holds. In the vast majority of cases, the rate used corresponds to the after tax cost of debt, since, the interest expenses are deductible.

According to Damodaran (2008), this after tax cost of debt can be computed by "adding a default spread to the risk free rate, with the magnitude of the spread depending on the credit risk of the company", using the following formula:

$$\textit{After tax cost of debt} = (R_f + \textit{Default Spread}) * (1 - t) \ (7)$$

Formula 7: After tax cost of debt

The above formula consists in three parameters, risk free rate, default spread and the corporate tax rate. The first has already been analysed in the previous point, the corporate tax rate, according to Fernandez (2004), the effective tax rate should be used each year.

The default component is one that has a higher degree of subjectivity. If the company is tradable in the market (as is the case of BMW), we can obtain the default spread from the credit rating of the company. The subjectivity mentioned above is related to the fact that not all companies are traded in the market, in these cases, as reported by Damodaran (2002), its default spread can be obtained by estimating a synthetic rating or by looking at the firm's recent borrowing history.

### 1.1.2 Enterprise and Equity Value

Finally, the Enterprise Value represents the current value of the brand's business, with two instalments, the first shows the sum of the annual FCFF discounted at the WACC rate, the second corresponds to the terminal value updated to year zero at the WACC rate. The EV formula is represented below:

$$Enterprise\ Value = \sum_{t=1}^{n} \frac{FCFF}{(1 + WACC)^t} + \frac{Terminal\ Value_n}{(1 + WACC)^n}\ (8)$$

Formula 8: Enterprise Value

In order to compute the value of the company to the shareholders, it is necessary to make the transition from Enterprise Value to Equity Value, so it is essential to add to EV the Non Operating assets, and subtract the value of financial debt, the market value of preferred shares and the book value of minority interest. Since the market value of the preferred shares has been discounted, the final value obtained concerns the EQV of the common shares, as the following formula suggests:

$$Equity\ Value = EV + Non\ Operating\ Assets - Debt - \ Market\ Value\ of\ Preferred\ Shares$$
$$- \ Book\ Value\ of\ Minority\ interest\ (9)$$

Formula 9: Equity Value

Therefore, dividing the value of this EQV by the number of common shares gives the fair value per share.

### 1.1.2.1 Terminal or Continuing Value

One of the most important points when studying the Discounted Cash Flow model is the terminal value, since regarding Young et al (1999), this variable represents a large part of the value of cash flows. As Young et al. (1999) states "w*e spend 80% to 90% of our time on forecasts for the next few years when they represent 10% to 20% of the market value estimate*". The terminal value represents the present value of all future cash flows of the firm beyond the terminal year and because of that it should be treated cautiously and with the required attention (Schill, 2013).

As one can imagine, it is impossible to predict / estimate cash flows indefinitely, so the discounted cash flow model divides the timeframe into two distinct phases, the explicit period and the terminal value (Cassia et al. (2007)). The explicit period represents the time period in which cash flows are forecasted until the company reaches its steady state.

In order to compute the company's terminal value, Damodaran (2002) states that there are three possible valuation methods. The first one assumes that in the terminal year the company will be liquidated, this method assumes that the firm will cease its operations, sell all its assets and the total value received by these same assets represents the liquidation value.

According to Damodaran (2002), there are two different approaches at this point. The first approach is to base the estimate of the terminal value on the earning power of the assets (using a combination

of market-based numbers and cash flow-based estimates). The other approach is to base it on the book value of the assets (adjusted for inflation rate over the period under consideration).

The second methodology proposed is the multiples approach. At this point, the terminal value is calculated by multiplying the expected revenues or earnings in the terminal year by the respective multiple (for example, value to sales multiple). This methodology is quite simple and intuitive, but it has some limitations, since most of the time, "*these multiples are obtained by looking at what comparable firms are trading at in the market today, so the valuation becomes a relative valuation rather than a discounted cash flow valuation*" (Damodaran (2002)).

The third and final valuation methodology of the terminal value is the stable growth model. While the first approach assumes that the company will slowly cease its activities, at this last point it is possible to conclude that the firm will continue to invest in new assets and remain operating beyond the terminal year. In order to compute the terminal value, one must assume that the company will be in steady state and grow at a constant rate forever. This perpetual growth model considers the formula of a straightforward perpetuity to arrive at the terminal value:

$$Terminal\ Value\ \text{n} = \frac{Cash\ Flow\ year\ n * (1 + Perpetual\ growth\ rate)}{(Discount\ rate - Perpetual\ growth\ rate)}\ (10)$$

Formula 10: Terminal Value

As Damodaran (2002) declares, a company is not able to grow at a higher rate than the economy it operates and, the growth rate should be at the same terms as the valuation (cash flows to equity or cash flows to the firm).

### 1.1.3 Adjusted Present Value

As discussed before, the DCF presents some limitations, as such, Myers (1974) presented a better alternative with respect to the valuation of cash flows, denominated Adjusted Present Value (APV). This approach is based on valuing the company in parts and then adding all together, which allows

managers and analysts to verify not only how much the firm is worth but also from where the value is being generated (Luehrman, 1997). According to Luehrman (1997), the main limitations of the Discounted Cash Flow model have led to the use of the APV model to increase considerably, since, *"APV always works when WACC does and sometimes when WACC doesn't, because it requires fewer restrictive assumptions. Besides this APV is less susceptible to yield serious errors than WACC is. But, most important, general managers will find that APV's power lies in the managerially relevant information it provides."*.

As reported by Damodaran (2002) the valuation process is based on three steps, the first step relates to the assessment of the value of the company (set of cash flows) as if it had no leverage, as both terminal value and cash flows will be discounted at the cost of equity. The second step is related to the calculation of the additional funding that comes from financing side effects. The main objective at this point is to calculate tax advantages that come from financing operations. In order to achieve the present value of the tax shields, should be used as discount rate the cost of debt for the company as interest payments are deductible and reduce the taxable income amount of the firm. The third step is related to a very subjective point, bankruptcy costs. These costs must be deducted/subtracted when calculating the value of a particular company, otherwise the final valuation will not be correct. The subjectivity (previously mentioned) deals with the difficult task of calculating these bankruptcy costs, since, although direct costs are easy to calculate, indirect costs are highly complex in terms of their calculation.

In order to evaluate the company properly, the Expected Bankruptcy Costs (EBC) should be computed as follows:

$$EBC = Probability\ of\ Default * Bankruptcy\ Costs\ (11)$$

Formula 11: Expected Bankruptcy Costs

According to Damodaran (2002), for example, one of the solutions to calculate the Probability of Default (PD) is to use the bond rating of a company, if exists, as an estimate.

Even though the APV has advantages over the DCF, it has some limitations, since, according to Damodaran (2002): *"The first and most important is that most practitioners who use the adjusted present value model ignore expected bankruptcy costs. Adding the tax benefits to unlevered firm value to get to the levered firm value makes debt seem like an unmixed blessing. Firm value will be overstated, especially at very high debt ratios, where the cost of bankruptcy is clearly not zero and, in some instances, the cost of bankruptcy is higher than the tax benefit of debt.".*

In the end, although most authors ignore the bankruptcy costs, the value of a levered company will be given, by the APV method, as follows:

$$Firm\ Value = Value\ of\ Unlevered\ Firm + PV\ of\ Interest\ Tax\ Shields$$
$$- PV\ of\ Expected\ Bankruptcy\ Costs\ (12)$$

Formula 12: Firm Value

## 1.1.3.1 The Present Value of Interest Tax Shields

As mentioned in the first of the three steps, when you consider that a company is fully funded by equity, the value that is generated over time will be shared between shareholders and government. Some companies choose to finance themselves entirely by equity, but there are associated perks when funding is incurred, since debt is deductible and as such, it is possible for the company to reduce the amount that is paid to the state. Therefore, debtholders will be paid first and the remaining amount will be paid to shareholders plus the tax savings that come from the financing (Graham, 2011). However, it is not always positive and advantageous for companies to request external financing as there are some costs associated with a financing (for example, distress costs) and consequently, it only makes sense to carry out this financing operation if the benefits of the tax shield are higher than the costs that are being generated. According to Graham (2011), the companies that have higher liquidity (which is the case of BMW), have relatively low financing costs and are able to carry more debt.

Myers (1974) specifies that the Present Value of Interest Tax Shield (PVITS) is one of the main components of the Adjusted Present Value and can be computed as follows:

$$PVITSt = \frac{D * rd * T}{(1 + rd)^t} \ (13)$$

Formula 13: Present Value of Interest Tax Shield (discounted at the cost of debt)

The formula presented above has always been subject of some criticism and never generated an absolute consensus. Fernandez (2004) believes that the equation above is correct only when there is no increase in the debt of the company. If it is probable that there is an increase in the value of the debt, the interest tax shields should be discounted at the unlevered cost of equity as follows:

$$PVITSt = \frac{D * ru * T}{(1 + ru)^t} \ (14)$$

Formula 14: Present Value of Interest Tax Shield (discounted at the cost of equity)

## 1.2    Dividend Discount Model

Throughout the dissertation, it is emphasized that stock market investors have two possibilities regarding income. Firstly, they have the possibility of receiving dividends due to the shares of the company they own and secondly, they have the chance to sell their shares for a higher price than the one at which they bought. In this point, the simplest and oldest valuation technique of cash discount models will be used to estimate the equity value of a firm.

According to the Dividend Discount Model, the price of a share corresponds to the present value of the perpetual stream of future dividends (per share), discounted at the cost of equity, as the following equation presents:

$$Share\ Value = \sum_{t=1}^{\infty} \frac{DPS}{(1+r)^t} \quad (15)$$

Formula 15: Share Value (DDM)

However, this model is too simplistic and other variations of the dividend discount model have been developed throughout the years. The model can be divided into two "sub-models", the first is called the Gordon Growth Model presented by Gordon and Shapiro (1956). This model is only used for companies with a stable growth rate assumed to be sustained in perpetuity. Besides this fact, this model assumes that the company has a consistent payout policy according to dividends which means that dividends will grow at a perpetual stable growth rate. This rate cannot be higher than the growth rate of the economy. The perpetuity value equation is given as follows:

$$Perpetuity\ Value = \frac{Expected\ Dividends\ next\ period}{(Cost\ of\ equity - Expected\ growth\ rate\ in\ perpetuity)} \quad (16)$$

Formula 16: Perpetuity Value (DDM)

This "sub-model" is very easy to compute, however, its main limitation is that it can only be used for companies that are expected to grow at a stable rate. When it is not applied correctly and with the necessary assumptions, this model can yield distorted results or even unreasonable ones (when the cost of equity and the perpetuity growth rate are very similar).

The second sub-model arises in order to circumvent the idea of a company growing at the same rate forever, consequently, a multistage dividend discount model (two-stage model and three-stage model) was developed. This model considers different growth rates throughout the life of the company. For example, the three stage model assumes an initial phase of stable high growth, an intermediate phase where there is a marginal decrease of the growth rate until it reaches the final stage growth rate, when the company reaches the steady state and its rate of growth remains constant (in the long run). The two stage model is very similar to the model with three steps. Nevertheless, in this model there is a first phase where the company does not grow at a stable rate

and, the second phase that reflects the period when the firm reaches the steady state and its growth rate is constant and remains constant.

Finally, from a global point of view, Damodaran (2012) points out some limitations concerning this technique of valuation, since the valuation is conducted using dividends and mistakes can be made. For example, if the company accumulates cash and pays out a small amount of dividends, yields an excessive conservative valuation. Another reason that makes the valuation performed too conservative is that this model ignores the effect of stock buybacks.

## 1.3    Multiples

Baker and Ruback (1999) say that valuating a company using multiples is a fairly simple, popular and reliable method. This method can be used autonomously or as a supplement to the discounted cash flow method. However, according to Damodaran (2002), the purpose of one method is different from the other. While the focus of the discounted cash flow approach is to reach the final value of the asset/project, given their cash flows, risk and growth characteristics, the relative valuation (multiples) aims to reach the final value of the asset, based on how similar assets are currently being priced in the market. Damodaran (2002) argues that, "the assumption behind this reasoning is that the market is correct in the way it prices stocks, on average, but that it makes errors in the pricing of individual stocks".

Damodaran (2006) adds the fact that, "if the market is correct, on average, in the way it prices assets, discounted cash flow and relative valuations may converge. If, however, the market is systematically overpricing or under pricing a group of assets or an entire sector, discounted cash flow valuations can deviate from relative valuations".

Fernandez (2001) also mentions that valuation using multiples can be useful in order to check the valuation carried out and to identify the differences between the firm being valued and the firms it is compared with. Using several ratios in companies from the same industry, it makes possible to identify in which ratio or ratios the company should focus more and to verify in which ratios the company is above or below the benchmark. If this happens, one should try to understand the reason

for this and to analyse the performance of other competitors. Multiples take into consideration the dimension of each company and using them it's possible to take some conclusions about company's valuation. This type of valuation is very useful for managers, investors and shareholders since it makes possible to arrive at several conclusions about the performance of the company compared to other competitors.

According to Bhorjraj and Lee (2001), "the choice of comparable firms should be a function of the variables that drive cross-sectional variation in a given valuation multiple" and "the choice of comparable firms is, to some extent, dependent on the market multiple under consideration".

Even in the case where comparable companies are selected, differences in the effects of inflation, in accounting policies, among other factors may well distort results. The choice of multiples is an absolutely fundamental aspect, since the choice of these is dependent on the nature of the business and the industry in which the company is inserted. Damodaran (2006) and Fernandez (2001) declare that there are three main groups of multiples:

| Enterprise Value Multiples | - EV/EBITDA (Enterprise Value to EBITDA) <br> - EV/EBIT (Enterprise Value to EBIT) <br> - EV/Sales (Enterprise Value to Sales) |
|---|---|
| Equity Value Multiples | - Price to Earnings (PER) <br> - Price to Cash Flow ratio (PCF) <br> - Price to Book Value (PBV) <br> - Price to Customer |
| Growth-references Multiples | - PEG (Price/Earnings to growth ratio) <br> - EV/EG (Enterprise value to EBITDA Growth) |

Source: Damodaran
Table 1: Three main groups of Multiples

Although Damodaran (2006) and Fernandez (2001) defend this theory, there are other authors who present different ideas regarding multiples. For example, Liu et al (2002) argue that multiple based on reported earnings outperforms multiple based on reported operating cash flows. Moreover, in recent studies Liu et al (2007) found that changing from reported operating cash flows to forecasted operating cash flows considerably improves the valuation estimate.

