CATÓLICA LISBON
SCHOOL OF BUSINESS & ECONOMICS

UNIVERSIDADE CATÓLICA PORTUGUESA

Equity Valuation

Rolls-Royce PLC

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Executive Summary – Rolls Royce PLC

Rolls-Royce PLC is a top competitor worldwide in the Aerospace & Defense sector.

Despite the current economic crisis that has affected several businesses, the civil aerospace sector where RR operates is expected to thrive. Given the macroeconomic environment where the company operates, it is expected that the civil sector will continue to expand and be the one that drives revenue growth within the company. The defense sector is facing some difficulties mainly due to the defense budget cuts that major strategic players in this sector are imposing – the USA and the EU. Despite this fact, it is expected that its position within this market will continue strong.

One can anticipate that RR will be able to take advantage of the opportunities that will arise, as the company is planning to honor its investment plan contemplating investment in R&D.

In order to reinforce its position within the A&D market, it is expected that R&D investment will reach 5% of the revenues. Moreover, the company is engaged in new projects, namely in the nuclear and energy sector, where it is expected to boost domestic oil production in Abu Dhabi, as well as, in light of a new contract, strengthen China's energy infrastructure.

Although revenues are expected to continue increasing, rendering the ability of RR to strengthen its position in the market where it operates and, despite the fact that it has established cost reduction as a goal, this report considers that, as costs depend on revenues, they are also expected to increase.

In conclusion, RR continues to be a very stable company with a positive outlook and an A credit rating by S&P thus, being able to finance itself very easily in the markets. The confidence and stability of RR in the markets where it operates and its ability and commitment to grow, innovate and prosper comes as an asset, reinforcing a buying opportunity for investors.

Recommendation:

BUY

Target price:

1369 (p)

Company Information:

Equity Value (mn): 25.739,93

Debt Value (mn): 3.096.41

Shares (mn): 1880,278076

Target price: 1369 (p)

Price: 1112 (p) – 30th September 2013

JPM Valuation Target:

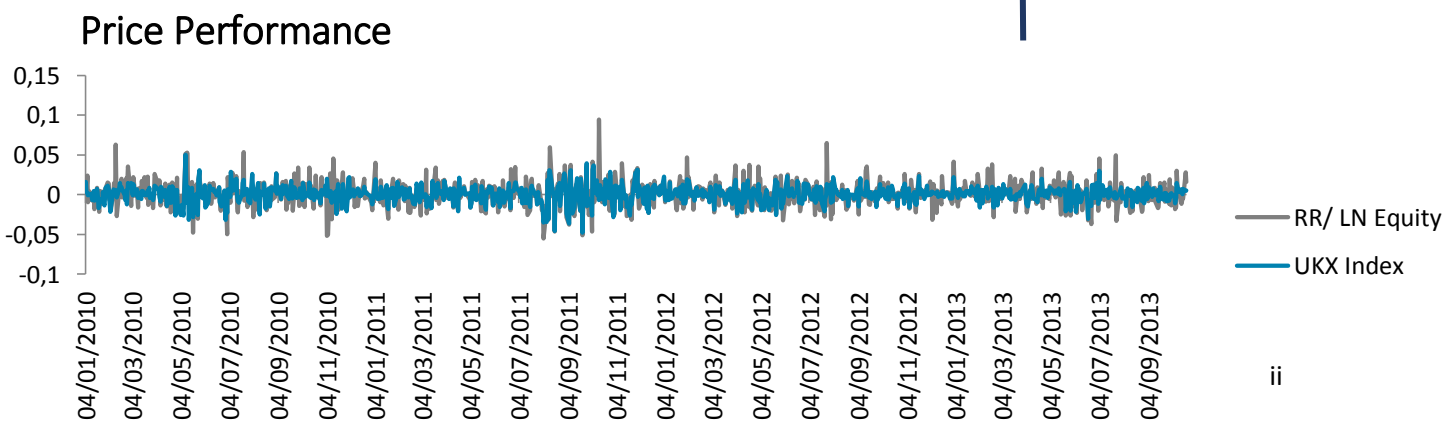
Target Price: 1420 (p)

52 week range: 1177-778 (p)

Shares (mn): 1851

Credit Rating:

S&P: A



Abstract

The purpose of this thesis is to evaluate Rolls-Royce PLC. In order to do so, two valuation methodologies will be presented.
The first one regards the Discount Cash Flow – WACC methodology, where each sector of the company is valued. By doing so, it is possible to reach a price per share of 1369 pence. Therefore, when using this methodology, the company is presented as a buying opportunity (the market yields a price of 1112 pence.)
The second valuation presented and which is introduced as a second stage valuation is the multiples one. By using the price to earnings ratio, it is possible to value RR at 988 pence. With this methodology, the company is presented as a selling opportunity.
Finally, when comparing the valuation introduced in this thesis to the one performed by J.P.Morgan, it is possible to conclude that this valuation is more conservative than the one presented by the investment bank (J.P.Morgan presents a price of 1420 pence). The differences in the assumptions will be further analyzed in this report.

Acknowledgements

This thesis was an opportunity to further enhance my knowledge in the field of Equity Valuation.

Firstly, I would like to express my gratitude to Professor José Carlos Tudela Martins for his support, continuous guidance and valuable insights throughout this process.

