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VALUATION OF VOLKSWAGEN AG

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Project submitted as requirement for the conferral of
Masters in Finance

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September 2019

Sumário

O grupo Volkswagen representa um dos principais impérios dentro do mundo automobilístico. Este aglomerado de 12 marcas fornece aos clientes, para além de veículos de transporte, serviços financeiros de diversas naturezas. Após a enorme crise de 2015, derivada das emissões excessivas de dióxido de carbono para a atmosfera, todo o grupo teve a resiliência e bravura para se reerguer e voltar ao topo, constituindo em 2017 o grupo do seu ramo com maior número de vendas. No âmbito das atividades a desenvolver pelo grupo salienta-se o forte investimento no setor elétrico e na reconciliação, após a crise de 2015, não só com o público alvo, mas também com o meio ambiente.

Assim sendo, é de enorme interesse avaliar não só toda a extensão do desempenho do grupo Volkswagen, mas também compreender se todo o panorama representa uma oportunidade de investimento ao nível do mercado bolsista, sendo para tal realizada no presente documento uma avaliação de todo o grupo. Para tal, diversas ferramentas como o método dos fluxos de caixa descontados, a avaliação através de múltiplos e o modelo de dividendos descontados foram implementadas.

É necessário evidenciar que os diferentes modelos de avaliação, pelas suas diferentes naturezas, evidenciam também resultados diferentes. De destacar o facto de o modelo de dividendos descontados ter originado resultados extremamente diferentes dos restantes métodos, pela razão de os dividendos pagos serem também inconstantes, com variações abruptas ao longo do tempo.

O resultado conjunto da análise desenvolvida demonstra que as ações do grupo Volkswagen se encontravam subvalorizada no período inicial do ano de 2019, sendo o seu valor de mercado à data igual a 136€ por ação, importância esta diferente da calculada através dos métodos válidos aplicados ao longo desta análise, cuja média agregada resultou num valor igual a 153,32€ por ação.

Conclui-se que a compra de ações do grupo Volkswagen no início de 2019, constituía um bom investimento, tal como é possível constatar pelo seu valor à data de final de setembro do mesmo ano que é de 154,90€ por ação.

Palavras-chave: grupo Volkswagen, automobilístico, crise, avaliação, método dos fluxos de caixa descontados, avaliação através de múltiplos, modelo de dividendos descontados.

JEL Sistema de Classificação: G30 (Finanças Corporativas); O22 (Análise de Projetos)

Summary

VW AG represents one of the major empires of the automotive world. This agglomerate of 12 brands supplies to its clients, besides transportation vehicles, financial services of different nature. After the huge 2015 crisis, caused by the excessive CO2 gas emissions to the atmosphere, the whole group had the resilience and bravery to rebuild and come back to the top, constituting in 2017 the group of its sector with the highest amount of sales. Within the scope of the group activities, stands out a strong investment in the electric sector and reconciliation after the 2015 crisis, not only with the target clients, but also with the environment.

Therefore, it is of enormous interest to evaluate not only the extension of the VW AG performance, but also to understand if all the panorama represents an investment opportunity at the stock market level, being performed for this purpose in this same document a whole group valuation. To do so, many tools such as the discounted cash flow model, the RVM or the DDM will be implemented.

It is necessary to highlight that the different valuation models, due their different nature, also show different results. It is noteworthy that the dividend discounted model produced extremely different results from the other methods, because the dividends paid were also inconsistent, with abrupt changes over time.

The combined result of the developed analysis shows that Volkswagen group shares were undervalued in the initial period of 2019, with a market value at the time of 136€ per share, which is different from those calculated using the valid methods applied on this analysis, whose aggregate average resulted in a value of € 153.32 per share.

It was concluded that the purchase of Volkswagen group shares in early 2019 was a good investment, as evidenced by its value at the end of September of the same year, which is € 154.90 per share.

Keywords: VW AG, automotive, crisis, valuation, discounted cash flow model, the relative valuation model, Dividend discounted model.

JEL Classification: G30 (Corporate Finance); O22 (Projects Analysis)

Acknowledgments

In the first place, I want to give a huge thanks to my parents for the assistance and guidance over the years, I definitely wouldn´t be here without them. I can´t really translate into words how important they really are.

Secondly, I would like to give a very **SPECIAL** thanks to all my grandparents, unfortunately some of them aren´t with me physically anymore, however they motivated me to become better, to put my best effort into the smallest thing I do and to never give up on anything I want. They contributed massively not only for this thesis but more importantly, for my overall development as a person.

Thirdly, I want to thank my tutor, Pedro Inácio, for his availability to help me and for guiding me when I was undecided or had doubts about any topic. He really is an amazing teacher, and more importantly a very good person. Huge THANK YOU!

Fourthly, I want to thank to my friend Neuza, who is also attending this masters program, for the patience to help me in this project development. Big thanks!

To conclude, I want to thank all people who have helped and stimulated me at the most difficult times of the thesis, directly or not, including my family, my friends and my coworkers. I can only wish the best for all of them!

List of Acronyms

APV - Adjusted Present Value Model

BCG- Boston Consulting group's product portfolio matrix

C - Interest expense

CAPEX - Capital Expenditures

CAPM - Capital Asset Pricing Model

CO2- Carbon Dioxide

DDM - Dividend Discounted Model

D&A - Depreciation and Amortization

EBIT - Earnings before Interest and Tax

EBITDA - Earnings before Interest Tax Depreciation and Amortization

GDP – Gross Domestic Product

FCF - Free Cash Flow Model

FCFF - Free Cash Flow To The Firm

FV - Total Book Value Of Debt At Maturity

IPO – Initial Public Offer

Kd - Cost Of Debt

Ke – Shareholders Required Rate of Return

NOA - Non-Operating Assets

Rf - Risk Free Rate

RIM - Residual Income Model

RVM - Relative Valuation Model

SWOT - Strengths, Weaknesses, Opportunities and Threats

USA- United States

T - Corporate Tax Rate

t - Weighted Average Maturity

VW-Volkswagen

VW AE – Volkswagen Autoeuropa

VW AG -Volkswagen Group

WACC - Weighted Average Cost of Capital

Δ Net WC - Net Change in Working capital

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1. Introduction

1.1 Transportation definition and company selection

Transport is defined as the movement of people and goods from one place to another. Through the upgrades in the transport vehicles in these past centuries, humans developed a lot. People can do way more things now than they did in the past, industry raw materials are quickly gathered, businesses rely on transports to deliver its products. We expanded our field of operation in every area, from work to recreation and vacations (New World Encyclopedia, 2015). Movement is key in today´s world, it allows us to have an easier job and labor market accessibility, permits businesses to reach new borders, enhances supply chain effectiveness and efficiency, raises productivity and supports clusters and agglomerations (Dowell, 2017). The world has simply become a smaller place.

In order for this movement to exist someone has to create it, which is one of the reasons why we chose to explore the automotive sector in this thesis. More specifically, VW AG was the elected vehicles group because it is one of the major ones and due to the fact that it has a huge impact in Portugal through VW AE, place where the author was enrolled in a trainee program, representing the company with the biggest foreign investment ever made in Portugal. The group is the result of brands that operate independently and so instead of choosing one specific brand within the group, we decided to study a whole automotive group, consequently the project will deal with bigger amounts of circulating assets and money that have a bigger impact worldwide. Moreover, the group is filled with luxury brands like, Bugatti, Porsche, Bentley, among others and so there are loads of circulating information regarding them. Furthermore, one of the group main companies, VW, faced huge problems during 2015 due to environmental unconformities. Consequently, we think that it would be quite interesting to analyze how the group financial statements were affected during the VW producer's crisis years and to reflect on the group ability to recover from such a tragic event. All this information made us put in perspective how important this manufacturer truly is to our country and world well-being, thus VW AG is the elected as the case study group for this masters' thesis.

1.2 Objectives

The goal of this project is to analyze and evaluate VW AG by using different valuation models, some of them learned during the first year of the master's program. More specifically, some of the topics and questions that we would like to address are:

- VW AG history, mission and strategy, shareholder analysis.
- 2015 Volkswagen crisis, VW AG future and VW in Portugal.

- Describe some appraisal tools and its use in the company valuation, such as the FCF methods, the DDM, the RIM, the APV model and the RVM.
- Industry, corporate and product analysis by utilizing Porter´s 5 Forces Analysis, SWOT analysis and the BCG model for the main products in the brands major targets.
- Financial analysis of the group.
- VW AG valuation.
- Conclusion on the investment possibility (compare the different models results).

2. Review of the literature

2.1 Valuation

Valuation is the base of this thesis, as such, we will describe here some of the most commonly used approaches to perform it. According to Damodaran (2012) there are three major valuation routes that we can follow: Discounted Cash Flow Valuation, Relative Valuation, and Contingent Claim Valuation model. However, the last one will not be analyzed in this project. We will go into depth regarding the first two (DCF and RV) in this analysis, by analyzing each one of its major components.

Valuation can assume different roles, Damodaran (2012) affirms that it can be useful in portfolio management, in acquisition analysis and in corporate finance.

Regarding portfolio management, Damodaran (2012) affirms that valuation, even though it might not be useful for passive investors, it can represent an incredible tool for an active investor and that even among active investor it can have a significantly different use for each one of them, for example, market timers will use valuation less than investors who pick stocks for the long run and they will place more importance on market valuation rather than on firm specific valuation. Stock pickers will emphasize fundamental analysis over a more technical one.

In relation to acquisition analysis, Damodaran (2012) enforces that valuation is of extreme importance because it can mark the action of buying/ selling the company or not and that it is not a simple process. The buyer has to offer a fair value for the firm and the seller has figure a reasonable value for which they will accept the offer. Moreover, Damodaran (2012) claims that in this analysis other factors have to be considered, first the effect of synergies must be taken into account before making the offer, second a change in management and in a restructure of the acquired firm will also be considered when proposing a value. To conclude, there are other forces at play here, for example, if the bidding firm has a pre-conceived idea of acquiring the other firm, for strategic reasons, then it is very likely that their analyst, who is under pressure, will estimate a value that permits the acquisition.

Finally, the valuation role in corporate finance, according to Damodaran (2012) is based around maximizing its value by aligning its strategy with its financial decisions. To do so, many institutions have been acquiring knowledge from management consulting firms that will guide them in regard to which projects should be undertaken, how to finance them and also in relation to its dividend policy. By doing so they achieve a better performance, maximize firm value and become more acknowledgeable of its financial structure.

To conclude and before we start the appraisal tools description, valuation as affirmed by Damodaran (2012) is key in many finance areas, from mergers and acquisitions to portfolio management. However, it should be highlighted that it does not represent an objective exercise, because any preconceptions that an analyst makes will influence the calculated value. Finally, no matter how perfect the valuation tool and analysis are, the final value will still have a high probability of being wrong.

2.2 DCF Valuation

The DCF valuation tool can be used in three different approaches: Firm valuation, Equity valuation and APV valuation. Although we are going to analyze the first two the third one is out of scope of this project. The goal of the DCF method is to figure the value of a firm today by doing some projections of its cash flows into the future. Astranti (2015) affirms that, although this sounds relatively simple, we also have to take into account the time value of money, in other words, the same amount of money today is worth more than the equivalent amount of money in some point in the future. This happens first because of uncertainty, the business world is filled with risk and uncertainty, therefore we can never be sure that the money will be collected until we actually receive it, the second component is inflation, it is common sense that 1 euro is more valuable now than it will be in the future, the third element is that individuals attach more importance to their current needs than to the future ones, discounting is a measure of this preference too, finally the fourth variable is that money can be invested now to make future profits, this is why the discounted cash flow tools can be used to measure the gains that the alternative uses of money would earn (Astranti, 2015).