## 2. Industry Overview

In order to reproduce a BMW quality assessment, it is important to examine and take into account the automotive industry, since macroeconomic factors greatly influence this sector. Automobiles are nowadays one of the most widely used land transport modes of the world population, and there are currently over one billion vehicles worldwide. Additionally, according to studies, this number tends to increase, and it is expected that by the year 2035 the number of vehicles worldwide will amount to around two billion. This exponential growth of automobiles means that environmental and urban traffic concerns have also been increasing, and environmental problems are a much discussed factor in society today.

In view of the above, automotive companies have been evolving in this direction to match and satisfy customers but also taking into account the environmental factor. Most companies today are very concerned about the environmental factor, and the regulations that have been introduced over the years have also had a major impact on this environmental and social cause. This industry revolution may seem simple to implement, but all these changes impact the value chain, new players, suppliers, and customers.

### 2.1. Automotive Industry

The automotive industry is one of the most important industries in the world, and the registrations of passenger cars and light commercial vehicles in international automobile markets grew around 1.1% in 2018. This expansion came primarily from Asia, being China the main responsible for this increase, since its sales increased by 7.7% between 2017 and 2018. By contrast, registrations in Europe fell by 0.3%. (BMW AG Annual Report 2018)

As mentioned earlier, this wave of innovation impacts many players, and for companies in this sector (such as BMW for example), this revolution represents a big raise in costs (huge investments in R&D) and implies a structural change in order to cope with this innovation. Allied to these structural changes are the environmental and urban traffic concerns (previously noted). About the

first concern, traditional combustion engines are expected to be replaced over time by hybrid and electric engines. This trend meets the concerns of both motorists and governments, which even have laws aimed at restricting combustion engine cars. With regard to high urban traffic, it is becoming increasingly important and urgent to free up space in cities and reduce gas emissions in places where millions of people live in certain cases. These matters lead to the emergence of four new trends in the automotive sector:

- **Electrification** – Since the early 21st century, there has been a major evolution towards eliminating internal combustion engines, converting these engines into hybrid and electric models.

- **Smart cars** – vehicles that integrate software with internet connection and the possibility of pairing with other devices, such as mobile phones, computers and tablets, thus allowing access to information at a distance. Through this innovation, companies like Apple, through CarPlay, and Google, through the Android Auto system, enter in the car market.

- **Ride sharing** – At this point the goal is to develop a new mobility model based on car sharing, in which the customer rents the car for the period of time they need, picking it up in one place in the city and leaving it in another, in detriment of their own vehicle. For example, Toyota is collaborating with Uber and General Motors with Lyft.

- **Autonomous driving** – The autonomous driving allows the vehicle to drive on the road without any human intervention, this is, the car is controlled through radar, GPS and computer vision. This innovation allows humans to rest or work while traveling.

According to McKinsey & Company, the expansion associated with these four trends mentioned above, could expand automotive revenue pools by about 30 percent, adding up to $1.5 trillion in 2030 (high-disruption scenario), compared with about $5.2 trillion from traditional car sales and aftermarket products / services.

**Recurring revenues from new services**
 - Shared mobility - eg, car sharing, e-hailing;
 - Data-connectivity services - including apps, remote services, software upgrades.

**Aftermarket**
- Growth from increased vehicle sales.

**One-time vehicle sales**
- 2% annual increase driven by macroeconomic growth in emerging markets.
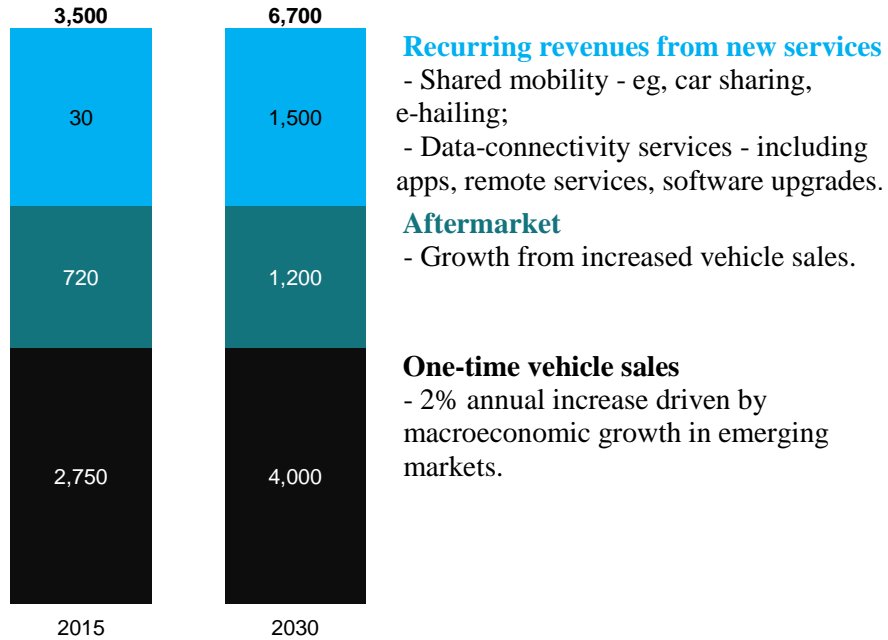
Source:, McKinsey&Company, January 2016
Figure 1: Automotive Revolution – Perspective towards 2030 (in $billion)

Although the above analysis focuses heavily on new trends in the automotive sector, environmental worries, concerns about urban traffic, it should be noted that, despite the revolution in the automotive sector, the fact is that, in checking the projections of worldwide vehicles sales, it can easily be seen that sales will continue to increase from year to year, as shown in the chart below:
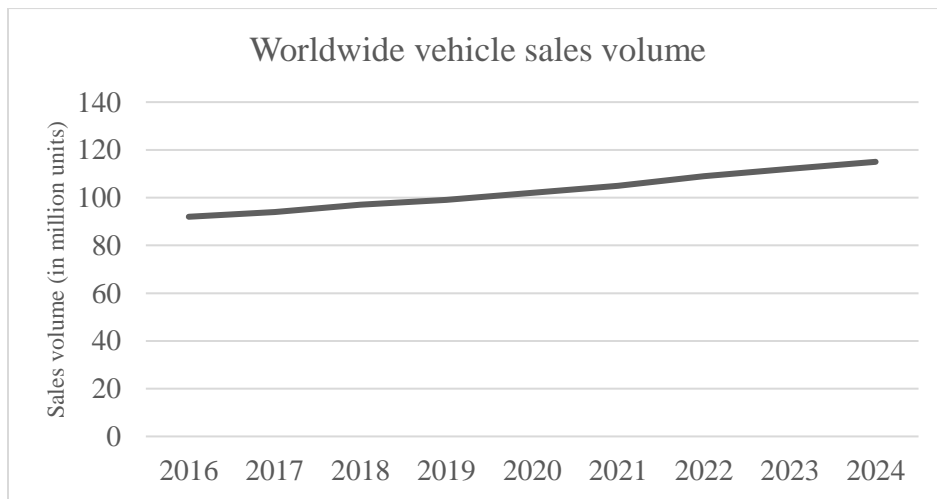


Source: Statista.com
Figure 2: Worldwide light vehicle sales from 2016 to 2024

Given the information from the Global Auto Database website, the main players of the automotive industry in the year 2018 are the companies Toyota, Volkswagen, Ford, Nissan and Honda. Toyota is in the first position with 8.8 million vehicles sold in 2018, the second of the list is the company Volkswagen, ended the year with 6.9 million units sold, the third of the list is Ford, with 5.4 million units sold. BMW is in the 11th place with 2.1 million vehicles sold in 2018.
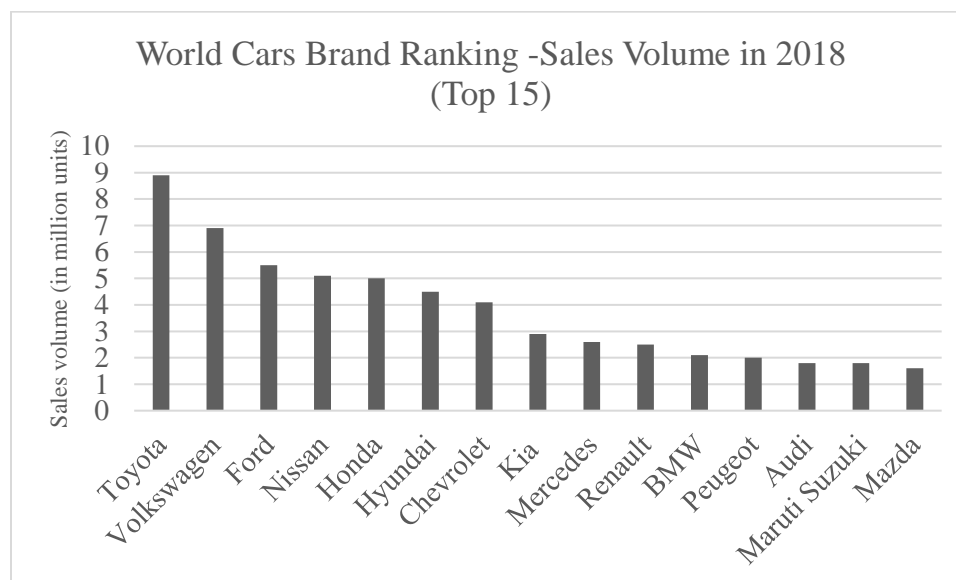


Source: Global Auto Database, focus2move.com
Figure 3: World Cars Brand Ranking – Sales Volume in 2018 (Top 15)

## 2.2. Motorcycle and Financial Services Industries

After analysing the automotive industry, it is now important to explore the motorcycle and financial services industry. With regard to motorcycles, this area has also been changing due to environmental problems, leading to the emergence of new brands and forcing existing companies to reinvent themselves in order to meet customer needs and government gas emission requirements. In line with the automotive sector (which increased by 1.1% in 2018), the motorcycle industry during 2018 saw a slight increase in worldwide sales to around 0.9%, with the United States being one of main responsible for this smooth growth. Markets such as Germany and Italy decreased by 10.7% and 2.2%, respectively, when compared to 2017. Countries such as Spain (2018: 11,124

units; 2017: 11,193 units) and France (2018: 16,615 units; 2017: 16,607 units) maintained their similar number of sales when compared to the year 2017.

The Financial Services segment performed quite positively during the year 2018, in balance sheet terms, business volume grew by 6.8% to € 133,210 million when compared to the year 2017, when business volume was around € 124,719 million. At the Automobiles and Auto Parts industry level, it is notorious the focus on this segment of financial services, and nowadays this section represents an important portion of corporates income.

## 3. Company Overview

### 3.1. History
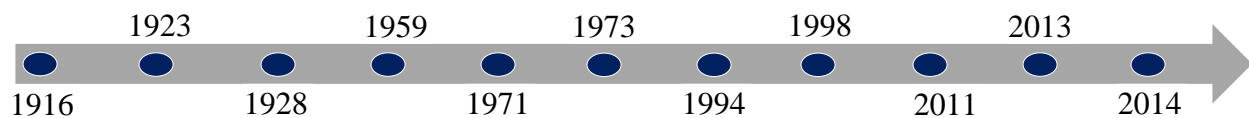


Source: BMW's Annual Report 2018, www.bmw.com

Figure 4: BMW's History

Bayerische Flugzeugwerke AG is a German company responsible for aircraft manufacturing that was founded in 7 March, 1916. BMW's first product was a straight-six aircraft engine called the BMW IIIa. The IIIa engine was known for good fuel economy and high-altitude performance. The resulting orders for IIIa engines from the German military caused rapid expansion for BMW. After the end of World War I in 1918, the company continued its business, focusing from there on the production of motorcycles engines, rail brakes and agricultural equipment.

In 1923, the company produced the first motorcycle, named BMW R32. A vehicle powered by a flat twin engine. However, BMW currently has many models with other types of engine.

BMW bought the automaker Fahrzeugfabrik Eisenach in 1928 and started car production in the same year. The first vehicle sold by the company was the BMW 3/15 model. From the 1930s, BMW expanded its variety to sports and luxury vehicles. In the late 1930's, more precisely in the year 1939, the beginning of World War II had a major impact on the brand. Until this date the main products of the brand were aircraft engines, automobiles and motorcycles. With the onset of the war, the brand concentrated its production on aircraft engines, making the automotive and motorcycle market secondary. During the World War II, many of BMW's German factories were bombed, and the remaining facilities were prohibited from producing aircraft or motor vehicles after the war. This ban caused a major setback for the company, and from then BMW survived by selling bicycles.

In the late 1940s, BMW resumed production of cars and motorcycles. However slow sales of luxury cars and small profit margins led to very serious financial problems and by 1959 the company was

close to being acquired by the direct rival Daimler-Benz AG. Yet, a large investment made by Herbert Quandt and Harald Quandt in the brand allowed it to maintain independence. Following this major investment came the launch of the hugely successful BMW 700 model, which enabled BMW to recover its financial situation.

In 1971, a new subsidiary of the BMW Group, called BMW Bank GmbH, was founded which provided customer financing and facilitated the leasing business. This segment is vital for the brand today, representing an important value in total revenues (this topic will be addressed further. ahead in the dissertation).

The brand's museum opened in Munich in 1973, an imposing and innovative building known as the "four-cylinder building".

In 1994, BMW bought the Rover group, which included the Rover, MG, Land Rover and MINI brands. This "bond" lasted only six years, in 2000 MG and Rover were sold to the Phoenix Consortium, while Land Rover was sold to Ford. From the Rover group, BMW AG only owns MINI nowadays. In 1998, after some negotiations the brand acquired Rolls-Royce.