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Table of Contents

1. Introduction

The aim of this thesis is to evaluate a public listed company and therefore the valuation of Rolls-Royce PLC will be conducted.

In order to do so, a discussion on the several valuation methods and the advantages and disadvantages of each of them will be introduced. This aims at understanding which method better applies to RR.

Then, RR will be valued according to both the Discounted Cash Flow Methodology (WACC) and the Multiples Valuation. After reaching a target value, the price estimated, in this thesis, for RR will be compared to the one that is yielded by the market on 30th September, 2013 (date on which this thesis is based).

Finally, a comparison between the valuation conducted in this thesis and the one presented by J.P.Morgan will be made. The purpose of this comparison is to identify the reasoning behind the differences in price and the consequent assumptions made.

2. Literature Review

The purpose of this section is to get a better understanding of the several methods that are available in order to properly valuate a company. Luehrman (1997) indicates that valuation is the "financial analytical skill"[1] that managers want to master.

According to Young et al (1999), "different approaches make different aspects of the valuation problem clear at the expense of obscuring other aspects"[2]. This is why it is important to understand the methods that can be considered and what are the company's characteristics that they will privilege. Young et al (1999) further refer that even though there are some similarities among the different valuation approaches, it is necessary that the assumptions made are consistent across the models and even though different valuation methods may yield different final values, it should be possible to compare them and understand why these differences arise.

One should keep in mind that different analysts will evaluate a company in different ways and a final common value will not be reached. Different assumptions will be made and the accuracy of those will define whether a valuation method is valid or not.

As Booth (2002) states, there are many methods that are considered "correct" to perform valuation. This study will introduce the discounted cash flow based ones, the

[1] Luehrman, Timothy A.1997. "What's it worth? - A General Manager's Guide to Valuation". Harvard Business Review, pp.132-142

[2] Young, M., Sullivan, P., Nokhasteh, A., Holt, W., .1999. "All Roads Lead To Rome – An Integrated Approach to Valuation Models". Goldman Sachs Investment Research, pp.1-32.

multiples approach, options and other methodologies and variables that may be considered relevant for the valuation purpose.

2.1. Multiples

Multiples are considered to be an intuitive tool for valuation and therefore easy to be presented to customers and investors.

According to Damodaran (2012), the main goal of the relative valuation is to value assets, based on similar assets, currently priced in the market. Nonetheless, using the multiples valuation can also be misleading.

One should take into consideration that multiples should be used as a second stage valuation, Fernández (2002), that is, after performing the valuation using another method.

Using multiples as a valuation method allows for the simplification of the underlying assumptions, when compared, for example, to the DCF approach (Damodaran, 2012). Moreover, when computed properly, the multiples can be a useful tool to stress-test the expected cash flows and to understand the position of the company regarding its value creation opportunities (Goedhart et al, 2005).

However, when developing a valuation using multiples, some important factors such as risk, growth or cash flow potential may be ignored, leading to an inconsistent valuation (Damodaran, 2012). Therefore, it is very important that one understands the basic drivers of multiples.

First and foremost, one should start by defining the comparable group that will be used to conduct the valuation. According to Damodaran, a comparable firm is one that presents cash flows, potential growth and risk similar to the company that is being studied. Other criteria such as the size of the comparable firm could also be applied. Moreover, firms that can be identified as peers should compete in the same markets and be subject to the same macroeconomic events (Foushee et al, 2012).

However the aforementioned approaches only translate themselves into relative criteria, therefore, Damodaran suggests a different approach which states that all firms in the market should be considered comparable and so one should control for differences across firms, using multiples regressions, for example. This approach is followed by Bhojraj and Lee (2001). They argue that the regression estimation allows the control of several variables that can influence the independent variable (multiple), by attributing weights to each explanatory variable.

When computing multiples, according to Damodaran, one should considerer the basic principles that will lead to a more accurate valuation. The first one is related to the fact that the computation should be consistent, that is, "if the numerator for a multiple is an equity value, then the denominator should also be an equity value. If the numerator is a firm value, then the denominator should also be a firm value"[3].

However, it is stated that some analysts do not agree with the previous criteria, arguing that consistency does not matter, as long as the multiple is computed in the same way across firms. Furthermore, a multiple computed for the valuated company, should also be computed for its peers.

Finally, one should understand the basics of a given multiple and how they affect it. For instance, the price to earnings ratio is strongly affected by capital structures and it can be misleading, given that it is based on earnings that may be affected by onetime events such as restructuring charges and write-offs (Goedhart et al, 2005).

An alternative for this multiple is given by Enterprise Value over EBITA, which is less sensible to changes in capital structures but easily manipulated by changes in the cost of capital.

By making a careful interpretation of each multiple, it is possible to understand that some multiples are more accurate for some firms than others.

Regarding this subject, there is a common agreement among professionals that forward looking multiples perform better relatively to others. In what this subject is concerned, Liu et al (2002), examined the performance of a certain group of multiples when explaining stock prices.