Damodaran (2012) affirms that the cash flows are different depending on the asset, ranging from coupons to dividends among others. The discount cash flow rate will depend on the riskiness of the estimated cash flows, lower rates for safer assets and higher ones for risky ones. For example, if we are talking about the default zero coupon, with a guaranteed cash flow in the future, then the utilized rate, a riskless one, should yield the value of the bond at the end, by contrary if we are talking about

equities, there will be substantial risk around expectations and so we will use a rate that reflects the uncertainty (Damodaran, 2012).

To value a business, we can follow two paths, the first is to value the equity stake in the business, the second is to value the entire business, this includes besides shareholders, other claimholders in the firm like bondholders and preferred stockholders. Since both methods are different, they will also use the different cash flows and discount rates (Damodaran, 2012).

2.2.1 FCFF

According to Abate and Grant (2001) the firm value is attained by discounting expected cash flows to the firm (FCFF), this is the residual cash flows after subtracting all operating expenses, reinvestment necessities and taxes but before any payments to debt or equity holders, at the WACC, that represents the cost of different parcels of the financing utilized by the firm, with the respective weight associated with each of them.

$$Value\ of\ firm = \frac{FCFF_1}{1+WACC} + \frac{FCFF_2}{(1+WACC)^2} + \cdots + \frac{FCFF_n}{(1+WACC)^n} + \frac{TV_n}{(1+WACC)^n}$$

Where,

n - Life of the asset

$FCFF_n$ - expected cash flow generated by the firm on period n

WACC - Weighted Average Cost of Capital (discount rate)

TV_n - $\frac{FCFF_{n+1}}{WACC-g}$ – terminal Value of the firm on year n

$FCFF_{n+1}$ - $FCFF_n$ x (1+g)

The formula to calculate the FCFF is the following:

$$FCFF = EBIT*(1 - T) + D\&A - \Delta\ Net\ WC - CAPEX$$

Where,

EBIT - Earnings before Interest and Tax

T - Corporate Tax Rate

D&A - Depreciation and Amortization

CAPEX - Capital Expenditures

Δ Net WC - Net Change in Working capital

We may also consider Net CAPEX, which is simply the difference between CAPEX and D&A.

WACC - Weighted Average Cost of Capital

Fernández (2011) claims that the WACC is the discount rate at which the FCFF must be discounted to get to the same values that we would obtain by using Equity Cash Flows discounted at the cost of equity.

The WACC does not represent a cost or a required return: it is a weighted average of a cost and a required return.

To be more accurate, the WACC is a weighted average of the following:

- The cost of debt, representing the effective rate at which a company pays its current debt.
- The required return to equity which represents the return required by the business holders on a project financed with internal funds as opposed to debt.

Torries (1998) asserts that as long as the project has a higher return than its WACC, it should be considered.

According to Sabal (2005), Modigliani and Miller seminal paper (1958) praised two major alternatives regarding firm valuations: the WACC and APV. According to those authors, the WACC is preferred whenever a target debt ratio is set for the long term, which usually is the case with larger firms in industrialized economies. By contrary, the APV is more appropriate for emerging markets, where there is high economic uncertainty. Ezzell and Miles (1980) affirm that although the WACC is an appropriate discount rate for a huge range of assumptions, from a one-year project life to a level perpetual project cash flows, some authors affirm that it does not generally provide correct valuations of uneven finite cash flows. The scope of this thesis is centered on the valuation of a large group within industrialized economies while using even perpetual cash flows and as such the WACC is an acceptable discount rate to be utilized.

$$WACC = \frac{E}{V} * Ke + \frac{D}{V} * Kd * (1 - T)$$

Where,

E - Market value of the firm's equity

D - Market value of the firm's debt

V - E + D

Ke – Required return on equity

Kd - Cost of debt

T- Corporate tax rate

We will now define each one of these entries:

Market value of the firm's equity

Regarding the market value of equity, it represents the value of a company equity. It can be calculated by multiplying the current stock price by the total number of outstanding shares. This value is always due to the previous inputs variation. This value differs from the book value of equity, because the second does not take into account the firm growth potential.

Market value of the firm's debt

In relation to the Market Value of Debt, it reflects the market price investors would be willing to buy a company's debt at, which differs from the book value on the balance sheet. A company's debt can assume different forms, it can be non-tradable (bank loans) or in the form of publicly traded bonds, which have a specified market value.

This debt is reported at book value in the financial statements, however we should use the market value of debt because it is more accurate due to the fact that it includes both the cash and debt of a firm, thereby it takes into account the firm capital structure.

In order to estimate the Market Value of Debt, we can think of the debt book value as a single coupon bond, with the coupon being equal to the interest expenses on all debt and the maturity as the weighted average maturity of the debt.

The formula to calculate market value of debt is:

$$Market\ Value\ of\ Debt = C*[\frac{1-\frac{1}{(1+Kd)^t}}{Kd}] + [\frac{FV}{(1+Kd)^t}]$$

Where,

C - Interest expense (in currency values)

Kd - Current cost of Debt (in percentage)

t - Weighted average maturity (in years)

FV - Total book value of debt at maturity

Cost of debt

The cost of debt is the return paid by a company to its debt holders and creditors. Both are compensated for the risk exposure associated with lending to a firm. Cost of debt is easier to calculate than cost of equity, because perceptible interest rates are very important when estimating the cost of debt. Cost of debt reflects not only the default risk of a firm but also the interest rates that are in force in the market.

The formula to calculate cost of debt is:

$$Kd = (rf + credit\ spread) \times (1-T)$$

Where,

rf – Risk-free rate

Credit spread – Rate paid by the firm associated with its rating status

T – Corporate tax rate

OR

$$Kd = C\ (1 - T)$$

Where,

C - Interest rate (in percentage values)

T – Corporate tax rate

To figure the interest rate, we have to calculate the weighted average firm interest rates.

Expected return on equity

The cost of equity will be calculated through the use of the CAPM.

CAPM

According to Damodaran (2010), risk constitutes one of the central points in modern finance, understanding that it matters and that investors must be rewarded for higher risks with higher returns is key. Thus, the expected return must be interpreted as a sum of the risk-free rate and a risk premium to compensate for the undertaken risk. The equity risk premium represents how much risk we see in an economy and the price attached to that risk, it influences the expected return on an investment and the value estimated for that investment, therefore it carries weight on our wealth allocation across different assets and on which ones we invest within each asset class.

Different risk and return models seat on two major prepositions, the first is that they all define risk in terms of variance in actual returns around an expected return, the second is that risk has to be quantified from the perspective of a well-diversified marginal investor in an asset. Consequently, they argue that only the investment added risk should be measured and compensated, this can be done though two components, a firm specific component that measures risk related only with that investment or others similar to it and another one, a market component containing risk that affects a large amount of investments. This last component should be rewarded because it is not diversifiable. However, the different models don't agree on one key point and that is how to measure market risk (Damodaran, 2010).

Damodaran (2010) affirms that, in the CAPM, the total risk premium for a risky asset is attained through the calculation a beta, representing the market risk, multiplied by the equity risk premium. In other models, such as the arbitrage pricing and multi-factor models the betas are estimated against individual market risk factors, where each one has its own risk premium. The usefulness of each model depends on the depth of research. The CAPM is more usefully if a limited study is needed, by contrary if a more profound research is conducted then APT is probably a better tool.

The formula to calculate CAPM is:

$$Ke = rf + \beta_i (ER_m - rf)$$

Where,

Ke – Expected return on equity

rf = Risk-free interest rate

βi = Beta of the investment

ERm = Expected return of market

(ERm - Rf) = Market risk premium

The minimum rate that an investor can expect to get on investments without risk is here represented as the risk-free interest rate.

The systematic risk, which compares the volatility of a firm stock price with the market is here represented by the beta (β). The beta can assume different values:

If β is equal to 1, will move exactly at the market pace.

If β is higher than 1, the firm stock price is more volatile than the market.

If β is lower than 1, the firm stock price is less volatile than the market.

The Market risk premium represents the additional return an investor expects to receive above the Rf rate from holding a risky market portfolio and it is dependent on the investor style. We can categorize investor depending on the type of investments they take:

Risk tolerant investors: If the investors are experienced and accept whatever risks they need to go through (within reasonability), they belong to this category. These investors will not expect much out of the investments and so the premiums will be lower than the risk averse investors.

Risk averse investors: These investors usually are not as experienced and have not dealt with risky assets. Normally, these investors expect more out of the investments and so the premiums would be higher than the risk tolerant investors.

Besides investor risk profile, there are two other factors to consider when calculating the premium:

1. **Required Market risk premium**: Represents the difference between the minimum rate of return expected from the investors regarding any sort of investment and the Rf rate.
2. **Historical Market risk premium**: Represents the difference between the historical market rate of a specific market and the risk-free rate.

Corporate tax rate

This tax represents a charge on the profit of a firm to raise taxes. It is applied after operating earnings are calculated, by subtracting the cost of goods sold, the selling expenses, the administrative expenses, depreciations from revenues and after the interest expenses and benefits are also taken into account. These tax rates are applied to generate a legal obligation in the firm owned to the government. The corporate tax rates obey to a wide range of rules around the globe and must be approved by the population through the right to vote and by the government to be applicable.

Implied share value

Finally, to obtain the implied value per share, we will discount the FCFF at the WACC rate and add the net debt composed by NOA, such as cash & cash equivalents and/or marketable securities and by both short and long term debt.

$$Share\ Value = (Firm\ Value + NOA - DEBT) / Number\ of\ shares\ outstanding$$

2.2.2 FCFE

Represents the amount of available cash to the equity shareholders after deducting all expenses, reinvestment and debt are settled (Damodaran, 2006).

$$\text{Equity value} = \textit{Value of firm} = \frac{FCFE_1}{1+Ke} + \frac{FCFE_2}{(1+Ke)^2} + \cdots + \frac{FCFF_n}{(1+Ke)^n} + \frac{TV_n}{(1+Ke)^n}$$

Where,

n - Life of the asset

$FCFE_n$ - expected free cash flow to the equity generated on period n

Ke – Expected return on equity (discount rate)

TVn - $\frac{FCFE_{n+1}}{Ke-g}$ (terminal Value on year n)

$FCFE_{n+1}$ - $FCFE_n$ x (1+g)

g – Growth rate in FCFE

FCFE = Net income + D&A - CAPEX - *Δ Net WC + New Debt – Debt Repayment*

Where,

Net income - present on the company income statement

D&A - Depreciation and Amortization

CAPEX - Capital Expenditure

Δ Net WC - Changes in Net Working Capital

FCFE is usually used by analysts to determine the company value. It constitutes an alternative to the DDM if the firm does not pay dividends. It measures the amount available to shareholders but might not be equal to the amount paid out to them. Regarding the tools used to calculate FCFE, we can say that the net income is present on the company income statement, that both CAPEX and WC are found on the firm cash flow statement and that the last one represents the difference among the company´s most current assets and liabilities. Net debt is also on the financing section of the cash flow statement. This valuation method is also useful to understand if stock repurchases and dividend payments are for with FCFE. Ideally, investors want a FCFE that covers the dividend payment and share repurchase. If this does not happen, the firm is funding with debt, through existing capital or issuing new securities. In short, if the company FCFE is higher than its dividend payment, the excess is used to increase cash amount or to invest in new securities. If the FCFE is around the same as the dividend payment, the firm is paying it all to its investors. By dividing the Equity value by the number of shares outstanding, we get to the share value.