In 2011 DriveNow was introduced to the market, the modern mobility concept. This car-sharing system started in Munich, but quickly spread to different cities, not only German but also worldwide. BMW currently has a wide range of vehicles for this type of service (premium, compact or electric).

More recently, BMW has launched the i segment, consisting only of electric vehicles, vehicles that are completely zero emission and allow the brand to bet on the sustainable / environmental aspect. Consequently, in 2013, the company launched the i3 model and a year later, in June 2014, the i8 model entered the market.

### 3.2. BMW AG Nowadays

Bayerische Motoren Werke Aktiengesellschaft is an enterprise based in Munich (Germany), with one hundred and thirteen years of history. The company is divided into four different business segments, automotive, motorcycles, financial services and other entities. BMW AG is one of the largest industrial companies worldwide in the different segments. As mentioned above, the BMW Group owns not only the BMW brand itself but also the MINI and Rolls Royce brands (acquired in 1994 and 1998, respectively). It is the only manufacturer that focuses solely on the premium segment with all their brands.

The company under analysis is distinguished from its competitors by the high standards of quality, comfort and aesthetics. Presently, BMW AG has a Research and Innovation team of about 9,000 workers, including engineers, designers, scientists, technicians and managers. BMW Group operates in more than 140 countries worldwide, employing around 134,682 people. The Financial Services segment is present in 53 countries. The leasing sector comprises a wide range of leasing businesses for the BMW and MINI brands, with a particular focus on the automotive industry.

The company has 31 production and assembly plants and 16 research and development locations.

In terms of management, operating performance at segment level is managed at an aggregated level based on returns on capital. However, this depends on the business model, as there are segments that are measured on the basis of return on total capital or equity. For the automotive and motorcycle segment, Return on Capital Employed (RoCE) is used, for financial services, Return on Equity (RoE) is applied.

As mentioned above, the BMW AG company has four segments. In this section three will be subject of further analysis (automotive, motorcycles and financial services) given their relevance to the brand.

Automotive Segment

This segment is the most significant for the company, with global sales network around 3,500 BMW, 1,600 MINI and 140 Rolls Royce dealers. Regarding the number of cars sold, the results in the year 2018 were very encouraging, beating the record of vehicles sold for the eighth consecutive year. Deliveries of BMW, Rolls Royce and MINI brand worldwide increased by 1.1%, which is

quite positive, representing an increase of 27,138 units (2018: 2,490,664 units; 2017: 2,463,526 units). Favourable market conditions in the Asian market had a major impact on this growth.

Individually, BMW brand registered a number of units sold of 2,125,026, an increase of 1.8% over the year 2017, setting a new record. In the case of MINI the trend was the opposite, with the brand having a slight decrease in sales compared to 2017, of about 2.8%. Rolls Royce exhibited a remarkable increase (22.2%) when compared to 2017, reaching its annual sales record (2018: 4,107 units; 2017: 3,362 units).

The BMW Group's sales in Europe decreased slightly between 2017 and 2018 (-0.3%), from 1,101,760 units to 1,098,523 units, partly due to the debate on diesel in some countries. From the chart below it can be seen that, in 2018, the world countries with the highest delivery rates are China, United States, Germany and UK.
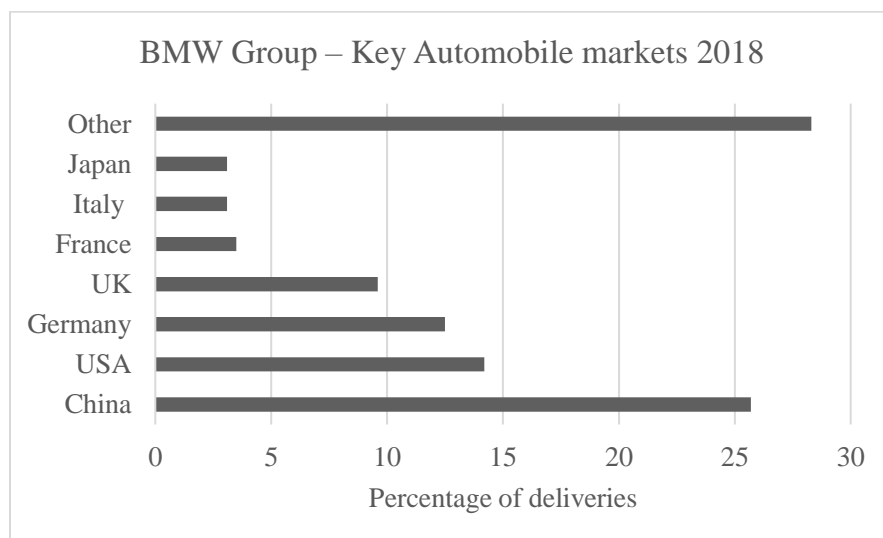


Source: BMW's Annual Report 2018
Figure 5: BMW Group – Key Automobile markets 2018

After presenting the Group's number of deliveries and understanding which countries represent the largest share of vehicles delivery, it is important to know which models impact BMW, MINI and Rolls-Royce the most. Starting with BMW, it is possible to conclude from the table below that the models that contribute the most to the company are, BMW 5 Series, BMW 3 Series, BMW X1, BMW X3 and BMW 1 Series. Among the five models mentioned, only three contributed positively to the increase in the number of deliveries between 2017 and 2018.

| | Deliveries of BMW vehicles (in units) | | |
|---|---|---|---|
| Model Variant | 2018 | 2017 | Change in % |
| BMW 5 Series | 382,753 | 347,313 | 10.2 |
| BMW 3 Series | 366,475 | 409,005 | -10.4 |
| BMW X1 | 286,827 | 286,743 | 0.0 |
| BMW X3 | 201,637 | 146,395 | 37.7 |
| BMW 1 Series | 199,980 | 201,968 | -1.0 |
| Other | 687,354 | 696,859 | - |
| **Total** | **2,125,026** | **2,088,283** | **1.8** |

Source: BMW's Annual Report 2018
Table 2: Deliveries of BMW vehicles by model variant

Regarding the MINI brand, the analysis is simplified since there are only four models. The BMW AG Annual Report 2018 shows that the slight decrease in the number of deliveries between 2017 and 2018 is largely due to two models, the MINI Hatch and the MINI Clubman. Conversely, the MINI Countryman model showed a positive change of 17.5% between 2017 and 2018.

| | Deliveries of MINI vehicles (in units) | | |
|---|---|---|---|
| Model Variant | 2018 | 2017 | Change in % |
| MINI Hatch | 182,189 | 194,070 | -6.1 |
| MINI Convertible | 32,356 | 33,351 | -3.0 |
| MINI Clubman | 47,236 | 59,572 | -20.7 |
| MINI Countryman | 99,750 | 84,888 | 17.5 |
| **Total** | **361,531** | **371,881** | **-2.8** |

Source: BMW's Annual Report 2018
Table 3: Deliveries of MINI vehicles by model variant

In more than 100 years of brand history, Rolls-Royce has never had such positive numbers, presenting an increase of 22.2% compared to 2017. Two very important models contributed to this record, the Phantom and the new Rolls-Royce Cullinan, as shown in the table below.

| | Deliveries of Rolls-Royce vehicles (in units) | | |
|---|---|---|---|
| **Model Variant** | **2018** | **2017** | **Change in %** |
| Phantom | 830 | 235 | 253.2 |
| Ghost | 958 | 1,098 | -12.8 |
| Wraith/Dawn | 1,775 | 2,029 | -12.5 |
| Cullinan | 544 | - | - |
| **Total** | **4,107** | **3,362** | **22.2** |

Source: BMW's Annual Report 2018
Table 4: Deliveries of Rolls-Royce vehicles by model variant

Lastly, the electric models, an industry that surpassed the mark set by the brand (140,000 units), with deliveries of 142,617 vehicles in 2018, becoming the world leader in terms of combined deliveries of all-electric and plug-in hybrid vehicles. As it can be seen on the table 5, the model that contributed the most in terms of units was the BMW iPerformance, with a total of 91,853 cars delivered in the year 2018.

| | Deliveries of electrified vehicles (in units) | | |
|---|---|---|---|
| **Model Variant** | **2018** | **2017** | **Change in %** |
| BMW i | 37,545 | 33,676 | 11.5 |
| BMW iPerformance | 91,853 | 63,605 | 44.4 |
| MINI Eletric | 13,219 | 5,799 | 127.9 |
| **Total** | **142,617** | **103,080** | **38.4** |

Source: BMW's Annual Report 2018
Table 5: Deliveries of electrified vehicles by model variant

Regarding financial results, more precisely revenues, they have a value in 2018 very similar to the value recorded in 2017 (+ 0.1%). In relation to EBIT margin, the trend is opposite to revenues, as they registered a decrease of 2.0% (2017: 9.2%; 2018: 7.2%), but this figure is in line with the expectations set by BMW AG in the Quarterly Report to 30 September 2018 (EBIT margin > 7.0%). The same downward trend for 2017 showed the Return on Capital Employed indicator, registering a very significant decrease, around 27.9%. The main reasons for this decrease were higher investments in the expansion and rejuvenation of the model portfolio, in the electrification and digitization of the BMW Group's vehicle fleet as well as the expansion of the production

network. Despite this sharp decrease, the RoCE ratio in 2018 (49.8%) surpasses the long-term target RoCE for the automotive segment (26.0%).

|  | 2018 | 2017 | Target |
|---|---|---|---|
| **Profit before financial result (in € million)** | 6,182 | 7,888 | |
| **Average capital employed (in € million)** | 12,420 | 10,147 | |
| **Return on Capital Employed (in %)** | 49.8 | 77.7 | 26.0 |

Source: BMW's Annual Report 2018
Table 6: Return on Capital Employed – Automotive Segment

Motorcycles Segment

This segment business network is organized in the same way as the automobiles business, entirely focused on the premium segment. Currently, motorcycles are sold by more than 1,200 dealerships and operate in more than 90 countries. For the eighth consecutive year, the motorcycle segment reaches a new record with respect to vehicles sold, 165,566 units in 2018, an increase of 0.9% compared to 2017. As mentioned earlier in this dissertation, the German and Italian market recorded a decrease in the number of motorcycles sold in 2018 compared to last year. Nonetheless, in 2018, BMW introduced eight new models, R 1250 GS, R 1250 Adventure, R 1250 RT, R 1250 R, R 1250 RS, C 400 GT, F 850 GS Adv. and S 1000 RR, which counterbalanced the decrease in sales in the European market. Germany, Italy and France are the most representative countries in this segment, as shown in the figure below.
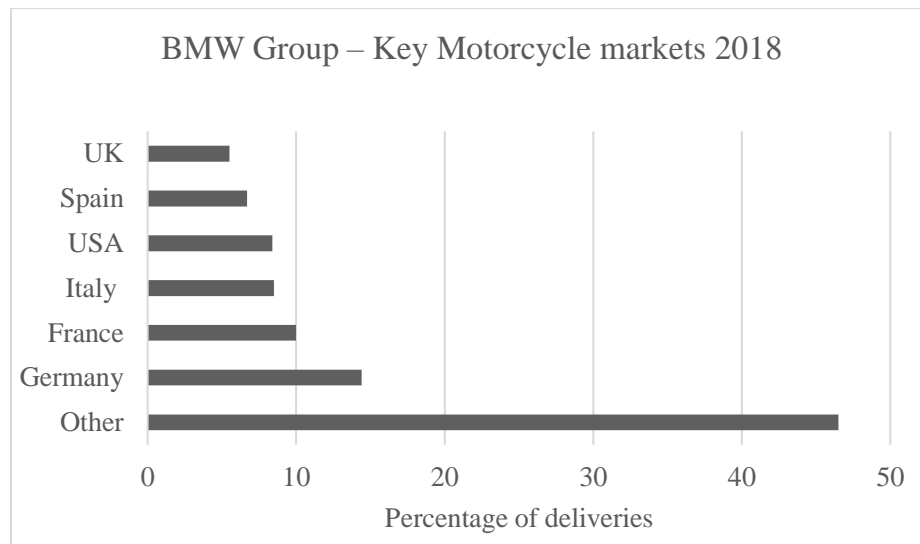
Source: BMW's Annual Report 2018
Figure 6: BMW Group – Key Motorcycle markets 2018

Concerning financial data, EBIT margin decreased 1.0% compared to 2017, but presented a value (8.1%) within the expectation created by the brand for the year 2018 (between 8.0% and 10.0%). The RoCE is also a key performance indicator for this segment. Regardless of the decrease in the percentage between 2017 and 2018 (-5.6%), the value registered in the year 2018 (28.4%) exceeded the target established by the brand (26.0%).

| | 2018 | 2017 | Target |
|---|---|---|---|
| **Profit before financial result (in € million)** | 175 | 207 | |
| **Average capital employed (in € million)** | 616 | 609 | |
| **Return on Capital Employed (in %)** | **28.4** | **34.0** | **26.0** |

Source: BMW's Annual Report 2018
Table 7: Return on Capital Employed – Motorcycles Segment

Financial Services Segment

This business segment increased by 6.8% compared to 2017, with a volume of €133,210 million, following the growth of recent years, which is remarkable, since the market is increasingly competitive. 2018 was a solid year-on-year growth in dealerships financing, presenting an increase of 6.7% over the previous year (2018: €20,438 million; 2017: €19,161 million). Conversely, the ROE ratio decreased by 3.3% compared to 2017, which was already foreseen in the 2017 Annual Report, as nowadays there are more stringent regulatory requirements for equity capital.

| | 2018 | 2017 | Target |
|---|---|---|---|
| Profit before tax (in € million) | 2,161 | 2,207 | |
| Average equity capital (in € million) | 14,630 | 12,167 | |
| Return on Equity (in %) | 14.8 | 18.1 | Between 14% and 18% |

Source: BMW's Annual Report 2018
Table 8: Return on Equity – Financial Services Segment

Respecting the number of contracts, there was a positive variation of approximately 6.1%, being that at 31 December 2018 the contract portfolio under management covered 5,708,032 contracts (2017: 5,380,785 contracts).
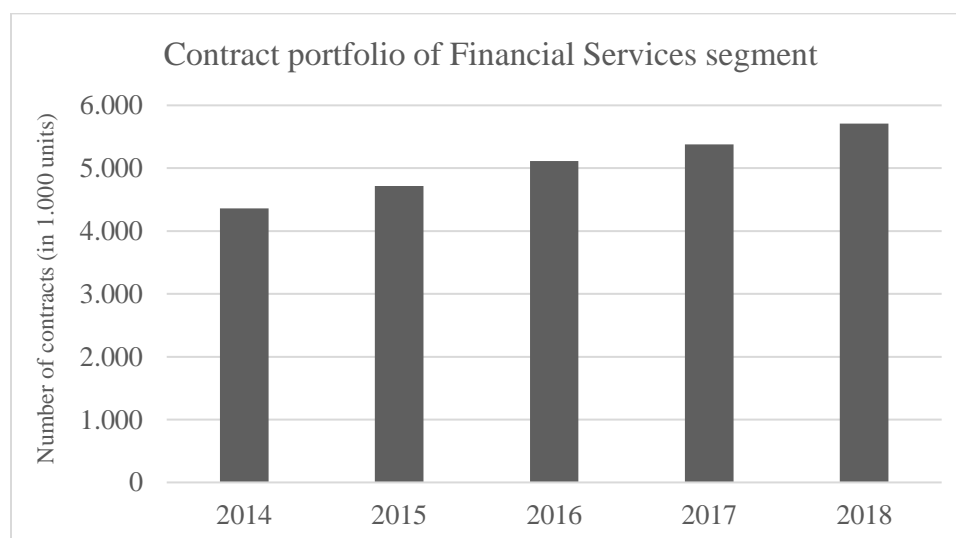


Source: BMW Annual Report 2018
Figure 7: Contract portfolio of Financial Services segment

Two key elements for the success of the Financial Services segment are credit financing and leasing business with retail customers, where the leasing represent 33.1% of the total value of new contracts and credit financing 66.9%. During the year 2018, 1,908,640 new credit financing and leasing contracts were concluded with customers, 4.4% above the value of the previous year (2017: 1,828,604 contracts).