They concluded that the forward earnings measures are the ones that perform better, followed by the historical earnings measures, the cash flow measures and the book value of equity and finally the sales. The previous results are explained by the fact that forecasted earnings yield the lowest pricing errors, given that "future cash flows should reflect future probability better than historical".[4]

The reason behind the poor performance of the sales is explained by the fact that they do not reflect profitability until the expenses have been considered. This last set of multiples should be used when earnings are negative. Finally, following the line of

[3] Damodaran, Aswath.2012."Chapter 17 – Fundamental Principles of Relative Valuation". In *Investment Valuation – Tools and Techniques for Determining the Value of Any Asset*, ed. John Wiley & Sons, Inc, 453-468. New Jersey

[4] Liu, J., Nissim, D., Thomas, J.,.2001. "Equity Valuation Using Multiples". *Journal of Accounting Research*, 40(1):153

research of Baker and Ruback (1999), Liu et al (2002), state that computing multiples using the harmonic mean will yield better results when mean or median are used.

In conclusion, even though multiples should be used as a second stage valuation, there is still a final remark that should be made. Despite the fact that several approaches can be followed in order to evaluate a company, such as discounted cash flows and multiples, one cannot expect that the same value will be reached. A stock may be overvalued on a discount cash flow basis but undervalued on a relative basis (Damodaran, 2012). The analyst needs to be sensible to the presented remarks in order to reach an accurate valuation.

2.2. The peer group

As already mentioned, there are several ways to compute a company's peer group, either more analytical or more theoretical ones.

The approach that will be followed in this study to compute the most accurate peer group is the cluster analysis. This approach will lead to a more coherent computation of the peer group and it is based on the minimization of the distance to the centroids.

The first step consists in defining the number of centroids. This will be done further ahead in the study. Then, the variables chosen need to be standardized so as to minimize the distance to the centroid. After that, the new centroid will be the mean values for the observations of each cluster. New clusters will be attributed to the observations and the process will be repeated until the point in which the centroids are stabilized is reached.

2.3. The Discounted Cash Flow method

There are several approaches used to estimate the value of a company. One of the most popular approaches among analysts is the discounted cash flow method. This method has been considered a standard one for the past 20 years (Luehrman, 1997). The main goal of the discounted cash flow method (DCF) is to forecast the expected future cash flows and then discount them to the present ones at their opportunity cost, that is, at a rate that reflects their level of risk.

The theoretical methodology behind the DCF seems easy to follow, however, in practice it may turn out differently (Gilbert, 1990).

The first step that should be taken is to forecast the expected cash flow. This should be done for a period of 5 to 10 years. According to Gilbert (1990), the cash flow that should be used is the so called free cash flow. The Free Cash Flow to the Firm (FCFF)

is computed by adding the after tax income, the depreciations and the amortizations, subtracting the capital expenditures and the working capital increases. In short, what is being taken into account is the sum of all the sources of cash, discounting all the expenditures.

Furthermore, it is also relevant to mention that the Discounted Cash Flow Method can also be computed using the Free Cash Flow for the Equity (FCFE), that is, the cash flow that is available to stockholders. It is the cash flow from operations, minus the capital expenditures, minus the payments to debt holders (Pinto et al, 2010). The stream of cash flows yielded should be discounted to the cost of equity.

Nonetheless, these two types of cash flow, despite being calculated differently and at different rates (FCFF is discounted to the weighted average cost and FCFE is discounted to the cost of equity), if the same set of assumptions is made, they should yield the same valuation result. The relation between these two types of cash flow is given as follows:

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

According to Pinto et al (2010), these two types of cash flow (FCFF and FCFE) are the preferred type of cash flow since they can be used directly in the valuation of the firm or the equity. For instance, cash flows computed from EBITDA are not accurate, since they do not take into consideration taxes and the capital structure. Moreover, EBITDA based cash flows do not take into account the investment made by the company in working capital, in order to maintain the long-term value of the company.

The question that now arises is related to which cash flow should then be used. According to Pinto et al (2010), the FCFF should be used when, firstly, the company is levered and the FCFE is negative; secondly, the company is levered with a changing capital structure. This is justified by the fact that the cost of equity may be more sensitive to changes in capital structure, than the Weighted Average Cost of Capital (WACC).

Given the aforementioned analysis, in this study, the cash flow used in the DCF valuation method for Rolls-Royce will be the FCFF.

With the distinction made between the set of different cash flows, the issue that now arises is related to the estimation of the future cash flows.

As it was mentioned before, the analyst should estimate five to ten years of expected cash flows. However, as one tries to further predict each future year, the process becomes more difficult and the quality of the predictions decreases. In order to

overcome this issue, the future cash flows, after the estimation period, should be computed using the terminal value. This concept will be analyzed later in this study.

Therefore, the DCF formula is presented as follows:

$$Value = \frac{CF1}{(1+i)^1} + \frac{CF2}{(1+i)^2} + \cdots + \frac{TV_t}{(i+i)^t}$$

Moreover, one should keep in mind that the DCF is fallible. For companies that are subject to the economic cycles, the DCF does not prove to be an appropriate method since the cash flow will be different over time (sometimes they will be up, other times down). Furthermore, DCF does not work properly when valuing financial distressed companies or companies which are going under major changes in their capital structure. Nonetheless, the Adjusted Present Value comes as an alternative to these situations and will be presented onwards.

The issue that is relevant to discuss is how to identify and compute the proper discount rate.