Share Value = Equity value / Number of shares outstanding

2.2.3 DDM

The DDM is used to predict the price of a company´s stock through the sum of all its future dividend payments discounted to their present value. This method takes into account the dividends payout and the market expected returns. It can be used to understand if the stock is under or overvalued by comparing the value obtain from this tool with the current trading price of shares.

This valuation method, just like the previous, can be tricky to calculate because it is necessary to try to identify trends based on past dividend payment to estimate future ones. Regarding its discounting factor, the one expected return on equity will be the selected one, because shareholders take risks by investing in stocks that might lose value and as such they expect a compensation for this.

Despite the fact that many analysts don´t particularly like this tool by pronouncing that its values are too conservative, its foundation is similar to other valuation tools we have seen (Damodaran, 2006). This method represents the oldest among the DCF models; it takes into account two major factors.

1. The expected dividends return by the investors during the time they hold the security.
2. The sale price of the security.

In order to value this, the following formula based on the expected dividends, as well as the expected return on equity is used.

$$\text{Value per share of stock} = \sum_{t=1}^{t=\infty} \frac{E(DPS)t}{(1+Ke)^t}$$

Where,

E(DPSt) - Expected dividends per share in period t

ke - Expected return on equity

This formula offers an overview on the valuation method, but projections of dollar dividends cannot be made in everlasting and publicly traded firms, other alternatives of the same model were invented. The most famous designs the stock value based on a stable growth firm.

$$\text{Stock Value} = \frac{E(DPS)}{(Ke-g)}$$

Where,

E(DPS) = Expected dividend per share next period

ke = Expected return on equity

g – constant growth rate

Damodaran (2006) detailed that this model, popularized through articles and books publications, was developed by Durant (1957) and Gordon. There are three main particularities to consider here:

1. This appliance can only be utilized in firms that are growing at a stable rate that can be maintained forever.
2. The firm dividends growth rate has to be lower than the economy growth rate, because we are assuming perpetual growth.
3. Dividends are expected to grow at the same rate as the other firm performance indicators, due to balance between the payout ratio and the dividends payment sustainability. This is if dividends payment was too high it would exceed earnings, by contrary if dividends growth was too slow the payout ratio would converge to zero and both of these situations don't accommodate a steady state.

In order to cover more companies, other methods are available. In particular, one of the DDM models contains a two stages growth model, where the initial growth rate is not stable but at some point, in time it becomes so (Damodaran, 2006). The formula is the following:

$$\text{Value per share of stock} = \sum_{t=1}^{t=n} \frac{E(DPS)t}{(1+Ke)^t} + \frac{Pn}{(1+Ke)^n}$$

Where,

E (DPSt) = Expected dividend per share in period t

ke = Expected return on equity

$Pn=\frac{E(DPSn+1)}{(Ke-g)}$

E (DPSn+1) = Expected dividends per share in period n+1

g – Constant growth rate after n years

Furthermore, there are other DDM models like the H model, presented in Fuller and Hsia (1984) and based on the assumption that the initial growth phase declines until it reaches the stable growth rate in steady state. It also assumes that the dividend payout and expected return on equity are constant over time. The H Model is as follows:

$$\text{Value per share of stock} = \frac{DPS0 * (1+gn)}{(r-gn)} + \frac{DPS0 * H * (ga-gn)}{(r-gn)}$$

Where,

DPS0 - Current dividends per share

gn – Stable growth rate

ga – High initial growth rate

H – Half of the extraordinary growth phase

This model is the solution for the drop from the quick growth to a stable one, but it also has some cons:

1. The decline is supposed to be made in linear decreases based upon the initial growth rate, the stable growth rate and on the period H length. However, if this drop happens through large deviations the value can be significantly stilted.
2. The payout ratio is assumed to always be constant, but this is not real. In other words, normally when the growth rates decline the payout ratio increases.

To conclude, the model requires both high growth and high payout to work limiting its utility. It could be useful for a rapid growth company at the moment, with a linear declining future growth. However, there would still be problems regarding the payout ratio if nowadays the firm has low or no dividends.

All in all, DDM valuation models are quite simple to use due to the low amount of conjectures and because the dividend amount is stable and easier to forecast when compared with other DCF tools.

2.3 RVM

Values reached through the use of multiples almost always have a broad dispersion. These tools should be utilized in a second stage of the valuation, this is after performing the valuation with another method to better understand the gathered results. Some of the most utilized valuation methods belonging to RVM are the PER (Price to earnings ratio), EV/EBITDA (Enterprise value to EBITDA), EV/EG (Enterprise value to EBITDA growth) and P/BV (Price to book value). Since we will evaluate a group operating in the automotive sector, we should choose the most commonly used multiples in that same industry. P/S (Price to sales) is the most famous one but we will also use PER (Price to earnings ratio) and EV/EBITDA (Enterprise value to EBITDA) because they are extremely utilized in the engineering sector, therefore they might be relevant (Fernández, 2001).

Goedhart, Koller and Wessels (2005) affirm that not every valuation tool has the same structure. That is, managers who are dedicated to maximize shareholder value will appoint the DCF method as the

most accurate and flexible. However, those analysis are only as accurate as the utilized inputs and any error regarding a company´s returns on invested capital, its growth rate and its WACC will indulge in fallacies regarding the company or project valuation. These authors state that there are some basic principles that help companies in applying multiples properly:

1. **Use peers with similar prospects for ROIC and growth**: it is necessary to examine each peer group company and understand where the differences come from. To do this, we need to reflect on certain matters, such as, the companies' relative product quality, their access to clients, the dimensions of its economies of scale, how they generate revenue and profits while growing, among others. After, we can look at these strategic advantages and see if they translate or not into superior returns on invested capital and growth rates, if they do, it is expected that the companies with an edge will trade at higher multiples. At the end of the analysis, the peer group will be smaller but more realistic.

2. **Use forward-looking multiples or data as recent as possible**: the writers, recommend that multiples based on forecast are better than historical profits, if those aren´t available then we should use data as recent as possible. There are some studies affirming this, to be more specific, there was a study conducted by Moonchul Kim and Jay Ritter written in 1997 named "Valuing IPO's", where there was a comparison between the pricing power of historical and forecast earnings for 142 IPO´s. The main conclusion was that earnings based on historical values had an average prediction error of 55%, meanwhile those based on one year forecast figures had a 43.7% error. Moreover, the error when using two year forecasts dropped even more to 28.5%. Another interesting metric was the percentage of firms valued within 15% of their actual trading value, where this value raised from 15.4% based on historical values, to 18.9% based on one year forecast figures and even higher to an incredible 36.4% when the two year forecast numbers were used.

3. **Use enterprise value multiples:** P/E multiples are flawed, they are continuously affected by the company capital structure. In other words, for unlevered companies P/E ratios rise with leverage, thus a company with a high P/E can increase the same ratio by swapping debt for equity. Moreover, the P/E ratio is based on earnings, which include many nonoperation items, like restructuring charges and write-offs that can be misleading at times. Instead, the enterprise value to EBITDA is less affected by capital structure because both, equity and debt are already considered by the ratio and its EBITDA actually represents the profit available to investors. Moreover, this ratio might actually increase with a lower expected return on equity, but we have to remember that it is still dependent on growth and ROIC making it more forgivable.

3. VW AG

3.1 VW AG Description

VW AG "people's car" in German is an automotive group founded in Wolfsburg, Germany by the German Labour Front in 28 of May 1937 and with headquarters in the same place it is the largest carmaker in Europe. It has a wide range of action from the production, design and distribution of vehicles, motorcycles, engines and turbo machinery. Volkswagen also operates in the finance sector through Volkswagen Financial Services, representing the largest automobile financial services provider in Europe operating in 51 countries in different continents. The main fields of Volkswagen financial services are financing, leasing, insurance of motor vehicles for VW AG clients along with the mobility services provision and direct banking. Taking this into account, the group prime objective is to produce new, more evolved vehicles and components for all its brands.

VW AG is constituted by 12 brands original from 7 European countries: Volkswagen, Bentley, Ducati, Audi, Bugatti, Commercial Vehicles, Seat, Lamborghini, Scania, Skoda, Porsche and MAN distributed along 122 production plants in 20 European countries and 11 in the other continents. The brand set is very successful, in 2016 and 2017 VW AG was the sector agglomerate with highest sales, 10.8 million vehicles in the past year and its sales revenue in 2018 totaled 236 billion euros.

It employs 664,496 people who help producing approximately 44,000 vehicles every day that are exported and sold in 153 countries.

VW AG vision is to become a globally leading provider of sustainable mobility. Its mission is to offer tailor made mobility solutions to its customers, to serve them with a diversified portfolio of high quality brands, to be responsible regarding its environmental, safety and social effects. Finally, the group believes that integrity, quality and passion must be its work foundation.

VW AG is represented in many continents, Europe, America, Asia and Africa.

Table 1: VW AG production countries

Europe	Portugal, Spain, France, Italy, UK, Germany, Switzerland, Russia, Belgium, Netherlands, Denmark, Austria, Sweden, Poland, Czech Republic, Hungary, Bosnia and Herzegovina, Finland. Slovakia and Turkey.
America	EUA, Mexico, Brazil, Argentina.
Asia	India, China, South Korea, Taiwan, Thailand, Malaysia.
Africa	South Africa.

(Source: Author)

Group sustainability:

Environment: When people think of an environmental role model, they surely do not think of Volkswagen. However, the group goal is to be a role model in this field. VW AG wants to deliver mobility for everyone while minimizing the environment impact. For that reason, it is undertaking many projects to pursue this goal. In other words, the brands conglomerate fosters strategic partnerships with suppliers to drive forward innovations that help protect the environment, it is launching electrification offensives in the automobile industry through electric vehicles that reduce CO2 emissions during usage. VW AG is also working on new CO2 neutral fuels, it is re-commissioning car batteries, recycling and reutilizing materials.

Some examples of these new ways of interacting with the environment are:

-MAN is developing electronically connected trucks on the road keeping them at a steady distance. This technology reduces fuel consumption and emissions for the trucks group by up to ten percent, this happens because the short distances between vehicles reduce drag on all vehicles behind the platoon leader.

-At busy intersections the CO2 emissions can peak, therefore Volkswagen is creating the green light assistance that governs the car speed to ensure that it does not stop at the lights. If this is unavoidable, the system slows down the car to help as many following cars crossing the intersection during the green phase meaning that they will spend less time waiting, consequently, less energy is consumed and CO2 emissions are released.

-The group is developing the “TOGETHER - Strategy 2025” program, whose goal is to capture sustainable mobility in the best possible way by transforming its business core through the launch of 30 plus fully electric cars by 2015.

Refugee Aid:

VW AG assists in the integration of refugees into society through emergency assistance. These actions range from providing shelters to monetary and non-monetary donations. The Group is giving German language classes and some other qualifications. These represent very important activities regarding the refugee's capacities to learn and to become a part of the workforce. These activities are used to determine an individual's skill level, to give them communication skills and to enable a complete work experience through internships. The programs have been quite successful and in 2016 and 2017, about 3,500 refugees attended them in Germany.