## 3.3. Market Share and Rating Evolution

The year 2018 was quite troubled regarding the numerous political uncertainties that had settled in the capital markets. The introduction of higher customs tariffs on goods traded between China and the USA in July 2018 had a very negative effect on global stock exchanges, an integral part of these stocks belonging to the automotive sector. The company under review (BMW AG) showed a positive trend in the first three months, counteracting the negative movement that the brand anticipated. However, over the next three months this trend reversed substantially, showing significantly lower stock prices during April, May and June (03-04-2018: €88.68; 29-06-2018: €77.63). The third and fourth semesters were marked by the great instability noticed worldwide, inflated by the fears of a disorderly Brexit and a deterioration in the trade disputes between China and USA and the USA and Europe, which caused a great fall in the stock price of the company.

At the end of the year 2018, BMW AG stock closed with a very similar performance compared to the DAX (stock index that represents 30 of the largest and most liquid German companies that trade on the Frankfurt Exchange). Preferred stock finished the year at €62.10, significantly below when compared to the value recorded on 29-12-2017 (€74.64). For common stocks, the price at the end of 2018 was €70.70, a change of -18.6% since the beginning of the year. Despite this significant drop, the BMW Group remained among the most valuable German companies listed on the stock market.

Regarding the rating, BMW AG is classified as follows:

| Company Rating | Moody's | Standard & Poor's |
|---|---|---|
| Non-current financial liabilities | A1 | A+ |
| Current financial liabilities | P-1 | A-1 |
| Outlook | Stable | Stable |

Source: BMW's Annual Report 2018
Table 9: Company Rating

Based on the table above it can be seen that in the long term (non-current), the rating assigned by the Standard & Poor's company is A+ (stable outlook). As regards the short term, the rating allocated by this same company is A-1. The rating company Moody's assigned a rating of A1 to long-term financial liabilities and P-1 to current financial liabilities. From a general point of view, given the classification, the BMW Group's outlook on the market is stable. The strong operating performance, the excellent positioning with respect to the challenges faced by the automobile industry, a solid capital structure and a prudent financial approach contribute significantly to this favourable outlook.

### 3.4. Looking ahead into the future of BMW/ Strategy

In accordance with the strategy defined by the brand, marked by its offensive model, new vehicles (five new models and two new variants of BMW M vehicles) and vehicle concepts were launched in the market. The major focus on technologies that will suit as the foundation for a positive brand future are software development and connectivity, autonomous driving, driver assistance, battery research and electric mobility. The main objective is always to find innovative solutions and anticipate the future needs of customers and future customers of the brand. In line with the above, the company opened in May 2018, the Autonomous Driving Campus near the city of Munich. A center focused on the development of new technologies, such as, driving simulation and artificial intelligence.

In the same month of 2018, the company opened a new research and development centre in Beijing, where systems and services are developed, the second in the country (China), since it already had

a research centre in Shenyang. A month later, in June, the BMW Group's inaugurated another R&D centre in China, this time in Shanghai, strengthening its position in a highly competitive country. This R&D center in Shanghai is focused on three different points, digital services, autonomous driving and futuristic design. This expansion led the company to significantly increase the number of employees compared to last year (+ 3.7%). Most of these employees are IT specialists and software developers in the area of artificial intelligence, data analysis and machine learning.

Focusing on the strategy Number One > Next, the BMW Group's has spent over 373 million euros on training and development. This concentration on robotics, electric mobility, data analysis and artificial intelligence enables the company to create an important foundation for the success of its strategy. Another key factor for the brand's future vision is diversity, based on three aspects of gender, age/experience and cultural background. For example, the percentage of women in the BMW AG was 19.9% in 2018, 3.4% above 2017. In 2018, the female population represents about 44.0% and 28.0% of BMW Group's trainee and student programs, respectively. In order to secure its position in the automotive market worldwide, the BMW Group is increasingly integrating the theme of sustainability in its business model. The company emphases on three fundamental points: efficient use of resources along the value chain, responsibility with regard to employees and society and the development of products and services that provide sustainable individual mobility.

# 4. BMW Group Valuation

## 4.1. Assumptions for the Valuation

This point of the project is focused on the explanation of the assumptions employed in the estimates for the explicit period. In line with the BMW Group's growth strategy, it is important that the definition of these assumptions are aligned with reality worldwide, as the brand is present on five continents and in more than 140 countries. These assumptions will be the basis for the calculation of BMW AG's share price through the DCF-FCFF method, where the objective is to present a final value closer to the reality. The DCF-FCFF model is estimated based on a five year explicit period (2019-2023) and then, a steady state is assumed from that period onwards, with the stability of the economy.

### 4.1.1. Revenues

Revenues are a very important heading in this assessment given their magnitude (€ 97,480 million), to identify the main sources of brand value creation, future revenues projections are analysed individually by segment. The forecasts drivers are based on three aspects, historical growth, macroeconomic framework and trends in the main geographies where the brand operates (appendix 1).

#### 4.1.1.1. Automotive Revenues

The automotive revenues between 2014 and 2015 increased significantly (13.79%). In spite of that, from 2015 to 2018 the figures presented are very similar, consequently, the forecast driver is

centred on two very important points, the Compound Annual Growth Rate (CAGR) and the Terminal Growth Rate (TGR). The CAGR formula is as follows:

$$\text{CAGR} = \left(\frac{Ending\ Balance}{Beggining\ Balance}\right)^{\frac{1}{n-1}} - 1\ (17)$$

Formula 17: Compound Annual Growth Rate

Through the above formula, the value of CAGR in the period 2015-2018 is 0.12%. However, another factor must be taken into account when provisioning revenues, the terminal growth rate. This concept represents an assumption that the company will continue to grow/decline at a steady constant rate into perpetuity. In calculating the perpetual growth rate, two variables are taken into account, inflation and GDP. As BMW AG operates in a large number of countries, the countries/regions where the company has the most impact in terms of revenues are selected, Europe (where Germany has a special focus), the USA and China. In order to achieve the inflation and GDP value, the company's revenues in 2018, its weight in this analysis (appendix 2) and the inflation rate and GDP growth provisions in each of the regions analysed are considered. This data is obtained from the source, Trading Economics (appendix 3).

As reported by the above information, the value of the TGR results from the sum of the inflation rate (1.57%) and the GDP growth rate (1.39%), which makes a total of 2.96%.

| Inflation | GDP growth rate | Total (TGR) |
|---|---|---|
| 1.57% | 1.39% | 2.96% |

Source: Trading Economics, Own Calculations

Table 10: Terminal Growth Rate

The forecast is that revenues will grow at a rate of 2.96% from 2023 (inclusive). According to industry and company analysis, in 2018, different models were implemented, new BMW Group's facilities were built with special focus on research and development, so it is reasonable to consider that the company's revenues in the automotive segment will increase from year to year at an

increasing rate until it reaches the steady state in the year 2023. Therefore, revenue growth rate in the automotive sector between 2018 and 2023 are summarized in the following table:

| Forecast Driver | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|
| Automotive sector | 0.12% | 0.69% | 1.25% | 1.82% | 2.39% | 2.96% |

Source: Own Estimates

Table 11: Automotive sector growth rate (2018-2023F)

Given the projections, the value of revenues in the automotive sector will reach a value of €93,943 million in the year 2023.

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|---|---|---|---|
| Automotive Revenues | 75.173 | 85.536 | 86.424 | 85.742 | 85.846 | 86.436 | 87.521 | 89.116 | 91.245 | 93.943 |

Source: BMW AG Annual Report 18, Own Estimates

Table 12: Historical and Forecasted Data – Automotive Revenues (2014-2023F)

## 4.1.1.2. Motorcycles Revenues

The motorcycle segment is completely different in size from the automotive sector, €2B vs €85B in 2018, respectively. Despite this situation, the motorcycle segment is present in several markets worldwide, as mentioned in the industry and company analysis. As stated above, it is expected that the motorcycle market increase its revenues, largely justified by the launch of eight new models in 2018. For this reason, regardless of the decrease in sales between 2017 and 2018, it is reasonable to consider a growth rate of 3.14%, resulting from the arithmetic average of growth over the past three years.

## Historical and Forecasted Data – Motorcycle Revenues
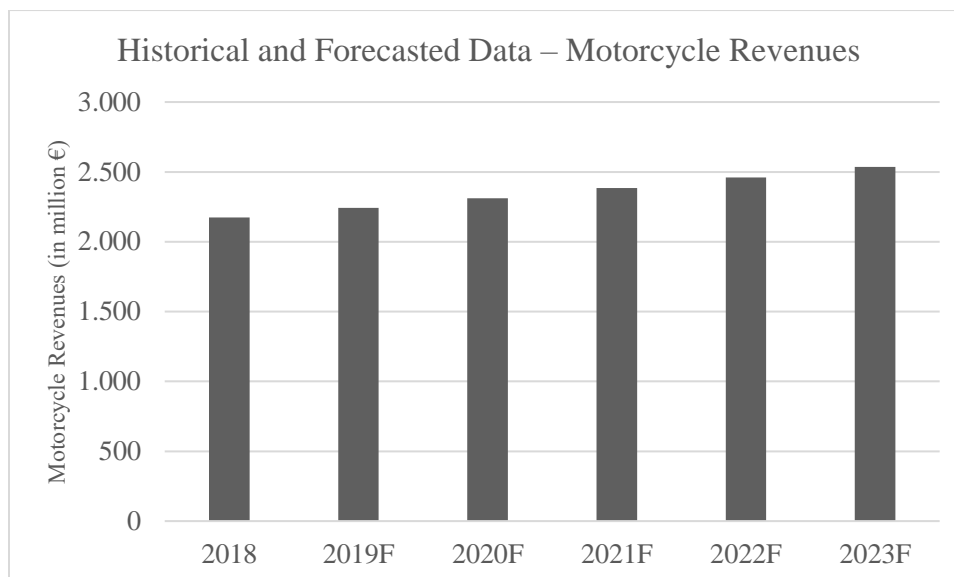
Source: BMW AG Annual Report 18, Own Estimates

Figure 8: Historical and Forecasted Data – Motorcycle Revenues (2018-2023F)

### 4.1.1.3. Financial Services Revenues

According to forecasts made and based on the Annual Report 2018, it is projected that the value of this segment will continue to increase from year to year. This sector is the second most representative of the brand in terms of revenues, with a value of €28,165 million in 2018. Consequently, the computation of the growth rate presents the same basis of calculation as the growth rate of the automotive sector. Through *formula 17*, the value of CAGR during the period 2015-2018 is 5.86%. Nevertheless, as mentioned in the industry analysis, there is an increasing bet on this sector by companies, so it is expected that this figure (5.86%) gradually decreases over time until it reaches the terminal growth rate (2.96%), a rate that will be maintained perpetually.

| Forecast Driver | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|
| Financial Services Revenues | 5.86% | 5.28% | 4.70% | 4.12% | 3.54% | 2.96% |

Source: Own Estimates

Table 13: Financial Services sector growth rate (2018-2023F)

### 4.1.1.4. Other Entities Revenues and Eliminations

The segment of Other Entities presented a very residual and constant value over the five historical years (appendix 4), thus the value recorded in 2018 is assumed as a reference for the forecasted years.

For eliminations, the benchmark growth rate is based on the weight of eliminations relative to revenues each year. The forecast driver is obtained through the arithmetic average of the percentages obtained in each historical year (2014-2018). The resulting output from this operation is a rate of 16.65%. It is possible to see that the value of eliminations will increase between 2019 and 2023 through the *appendix 4*. This item (eliminations) includes inter-segment transactions which relate primarily to internal sales of products, provision of funds for the Group companies and the related interest.

### 4.1.2. Cost of sales

According to Koller et al. (2010), cost of sales should be based on revenues since it is driven by them. In this way, the CoS were analysed by segment in order to find out the origin of the main costs for the company. In addition to the division of costs by segment, R&D spending was also investigated separately given the growing importance of this sub-heading and the high correlation of this type of expenditure with revenues. As mentioned in the entity's analysis, BMW Group's invested heavily in R&D in 2018 and it is likely that this investment will continue over the medium-long term in technologies such as driving simulation, artificial intelligence, battery research and electric mobility.