2.4. The discount rate

Professionals have been using the Weighted Average Cost of Capital as the preferred discount rate to be used in the discount cash flows valuation. The reasoning behind this choice is, according to Luehrman (1997), the easiness in calculations that WACC yields. The formula is given as follows:

$$WACC = \frac{D}{D+E+P} * r_d * (1-t) + \frac{E}{D+E+P} * r_e + \frac{P}{D+E+P} * r_p$$

As one can infer, the WACC computation takes into account the capital structure of the company being evaluated and it is able to capture the tax advantage that is derived from corporate borrowing (Luehrman, 1997). The cost of debt and equity are also considered in the computations.

However, despite being one of the most used methods, the WACC is considered an obsolete tool (Luehrman, 1997). According to Luehrman, the WACC is a proper discount rate, only when the company which is being evaluated, presents a simple capital structure. For a more complex capital structure, the WACC should be adjusted to tax shields, issue costs, subsidies, exotic debt securities and changing capital structures. Nonetheless, when professionals use the WACC as a discount rate, they usually assume it to be constant. Booth (2002) indicates two sets of reasoning for the WACC to be constant – either debt financing has no impact on WACC or debt ratio and financial risk

is constant through time. These are very limited assumptions and in case either of one fails, WACC should be adjusted. These adjustments "should be made period by period within the project" (Luehrman, 1997)[5]. Moreover, as mentioned before, WACC tends to be poor when the company presents exotic debt structures. It is the case of high yield debt, floating rate debt or convertible debt. Luehrman (1997) states that in these cases, WACC can easily misevaluate the interest tax shield and the future cash flows. Given the aforementioned discussion on the weakness of the Discounted Cash Flow methodology, the Adjusted Present Value (APV) is introduced in the next section as a feasible solution that is commonly accepted in the literary world.

2.5. The Adjusted Present Value

The Adjusted Present Value (APV) appears as a new alternative to the DCF valuation method. Luehrman states that the APV can yield correct valuations just as the DCF does, but also when the latest does not provide correct valuations. Furthermore, the APV does not require an extensive set of assumptions and is less sensitive to mistakes when compared to the WACC approach (Luehrman, 1997).

The calculation of the APV method seems easy at a first glance, however, in reality, it may not be as simple as it seems. The first step towards a valuation using APV is to compute the set of expected cash flows. In comparison to the WACC methodology, this step is exactly the same for both methods. Nonetheless, from the second step onwards, the valuation using APV becomes slightly different.

The purpose is to estimate the value of the company as if it had no leverage. In order to do so, both cash flows and terminal value will be discounted to the cost of equity. The third step is related to the calculation of the additional funding that comes from side financing effects. The main goal here is to calculate the tax advantages that derive from financing operations. Thus, it is expected that the analyst will be able to identify the interest tax shield that the company is earning and discount it to the present at the cost of debt. In order to do so, it is necessary to know the optimal amount of debt (Booth, 2002).

Furthermore, the bankruptcy costs should also be taken into consideration when making the valuation of a certain company, otherwise the final valuation will not be correct.

[5] Luehrman, Timothy A.1997. "What's it worth? - A General Manager's Guide to Valuation". Harvard Business Review, pp.132-142

However, computing bankruptcy costs is not a straightforward task and thus it introduces one of the major problems that come with the APV method.

In order to correctly evaluate the company, as mentioned before, the expected bankruptcy costs (EBC) should be computed as follows:

$$EBC = Probability\ of\ default * Bankruptcy\ Cost$$

In order to calculate the probability of default, there is no standard approach that can be followed, but in this section the bond rating of the firm is going to be presented as a proxy (Damodaran). In order to calculate the rating for the company, Damodaran provides a table that allocates the interest coverage ratio, to the corresponding rating.

A larger problem is then related to the computations of the bankruptcy costs. The direct ones (for example lawyer fees) are easy to estimate, however, the indirect costs are more difficult to predict (it is the case of lost sales, profits or the ability and easiness of a company to finance itself in the market).

Concerning this problem, Altman (1984) indicates that even though indirect bankruptcy costs have been identified as relevant, they have never been measured. Altman comes up with an empirical study that defines the indirect costs as unexpected losses. The first method the author uses to compute them is based on a regression method and the second one measures the indirect costs based on the "analyst's expectations of earnings vs. actual earnings". Altman concludes that the bankruptcy costs reached "11% to 17% of the firm value three years prior to bankruptcy."[6]

In the end, the value of the levered company will be given, by the APV method, as follows:

$$V_L = V_U + PVITS - EBC$$

Nonetheless, despite the problems in calculating the expected bankruptcy costs, the APV comes as a great advantage, which is related to the fact that by using APV, it is possible for managers to identify where value is being generated (Luehrman, 1997).

2.6. The Dividend Discount Model (DDM)

Another valuation technique that can be used is the Dividend Discount Model. Its main roots rely on the fact that the value per share of a stock is given by the present value of the dividends paid (per share), discounted to the cost of equity. However, the model can be divided into two "sub-models".

[6] Altman, E.I.1984. "A Further Empirical Investigation of the Bankruptcy Costs". *The Journal of Finance*, 39(4):1067-1089

The first and simpler version of the DDM is the Gordon Model. This model assumes that the value of the stock is given by the dividends per share in the next period, discounted to the cost of equity and, assuming that dividends grow at a constant rate, in perpetuity (Damodaran, 2012). The formula is given as follows.

$$Value\ of\ Stock = \frac{DPS_1}{r_e - g}$$

Despite the fact that this is a very simple model and that it is very easy to compute, its main limitation is related to the fact that it can only be used for firms that are expected to grow at a stable rate. Notice that, if not used properly, the model can yield misleading results or even unreasonable ones (the case when the growth rate converges to the cost of equity).