Volkswagen Group also tries to increase its workers commitment and to provide ideas to interested employees, which can be used to offer assistance jointly with organizations concerned with human rights.

3.2 VW AG History

Figure 1: VW AG history

VW	•Volkswagen was founded in 1937 in Wolsfsburg. Currently it has 200266 employees and facilities distibuted for 14 countries producing vehicles for customers in more than 150 countries. The brand delivered 6,23 million vehicles in 2017
Audi	•Audi was founded in 1909 in Ingolstadt. Currently it has 90705employees and it has been part of VG AG since 1965 operating in more than 100 markets. The brand delivered 1,87million vehicles in 2017.
Seat	•Seat was founded in 1950 in Martorell. Currently it has 14,716 employees and it has been part of VG AG since 1965. The brand delivered 0,4684 million vehicles in 2017.
Skoda	•Skoda was founded in 1895 in Mladá Boleslav. Currently it has 32985 employees and it has been part of VG AG since 1991 operating in more than 100 markets.
Bentley	•Bentleywas founded in 1919 in Crewe. Currently it has 4,332 employees and it has been part of VG AG since 1998. The brand delivered over 11000 vehicles in 2017.
Bugatti	•Bugatti was founded in 1909 in Maolsheim. Currently it has 302 employees and it has been part of VG AG since 1998.
Lamborghini	•Lamborguini was founded in 1963 in Sant´Agata Bolognese. Currently it has 1606 employees and it has been part of VG AG since 1998.The brand delivered over 3815vehicles in 2017.
Scania	•Scania was founded in 1891 in Södertälje. Currently it has 40737 employees and it has been part of VG AG since 2008.The brand delivered over 90800 commercial vehicles in more than 100 markets.
Ducatti	•Ducatti was founded in 1926 in Bologna. Currently it has 1570 employees and it has been part of VG AG since 2012.The brand produced 57000 motorcycles in 2017.
Porsche	•Porsche was founded in 1931 in Zuffenhausen. Currently it has 27352 employees and it has been part of VG AG since 2012.The brand delivered over 246000 vehicles in 2017.
Man	•Man was founded in 1758 in Munich. Currently it has 54297 employees. MAN is the market leader in the following sectors: supplies trucks, buses, vans, diesel engines, turbomachinery and special gear units.
Commercial Vehicles	•Volkswagen Commercial Vehicles was founded in 1995 in Hanover. Currently it has 21818 employees and it focus on the development, production and distribution of light commercial vehicles.

Source: (Author)

3.3 VW AG Mission, Vision and Strategy Analysis

The VW AG launched the TOGETHER – Strategy 2025 program. This is a revolutionary project with a very ambitious vision and mission, with the goal of turning this group into the becoming the world leading provider of sustainable mobility. We will now describe in detail, the elements that shape this new guide:

Vision:

"We are a globally leading provider of sustainable mobility".

Mission:

1. "We offer tailor-made mobility solutions to our customers"
2. "We solve our customers diverse needs with a portfolio of strong brands"
3. "We assume responsibility regarding the environment safety and social issues"
4. "We act with integrity and build on reliability, quality and passion as the foundation of our work"

In other words, the ultimate objective of this automotive group is to be an excellent employer, to bring excitement into the customers lives, to grow in a sustainable way, to be a role models regarding the environment safety and integrity while achieving competitive profitability.

To achieve all this, VW AG believes that its brands should work together, through functioning networks of experts and good relationships among people, synergy is also extremely important because by doing so much less resources are utilized and higher quality is obtained, finally the group also puts the swell-being of the brand conglomerate over the well-being of any specific brand, this ensures that everyone succeeds and no one is left behind. In order to achieve all this some values are utilized as guidelines, namely:

1. Mutual trust
2. Genuineness
3. Simplicity
4. Open mindedness
5. Equality
6. Unity

The image bellow represents the four key building blocks of the future program and its major strategies and initiatives.

Figure 2: VW AG building blocks

(Source: VW AG website)

3.4 Shareholders Analysis

VW AG shareholder structure is represented bellow through a chart where we can access the 6 main associates. The group had, at the end of 2018, 206,205 preferred shares and 295,090 ordinary shares amounting to a total of 501,295 in outstanding shares.

Figure 3: VW AG subscribed capital distribution at the end of 2018

(Source: VW AG website)

Figure 4: VW AG voting rights distribution at the end of 2018

(Source: VW AG website)

3.5 The Environmental Crisis (2015)

Volkswagen emission scandal happened in September of 2015. The USA Environmental Protection Agency found that Volkswagens vehicles emissions controls were only activated during laboratory emissions testing which caused its values to be within the standards. However, when the cars got tested in the real world conditions the N0x emissions were up to 40 times higher than in the laboratories. Due to this, many other regulators began to investigate the brand and its stock value dropped by a third right after the scandal. The Volkswagen CEO Martin Winterkorn resigned. In April of 2016 Volkswagen planned to spend 16.2 billion € to rectify the whole situation. However, the problem was even bigger, VW market value declined by 26.8 billion dollars and they had to recall 11 million affected cars worldwide. VW also faced a penalty of approximately 18.0 billion dollars from the USA Environmental Protection Agency and another 7.3 billion dollars to fix all the affected cars. The scandal raised awareness on the actual pollution levels released by diesel cars, which surpassed the emission limits standards. The International Council on Clean Transportation and the General German Automobile Club also tested other brands and the ones with the highest deviation levels were Volvo, Renault, Jeep, Hyundai, Citroen and Fiat.

Table 2: Price of VW AG stock 17 September–5 October 2015

Date	Close	Variation
Oct 02, 2015	92,36	-44,96%
Oct 01, 2015	96,5	-42,49%
Sep 30, 2015	97,75	-41,75%
Sep 29, 2015	95,2	-43,27%
Sep 28, 2015	99,3	-40,82%
Sep 25, 2015	107,3	-36,05%
Sep 24, 2015	112,15	-33,16%
Sep 23, 2015	111,5	-33,55%
Sep 22, 2015	106	-36,83%
Sep 21, 2015	132,2	-21,22%
Sep 18, 2015	162,4	-3,22%
Sep 17, 2015	167,8	

(Source: Author)

Volkswagen sales in the US, when comparing November of 2015 to November of 2016, suffered a 24.7% decrease. However, in Great Britain, the amount of sales remained stable, increasing in 2016 to an all-time high. Regarding Europe, VW sales returned to growth in April 2016 for the first time since the scandal broke, with a market group share of around ¼, similar to the one in the previous year.

This event brought inevitable consequences to the group workforce and by November of 2016, VW AG had to dismiss around 30,000 people as a result of the costs from the violations. However, through the stimulus induced to produce more electric cars, 9,000 new jobs were to be created.

3.6 The Comeback and the Future

Volkswagen Group, the world´s largest automaker, in some ways better resembles an army or a country than a mere corporation. Its main factory in Wolfsburg, Germany produces over 3,000 vehicles every day. There and at the other 100 plus factories worldwide, the 12 brands make 355 models, employing more than 600,000 people who generate $284 billion in annual revenue.

The current CEO, Matthias Müller, who received a huge promotion from turning the Porsche crisis around is trying to take the group into the electric vehicles direction. VW embarked on the largest program of electrification in the car industry by planning to spend €20 billion in the development of battery-powered or hybrid variants of every one of its models by 2030 with the ultimate goal of making electric vehicles at the high end of the market, cheap and commonplace.

The crisis was "an unmistakable wake-up call a warning that things could not stay the way they were," Müller affirmed. The crisis at Volkswagen brought an opportunity to eliminate some major drawbacks, for example, the Phaeton, a luxury sedan priced at almost 90,000€ assembled by hand in a factory with hardwood floors and glassed-in viewing stations for the public, it was the product of a weird bet that high-end buyers would prefer an over-engineered Volkswagen to a BMW, Mercedes, among other luxury brands.

Müller redesigned the Wolfsburg building where the Phaeton was produced to a new unit responsible for electric vehicles development. He also began work on a new deal with Volkswagen's unions and both parts agreed to a 30,000 workforce reduction. Before the crisis, Volkswagen booked celebrities like Justin Timberlake to appear at product launches, after the scandal the music is recorded.

With the crisis diesel was seen as a fraud for many customers, therefore Müller at an event in Paris in September 2016 presented the I.D., a battery-powered hatchback with a range longer than Tesla Inc.'s lowest priced vehicle and accessible to the masses. The car, Müller said, presented "a new Volkswagen".

Nowadays every automaker is pushing into to get into the electrics' markets, albeit in different forms. The big Asian brands, Toyota and Hyundai Motor Co. are investing in fuel cells and hybrids. In the other hand, U.S. automakers, are changing slowly because of their home market's adversity to comply with climate change. Nonetheless, none is committing nearly as much capital as Müller's Volkswagen. The goal is for electric vehicles to amount for 25 percent of global sales by 2025, when they are still expected to represent a small share of global demand.

VW was transparent and forthcoming with the results of the internal investigation, as such, the brand has eliminated the risk of false information and negative publicity spreading.

All the actions mentioned above have been successful at preventing further damage, however they have not actually contributed to the rebuilding of the brand. To do so Volkswagen had to revolutionize a new corporate strategy. The 'TOGETHER- 2025 strategy', announced by Mueller, will be the biggest change process in the Volkswagen Group's history. It aims to bring twenty new electrical cars or plug-in hybrid models by 2020 and thirty electric models by 2025. Nevertheless, this might not be enough to put things right and turn around what happened. Only time will tell whether the statements above are true and if consequently, Volkswagen redeems people's trust to become a global leader of sustainable mobility.

3.7 Share Price Evolution

Table 3: VW AG and competition stock evolution (2014-2018)

Period	VW AG	Toyota Motor	Ford	General Motors
2014	-9,55%	+17,73%	+0,45%	-14,58%
2015	-27,57%	-0,93%	-9,10%	-1,66%
2016	-0,30%	-8,15%	-13,91%	+2,44%
2017	+24,82%	+4,87%	+2,97%	+17,65%
2018	-16,54%	-11,19%	-38,75%	-18,39%

(Source: Yahoo Finance)

We can conclude that the Volkswagen Group share price performance was diminished by the 2015 crisis. However, looking at the two last years, the group is performing better than its more direct rivals with an extreme growth during 2017. Overall, the share price evolution is quite hard to forecast, and we do not know what the future may bring to us but looking at the years referred above, the company is very competitive regarding its direct rivals.

Figure 5: VW AG stock vs S&P 500 performance

(Source: Yahoo Finance)

The graph depicts the VW AG evolution comparison with the S&P500 performance. If an investor bough VW AG shares in July of 2014 and held them for a five years period, its value would decrease by 9,45%. This is not positive and from the graph we conclude that the September of 2015 crisis had a huge impact on the stock value of VW AG, it was so big that if we compare the automotive group with the S&P500 from January of 2015 until July of same year, VW AG was actually outperforming the American stock index. By contrary, after September of 2015 VW AG share value crashed and since then it has not been able to recover in a sufficient manner to compete with the referred index.

3.8 Volkswagen in Portugal

Volkswagen has a huge factory in Portugal known as VW AE, where more than 850 cars are produced and shipped to other continents every day. During the first half of 2018, the company produced 115,715 vehicles, 75.1% of the total of 154,045 vehicles produced in Portugal. Regarding passenger cars, this number raises even higher reaching an astonishing 93%, another surreal fact is that 77% of Portugal automotive exports are made by VW AE with the main destinations being Germany (20,9%), France (14,7%), Spain (11,6%) and Italy (10,6%) (Curvelo, 2018).