Looking now at the financial side and more specifically at historical performance, it is apparent that the CoS / Revenues ratio ranged from 78.85% (2014) to 80.96% (2018) for the BMW Group. Regarding the different segments of the company, the arithmetic average of the CoS / Revenues ratio between 2014 and 2018 was defined as forecast driver. For that reason, the value used as

reference for the forecasted period for cars, motorcycles, financial services and eliminations is respectively 82.12%, 79.42%, 86.68% and 98.63%.

Following with previous contributions, the value of CoS in the year 2023 will be €87,515 million. Regarding R&D expenditure, as mentioned above, will be projected according to its historical performance during the 2014-2018 period, centred on revenues. Through the arithmetic average of the R&D/Revenues ratio over the last five years, the forecast driver is 4.96% and the value of this sub-heading in 2023 will be € 6,777 million (appendix 5).
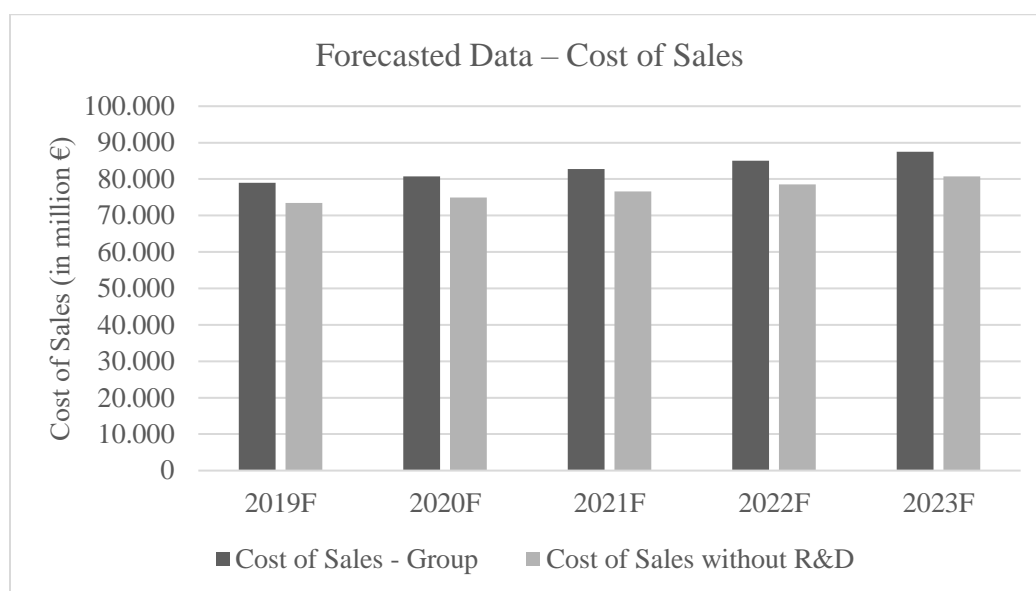


Source: Own Estimates

Figure 9: Forecasted Data – Cost of Sales (2019F-2023F)

### 4.1.3. Selling and Administrative Expenses and Other Operating Income and Expenses

The same model that was applied in the above point will be employed in these three sub-headings since there is a strong correlation between these three and revenues, subsequently it is expected that these costs (S&A and Other Operating Expenses) and income (Other Operating Income) follow the same trend. According to historical performance, the S&A / Revenues ratio fluctuated among 9.37% and 9.82% over the period 2014-2018, with a noticeable yearly increase in the value of this

sub-item from (appendix 4), partly due to the company's large investment in IT projects in all segments. The performance of the ratio has been quite stable in all segments, so the forecast driver used until the year 2023 is the average of the ratios between the year 2014 and 2018.

Regarding to OOI and OOE, as mentioned above, there is a correlation between these and revenues, so the forecast driver used in these two sub-items has the same rationale applied in S&A expenses. The OOI/Revenues ratio is relatively stable over the five-year history (forecast driver is 0.86%). For its part, the OOE ratio has a very similar performance, with a forecast driver of 0.96%.

### 4.1.4. Earnings Before Interest and Taxes and Earnings Before Taxes

All of the previously items presented generate Earnings Before Interest and Taxes (EBIT) through the following formula:

$$EBIT = Revenues - Cost\ of\ Sales - R\&D\ expenses - S\&A\ expenses + OOI - OOE \text{ (18)}$$
Formula 18: Earnings Before Interest and Taxes

This value of EBIT will be quite important later in this dissertation when computing the Free Cash Flow to the Firm (FCFF) in the DCF valuation model.

For the determination of Earnings Before Taxes (EBT) is crucial to analyse five sub-headings, Result from Equity Accounted Investments (REAI), Interest and Similar Income (ISI), Interest and Similar Expenses (ISE), Other Financial Result (OFR) and Financial Result (FR). The FR outcomes from the sum of the four previous headings, showing negative values in 2014 and 2015 and positive in 2016, 2017 and 2018. To estimate the forecast driver, the arithmetic average between 2014 and 2018 of the four headings individually is used as reference (REAI / EBIT, ISI / EBIT, ISE / EBIT and OFR / EBIT, respectively). Since EBIT has increased from year to year during the forecasted period, it is projected that the EBT value will follow the same trend (appendix 4).

**4.1.5. Effective Tax Rate**

According to the BMW Group Annual Report 2018, the effective tax rate results from the division of the current tax expense by the group profit before tax. The tax rate applicable in Germany is 30,8%, which results in an expected tax expense of €3,023, however, to calculate the Group's current tax expense, is indispensable to add to this value the variances due to different tax rates (- €359), the tax increases as a result of non-deductible expenses and tax-exempt income (+ €141), the tax expense (+)/benefits (-) for prior years (- €16) and other variances (- €214). Considering the historical performance of the Group with regard to this item, it is possible to verify that there is some volatility, especially between 2016 and 2018. Therefore, for the purpose of this dissertation, the rate applied in 2018 (26.24%) will be used as forecast driver (appendix 4).

**4.1.6. Depreciation and Amortization**

In order to forecast the value of Depreciations and Amortizations (D&A) there are three distinct methods. According to Koller et al (2010), the D&A can be estimated using the equipment purchases, a percentage of revenues and a percentage of Property, Plant & Equipment (PP&E), the latter, according to the authors is what generates the best results. Consequently, for the calculation of the D&A values between 2019 and 2023, this method is applied. However, as is done in BMW Group Annual Report 2018, the value of Intangible Assets and Investment Assets (leased products) is added to the value of PP&E.

To compute the estimate for intangible assets and property, plant and equipment, the CAGR of the 2014-2018 period was employed, however, for leased products, the CAGR of the 2016-2018 period was utilised, since there is a slight difference between LP values before and after 2016. After the calculation of the forecast drivers for LP, IA and PP&E, the estimate for D&A was computed based on the value of D&A over PP&E, IA and LP during the 2014-2018 period, as this ratio remained quite stable over the five years (appendix 6).

| (in million €) | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|
| Depreciation & Amortization | 5,113 | 5,457 | 5,676 | 5,917 | 6,180 | 6,470 |
| PP&E, Intangible Assets and Leased Products | 69,344 | 71,991 | 74,882 | 78,049 | 81,526 | 85,355 |
| Forecast Driver (in %) | | 7.58% | 7.58% | 7.58% | 7.58% | 7.58% |

Source: BMW AG Annual Report 18, Own Estimates

Table 14: Historical and Forecasted Data – Depreciation & Amortization (2018-2023F)

### 4.1.7. Capital Expenditures

Capital Expenditures (CAPEX) are funds used by a company to acquire, upgrade or maintain physical assets such as buildings, technology, industry plant or equipment. CAPEX is any type of expense that a firm capitalizes or shows on its balance sheet as an investment, rather than on its income statement as an expenditure. Based on the Annual Report 2018, it is possible to confirm that the value of CAPEX remained relatively constant over the period 2014-2016, but between 2016 and 2017 the value of this caption increased significantly by 22.14%, recording a value of €7,112 million in 2017. The year 2018 sustained this growth trend and recorded a value of €8,013 million. Consequently, the estimate for the capital expenditure among 2019 and 2023 will be the arithmetic average of the CAPEX / Revenues ratio between 2017 and 2018 (appendix 7).

| (in million €) | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|
| **Capital Expenditure** | **7,622** | **7,786** | **7,976** | **8,192** | **8,434** |
| Revenues | 98,628 | 100,752 | 103,207 | 105,997 | 109,135 |
| Forecast Driver (in %) | 7.73% | 7.73% | 7.73% | 7.73% | 7.73% |

Source: Own Estimates

Table 15: Forecasted Data – Capital Expenditures (2019F-2023F)

The value of CAPEX will tend to increase every year, as shown in the table above, as competitiveness in the sectors where BMW AG is present is growing and the brand needs to maintain its strong market position, investing in several areas, especially software.

## 4.1.8. Investment in Working Capital

Working Capital (WC) is a measure of a company's operational efficiency, liquidity and its short term financial health. If a company's current assets exceed its current liabilities, then it should have the potential to invest and grow, if its current assets do not exceed the current liabilities could be a problem for the company, affecting the growth or paying back creditors, and in extreme cases it may lead to bankrupt.

The WC is quantified according to the following formula:

*Working Capital = Inventories + Trade and other receivables – Trade and other payables + Other Current Assets + Current tax (Assets) – Other Current Liabilities – Current tax (Liabilities) (19)*

*Formula 19: Working Capital*

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Inventories | 11,089 | 11,071 | 11,841 | 12,707 | 13,047 |
| Trade and other receivables | 2,153 | 2,751 | 2,825 | 2,667 | 2,546 |
| Trade and other payables | 7,709 | 7,773 | 8,512 | 9,731 | 9,669 |
| Other Current Assets | 5,038 | 4,693 | 5,087 | 7,485 | 9,790 |
| Current Tax (Assets) | 1,906 | 2,381 | 1,938 | 1,566 | 1,366 |
| Other Current Liabilities | 7,775 | 9,208 | 10,198 | 13,443 | 15,117 |
| Current Tax (Liabilities) | 1,590 | 1,441 | 1,074 | 1,124 | 1,158 |
| **Working Capital** | **3,112** | **2,474** | **1,907** | **127** | **805** |

Source: BMW AG Annual Report 18

Table 16: Historical Data –Working Capital (2014-2018)

Through the table above it is possible to verify that Working Capital presented its lowest value in 2017 (€127 million), in reverse, reached the highest value in 2014 (€3,112 million). In order to compute the forecast driver for the period 2019-2023, the Working Capital / Revenues ratio between 2014 and 2018 (1.91%) was used. Revenues were applied as an estimate since this line (WC) has a strong connection with them, therefore it is expected that over the period 2019-2023, the WC will represent 1.91% of the revenues. Based on the forecast made earlier, revenues will increase from year to year between 2019 and 2023, so, as a direct consequence, the value of WC will also increase accordingly. The investment in working capital represents the variation between the value of $WC_n$ and $WC_{n-1}$.

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|---|---|---|---|
| Revenues | 80,401 | 92,175 | 94,163 | 98,282 | 97,480 | 98,628 | 100,752 | 103,207 | 105,997 | 109,135 |
| **Working Capital** | **3,112** | **2,474** | **1,907** | **127** | **805** | **1,881** | **1,921** | **1,968** | **2,021** | **2,081** |
| % Working Capital / Revenues | 3.87% | 2.68% | 2.03% | 0.13% | 0.83% | 1.91% | 1.91% | 1.91% | 1.91% | 1.91% |
| **Change in Working Capital (Investment in W.C.)** | **-** | **-638** | **-567** | **-1.780** | **678** | **1.076** | **41** | **47** | **53** | **60** |

Source: BMW AG Annual Report 18, Own Estimates

Table 17: Historical and Forecasted Data – Investment in Working Capital (2014-2023F)

## 4.2. Discounted Cash Flow of BMW AG

### 4.2.1. Free Cash Flow to the Firm

In order to determine the FCFF for each forecasted year, it is indispensable to take into account five components previously analysed in this dissertation, EBIT, effective tax rate, Depreciation and Amortization, Capital Expenditure and Investment in Working Capital. The FCFF formula is as follows:

*FCFF = EBIT (1- tax rate) + Depreciation and Amortization – CAPEX - Investment in WC (1)*

*Formula 1 (p.16): Free Cash Flow to the Firm*

| (in million €) | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|
| EBIT | 9,121 | 10,030 | 10,242 | 10,490 | 10,772 | 11,092 |
| Tax Rate | 26.24% | 26.24% | 26.24% | 26.24% | 26.24% | 26.24% |
| EBIT (1-t) | 6,728 | 7,399 | 7,555 | 7,738 | 7,946 | 8,182 |
| Depreciation and Amortization | 5,113 | 5,457 | 5,676 | 5,917 | 6,180 | 6,470 |
| CAPEX | 8,013 | 7,622 | 7,786 | 7,976 | 8,192 | 8,434 |
| Investment in Working Capital | 678 | 1,076 | 41 | 47 | 53 | 60 |
| **FCFF** | **3,150** | **4,158** | **5,405** | **5,631** | **5,881** | **6,158** |

Source: BMW AG Annual Report 18, Own Estimates

Table 18: Historical and Forecasted Data – Free Cash Flow to the Firm (2018-2023F)

## 4.2.2. Cost of Capital

### 4.2.2.1. Cost of Debt

In order to compute BMW Group cost of debt two inputs are required, the risk free rate and the spread associated with the credit risk. To determine the value of the risk free rate, it is used the assumption mentioned in the Literature Review, which argues that the rate should be the 10 Year yield Germany Bund. According to Bloomberg, the risk free rate on 28-12-2018 was 0.24%.