The second sub-model of the DDM is the two stage dividend discount model. The first stage of the model is related to the period when the company does not grow at a stable rate and, the second stage reflects the period when the company reaches the steady state and so its growth rate is constant and remains constant, in the long run.

Regarding the limitations of the two stage dividend discount model, Damodaran indicates two that should be worth mentioning. The first one is related to the fact that it is difficult to indicate the length of time during which the company will be growing at non stable rates. The second limitation is related to the fact that the transition between the first stage and the second stage occurs abruptly, meaning that, the transformations in the growth rate happen suddenly and not smoothly as one would expect.

Finally, in relation to the DDM as a whole, Damodaran (2012) also points out a significant criticism. Because the valuation is conducted using dividends, mistakes can be made. For instance, if the company accumulates cash and so pays out a small amount of dividends, by using the DDM the company will be undervalued. In Rolls-Royce case, the Dividend Discount Model is not the most accurate model to apply, since Rolls-Royce pays its dividends in a different form, which will be analyzed onwards in the study.

2.7. The Economic Value Added (EVA)

Damodaran (2013) defines the Economic Value Added (EVA) as a *measure of surplus created by an investment.* The definition of this measure is presented as follows:

$$EVA = (Return\ on\ Capital - Cost\ of\ Capital) * (Capital\ Invested\ in\ project)$$

According to Damodaran (2013), the capital invested in projects is used to capture the capital invested in assets in place (projects that are already being developed). However, it is stated that there is a disagreement about what this measure should include.

Some defend that the invested capital should be measured by market value. However, Damodaran (2013) states that the market value includes the expected growth (besides assets in place) and so it may not be an accurate measure. Another possible proxy that is indicated is the book value, but this measure may not always translate market value and so some adjustments need to be made.

Regarding the two other components of EVA, the return on capital and the cost of capital, Damodaran also indicates their limitations. The return on capital should measure return on investments already in place and the cost of capital should measure the market value of the cost of capital. Professionals sometimes compute EVA using book values, which, once again, Damodaran states is not the correct approach.

Moreover, one should take into consideration that companies with the highest EVA may not be the best ones to invest in. According to Damodaran (2013), investors should put their money on companies whose EVA has increased more than it was expected, since expectations are the driver of the stock price.

Finally, when using EVA as a valuation tool, it is possible to derive a relationship between Enterprise Value and EVA. Damodaran (2013) states that the value of a given "company can be given by the capital invested in assets in place plus the present value of EVA from assets in place plus the present value of EVA from all future projects." [7]

2.8. The Terminal Value

The terminal value is one of the most important components when developing a Discounted Cash Flow Valuation, since this variable is the one that yields most part of the final value. As one can imagine, it is not possible to estimate cash flows indefinitely and forever so, the terminal value comes as a solution to this situation. Damodaran defines the terminal value as the value of the firm at future $time_t$, that is, when one stops predicting cash flows at $time_t$, the terminal value computes the value of the firm at that point in time.

In order to compute the terminal value of the firm, Damodaran indicates three possible valuation methods.

[7] Damodaran, Aswath.2013."Chapter 10 – Value Enhancement and Cash-Driven Valuation Models". In *CFA Institute Investment Books*, 223-226.

The first one indicated is the liquidation method. This method assumes that at some point in time, the company will cease its operations, sell all its assets and the value that will arise is the liquidation value. One way to estimate this liquidation value is to base it on the book value of assets, however, Damodaran indicates that this does not translate the earning power of assets and so it is not a good measure. It should also be noticed that the debt outstanding in the terminal year should be discounted from the liquidation value, in order to get the final value to equity holders. Since there is no evidence that Rolls-Royce will cease its operations in the years to come, this methodology will not be taken into consideration.

The second methodology that is suggested is the multiples approach. As the name indicates, the terminal value will be computed by multiplying the expected revenues or earnings in the terminal year by the respective multiple (for instance, value to sales multiple, price to earnings ratio). However, Damodaran states that this method can be misleading since it will no longer be just a discounted cash flow valuation, but a mix between the first and the relative valuation.

The final approach to compute the terminal value is the stable growth model. Instead of assuming that the firm will slowly cease its activities, it is possible to assume that the firm will continue to invest in new assets and so continue to operate beyond the terminal year. Therefore, in order to compute the terminal value, it is possible to assume that the firm will be in steady state and grow at a constant rate indefinitely. Following Damodaran approach, the terminal value will be computed as follows:

$$Terminal\ Value_t = \frac{Cash\ Flow_{t-1}}{r - g}$$

Furthermore, some attention should be drawn to the limitations of the growth rate. Damodaran states that a company is not able to grow at a higher rate than the economy where it operates. Since Rolls-Royce is an international company, the growth rate in the global economy should be used as a limit to the growth rate that can be used when computing the terminal value. Furthermore, the growth rate should be on the same terms as the valuation, meaning that if the valuation is being made in nominal terms, so should the growth rate be.