Volkswagen's factory in Portugal built 224,000 cars during 2018. This number includes the Seat models produced in that location. The impressive performance represents an increase of 103% compared to 2017 production, which nevertheless falls short of the target of 240,000 cars, which the German manufacturer had set for the Palmela unit (Publico, 2019).

In order to achieve such results, the main source was the construction, on an exclusive basis for the European market, of the VW T-Roc, a small SUV that the brand launched in August 2017. In 2017

the factory produced 110,256 vehicles, however in 2018 an even more amazing feat was achieved through a new production top score. In this rational, VW AE had already surpassed by the end of August an annual production record that had been in force since 1998. This is in eight months that were not exactly easy to manage, due to the labor unstable climate (including a threat of strike in February, which was never realized). The reasons for this climate were associated with the new T-Roc production since it demanded changes to the work schedule, with the introduction of a third shift on weekdays and during the weekends, in two phases, first in February (two shifts on Saturday, which increased production by 10%) and then in September (two shifts on Sunday). VW AE is producing several models for the German brand, including the Volkswagen Sharan and Seat Alhambra MPVs, as well as the new T-Roc, which is responsible for the significant increase in production at the Palmela plant. (Publico, 2019).

As referred to above, Palmela factory doubled its production in 2018 and is expected to invest 110 million euros in 2019 in the assembly and stamping of parts. This plan includes increasing T-Roc's production capacity in response to the market's growing acceptance of the model and the expansion of the die and die unit, which is responsible for various projects for the Volkswagen Group (Distrito Online, Notícias da Região de Setúbal, 2019). VW AE already represents 1.6% of GDP, the company announced, based on data released by the National Institute of Statistics. This percentage corresponds to 3.2 billion euros. According to the administration, in 2018, Volkswagen's car plant in Palmela also recorded a 67% increase in goods exports and had a 5% impact on the value of Portuguese exports (Dinheiro Vivo/Lusa, 2019).

VW AE exported 20 million pieces from the press unit, which strengthened VW AE role as the second largest national exporter. VW AE currently has around 5,800 employees, which makes it among the largest national employers, and in 2018 two labor agreements were approved by a large majority that guarantee social stability for the company. The internal opinion barometer, which had an anonymous participation of 84% of employees, showed an overall satisfaction index of 81.5% (Distrito Online, Notícias da Região de Setúbal, 2019).

4. Industry and Product Analysis

Overall, a company success is extremely linked with the overall industry attractiveness and the political environment. However, through a complete industry analysis, businesses can leverage their positions by better understanding their strengths, weaknesses, opportunities, threats and overall market position. In order to figure their actual standing, they can look into their own financial statements and understand if they are generating profit or not, to note that this will only provide for an absolute analysis, which is very dependent on the company size meaning that if the company wants to achieve a reasonable comparison with its opponents, some much larger than them, they can use some ratios to determine if they are competitive by comparison.

To perform an industry analysis many tools can be used, but the most common are Porter´s five forces and SWOT analysis. The first, like the name refers to, leads to the analysis of five different forces: the potential for new rivals to enter the market, the substitute products availability, the buyers' power, the suppliers power and finally the competitors and the competition nature. Regarding the second, we can say that it brings a lot of insight, on the company's strengths, weaknesses, opportunities and threats.

By performing these analyses, the business owners can understand the industry structure and better position their organizations by implementing an effective and efficient strategy. Porter (1980) affirmed that "an effective competitive strategy takes offensive or defensive action in order to create a defendable position against the five competitive forces", the strategies can range from anticipating shifts in the underlying industry factors to using the company unique capabilities as a defense mechanism.

The product analysis, just like the industry analysis, can be utilized for long term strategic planning. To do so, the business can review its products portfolio and from there, decide where to invest and develop or which products should be withdrawn from the market. One of the most famous tools to perform such analysis is the BCG Matrix. This matrix has 4 quadrants that take into account each product growth prospects and relative market share, to facilitate its use, names were attributed to each quadrant: the ones within high growth markets and high market share are named stars, the ones in low growth markets or low market share are dogs, products in high growth markets but with a low market share are named question marks or problem child and the ones in low growth markets but with high market shares are cash cows. By placing the products in each quadrant, a company can have a better idea on what to do. For example, the products with low relative market share and within low

growth markets, dogs, are usually withdrawn from the company, by contrary if the product represents a star then it may become a market leader through ongoing investment on it.

5. Porter's 5 Strengths Analysis

5.1 Potential for new rivals to enter the market

This potential is mitigated from the VW AG perspective because the automotive sector is particularly hard for new companies or startups to launch into the market. This happens due to the huge costs that go into the creation and maintenance of the factories assembly and painting lines, the expenses regarding cars development and the hiring of thousands of talented people that will contribute with their specialized knowledge to the vehicles performance. In addition to this, the companies set up processes can take a long time and obey to many complex procedures. Finally, factoring in economies of scale a new entrant would have to spend extra to produce few units, compared to established companies that produce in large volumes reducing the cost of productivity.

5.2 Substitute products availability

This represents a threat to the VW AG. The explanation is based on the fact that, as time goes by, the automotive car sector becomes more competitive through an increase in the car brands and models available to the customers. Additionally, the clients can simply lease or rent a car instead of buying one. Additionally, we can also affirm that motorcycles and other means of transport, such as public transportation, are preferred due to being more affordable/ practical.

5.3 Buyers power

Buyers ability to drive prices down depend on two major factors: their price sensitivity and their bargaining power relative to the firms. The former is defined by product differentiation, competition and product importance to the customer. The latter is determined by cost and ease of switching from one brand to another. VW AG consumers have low bargaining power due to the high switching costs of switching to another brand. VW AG produces premium car products, this attracts premium customers who are price insensitive because of the differentiated car products that promote customer loyalty. This loyalty enables VW AG to increase the prices of the products.

5.4 Suppliers power

Suppliers power depends on two main variables: how easily can the firms in the industry switch between different input suppliers and the relative bargaining power of both parts. Regarding the latter, VW AG suppliers bargaining power is low because there are many available suppliers and given VW

AG reputation and size, existing suppliers are afraid of losing their contracts with the group to other suppliers.

5.5 Competitive Rivalry

Competitive rivalry is determined by seller concentration, competitors diversity, product differentiation and exit barriers.

Regarding these variables, VW AG faces intense competition regarding advertising and product innovations. In order to surpass these obstacles, to oust rivals who use diesel, VW AG invested around 30 billion pounds to begin manufacturing electric cars to satisfy consumer needs.

Finally, there are considerable exit barriers. This happens because the resources associated with the industry are durable and specialized, moreover employees are entitled to job protection.

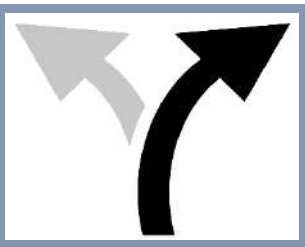
6. SWOT Analysis

Figure 6: VW AG SWOT analysis

Strengths

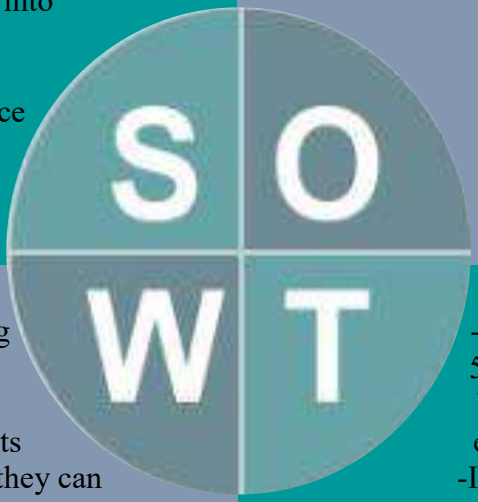
-Worldwide presence and recognition;
-Well-structured group (each business unit is responsible for its own branding and success);
- Large product portfolio (from ordinary passenger cars, to buses or even super cars);
- Research & Development (the group cars are known
for their performance and high technology inbuilt,
the group brands are expanding into Hybrid/
electric cars);
-Largest automaker by sales since 2016
until 2018, selling 10,8 million vehicles.

Opportunities



-The emissions scandal (loss of trust by the clients);

-Parent brand can be strengthened (VW AG needs to create more brand equity for the main brand, Volkswagen. Some models, which were a hit under the Volkswagen brand need to be reborn).



Weaknesses

- Purchasing power is increasing (vehicles which were seen as expensive before, nowadays are relatively cheaper because clients have more relative income and they can also acquire vehicles through loan/leasing options);
-Worldwide expansion (VW AG is trying to get into emerging countries by customizing its products in accordance with the target);
-Modern and creative designs (each brand launches new designs every new quarter);
- Hybrid, electric and auto driving vehicles (as fuel becomes more expensive, consumers will look for cheaper alternatives, such as, hybrid or electric vehicle

Threats

- Fragile brand reputation (more 5 million cars, including Audi´s, Volkswagen , SEAT, among oth ers had to be recalled);
-Increasing competition and innovation (other brands are gaining pace through the new technologies, for example, Tesla is developing auto driving vehicles and establishing its position in the market.
-Government regulations in different countries (to suit the local policies changes have to be made in design)

(Source: Author)

7. BCG Matrix

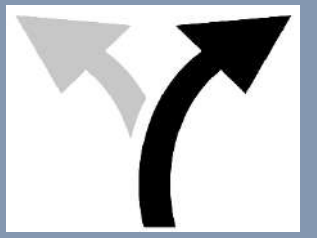
Figure 7: VW AG BCG Matrix analysis

Stars

-Among the passenger cars, the brand that is of relevance in this context is SKODA which has recently gained a higher ratio of sales as compared to the leading brand of Audi (Taylor, 2018). In 2017, the brand revenue was 16,559 (€ million), but in 2018, its profit margin improved by 4.4% to 17,293 (€ million) due to the surge in its demand (Volkswagen, 2018). SEAT is another star for Volkswagen group because of the favorable future prospects of the car. The sales revenue for the car has increased from 9,892.0 (€ million) in 2017 to 10,202,0 (€ million) in 2018.

Question marks

Bentley has shown some improvement in its financial performance in some regions, however, the sales of the brand in the US have declined which was a major market for these automobiles. The company has launched third generation of Bentley Continental which has received some response in the international market, generating a sales revenue of 1,843 (€ million) in 2017 but 1,548 (€ million) in 2018 (Volkswagen, 2018).



Cash cows

For Volkswagen group, the cash cow is evident in the form of Porsche and Audi. Both of these divisions have reported high sales over the years. In case of Porsche, the annual sale revenue was 23.67 (€ million), while Audi has recorded revenue of 59.2 (€ million) in fiscal year 2018 (Volkswagen, 2018).

The demand for Porsche has been relatively strong as compared to the other business divisions, making it one of the consistently profitable ventures for Volkswagen group (Bryant, 2018). According to the Volkswagen (2018), the 9.2 % increase in sales revenue depicts strong market presence of Porsche.