To estimate the other cost of debt component, the spread, the rating assigned by the major rating agencies, Moody's and Standard & Poor's, was applied. According to the BMW AG Annual Report 18, "Since December 2013, BMW AG has had a long-term rating of A+ (stable outlook) and a short-term rating of A-1 from the rating agency Standard & Poor's. This represents the highest rating currently given by Standard & Poor's to a European car manufacturer. In January 2017, Moody's raised its long-term rating for BMW AG from A2 (positive outlook) to A1 (stable outlook). The P-1 short-term rating was confirmed.". This way and according to Damodaran's table,

the A1 / A+ rating is associated with a spread of 1.25% (appendix 8). Thus, the cost of debt of BMW Group is obtained by summing the risk free rate with the allocated spread, totalling 1.49%.

| Risk Free Rate | 0.24% |
|---|---|
| Spread | 1.25% |
| **Cost of Debt** | **1.49%** |

Source: Bloomberg, Damodaran, Own Estimates

Table 19: Cost of Debt

### 4.2.2.2. Value of Debt and Equity

The market value of equity is obtained by multiplying the stock price by total shares outstanding. According to the BMW AG Annual Report 18, the number of preferred shares and common shares issued at 31 December of 2018 is 56,126,904 and 601,995,196, respectively. Based on Bloomberg, the price of common shares is €70.70, while the price of preferred shares is €62.10. According to the number of shares and their unit price, the market value of equity is €46,047 million (appendix 9). Regarding the debt value, BMW AG has a responsibility divided into several sources, with a large part of this allocated to bonds. Considering the BMW AG Annual Report 2018, the value of the financial debt on December 31, 2018 is €103,597 million. To obtain the value of Net Debt, it is necessary to withdraw from the value of the financial debt the financial assets and cash and cash equivalents.

*Net Debt = Financial Debt – Financial Assets – Cash and cash equivalents (20)*

*Formula 20: Net Debt*

**4.2.2.3. Cost of Equity**

The cost of equity represents the compensation the market demands in exchange for owning the asset and bearing the risk of ownership. That is, the return that a firm requires to decide if an investment meets capital return requirements. The traditional formula for the cost of equity is the Capital Asset Pricing Model, presented earlier in the Literature Review (*formula 4*).

Concerning this point, there are some components that need to be taken into account, such as, risk free rate, beta levered and beta unlevered, debt to equity ratio, effective tax rate, equity risk premium and country risk premium. Three of the components are analysed previously in this dissertation, the risk free rate used was the 10 Year yield Germany Bund (0.24%), the debt and equity values are €103,597 million and €46,047 million, respectively, which makes a ratio of 2.25 and finally, the effective tax rate (section 4.1.5). To compute the beta levered, the *formula 6* mentioned in the Literature Review is used, where the value of the unlevered beta (0.76) was taken from Damodaran (Unlevered beta corrected for cash from the Automotive Industry), the debt to equity ratio (2.25) was obtained through debt book value and equity market value, the beta of debt is zero and the effective tax rate is 26.24%. Therefore, the value of beta levered is equal to 2.02. Beta is a measure of market risk, in this case, a beta greater than one indicates a stock's risk greater than the market risk.

After computing beta levered, it is now important to analyse the equity risk premium (ERP) and the country risk premium (CRP). The ERP was taken from Bloomberg, since the company is German, the German ERP was employed (5.96%). Given that BMW AG operates in more than one hundred and forty countries, it is essential to consider the country risk premium associated with each country/region. The CRP applied was based on the company's 2018 revenues in each region (as there are different sales exposure worldwide) and the average CRP per region. This way a 3.83% country risk premium was obtained (appendix 10).

Given this information, through the CAPM formula was achieved a cost of equity of 20.02%.

| Beta Unlevered | 0.76 |
|---|---|
| Equity (in million €) | 46,047 |
| Debt (in million €) | 103,597 |
| D/E Ratio | 2.25 |
| Tax Rate | 26.24% |
| Beta Debt | 0.00 |
| Beta Levered | 2.02 |
| Equity Risk Premium (Germany) | 5.96% |
| Country Risk Premium | 3.83% |
| Risk Free Rate | 0.24% |
| **Cost of Equity** | **20.02%** |

Source: Bloomberg, Damodaran, Own Estimates

Table 20: Cost of Equity

## 4.2.2.4. WACC – Weighted Average Cost of Capital

After estimating the cost of equity and cost of debt and defining the target capital structure and the effective tax rate, a WACC of 6.92% was achieved for perpetuity. The table below agglomerate all the inputs needed to compute the WACC.

| Cost of Debt | 1.49% |
|---|---|
| Cost of Equity | 20.54% |
| Debt (in million €) | 103,597 |
| Equity (in million €) | 46,047 |
| Capital (Debt + Equity) (in million €) | 149,644 |
| Debt / Capital | 69.23% |
| Equity / Capital | 30.77% |
| Tax Rate | 26.24% |
| **WACC** | **6.92%** |

Source: Bloomberg, Own Estimates

Table 21: Weighted Average Cost of Capital

**4.2.3. Discounted Cash Flow - Valuation Results**

Given the Free Cash Flow to the Firm determined in section 4.2.1 of this dissertation, the terminal growth rate of 2.96% and a WACC of 6.92%, the sum of all present values of FCFF gives an Enterprise Value of €136,551 million. To calculate the Equity Value of Common Shares, it is crucial to add the value of Non Operating Assets (Financial Assets and Cash Equivalents, presented in the Balance Sheet, appendix 11), subtract the value of Debt, the Market Value of Preferred Shares and the Book Value of Minority Interest (appendix 12). Finally, it is obtained the Equity Value of Common Shares, which is divided by the number of common shares outstanding to reach the final share price of €77.40.

| | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F | Perpetuity |
|---|---|---|---|---|---|---|---|
| FCFF (in million €) | | 4,158 | 5,405 | 5,631 | 5,881 | 6,158 | 159,899 |
| Discount factor | | 0.94 | 0.87 | 0.82 | 0.77 | 0.72 | 0.72 |
| Present Value of FCFF (in million €) | | 3,889 | 4,728 | 4,607 | 4,500 | 4,407 | 114,420 |
| Enterprise Value (in million €) | 136,551 | | | | | | |
| Non Operating Assets (in million €) | 17,654 | | | | | | |
| Debt (in million €) | 103,597 | | | | | | |
| Market Value of Preferred Shares (in million €) | 3,485 | | | | | | |
| Book Value of Minority interest (in million €) | 529 | | | | | | |
| Equity Value of Common Shares (in million €) | 46,593 | | | | | | |
| Number of common shares outstanding (in million) | 602 | | | | | | |
| **Value per Common Share (€)** | **77.40** | | | | | | |

Source: BMW AG Annual Report 18, Bloomberg, Own Estimates

Table 22: Discount Cash Flow Valuation

## 4.2.4. Sensitivity Analysis

The Discounted Cash Flow model - Free Cash Flow to the Firm includes in its calculation different variables, and the final share price is affected by all of these, however, in different magnitudes. In order to achieve a more accurate sensitivity analysis, two critical variables were selected for the calculation of BMW AG's share price, the WACC and the TGR. The share price obtained through the DCF model was €77.40, with a WACC of 6.92% and a TGR of 2.96%.

To better understand how BMW's valuation may deviate from the value reached in the DCF valuation, a table was created allowing to analyse different interactions between WACC and Terminal Growth Rate. The parameters chosen for analysis are subject to a variation of ±0.4% (WACC) and ± 0.15% (TGR) from the initial values.

Table 22 presents the outcomes obtained in the computation of the sensitivity analysis:

| Terminal Growth Rate | WACC | 6.12% | 6.52% | 6.92% | 7.32% | 7.72% |
|---|---|---|---|---|---|---|
| 2.66% | | 113.34 | 85.85 | 63.51 | 45.02 | 29.44 |
| 2.81% | | 123.87 | 94.15 | 70.20 | 50.51 | 34.02 |
| 2.96% | | 135.40 | 103.14 | **77.40** | 56.37 | 38.88 |
| 3.11% | | 148.07 | 112.93 | 85.16 | 62.66 | 44.06 |
| 3.26% | | 162.08 | 123.62 | 93.55 | 69.41 | 49.59 |

Source: Own estimates (in €)

Table 23: Sensitivity Analysis – WACC and Terminal Growth Rate

Analysing the table above, it can be seen that the two selected parameters have opposite effects in the fair value of share price. The higher the terminal growth rate, the higher the share value (ceteris paribus), in the opposite direction, the higher the value of the weighted average cost of capital, the lower the share value (ceteris paribus). Another point that stands out is that small variations in WACC and TGR cause a significant variation in the final share price. Based on *table 22*, it can be stated that the best scenario (in terms of share price) happens when the WACC is equal to 6.12% and the terminal growth rate is 3.26%. This scenario can happen, for example, if GDP or inflation increases in the regions analysed (Europe, USA and China) and the CRP decreases, which will

reduce the cost of equity and consequently the WACC. Conversely, it is possible to state that the worst case scenario (in terms of share price) occurs when the terminal growth rate is 2.66% and the WACC is 7.72%. This could be the case, for example, if the risk-free interest rate or CRP rises, leading to an increase in the cost of equity value and consequently to the WACC and if inflation or GDP declines in the geographies that were considered for the analysis.

## 4.3. Relative Valuation (Multiples)

Relative valuation model is a business valuation process that relates a company's value to that of its competitors or industry peers to assess the firm's financial value. Relative valuation models are an alternative to absolute value models, which try to determine a company's intrinsic worth based on its estimated future free cash flows discounted to their present value, without any reference to another company. In order to complement the result obtained through the DCF method and in order to calculate the value per share based on companies similar to BMW AG, the multiples approach was applied. There are several multiples that can be used when valuing a company's share price, as mentioned in the Literature Review, there are Enterprise Value multiples, Equity Value multiples and growth-references multiples.

In this analysis, three multiples were elected, two of which related to the Equity Value multiples group (Price to Earnings Ratio and Equity Value / Sales) and the third based on company value (EV / Invested Capital). The PER is computed dividing share price by earnings per share, this multiple being one of the most used for determining whether shares are correctly valued in relation to another stock. However, this multiple is affected by the capital structure and can be manipulated by changing the leverage ratios. The other two multiples utilized, Equity Value / Sales and EV / Invested Capital, by contrast, are not easy to manipulate.

In order to make the assessment as accurate and realistic as possible, choose an appropriate peer group is essential. Based on the automotive companies, seven competitors of BMW AG were selected. Nevertheless, in order to select a more restrict and realistic peer group regarding the valuation method, different factors were taken into account: Sales, Total Assets, EBIT, Market Capitalization, ROIC, proximity to the business and strategy of BMW AG.

| Companies | Sales | Total Assets | EBIT | Market Cap. | ROIC |
|---|---|---|---|---|---|
| BMW AG | **97,480** | **208,980** | **9,121** | **46,039** | **4.19%** |
| Low Range | 48,740 | 104,490 | 4,561 | 23,020 | 2.10% |
| High Range | 146,220 | 313,470 | 13,682 | 69,059 | 6.29% |
| Volkswagen AG | 235,800 | 458,156 | 17,100 | 73,910 | 4.22% |
| Daimler AG | 167,362 | 281,619 | 11,132 | 45,650 | 4.35% |
| General Motors Co | 147,049 | 227,339 | 11,783 | 52,955 | 6.37% |
| Ford Motor Co | 160,300 | 256,540 | 7,000 | 22,936 | 1.28% |
| Renault SA | 57,419 | 114,996 | 3,612 | 15,260 | 5.30% |
| Peugeot SA | 74,027 | 61,952 | 5,689 | 18,270 | 11.63% |
| Fiat Chrysler Automobiles | 110,412 | 96,873 | 5,032 | 18,790 | 5.97% |

Source: BMW AG Annual Report 18, Bloomberg, Own Estimates (in million €)

Table 24: Initial Peer Group

To elect the final peer group, a selection criterion was made based on the value of the BMW AG parameters. Therefore, a Low Range (-50% of the value of each criterion) and a High Range (+ 50% of the value of each criterion) were selected, so all companies that had at least three components within the range considered are nominated to the final peer group. Volkswagen AG, despite meeting only one of the five requirements (the rest of which has values above the maximum threshold), was chosen for the final peer group because of its close proximity to the business and strategy of BMW AG. Consequently, according to all of these restrictions, the firms that constitute the final peer group are Daimler AG, General Motors Co., Volkswagen AG, Renault SA and Fiat Chrysler Automobiles. According to the Bloomberg platform, the values of multiples per company are as follows:

| Company | PER | EV / Invested Capital | Equity Value / Sales |
|---|---|---|---|
| Volkswagen AG | 5.91 | 1.10 | 0.17 |
| Daimler AG | 11.00 | 0.23 | 0.30 |
| General Motors Co | 5.11 | 0.57 | 0.32 |
| Renault SA | 4.46 | 0.34 | 0.28 |
| Fiat Chrysler Automobiles | 4.60 | 0.54 | 0.10 |
| **Median** | **5.11** | **0.54** | **0.28** |
| **BMW AG** | **5.79** | **0.76** | **0.44** |

Source: Bloomberg, Own Estimates

Table 25: Final Peer Group Median

From the table above it is possible to see that, all the multiples of the company BMW AG are higher than the median of the five companies analysed. In this analysis, the median was applied instead of the normal average in order to eliminate the effect of outliers. To compute the share price of the multiple PER, the net profit and the number of shares of BMW AG were used. Relatively to the other two multiples, the Enterprise Value (EV / Invested Capital) was estimated based on the peer group median and Invested Capital of BMW AG, while Equity Value (Equity Value / Sales) was obtained by multiplying the median peer group by sales of BMW AG (appendix 16). The Invested Capital is computed using the following formula:

$$Invested\ Capital = Equity + Financial\ Debt - Non\ Operating\ Assets\ (21)$$

Formula 21: Invested Capital

To reach the share price in the multiple EV / Invested Capital it is still necessary to add the value of Non Operating Assets, subtract the value of Debt, the market value of preferred shares, the book value of minority interest and finally, divide by the number of common shares. For the Equity Value / Sales multiple, the EQV needs to be divided by the number of common shares. Therefore, the output is as follows:

| | PER | EV / Invested Capital | Equity Value / Sales |
|---|---|---|---|
| Enterprise Value (in million €) | - | 86,696 | - |
| Non Operating Assets (in million €) | - | 17,654 | - |
| Debt (in million €) | - | 71,026 | - |
| Number of preferred shares outstanding (in million) | - | 56 | - |
| Market Value of Preferred Shares (in million €) | - | 3,485 | - |
| Book Value of Minority interest (in million €) | - | 529 | - |
| Market Value of Common Shares (in million €) | - | 42,561 | 27,385 |
| Number of common shares outstanding (in million) | - | 602 | 602 |
| **Value per Common Share (in €)** | **55.98** | **48.69** | **45.49** |

Source: BMW AG Annual Report 18, Bloomberg, Own Estimates

Table 26: Relative Valuation

**5. BMW AG share price through the valuation models**

Taking into consideration both methods used, the output is as follows:

| Share Price (in €) | 2018 |
|---|---|
| DCF - FCFF | 77.40 |
| PER | 55.98 |
| EV / IC | 48.69 |
| Equity Value / Sales | 45.49 |
| **Market Value (28th December 2018)** | **70.70** |

Source: BMW AG Annual Report 18, Yahoo Finance, Own Estimates

Table 27: Results Comparison

From the table above it is possible to verify that the value obtained through the DCF-FCFF model presents some discrepancy relatively to the outputs generated by the multiples methodology. According to the DCF method the share price is €77.40, which is above the reference price (market value per share of BMW AG on 28-12-2018). Regarding the three multiples used during this dissertation, both translate the same idea/conclusion, the value presented by all of them is below the market reference price.