2.9. The Present Value of Interest Tax Shield

When considering a firm that is all equity financed, the value that is being created will be divided between the shareholders and the government. However, most firms are also

debt financed and so it is possible to gain from this type of financing. Since debt is deductible, it is possible for a firm to reduce the share that is being allocated to the government. Therefore, debt holders will be paid first and so shareholders will receive what is left and also the tax savings that come from financing with debt (Graham, 2011).

Nonetheless, one should have into consideration that financing with debt is not always advantageous. Debt financing involves certain costs (for example, distress costs) and so, it is only optimal to finance with debt up to the point where the benefit of the tax shields are higher than the costs that are being generated. Consequently, the firm should decide which level of debt it should take. For instance, according to Graham (2011), firms with greater liquidity (which is the case of Rolls-Royce), should have lower borrowing costs and so be able to hold more debt.

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

$$PVITS_t = \frac{D * r_d * T}{(1 + r_d)^t}$$

The reasoning behind the formula is that the risk of tax saving is the same as the risk of debt. However, there is not a consensus on the computation of the PVITS. Fernández (2004) states that this is only acceptable if the company does not increase its debt levels. However, if the company expects to increase its debt levels, Fernández (2004) indicates that the right formula to be used is the following:

$$PVITS_t = \frac{D * r_u * T}{(1 + r_u)^t}$$

On the other hand, Damodaran indicates that the present value of interest tax shield is given by $D * T * r_u - D(r_d - r_f) * (1 - T)$, discounted to the cost of equity. Again, this is a formula that Fernández (2006) considers to be wrong, since the formula above takes into account that the return of debt is uncorrelated with the return of assets, which Fernández believes is difficult to justify.

2.10. The Market Risk Premium

The market risk premium (MRP) is a vital component that is used in order to estimate both the cost of capital and the cost of equity. Therefore, it is important to understand how it should be computed.

The market risk premium is defined as the difference between the actual returns on stocks and the actual returns of the default free government bond.

As it is stated by Damodaran, one of the most popular methods to compute the forward looking market risk premium is by estimating the historical premium. However, different market premiums can be computed as there is no consensus, for example, regarding which average to use. Damodaran indicates that some defend the usage of the arithmetic average, since it yields the best unbiased premium, given that annual returns should be uncorrelated. However, others defend the usage of the geometric average, since empirical studies reveal that returns are negatively correlated and so, "the arithmetic average is likely to over state the premium."[8]

Furthermore, more drawbacks have been attributed to the historical approach to compute the risk premium. The first is related to the fact that for markets with short and volatile industries, the historical market risk premium computed may not be accurate or reliable. Damodaran states that this is true not only for emerging markets, but also for the European ones.

2.11. Emerging Markets

There is still little agreement on how to conduct valuations in emerging markets. These markets are subject to extra levels of risk that should be taken into consideration, such as high levels of inflation, macroeconomic volatility, political changes and corruption. The question that now arises is on how to incorporate the extra amount of risk. According to James and Koller (2000) there are two ways that can be used to take into account the extra risk. The first one is to include the risk in the cash flow and the second one is to incorporate the risk premium in the cost of capital. In what the last method is concerned, according to Goedhart and Haden (2003), adding the risk premium to the cost of capital can lead to a misleading valuation since cash flows already include the probability of distress and so the risk is being accounted for twice.

Therefore, James and Koller (2000) defend an approach in which the extra risk that emerging markets carry should be accounted using a cash flow probability weighted scenario, which they believe, "provides both a more solid analytical foundation and a more robust understanding of how value might (or might not) be created".[9]

[8] Damodaran, A., 2012,"Equity Risk Premiums", Stern School of Business

[9] James, M., Koller, T.A.2000. "Valuation in Emerging Markets". *The Mckinsey Quarterly,* 4:80-85

Nonetheless, despite the extra levels of risk that emerging markets present, Goedhart and Haden (2003) argue that even though the risk is high, if portfolios are well diversified, for instance, across countries, those portfolios can be stable. Since this is not a concern in the Rolls-Royce structure, no further analysis will be made.

2.12. The risk free rate

The risk free rate arises as one of the building blocks used to compute both the cost of capital and the cost of equity. As one may think, the risk free rate is not easy to calculate and so there are several variables that should be considered before using a risk free rate that, in the end, may not be as risk free as one might think. For example, Fernández (2004) indicates that using the historical average of the risk free rate as the actual risk free rate is a serious mistake that should be avoided. He explains that the risk free rate should be the one that is computed now (when the cost of equity is calculated) when buying government bonds. Another mistake that can be made is to use the risk free rate as the short term government bond.

In order to correctly estimate the risk free rate to be used in the valuation, there are certain aspects that should be considered.

According to Damodaran (2008), the currency can be an important variable. For instance, if one accepts that the ten year bond rate is the risk free one, then a final different value can be reached, depending on the currency that is being used. Notice that when calculating the risk free rate, it is of course necessary to use a currency that is considered default free. In the case of the euro, Damodaran states that in order to get the risk free rate, the lowest of the 10-year government euro bond should be used, usually the German Bund. In the case of Rolls-Royce, the pound should be the currency used and the UK sovereign rating is considered by Standard and Poor's to be AAA.