Dogs

The dog for Volkswagen group is the VW Beetle. Even though this car was in high demand in the past, the new designs and emerging trends in the automobile industry have made the segment unprofitable. The chances for growth of the Beetle are also not likely to be as significant as other passenger and luxury cars. Therefore, the management at Volkswagen group has decided to discontinue with the Beetle production (Morris, 2018). This decision reflects the market dynamics where the product has become outdated due to the demand of cars with better features and facilities.

(Source: Author)

8. Financial Analysis

A financial analysis, prior to the investment, constitutes an extremely important value examination for the possible investors. This happens because, in order to forecast if the risk of undertaking the deal is going to be worth it. The measures to achieve those predictions, among others like the discounted cash flow method or the RVM, arise from a profitability, liquidity, solvency and growth analysis of the target entity to obtain an overview of the company current state and of its relative reliability compared with its more direct competitors.

A VW AG financial analysis in respect to its profitability, liquidity, solvency and growth is presented below.

8.1 Profitability Analysis

Table 4: VW AG Profitability Analysis

Volkswagen	2016	2017	2018
Return on sales			
Gross Profit Margin	18,87%	18,97%	19,65%
Operating Profit Margin	3,27%	6,02%	5,9%
Return on investments			
ROE	5,79%	10,51%	10,36%
ROA	1,31%	2,72%	2,65%

(Source: Author)

VW AG profitability ratios have been improving over the last 3 years.

Looking at the return on sales, which can be measured through 2 ratios, the gross profit margin and the operating profit margin, we can confirm that they have been successfully improving.

In respect to the gross profit margin, which measures the sales can cover the cost of sales, we can conclude that 80.35% of the prior are used to cover the latter allowing a margin of 19.65%. This value improved a lot since 2016, the year after the crisis, because the sales revenue improved around 20 million euros in that time frame while the cost of sales only increased by 10 million euros.

Regarding the operating profit margin, which measures how the sales cover, not only the cost of sales but also the remunerations, the distribution and the research and development expenses, we can conclude that this ratio got better after the crisis recovery.

In respect to the return on investments, there are 2 main indicators, return on equity (ROE) and return on assets (ROA).

ROE permits us to understand how much euros of profit is the group able to generate with each euro invested by the shareholders. This value increased a lot from 2016 to 2018, meaning that in 2018 for each shareholder invested euro, VW AG generated in 0.05 euros.

ROA measures how efficient are the assets at generating profit for the group. Looking at the figures, this is another growing ratio when compared with the period right after the crisis. For each euro invested in assets, VW AG was able to generate 0.0265 euros of profit.

Table 5: VW AG Competitors Profitability Analysis

Competitors Returns (2018)	Toyota	General Motors	Ford
Return on sales			
Gross Profit Margin	18,63%	8,61%	8,68%
Operating Profit Margin	8,67%	2,16%	1,51%
Return on investments			
ROE	0,87%	5,84%	-0,65%
ROA	0,33%	1,00%	-0,09%

(Source: Author)

Comparing VW AG figures with its competition regarding the different ratios, we achieved the following conclusions:

- In 2018, VW AG numbers outperform its rivals regarding the gross profit margin. This is amazing because its sales are covering its cost of sales and more direct production expenses better than the competition. This is a relative advantage for VW AG, we should still note that Toyota also achieved a good result when compared with the two remaining competitors, General Motors and Ford.
- In respect to the operating profit margin, the VW AG did not perform so well, with Toyota taking the lead in this respect with a 3.67% margin. This means that Toyota administrative, research and maintenance costs are relatively lower than VW AG expenses.
- VW AG ROE is incredibly higher than its competition. To note that Ford values are negative because its profit after tax was below 0 in 2018.
- VW AG ROA is also above its competition figures. To highlight again that Ford values are negative because its profit after tax was below 0 in 2018.

8.2 Liquidity Analysis

Table 6: VW AG Liquidity Analysis

Volkswagen	2016	2017	2018
Current ratio	0,877	0,998	1,093

(Source: Author)

The most commonly utilized liquidity ratio is the current ratio. It measures a company ability to cover its current liabilities with its current assets.

Current assets include all assets that can be converted into cash in less than one year, such as, cash and cash equivalents, marketable securities, accounts receivable, prepaid expenses and inventory.

Current liabilities include all obligations due within one year, such as short term debt, accounts payable and other debts.

The current ratio includes inventory, consequently it will be higher for enterprises focused in selling inventory, like the retail industry. This causes it to be very variable along the year because many stores accumulate huge amount of stock leading up to the holidays, boosting its current ratio. In contrary, when the season is over, the current ratio comes down drastically.

Regarding VW AG, we conclude that this ratio has been growing in a positive manner, this is, it is increasing which indicates a better ability for the group to cover its current liabilities through its current assets. To note, that until the end of 2017 the company did not have enough current assets to cover all of its current assets, which causes some instability because if some short-term crisis appears the company is not safe. By the end of 2018 the scenario was the opposite, meaning that even if some unexpected scenario happened, the group has the ability to outperform its challenges in the short term.

Table 7: VW AG Competitors Liquidity Analysis

Competitors Returns (2018)	Toyota	General Motors	Ford
Current ratio	1,001	0,916	1,2

(Source: Author)

Among the competition Ford has the best ability to cover its short-term liabilities by using its short-term assets. This enterprise values even surpass the VW AG ones. By contrary, General Motors cannot cover all of its current liabilities with its current assets, which indicates some unreliability in the firm regarding the short term and creditors would very likely consider the company a financial risk because there is a risk it may be unable to pay its short-term obligations.

This ratio is not variable for companies in the automotive sector across the year. This happens because the clients demand usually follows the same pattern along the whole year and as a consequence the enterprises are always producing vehicles without accumulating inventory.

8.3 Solvency Analysis

A company solvency analysis might be useful to attest its overall access to new lenders. For such purposes, the debt to equity and the debt to capital ratios can be useful.

The debt to equity ratio is computed by dividing a company total liabilities by its shareholder equity. It provides a forecast regarding solvency and measures the ratio between assets provided by shareholders and the assets provided by creditors.

The debt to capital ratio is computed by dividing the company interest bearing debt and dividing it by the total capital. Total capital is composed by all interest bearing debt, shareholders equity, which may include items such as common and preferred stocks and minority interest. It measures how much of the capital employed corresponds to debt.

Table 8: VW AG Solvency Analysis

Volkswagen	2016	2017	2018
Debt to equity ratio	1,816	1,602	1,734
Debt to capital ratio	0,645	0,616	0,635

(Source: Author)

Regarding VW AG debt to equity ratio, we can conclude that over the last years it has been stable. In the past year the creditors of VW AG provided 1.734€ of assets for every euro of assets provided by the shareholders.

In respect to the debt to capital ratio, in 2018 for every euro of VW AG invested capital 0.635€ came from its debt.

Table 9: VW AG Competitors Solvency Analysis

Competitors Returns (2018)	Toyota	General Motors	Ford
Debt to equity ratio	1,033	2,701	4,292
Debt to capital ratio	0,508	0,73	0,811

(Source: Author)

Comparing the 2018 performance of the VW AG to its direct competitors, we conclude that the group debt to equity is the second lowest, which shows a low leverage level when compared with GM or Ford that have a debt to equity of 2.701 and 4.292 respectively. In the context of the debt to capital ratio, VW AG performs in similar way with the second position when compared with its competition, meaning that its invested capital is less debt dependent than some rivals, which is very positive because it gives the group a better reputation and consequently better access to new lenders if needed.

9. VW AG valuation

For valuation purposes, we assumed that VW AG will keep its operations nature, as well as, an ongoing activity, meaning that it is assumed that the group will operate forever.

Regarding the valuation forecasts, a 5 year period was utilized meaning that the predicted figures will range from 2019 to 2023, after that period it is assumed that the growth will stabilize at a 1,255% rate. The referred time period, 5 years, was chosen due to the fact that macroeconomic factors are volatile and consequently it is impossible to judge with extreme accuracy what will happen after such time period.

9.1 FCFF

The utilized method for FCFF computation resulted from the application of the following formula, as already stated in the review of the literature:

$$FCFF = (EBIT *(1\text{-}tax\ rate)) + Depreciation - CAPEX - \Delta NWC$$

9.1.1 Income Statement projections

The first step to compute the cash flow values for the 2019-2023 period was the sales forecast. To estimate these values, the growth from 2017 to 2018 was utilized. In this sense, to the calculated rate (2,75%) was deducted a 0,25% growth rate for the 4 following years, afterwards from 2023 until infinity a 1,255% growth rate was utilized. This rate is equivalent to the last 10 years average Germany real GDP growth rate.

The same growth rate used to forecast the sales figures was applied to the gross and to the operating values of VW AG.

Table 10: VW AG Income Statement Projections

€ million	Dec. 31, 2012	Dec. 31, 2013	Dec. 31, 2014	Dec. 31, 2015	Dec. 31, 2016	Dec. 31, 2017	Dec. 31, 2018	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2021	Dec. 31, 2022	Dec. 31, 2023
Sales revenue	192,676	197,007	202,458	213,292	217,267	229,550	235,849	241,745	247,184	252,128	256,540	259,760
Sales growth		2,25%	2,77%	5,35%	1,86%	5,65%	2,74%	2,50%	2,25%	2,00%	1,75%	1,26%
Gross result	35,154	35,600	36,524	33,911	40,997	43,549	46,350	47,509	48,578	49,549	50,416	51,049
Operating result	11,498	11,671	12,697	-4,069	7,103	13,818	13,920	14,268	14,589	14,881	15,141	15,331

(Source: Author)

9.1.2 EBIT calculation

The EBIT considered was the operating result predicted in section 18.1 resumed in the following table.

Table 11: VW AG EBIT Projections

€ million	2019	2020	2021	2022	2023
EBIT	14,268	14,589	14,881	15,141	15,331

(Source: Author)

9.1.3 Applicable tax rate

Due to the diverse locations of the VW AG, these results are subject to different types of taxes rates. According to the historical results presented below, the group tax rate oscillated throughout time between 14,15%, in 2012, and 26.42%, in 2013, excluding the year 2015, year when the VW AG reported losses.

To employ a more stable and, at the same time, a conservative tax rate, it was supposed that the tax rate will maintain the same tax rate verified in 2018 of 22,31%.

Table 12: VW AG Tax Rate Projections

€ million	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EBIT	14,15%	26,42%	25,19%	-4,61%	26,23%	16,16%	22,31%	22,31%	22,31%	22,31%	22,31%	22,31%

(Source: Author)

9.1.4 Net CAPEX

Net Capex was computed through the non-current assets evolution, which assuming the necessity to guarantee the production associated with the aforementioned increase in sales, it had to evolve in the same proportion. In this context, net capex incorporates in its concept, both the depreciation and the capital expenditures associated with the non-current assets.

Table 13: Net CAPEX Projections

€ million	2018	2019	2020	2021	2022	2023
Net CAPEX		6,866	6,333	5,756	5,138	3,749
NCA	274,620	281,486	287,819	293,575	298,713	302,462

(Source: Author)

9.1.5 Net WC

In order to establish the ΔNWC, WC was computed. WC was calculated by the difference between operating current assets and operating current liabilities. Operating current assets include: inventories, trade receivables, financial services receivables, other financial assets, other receivable and tax

receivables. By contrast operating current liabilities encompass: trade payables, tax payables, other liabilities, provisions for taxes, and other provisions.