The DCF method, as mentioned in the literature review, is one of the most widely used methodologies when calculating the value of a company, since this method is based on free cash flows and is an excellent approach when assumptions are applied correctly. On the other hand, the relative valuation can generate outliers of the reference value, as this method is greatly influenced by the selected peer group.

As a result, it is possible to draw some conclusions regarding the final values obtained. According to the DCF methodology, the recommendation is to buy or hold BMW AG shares, as the price calculated using this reliable method (€77.40) is higher than the market reference value (€70.70). The launch of new products and models to the market, combined with the positive results demonstrated by the brand over the years, as well as the growth prospects, contribute to reinforce the recommendation made. Through the sensitivity analysis performed earlier in this dissertation,

it can be seen that the stock value is greatly affected by small variations in the terminal growth rate or WACC. For example, a change in the TGR from 2.96% to 2.81% would cause the share value decrease from €77.40 to €70.20. In the multiples method the idea would be to sell the shares as soon as possible, but as stated earlier in this thesis, these two models are complementary, so as is the case, one method will corroborate the other. Based on the selected peer group, it is possible to verify in *table 24* that the median of the three multiples is below the values obtained for the company BMW AG, according to the Bloomberg platform. Consequently, it is feasible to state that investors consider BMW AG to be above the market average, which corroborates the DCF method theory that the share price (€77.40) is higher than the market benchmark on the 28-12-2018 (€70.70).

## 6. Conclusion

One of the main conclusions that can be drawn from a project in Corporate Finance is that, there is no ideal and perfect valuation method for estimating the value of a company. Therefore, in order to reproduce a recommendation to investors about the BMW Group share price, two methodologies were selected, DCF-FCFF and Relative Valuation. In order to reach the final share price of BMW AG through these methods, it was necessary to define several assumptions, addressed and detailed in the fourth chapter of this dissertation. Associated with these assumptions is inherently a certain degree of subjectivity. Yet, to reduce this subjectivity, the assumptions were made taking into account the characteristics and the environment where the company is present, as well as the historical data of the brand.

As mentioned earlier in this project, the DCF method is based on future cash flow generation, while relative valuation focuses on comparing BMW AG with similar companies (characteristics and industry) listed in the market. Regarding the DDM methodology, the final share price was not calculated due to the implicit limitations of this model, since, according to Damodaran (2012), this valuation technique is governed by the dividends paid, and there is some uncertainty about the assumptions that can be assumed, which may result in a wrong valuation. Higher earnings generally translate into higher dividends, but this is not always true, for example, if the company accumulates cash and pays out of a small amount of dividends or the fact that this model ignores the effect of stock buybacks. Thus, the methods considered in the assessment, as mentioned above, are Relative Valuation and DCF.

This valuation should be carefully considered, as the automotive industry and the financial sector are currently changing, so as seen in the sensitivity analysis, small changes can have huge impacts on the brand's financial performance.

The final values obtained by both methods were analysed in the previous chapter. A comparison was made between the calculated values for BMW AG and the market value on 28-12-2018, so the recommendation is to buy or hold shares. This decision is supported by the value obtained through the DCF method and the conclusions drawn from the Relative Valuation methodology, where it is apparent that the two models complement each other, although the final values of BMW AG's share price show some discrepancy. Through the Relative Valuation method, it is possible to check that

investors rate BMW AG above the market average (table 24), which converges with the value obtained through the DCF method (€77.40). This value is above the market reference price on 28-12-2018 (€70.70).

Therefore, it can be concluded that BMW AG stocks in the market are undervalued, so this valuation could be an indicator that, in the future, the market will identify its high value.

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Bloomberg Terminal

## 8. Appendices

**Appendix 1 –** Historical and Forecasted Data – Revenues (2014-2023F)

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|---|---|---|---|
| Automotive Revenues | 75,173 | 85,536 | 86,424 | 85,742 | 85,846 | 86,436 | 87,521 | 89,116 | 91,245 | 93,943 |
| Motorcycle Revenues | 1,679 | 1,990 | 2,069 | 2,272 | 2,173 | 2,241 | 2,312 | 2,384 | 2,459 | 2,536 |
| Financial Services Revenues | 20,599 | 23,739 | 25,681 | 27,567 | 28,165 | 29,652 | 31,045 | 32,324 | 33,467 | 34,457 |
| Other Entities Revenues | 7 | 7 | 6 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| Eliminations | -17,057 | -19,097 | -20,017 | -17,306 | -18,710 | -19,708 | -20,132 | -20,623 | -21,180 | -21,807 |
| **Group** | **80,401** | **92,175** | **94,163** | **98,282** | **97,480** | **98,628** | **100,752** | **103,207** | **105,997** | **109,135** |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 2 –** Inflation and GDP growth rate reference for calculating TGR

| | Revenues 2018 (in million €) | Weight | Inflation (Reference) | GDP growth rate (Reference) |
|---|---|---|---|---|
| Europa | 45,011 | 56% | 0.79% | 0.79% |
| USA | 16,088 | 20% | 0.40% | 0.34% |
| China | 19,008 | 24% | 0.38% | 0.26% |
| **Total** | **80,107** | **100%** | **1.57%** | **1.39%** |

Source: BMW AG Annual Report 2018, Trading Economics, Own Estimates

**Appendix 3 –** Inflation rate and GDP growth rate forecasts

| **Inflation rate** | | **GDP (Growth Rate)** | |
|---|---|---|---|
| Europe | 1.40% | Europe | 1.40% |
| USA | 2.00% | USA | 1.70% |
| China | 1.60% | China | 1.10% |

Source: Trading Economics

**Appendix 4 –** Historical and Forecasted Data – Income Statement (2014-2023F)

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|---|---|---|---|---|
| **Revenues** | **80,401** | **92,175** | **94,163** | **98,282** | **97,480** | **98,628** | **100,752** | **103,207** | **105,997** | **109,135** |
| Automotive | 75,173 | 85,536 | 86,424 | 85,742 | 85,846 | 86,436 | 87,521 | 89,116 | 91,245 | 93,943 |
| Motorcycle | 1,679 | 1,990 | 2,069 | 2,272 | 2,173 | 2,241 | 2,312 | 2,384 | 2,459 | 2,536 |
| Financial Services | 20,599 | 23,739 | 25,681 | 27,567 | 28,165 | 29,652 | 31,045 | 32,324 | 33,467 | 34,457 |
| Other Entities | 7 | 7 | 6 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| Eliminations | -17,057 | -19,097 | -20,017 | -17,306 | -18,710 | -19,708 | -20,132 | -20,623 | -21,180 | -21,807 |
| **Cost of sales** | **-59,261** | **-69,772** | **-71,148** | **-73,409** | **-73,604** | **-73,438** | **-74,897** | **-76,598** | **-78,542** | **-80,738** |
| Automotive | 61,221 | 70,399 | 70,973 | 69,402 | 71,918 | 70,979 | 71,869 | 73,179 | 74,927 | 77,143 |
| Motorcycle | 1,365 | 1,542 | 1,639 | 1,798 | 1,738 | 1,780 | 1,836 | 1,894 | 1,953 | 2,015 |
| Financial Services | 17,783 | 20,586 | 22,135 | 23,986 | 24,541 | 25,701 | 26,909 | 28,017 | 29,008 | 29,866 |
| Other Entities | - | - | - | - | - | - | - | - | - | - |
| Eliminations | -16,973 | -18,484 | -19,305 | -16,857 | -19,273 | -19,438 | -19,856 | -20,340 | -20,890 | -21,509 |
| **Gross Profit** | **21,140** | **22,403** | **23,015** | **24,873** | **23,876** | **25,189** | **25,855** | **26,609** | **27,455** | **28,397** |
| **Gross Margin** | **26.29%** | **24.30%** | **24.44%** | **25.31%** | **24.49%** | **25.54%** | **25.66%** | **25.78%** | **25.90%** | **26.02%** |
| Selling and Administrative expenses | -7,892 | -8,633 | -9,158 | -9,560 | -9,558 | -9,485 | -9,659 | -9,874 | -10,130 | -10,429 |
| Other operating income | 877 | 914 | 670 | 720 | 774 | 852 | 871 | 892 | 916 | 943 |
| Other operating expenses | -872 | -820 | -847 | -1,214 | -651 | -942 | -963 | -986 | -1,013 | -1,043 |
| R&D expenses | -4,135 | -4,271 | -4,294 | -4,920 | -5,320 | -5,584 | -5,861 | -6,152 | -6,457 | -6,777 |
| **Profit/loss before financial result (EBIT)** | **9,118** | **9,593** | **9,386** | **9,899** | **9,121** | **10,030** | **10,242** | **10,490** | **10,772** | **11,092** |
| **EBIT Margin** | **11.34%** | **10.41%** | **9.97%** | **10.07%** | **9.36%** | **10.17%** | **10.17%** | **10.16%** | **10.16%** | **10.16%** |
| Result from equity accounted investments | 655 | 518 | 441 | 739 | 632 | 635 | 649 | 665 | 682 | 703 |
| Interest and similar income | 200 | 185 | 196 | 201 | 397 | 253 | 258 | 264 | 271 | 279 |
| Interest and similar expenses | -519 | -618 | -489 | -412 | -386 | -516 | -527 | -540 | -555 | -571 |
| Other financial result | -747 | -454 | 131 | 248 | 51 | -170 | -173 | -178 | -182 | -188 |
| **Financial Result** | **-411** | **-369** | **279** | **776** | **694** | **202** | **206** | **211** | **217** | **223** |
| **Profit/loss before tax (EBT)** | **8,707** | **9,224** | **9,665** | **10,675** | **9,815** | **10,232** | **10,449** | **10,701** | **10,989** | **11,316** |
| Income taxes | 2,890 | 2,828 | 2,755 | 2,000 | 2,575 | 2,685 | 2,741 | 2,807 | 2,883 | 2,969 |
| Tax Rate | 33.19% | 30.66% | 28.50% | 18.74% | 26.24% | 26.24% | 26.24% | 26.24% | 26.24% | 26.24% |
| **Net profit/loss** | **5,817** | **6,396** | **6,910** | **8,675** | **7,240** | **7,548** | **7,707** | **7,893** | **8,106** | **8,347** |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 5 –** Forecasted Data – Cost of Sales (2019F-2023F)

| (in million €) | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|
| Automotive | 70,979 | 71,869 | 73,179 | 74,927 | 77,143 |
| Motorcycle | 1,780 | 1,836 | 1,894 | 1,953 | 2,015 |
| Financial Services | 25,701 | 26,909 | 28,017 | 29,008 | 29,866 |
| Eliminations | -19,438 | -19,856 | -20,340 | -20,890 | -21,509 |
| **Cost of Sales - Group** | **79,022** | **80,758** | **82,749** | **84,999** | **87,515** |
| **R&D Expenses** | **5,584** | **5,861** | **6,152** | **6,457** | **6,777** |
| **Cost of Sales without R&D** | **73,438** | **74,897** | **76,598** | **78,542** | **80,738** |

Source: Own Estimates

**Appendix 6 –** Historical Data – Depreciation and Amortization (2014-2018)

| | 2014 | 2015 | 2016 | 2017 | 2018 | Forecast Driver |
|---|---|---|---|---|---|---|
| Depreciation & Amortization (in million €) | 4,170 | 4,659 | 4,806 | 4,822 | 5,113 | |
| PPE, Intangible Assets and Leased products (in million €) | 53,846 | 60,096 | 63,906 | 64,192 | 69,344 | 7.58% |
| % of PPE, Intangible Assets and Leased products | 7.74% | 7.75% | 7.52% | 7.51% | 7.37% | |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 7 –** Historical Data – Capital Expenditure (2014-2018)

| | 2014 | 2015 | 2016 | 2017 | 2018 | Forecast Driver |
|---|---|---|---|---|---|---|
| Capital Expenditure (in million €) | 6,100 | 5,890 | 5,823 | 7,112 | 8,013 | 7.73% |
| % of Revenues | 7.59% | 6.39% | 6.18% | 7.24% | 8.22% | |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 8 –** Rating and Default Spread (Market firms with Market Cap > $5 billion)

| > | ≤ | *Rating is* | **Spread is** |
|---|---|---|---|
| -100000 | 0.199999 | D2/D | 19.38% |
| 0.2 | 0.649999 | C2/C | 14.54% |
| 0.65 | 0.799999 | Ca2/CC | 11.08% |
| 0.8 | 1.249.999 | Caa/CCC | 9.00% |
| 1.25 | 1.499.999 | B3/B- | 6.60% |
| 1.5 | 1.749.999 | B2/B | 5.40% |
| 1.75 | 1.999.999 | B1/B+ | 4.50% |
| 2 | 22.499.999 | Ba2/BB | 3.60% |
| 2.25 | 249.999 | Ba1/BB+ | 3.00% |
| 2.5 | 2.999.999 | Baa2/BBB | 2.00% |
| 3 | 4.249.999 | A3/A- | 1.56% |
| 4.25 | 5.499.999 | A2/A | 1.38% |
| 5.5 | 6.499.999 | A1/A+ | 1.25% |
| 6.5 | 8.499.999 | Aa2/AA | 1.00% |
| 8.50 | 100000 | Aaa/AAA | 0.75% |