Moreover, one should remember that the currency is affected by the inflation rate and so, currencies that are subject to high levels of inflation will yield higher risk free rates than low inflation currencies (Damodaran, 2008).

Furthermore, one detail that should be taken into consideration is that the risk free rate should be computed according to the estimated cash flows, that is, the expected cash flows are computed in nominal terms, and so should be the risk free rate. The same happens if cash flows are presented in real terms. Consistency is needed in order to get the most accurate risk free rate.

2.13. The levered beta

The beta is a measure of market risk, that is, for a given asset, the beta measures a stock's contribution to the variance of the market portfolio.

However, computing beta may not be very straight forward. One way possible to compute the beta of a company, according to Damodaran, is by regressing the returns of the asset on the returns of the market portfolio, in this case, it is the index that will be used as a proxy for the market portfolio. It will then be possible to establish the relationship between the assets returns and the market portfolio:

$$r_i = \propto + \beta\, r_m$$

However, there are some problems related to this approach.

The first one involves the definition of the market index that will be used as a proxy for the market portfolio. Damodaran indicates that the market weighted indexes (each stock is weighted according to its market capitalization) should yield better results. The second issue is related to the time period that should be used to regress beta – a larger time frame allows for a larger number of observations but the firm's characteristics may have changed over time.

Finally, another concern is related to the return intervals that should be used. Once again, smaller returns may yield a higher number of observations but this can create a bias. According to Damodaran, for firms listed for more than 3 years (which is the case of Rolls-Royce), monthly data should be enough to estimate the beta. Moreover, because there is empirical evidence that returns are negatively correlated, weekly or monthly returns may be better than the daily ones.

In order to estimate the cost of equity, one of the most well known approaches is the Capital Asset Pricing Model that gives the following relation:

$$r_e = r_f + \beta_L * (E(r_{m)} - r_f) + e$$

However, once again there is not a common agreement on how to compute the levered beta. According to Fernández, if the company is expected to increase its level of debt then $\beta_L = \beta_u + (\beta_u - \beta_d)D(1-t)/E$. Fernández also draws attention to the fact that computing betas using historical industry beta or the average of betas for similar companies may not be the most correct decision.

2.14. Option Theory

APV has already been introduced and it is important to refer again that it does not perform well on projects that are option based (Luehrman, 1997). For companies whose main activity is related to the exploitation of commodities, options are considered to be the most accurate method for valuation.

The option traduces the "right to buy or sell something at a specific time in the future" (Luehrman, 1997)[10], that is, at a specific time in the future, a specific quantity of the underlying asset will be sold or bought at a specific price, previously determined.

In order to proceed with the valuation using options, the two most popular methods that can be used are the Binomial Model and the Black-Scholes Model. However, Damodaran states that the last one can only be used if the distribution is assumed to be normal and so "prices are continuous and there are no jumps in asset prices."

Moreover, there are some issues that need to be taken into consideration when using the option theory. Fernández (2002) first outlines that the basics behind the option theory is that it is possible to create and replicate any portfolio that will yield the same return as the option that is being valued and so, it is possible to avoid arbitrage. Furthermore, he indicates two concerns regarding the applicability of the Black Scholes Model.

The first one is related to the fact that the expected cash flow models are discounted to the risk free rate. Fernández indicates that this is done implicitly by the Black-Scholes formula but it is not correct. Even though the option will be exercised (or not) "when a future uncertainty is settled", this does not mean that the project is risk free.

Another mistake that is stated by Fernández (2002) is that the value of options increases when the interest rate increases. He explains that the negative effect caused by the increase in interest rates on the present value of cash flows is higher than the positive effect that arises from the reduction of the present value of the exercise price.

2.15. Research and Development Expenses

According to Damodaran, company expenses can be divided into three types – operating expenses (that occur in the current period), finance expenses (the case of interest expenses) and also capital expenses (those that will bring about future benefits, for instance, building a plant). One should notice that both operating and capital

[10] Luehrman, Timothy A.1997. "What's it worth? - A General Manager's Guide to Valuation". Harvard Business Review, pp.132-142

expenses are tax deductible while capital expenses should be accounted over the useful life of the investment as depreciation or amortization.

Traditionally, R&D is accounted as operating expenses, however, Damodaran proposes a new approach to this situation. He draws attention to the fact that accounting R&D expenses as operating ones, will make them tax deductible and so it will reduce the value of the net income. Given that capital expenditures will create long term benefit and so do R&D expenses, Damodaran proposes that they should be reclassified and considered capital expenses.

Nonetheless, since it is stated in the 2012 Rolls-Royce's financial report that the company's goal regarding R&D expenses is that they will reach 4% to 5% of Rolls-Royce's underlying revenues, the approach considered by Damodaran of using R&D as capital expenses will not be addressed.

3. **Industry Overview**

Rolls-Royce PLC is established in the Aerospace and Defense Sector and also operates in the marine and energy sector, even though the last two contribute less to the overall revenues of the company.

Regarding the civil sector, in the product segment, RR produces large, small and helicopter aircraft engines. In the same sector, but in the services segment, RR follows the maintenance and management of its engines through their life cycle. Furthermore, it also provides customer training regarding its engines.

In the defense sector, RR produces engines for combat jets, helicopters, transporters, trainers and tactical aircraft. In the services segment, they also provide training and help maintaining the engines.