The growth rates associated with the working capital follow the exact same rational as the sales:

Table 14: Net Working Capital Projections

€ million	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
WC	40,100	40,047	47,324	47,614	43,171	59,419	70,575	72,339	73,967	75,446	76,767	77,730
ΔNWC		-0,053	7,277	0,290	-4,443	16,248	11,156	1,764	1,628	1,479	1,320	0,963

(Source: Author)

9.1.6 FCFF results

The cash flows utilized for the FCFF method calculation, were as follows:

Table 15: FCFF Projections

€ million	2019	2020	2021	2022	2023
FCFF	2,455	3,373	4,325	5,305	7,199

(Source: Author)

9.1.7 Cost of equity

The utilized risk-free rate was the Germany Treasury Bonds 10 years rate at the beginning of 2019.

The unlevered beta, corrected for cash, was extracted from Damodaran database, applicable to the European auto & truck division at the beginning of 2019.

The beta levered was calculated through the application of the formula, which assumes the Beta of Debt is zero:

$$\textit{Equity Beta (Levered beta)} = \textit{Unlevered Beta } (1 + (1 - t)\ (\textit{Debt/Equity Ratio}))$$

The applied total debt value was a proxy for the accounting value at the end of 2018 (205,37 million €), the market capitalization was 74,50 million €. The tax rate, as previously mentioned was equal to 22,31%.

Regarding the total equity risk premium, the applicable rate to the USA was utilized because this is market with the largest exchanges in the world. Regarding the country risk premium, the Germany risk premium was utilized as default with such value being equal to 0,00%.

To note that, through the CAPM formula is was assessed a 12,233% rate for the cost of equity.

Table 16: Cost of equity computation

Rf	0,250%
Unlevered beta corrected for cash	0,6400
Beta levered	2,01
Total Equity risk premium	5,960%
Country risk premium	0,000%
Re	12,233%

(Source: Author)

9.1.8 Cost of debt

The cost of debt resulted from the average value of the VW AG financing costs from 2012 until 2017. This is due to the fact that the 2018 values were out of the ordinary when compared with the previous years.

Table 17: Cost of debt computation

€ million	2012	2013	2014	2015	2016	2017	2018	Average 2012-2017
Finance costs	-2,546	-2,366	-2,658	-2,393	-3,247	-2,317	-1,547	-2,439
Total debt	124,49	131,97	149,28	165,79	172,59	178,50	205,37	161,142
Cost of debt	2,045%	1,793%	1,781%	1,443%	1,881%	1,298%	1,188%	1,633%

(Source: Author)

9.1.9 WACC

The WACC, as indicated by its name, results from a weighted average of the cost of equity and the after-tax cost of debt.

Table 18: WACC computation

Cost of debt	1,633%
Cost of equity	12,233%
Market value of debt	205,37
Market value of equity	74,50
Equity + Debt	279,87
D/E+D	73,381%
E/E+D	26,619%
Tax rate	22,310%
WACC	4,187%

(Source: Author)

9.1.10 FCFF Method VW AG share valuation

To compute the FCFF, it is necessary to obtain an equity value, resulting from the enterprise value adjusted by the NOA and debt.

Regarding the enterprise value, it results from the discounted cash flows values from 2019 until 2022 plus the discounted terminal value, all of them discounted, in accordance with each cash flow time period, by the WACC. In this framework, the VW AG terminal value was obtained through the Gordon growth formula. The cash flow forecast was obtained by the EBIT*(1-T) value for 2023, deducted by the net capex and net working capital allocated to the same time period.

To compute the NOA, the following assets were considered to be dispensable for the execution of the VW AG operating activities: marketable securities, assets held for sale and cash, cash equivalents and time deposits (please refer to the appendix section).

The debt incurred at the end of 2018, was 205,371 million €, this value was obtained from the VW AG balance sheet and it is composed by both long and short term financial liabilities and other financial liabilities, as well as, put options and compensation rights granted to noncontrolling interest shareholders (please refer to the appendix section).

Table 19: VW AG FCFF share value

Terminal Value	245,493
WACC	4,187%
G	1,255%
Enterprise Value	222,134
NOA	46,018
Debt	205,371
Equity Value	62,781
Number of shares outstanding	0,501
Value per Share	125,24

(Source: Author)

The share value was achieved by dividing the equity value by the number of shares in the market, that at the end of 2018 was 501,300 shares. Consequently, the value per share according to the FCFF method at the end of 2018 was 125,24€, this value is close to the actual VW AG share price at such date of 136,00€ and 136,62€ for both ordinary and preferred shares.

9.2 DDM Analysis

The DDM valuation method utilizes the future dividends cash flows to quantity the shares present value.

The DDM valuation method projections ranging from 2019 until 2023, followed the same rational as the FCFF method. The forecast of the dividend per ordinary share was obtained by using the same growth rates as those applicable to the sales growth: i) 2,5% for 2019; ii) 2,25% for 2020, iii) 2,0% for 2021; iv) 1,75%% for 2022 and; 1,255% from 2023 onwards.

Table 20: VW AG Dividends Projection

DDM valuation	Dec. 31, 2012	Dec. 31, 2013	Dec. 31, 2014	Dec. 31, 2015	Dec. 31, 2016	Dec. 31, 2017	Dec. 31, 2018	Dec. 31, 2019	Dec. 31, 2020	Dec. 31, 2021	Dec. 31, 2022	Dec. 31, 2023
Dividend per ordinary share	3,500	4,000	4,800	0,110	2,000	3,900	4,800	4,920	5,031	5,131	5,221	5,287
Dividend per preferred share	3,560	4,060	4,860	0,170	2,060	3,960	4,860	4,980	5,091	5,191	5,281	5,347

(Source: Author)

To calculate the ordinary and preferred share value, the cost of equity obtained through the FCFF model was used. Regarding the growth rate and as aforementioned, the growth rate from 2023 onwards is assumed to be equal to the last 10 years average Germany real GDP growth rate.

Table 21: VW AG DDM share value

Ordinary shares	
Re	12,233%
Growth rate	1,255%
Terminal value	48,15459468
Share value	45,75044074
Preferred shares	
Re	12,233%
Growth rate	1,255%
Terminal value	48,701119
Share value	46,1727644

(Source: Author)

To note that at the end of 2018, the actual share value for both, ordinary and preferred shares, was equal to 136,00€ and 136,62€, respectively. These values are extremely different from the ones predicted by this model, 45,75€ for ordinary shares and 46,17€ for preferred shares. This is due to the fact that the applicable method is more consistent when dividends are foreseeable and maintainable, which is not the case at hand at all, as it is possible to understand by analyzing the dispersion of the dividends from 2012 until 2018.

9.3 RVM Analysis

RVM analysis entails on the forecast of the VW AG value, through the utilization of a peer group that includes VW AG main rivals. The selection of the main VW AG competitors was made by choosing the companies with the highest market capitalization values.

The utilized multiples were the following:

1. EV/Sales
2. EV/EBITDA
3. P/E
4. P/S

The values for each multiple were obtained through the access to charts database.

Table 22: VW AG Peer Group Multiples

Peer group	EV/Sales	EV/EBITDA	P/E	P/S
Toyota	1,147	8,296		
General Motors	0,875	5,628	6,049	0,314
Ford	0,945		8,315	0,191
Nissan	0,887	6,808	7,151	0,294
BMW	1,159	7,359	6,322	0,47
Honda		5,613	6,812	0,316
Average	1,0026	6,7408	6,9298	0,317

(Source: ycharts)

Note: some values were removed because they deviated too much from the rest of the peer group values, therefore they were considered as outliers.

To compute the share value, the average value of each multiple was utilized.

To calculate the share value, through the utilization of each of the multiple, the following data was utilized:

Table 23: VW AG RVM relevant figures

RVM	Sales	EBITDA	Net income	NOA	Debt
VW AG	235,849	36,311	12,153	46,018	-205,371

(Source: Author)

The following table reflects the calculations made, for each multiple, to reach the share value:

1. EV/Sales utilizes the total value of sales to compute the VW AG enterprise value, by multiplying the multiple by the total sales. After that, the NOA and debt values were added to

the VW AG enterprise value to compute the equity value which is divided by the number of shares outstanding.

2. For the second multiple, EV/EBITDA, the EBITDA value was multiplied by the multiple in order to compute the VW AG enterprise value. After that, the process is the same as previously described for the EV/Sales multiple.
3. For the P/E multiple, net income was multiplied by the multiple value to reach the Equity value. After this the Equity value was divided by the number of shares outstanding.
4. For the P/S multiple, sales were multiplied by the multiple value to reach the Equity value. After this the Equity value was divided by the number of shares outstanding.

The results of the multiples valuation are as follows:

Table 24: VW AG RVM share value

RVM Valuation	EV/Sales	EV/EBITDA	P/E	P/S
Average	1,003	6,741	6,930	0,317
VW AG EV	236,462	244,765		
NOA	46,018	46,018		
Debt	-205,371	-205,371		
Equity value	77,109	85,412	84,218	74,764
Shares outstanding	0,501	0,501	0,501	0,501
Implied value per share	153,82	170,38	168,00	149,14

(Source: Author)

In conclusion, the share value obtained through the multiples valuation is in the 149.14€ to 170.38€ range. These figures are a little higher than the actual VW AG share price of 136.00€ and 136.62€ for both ordinary and preferred shares at the end of 2018, respectively. This is attributed to the fact that valuation values are based on other entities, with different sizes and characteristics, whose performances are different from VW AG.

10. Valuation Models Comparison and Conclusions

VW AG is a strong group connected to the creation, production and transaction of road vehicles, represented by twelve brands and with a presence in 4 continents.

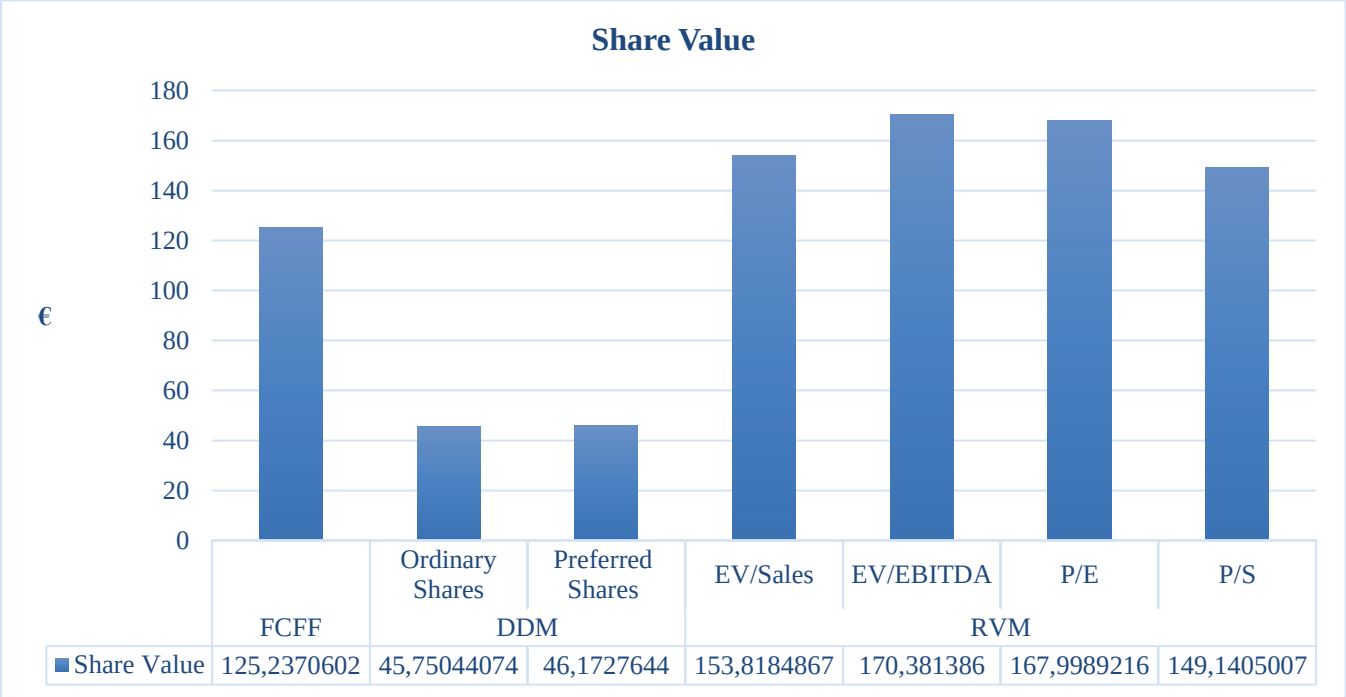
To note that the 2015 scandal, impacted seriously the group share value, however it was observed that, due to generalized distrust of consumers through the automobile sector, the peer companies were also negatively affected. Nevertheless, in the two following years, VW AG share value recovered.