Source: Damodaran

**Appendix 9 –** Market value of Equity (2018)

|  | **2018** |
|---|---|
| **Common Equity** | |
| Price/share (in €) | 70.70 |
| Number of shares (in million) | 602 |
| Total (in million €) | 42,561 |
| % of Common Equity | 92.43% |
| **Preferred Equity** | |
| Price/share (in €) | 62.10 |
| Number of shares (in million) | 56 |
| Total (in million €) | 3,485 |
| % of Preferred Equity | 7.57% |
| **Equity (in million €)** | **46,047** |

Source: BMW AG Annual Report 18, Bloomberg, Own Estimates

**Appendix 10 –** Country Risk Premium (2018)

| | Revenues 2018 (in million €) | Revenues 2018 (in %) | Average CRP by region (in %) | Revenues (in %) * Average CRP by region |
|---|---|---|---|---|
| Europe | 45,011 | 46.17% | 2.95% | 1.36% |
| America (including USA) | 19,694 | 20.20% | 5.39% | 1.09% |
| Asia (including China) | 30,079 | 30.86% | 3.85% | 1.19% |
| Other Regions | 2,696 | 2.77% | 6.69% | 0.18% |
| **Total** | **97,480** | **100.00%** | **18.89%** | **3.83%** |

Source: BMW AG Annual Report 18, Damodaran, Own Estimates

**Appendix 11 –** Historical Data - Balance Sheet - Assets (2014-2018)

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Intangible Assets | 6,499 | 7,372 | 8,157 | 9,464 | 10,971 |
| Property, plant and equipment | 17,182 | 17,759 | 17,960 | 18,471 | 19,801 |
| Leased products | 30,165 | 34,965 | 37,789 | 36,257 | 38,572 |
| Investments accounted for using the equity method | 1,088 | 2,233 | 2,546 | 2,769 | 2,624 |
| Other investments | 408 | 428 | 560 | 690 | 739 |
| Receivables from sales financing | 37,438 | 41,865 | 48,032 | 48,321 | 48,109 |
| Financial Assets | 2,024 | 2,208 | 2,705 | 2,369 | 1,010 |
| Deferred tax | 2,061 | 1,945 | 2,327 | 1,993 | 1,590 |
| Other assets | 1,094 | 1,568 | 1,595 | 1,630 | 2,026 |
| **Non-current assets** | **97,959** | **110,343** | **121,671** | **121,964** | **125,442** |
| Inventories | 11,089 | 11,071 | 11,841 | 12,707 | 13,047 |
| Trade receivables | 2,153 | 2,751 | 2,825 | 2,667 | 2,546 |
| Receivables from sales financing | 23,586 | 28,178 | 30,228 | 32,113 | 38,674 |
| Financial assets | 5,384 | 6,635 | 7,065 | 7,965 | 6,675 |
| Current tax | 1,906 | 2,381 | 1,938 | 1,566 | 1,366 |
| Other assets | 5,038 | 4,693 | 5,087 | 7,485 | 9,790 |
| Cash and cash equivalents | 7,688 | 6,122 | 7,880 | 9,039 | 10,979 |
| Assets held for sale | - | - | - | - | 461 |
| **Current Assets** | **56,844** | **61,831** | **66,864** | **73,542** | **83,538** |
| **Total Assets** | **154,803** | **172,174** | **188,535** | **195,506** | **208,980** |

Source: BMW AG Annual Report 18

**Appendix 12 –** Historical Data - Balance Sheet – Equity and Liabilities (2014-2018)

| (in million €) | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Subscribed capital | 656 | 657 | 657 | 658 | 658 |
| Capital Reserves | 2,005 | 2,027 | 2,047 | 2,084 | 2,118 |
| Revenues Reserves | 35,621 | 41,027 | 44,445 | 50,815 | 56,121 |
| Accumulated other equity | -1,062 | -1,181 | -41 | 114 | -1,338 |
| **Equity attributable to shareholders of BMW AG** | **37,220** | **42,530** | **47,108** | **53,671** | **57,559** |
| Minority Interest | 217 | 234 | 255 | 436 | 529 |
| **Total Equity** | **37,437** | **42,764** | **47,363** | **54,107** | **58,088** |
| Pension provisions | 4,604 | 3,000 | 4,587 | 3,252 | 2,330 |
| Other provisions | 4,268 | 4,621 | 5,039 | 5,632 | 5,776 |
| Deferred tax | 1,974 | 2,116 | 2,795 | 2,157 | 1,806 |
| Financial liabilities | 43,167 | 49,523 | 55,405 | 53,548 | 64,772 |
| Other liabilities | 4,275 | 4,559 | 5,357 | 5,045 | 5,299 |
| **Non-current provisions and liabilities** | **58,288** | **63,819** | **73,183** | **69,634** | **79,983** |
| Other provisions | 4,522 | 5,009 | 5,879 | 6,367 | 6,078 |
| Current tax | 1,590 | 1,441 | 1,074 | 1,124 | 1,158 |
| Financial liabilities | 37,482 | 42,160 | 42,326 | 41,100 | 38,825 |
| Trade payables | 7,709 | 7,773 | 8,512 | 9,731 | 9,669 |
| Other liabilities | 7,775 | 9,208 | 10,198 | 13,443 | 15,117 |
| Liabilities in conjunction with assets held for sale | - | - | - | - | 62 |
| **Current provisions and liabilities** | **59,078** | **65,591** | **67,989** | **71,765** | **70,909** |
| **Total Liabilities** | **117,366** | **129,410** | **141,172** | **141,399** | **150,892** |
| **Total Equity and Liabilities** | **154,803** | **172,174** | **188,535** | **195,506** | **208,980** |

Source: BMW AG Annual Report 18

**Appendix 13 –** Forecasted Data – Balance Sheet - Assets (2019F-2023F)

| (in million €) | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|
| Intangible Assets | 12,505 | 14,254 | 16,248 | 18,520 | 21,110 |
| Property, plant and equipment | 20,516 | 21,257 | 22,024 | 22,819 | 23,643 |
| Leased products | 38,970 | 39,371 | 39,777 | 40,187 | 40,601 |
| Investments accounted for using the equity method | 2,664 | 2,704 | 2,746 | 2,787 | 2,830 |
| Other investments | 857 | 995 | 1,154 | 1,339 | 1,553 |
| Receivables from sales financing | 51,222 | 55,012 | 59,165 | 63,590 | 68,277 |
| Financial Assets | 1,010 | 1,010 | 1,010 | 1,010 | 1,010 |
| Deferred tax | 1,490 | 1,397 | 1,309 | 1,227 | 1,150 |
| Other assets | 1,677 | 1,713 | 1,755 | 1,802 | 1,855 |
| **Non-current assets** | **130,911** | **137,712** | **145,187** | **153,280** | **162,029** |
| Inventories | 12,761 | 13,036 | 13,353 | 13,714 | 14,120 |
| Trade receivables | 2,759 | 2,819 | 2,887 | 2,965 | 3,053 |
| Receivables from sales financing | 43,763 | 49,522 | 56,039 | 63,414 | 71,759 |
| Financial assets | 7,043 | 7,432 | 7,843 | 8,276 | 8,732 |
| Current tax | 1,257 | 1,156 | 1,064 | 979 | 901 |
| Other assets | 9,905 | 10,119 | 10,365 | 10,645 | 10,961 |
| Cash and cash equivalents | 12,002 | 13,120 | 14,342 | 15,679 | 17,140 |
| Assets held for sale | - | - | - | - | - |
| **Current Assets** | **89,491** | **97,204** | **105,894** | **115,672** | **126,665** |
| **Total Assets** | **220,401** | **234,916** | **251,081** | **268,952** | **288,694** |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 14 –** Forecasted Data – Balance Sheet – Equity and Liabilities (2019F-2023F)

| (in million €) | 2019F | 2020F | 2021F | 2022F | 2023F |
|---|---|---|---|---|---|
| Subscribed capital | 658 | 658 | 658 | 658 | 658 |
| Capital Reserves | 2,147 | 2,177 | 2,207 | 2,237 | 2,268 |
| Revenues Reserves | 62,875 | 70,443 | 78,921 | 88,419 | 99,060 |
| Accumulated other equity | -1,338 | -1,338 | -1,338 | -1,338 | -1,338 |
| **Equity attributable to shareholders of BMW AG** | **64,343** | **71,939** | **80,447** | **89,976** | **100,649** |
| Minority Interest | 529 | 529 | 529 | 529 | 529 |
| **Total Equity** | **64,872** | **72,468** | **80,976** | **90,505** | **101,178** |
| Pension provisions | 1,965 | 1,658 | 1,398 | 1,179 | 995 |
| Other provisions | 6,230 | 6,719 | 7,247 | 7,817 | 8,431 |
| Deferred tax | 1,806 | 1,806 | 1,806 | 1,806 | 1,806 |
| Financial liabilities | 70,034 | 75,723 | 81,874 | 88,525 | 95,716 |
| Other liabilities | 5,608 | 5,936 | 6,283 | 6,649 | 7,038 |
| **Non-current provisions and liabilities** | **85,643** | **91,841** | **98,608** | **105,976** | **113,985** |
| Other provisions | 6,078 | 6,078 | 6,078 | 6,078 | 6,078 |
| Current tax | 1,119 | 1,119 | 1,119 | 1,119 | 1,119 |
| Financial liabilities | 39,168 | 39,514 | 39,864 | 40,216 | 40,572 |
| Trade payables | 9,267 | 9,360 | 9,572 | 9,816 | 10,092 |
| Other liabilities | 14,255 | 14,535 | 14,865 | 15,243 | 15,672 |
| Liabilities in conjunction with assets held for sale | - | - | - | - | - |
| **Current provisions and liabilities** | **69,887** | **70,607** | **71,497** | **72,471** | **73,532** |
| **Total Liabilities** | **155,530** | **162,448** | **170,105** | **178,447** | **187,517** |
| **Total Equity and Liabilities** | **220,401** | **234,916** | **251,081** | **268,952** | **288,694** |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 15** – Forecast Assumptions (Balance Sheet)

| Non-Current Assets | Forecast Driver | Rationale |
|---|---|---|
| Intangible Assets | 13.99% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Property, plant and equipment | 3.61% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Leased products | 1.03% | Projection based on Compound Annual Growth Rate (3-year historical). |
| Investments accounted for using the equity method | 1.52% | Projection based on Compound Annual Growth Rate (3-year historical). |
| Other investments | 16.01% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Receivables from sales financing | 6.47% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Financial Assets | 1,010 | Projected to be equal to 2018 nominal value (in million €). |
| Deferred tax | -6.28% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Other assets | 1.70% | Projection based on 5-year historical average as a percentage of sales. |

| Current Assets | Forecast Driver | Rationale |
|---|---|---|
| Inventories | 47 days | Projection based on average number of DSI between 2014 and 2018, and forecasted revenue for each year. |
| Trade receivables | 10 days | Projection based on average number of DSO between 2014 and 2018, and forecasted revenue for each year. |
| Receivables from sales financing | 13.16% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Financial assets | 5.52% | Projection based on Compound Annual Growth Rate (5-year historical). |

| Current Assets | Forecast Driver | Rationale |
|---|---|---|
| Current tax | -7.99% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Other assets | 10.04% | Projection based on % of Other Current Assets / Revenues (year 2018). |
| Cash and cash equivalents | 9.32% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Assets held for sale | 0 | Assets held for sale in 2018 are assumed to have been effectively sold during 2019. |

| Equity | Forecast Driver | Rationale |
|---|---|---|
| Subscribed capital | 658 | Projected to be equal to 2018 nominal value (in million €). |
| Capital Reserves | 1.38% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Revenues Reserves | 12.04% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Accumulated other equity | -1,338 | Projected to be equal to 2018 nominal value (in million €). |
| Minority Interest | 529 | Projected to be equal to 2018 nominal value (in million €). |

| Non-Current Liabilities | Forecast Driver | Rationale |
|---|---|---|
| Pension provisions | -15.66% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Other provisions | 7.86% | Projection based on Compound Annual Growth Rate (5-year historical). |
| Deferred tax | 1,806 | Projected to be equal to 2018 nominal value (in million €). |
| Financial liabilities | 8.12% | Projection based on Compound Annual Growth Rate (3-year historical). |
| Other liabilities | 5.84% | Projection based on the average growth rate (5-year historical). |

| Current Liabilities | Forecast Driver | Rationale |
|---|---|---|
| Other provisions | 6,078 | Projected to be equal to 2018 nominal value (in million €). |
| Current tax | 1,119 | Projection based on average values between 2016 and 2018 (in million €). |
| Financial liabilities | 0.88% | Projection based on Compound Annual Growth Rate (3-year historical). |
| Trade payables | 40 days | Projection based on average number of DPO between 2014 and 2018, and forecasted cost of sales, S&A and OOE for each year. |
| Other liabilities | 17.19% | Projection based on average % of Other Current Liabilities / (Cost of Sales + S&A + OOE) between 2017 and 2018. |
| Liabilities in conjunction with assets held for sale | 0 | Assets held for sale in 2018 are assumed to have been effectively sold during 2019. |

Source: BMW AG Annual Report 18, Own Estimates

**Appendix 16 –** Historical Data – BMW AG Statements (2018)

| | |
|---|---|
| Sales (in million €) | 97.480 |
| EBITDA (in million €) | 18.556 |
| EBIT (in million €) | 9.121 |
| Invested Capital (in million €) | 160.548 |
| Net Profit (in million €) | 7.207 |
| Shares (in million) | 658 |

Source: BMW AG Annual Report 18, Own Estimates