Regarding the near future, until 2030, the group wants to revolutionize the electric and hybrid vehicles market, by producing, environmentally friendly models for its clients.

Investors utilize different variables to measure their return on investments. As aforementioned, the financial analysis such as the return on sales, on equity and on assets, among others can be very useful to assess if it is worth or not to undertake a specific investment. Taking into consideration the overall obtained results, VW AG ratios are better than its rivals and more importantly, they improved from 2016 until 2018, meaning that there is comfort associated with the group stability from the investors' viewpoint.

To evaluate the VW AG, 3 different methodologies were employed: the FCFF, the DDM and the RVM. As expected, it culminated in 7 different values (4 estimations are allocated to the RVM) as follows:

Figure 8: VW AG Valuation Models Comparison



(Source: Author)

The group share values, through the aforesaid valuation methods, range from 12524€ to 170.38€, DDM is not considered because, as previously mentioned, this method is more consistent when dividends are foreseeable, which is not the case of VW AG.

To note that, the implemented valuation methods are highly dependent on the personal prospects of the person conducting such estimate and that all the models are extremely delicate to small changes in the parameters. In this rational, small and unpredictable changes related to the group policies, to general economic or politic reasons, have the potential to completely change the WACC or free cash flow projections, which would in turn reflect a completely different valuation result.

In this logic, excluding DDM, the valuation approaches average a result of 153,32€ for the share value at the end of 2018, thus looking at the actual prices at the time for ordinary and preferred shares, equal to 136,00€ and 136,62€, respectively, it is possible to say that VW shares were undervalued and therefore represented a good investment.

VW AG is on the right track and has well defined goals, such as the Together – Strategy 2025. VW AG intention is to include everyone in the production of exciting vehicles and forward-looking, tailor made solutions that will inspire clients, meeting their varied requirements with a strong brands portfolio. The group wants to achieve a healthy relationship with the environment, providing safety to society, while achieving the best possible performance. The group focus on integrity, reliability, quality and passion. In this way, VW AG aims for industry technological leadership, ensuring competitive profitability while simultaneously being an excellent, reliable and secure employer.

11. References

Articles:

Dowell, P. – (2017), The top five ways transportation impacts economic development, Available at WWW: <URL: https://csengineermag.com/article/top-five-ways-transportation-impacts-economic-development/ >, Consulted at 06-11-18

New World Encyclopedia writers – (2015), Transport, Available at WWW: <URL: https://www.newworldencyclopedia.org/entry/Transport>, Consulted at 06-11-18

Books:

Astranti – (2015) *Paper 2 Advanced Management Accounting*. Second Edition, BPP Learning Media Ltd; BPP House, Aldine Place. P.361. Consulted at 12-01-19

Damodaran, A. - (2006), *Valuation Approaches and Metrics: A Survey of the Theory and Evidence*, Stern School of Business P. 9, 11, 27-28. Consulted at 20-01-19

Damodaran, A. - (2010), *Equity Risk Premiums (ERP): Determinants, Estimation and Implications*, Stern School of Business. P. 4-5. Consulted at 13-01-19

Damodaran, A.- (2012) *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*. Third Edition, John Wiley & Sons, Inc. P. 6-14. Consulted at 12-01-19

Fernández, P. (2001), *Valuation using multiples. How do analysts reach their conclusions*, IESE Business School; P.2-3. Consulted at 08-02-19

Fernández, P. - (2011), *WACC: Definition, Misconceptions and Errors*, IESE Business School. P. 4-5. Consulted at 12-01-19

Goedhart, M., Koller, T., Wessels, D. (2005), *The right role for multiples in valuation*, McKinsey on Finance, No. 15, pp. 7-11; Consulted at 08-02-19

Grant, J, L.; James, A. A – (2001) *Focus on Value: A Corporate and Investor Guide to Wealth Creation*, John Wiley & Sons, Inc. P. 47-51. Consulted at 12-01-19

Miles, J., Ezzell, J. - (1980), *The Weighted Average Cost of Capital, Perfect Capital Markets, and Project Life: A Clarification*, The Journal of Financial and Quantitative Analysis, Vol. 15, No. 3, P. 719-730. Consulted at 12-01-19

Modigliani, F. and Miller, M. - (1958), *The Cost of Capital, Corporation Finance and the Theory of Investment*, The American Economic Review, P. 261-297, Consulted at 15-01-19

Kim, M and Ritter, R, J. – (1997), *Valuing IPOs*, Journal of Financial Economics, Volume 53, Number 3, P. 409–437, Consulted at 08-02-19

Porter, M, E. - (1980) *Competitive Strategy: Techniques for analyzing industries and competitors*, The Free Press, Consulted at 15-04-19

Sabal, J. - (2005), *WACC or APV? The Case of Emerging Markets*, Universitat Ramon Llull. P.1-2. Consulted at 12-01-19

Torries, F,T - (1998), *Evaluating Mineral Projects: Applications and Misconceptions*. Society for Mining, Metallurgy, and Exploration, Inc. P.38. Consulted at 12-01-19

WEB links:

VW AG plants and vision (15/03/2019)

VW presence around the globe:

https://www.volkswagenag.com/en/group/portrait-and-production-plants.html

VW AG future program and initiatives:

https://www.volkswagenag.com/en/group/strategy.html

VW AG in Portugal:

https://www.dinheirovivo.pt/empresas/producao-da-autoeuropa-valeu-32-mil-milhoes-de-euros-em-2018/

https://www.publico.pt/2019/01/04/economia/noticia/autoeuropa-produziu-224-mil-carros-2018-1856579

https://www.publico.pt/2019/03/06/economia/noticia/autoeuropa-duplicou-producao-2018-1864378

https://www.distritonline.pt/crescimento-da-volkswagen-autoeuropa-em-2018-consolida-peso-na-economia-nacional/

BCG matrix and Porter 5 forces analysis (31/03/2019)

https://www.123writing.com/sample/volkswagen-porters-five-forces-analysis-2018

https://bcgmatrixanalysis.com/bcg-matrix-of-volkswagen-group/

https://www.seat.com/content/dam/public/seat-website/company/annual-report/pdf/others-annual_report_2018_annual_accounts-NA-NA-NA-march-2019.pdf

https://annualreport2018.volkswagenag.com/divisions/audi.html

https://annualreport2018.volkswagenag.com/divisions/porsche.html

https://annualreport2018.volkswagenag.com/divisions/seat.html

https://annualreport2018.volkswagenag.com/divisions/skoda.html

https://annualreport2018.volkswagenag.com/divisions/bentley.html

VW AG main rivals (14/04/2019)

For the financial analysis:

https://www.marketing91.com/competitor-analysis-of-volkswagen/

https://www.owler.com/company/volkswagenag

https://notesmatic.com/2018/08/competitors-of-volkswagen-vw/

For the RVM analysis:

https://www.owler.com/company/volkswagenag

VW AG financial data (06/05/2019)

Dividends distribution:

https://annualreport2018.volkswagenag.com/group-management-report/shares-and-bonds/share-key-figures.html

Shareholder Structure:

https://annualreport2018.volkswagenag.com/group-management-report/shares-and-bonds/shareholder-structure.html

https://www.volkswagenag.com/en/InvestorRelations/shares/shareholder-structure.html

VW AG stocks:

https://finance.yahoo.com/quote/VOW3.DE/history?period1=1442271600&period2=1443999600&interval=1d&filter=history&frequency=1d

https://finance.yahoo.com/quote/VOW3.DE/chart?p=VOW3.DE

VW financial statements:

https://annualreport2018.volkswagenag.com/consolidated-financial-statements/balance-sheet.html

https://annualreport2018.volkswagenag.com/consolidated-financial-statements/income-statement.html

Capex:

https://annualreport2018.volkswagenag.com/group-management-report/results-of-operations-financial-position-and-net-assets.html

Depreciation:

https://annualreport2018.volkswagenag.com/consolidated-financial-statements/cash-flow-statement.html

Germany Real GDP growth rate:

https://data.oecd.org/gdp/real-gdp-forecast.htm#indicator-chart

Market Capitalization:

https://tradingeconomics.com/vow3:gr:market-capitalization

12. Appendix

NOA:

	Dec. 31, 2012	Dec. 31, 2013	Dec. 31, 2014	Dec. 31, 2015	Dec. 31, 2016	Dec. 31, 2017	Dec. 31, 2018
NOA	25,921	31,670	29,984	35,878	36,785	34,511	46,018
Marketable securities	7,433	8,492	10,861	15,007	17,520	15,939	17,080
Cash, cash equivalents and time deposits	18,488	23,178	19,123	20,871	19,265	18,457	28,938
Assets held for sale	0,000	0,000	0,000	0,000	0,000	0,115	0,000

Debt:

	Dec. 31, 2012	Dec. 31, 2013	Dec. 31, 2014	Dec. 31, 2015	Dec. 31, 2016	Dec. 31, 2017	Dec. 31, 2018
Debt	124,485	131,973	149,280	165,789	172,594	178,502	205,371
Current debt							
Financial liabilities	54,060	59,987	65,564	72,313	88,461	81,844	89,757
Other financial liabilities	4,425	4,526	7,643	10,350	9,438	8,570	9,416
Non current debt							
Put options and compensation rights granted to noncontrolling interest shareholders	0,000	3,638	3,703	3,933	3,849	3,795	1,853
Financial liabilities	63,603	61,517	68,416	73,292	66,358	81,628	101,126
Other financial liabilities	2,397	2,305	3,954	5,901	4,488	2,665	3,219

Risk Free Rate:

Unlevered beta corrected for cash (Damodaran Database):

Industry Name	Number of firms	Beta	Unlevered beta	Unlevered beta corrected for cash
Auto & Truck	25	1,26	0,56	0,64

Total Equity risk premium for the USA and country risk premium for Germany (Damodaran Database):

Country	GDP (in billions)	Moody's rating	Adj. Default Spread	Equity Risk Premium	Country Risk Premium	Corporate Tax Rate
United States	19390.60	Aaa	0.00%	5.96%	0.00%	25.00%
Germany	3677.44	Aaa	0.00%	5.96%	0.00%	15.00%