In the marine sector, RR produces engines, propulsors, deck machinery, bearings and seals and power electric systems. Moreover, it offers ship designs comprising offshore vessels (platform supply vessels, anchor handling/tug/supply vessels), coastguard vessels, fishing vessels, merchant vessels and specialized vessels, such as, coastal patrol, drilling storage and production. In the services segment, they offer customer training and work on upgrade designs so that customers can optimize the performance of their equipment.

Finally, in the energy sector, RR provides gas engines, gas turbine engines, gas compression, diesel engines and fuel cells (which generate electricity from continuously supplied streams of fuel and oxidant). Furthermore, in the services sector they offer

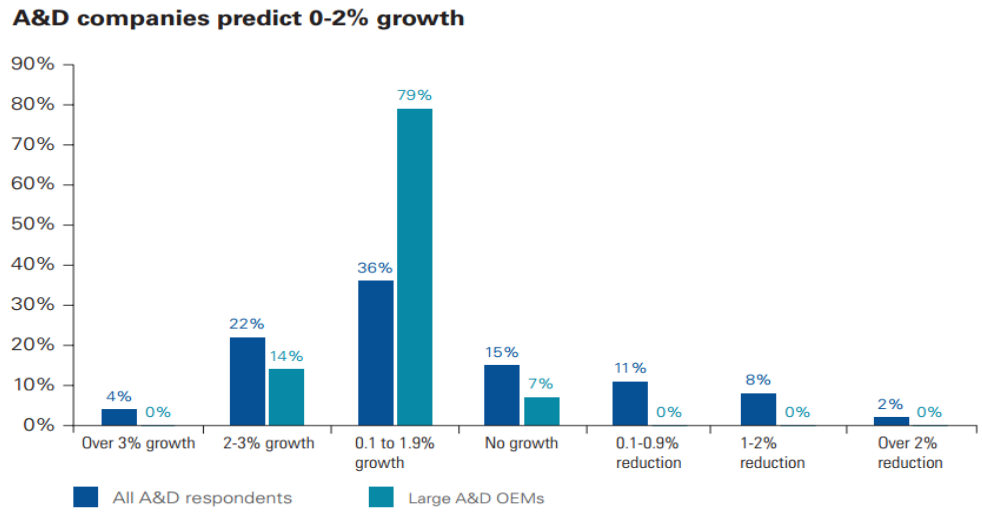
technical support and customer training. In the nuclear sector RR is a leader in nuclear submarine systems and it provides plans that support the building of nuclear power stations.

The analysis of the market outlook will now be introduced.

According to KPMG's 2013 Global Aerospace and Defense Outlook, the sector has gone through major changes.

The defense sector is facing some difficulties as governments are now cutting down on budgets in this sector. According to Deloitte's 2013 Global aerospace and defense industry outlook, the commercial aircraft sector is expected to reach new levels of revenue in 2013.

Globally, according to KPMG's report, the Aerospace and Defense sector companies are expected to grow only 2% in the next two years as can be observed in graph 1.



Graph 1 - Source: KPKG 2013 Global and Aerospace and Defense outlook.

Notice that even though this is the market tendency, Rolls-Royce is expected to continue growing and thus outperforming the market.

The two sectors, that represent more than 50% of Rolls-Royce's revenues, will now be analyzed separately.

3.1. The aerospace sector

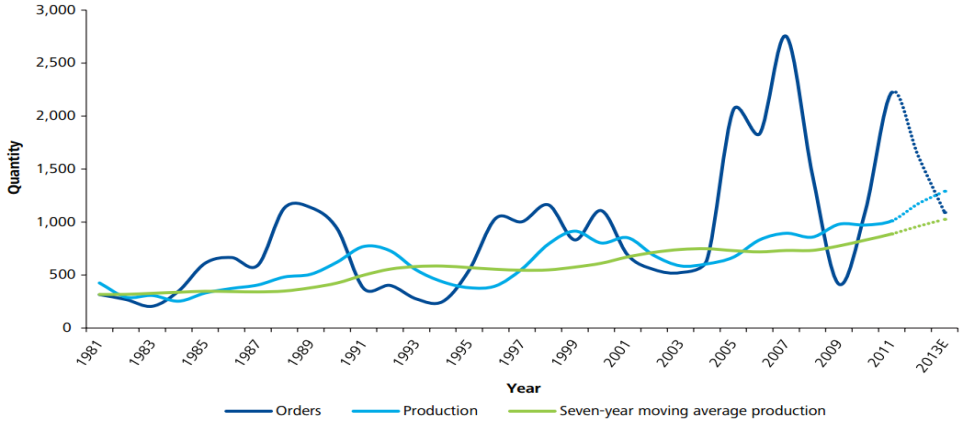
As already mentioned, the aerospace sector is expected to continue to expand and thus beneficiating Rolls-Royce's core business.

In 2012, the global aerospace sector registered an increase in revenue of about 5,9%. This growth is, according to Deloitte's report, verified by increases in production by both Boeing and Airbus.

Furthermore, the continuous growth in passenger travelling demand in Asia and the Middle East is also contributing to the expansion of this sector.

Moreover, it is also expected that, in the next twenty years, between 27.350 and 34.000 commercial aircraft will be produced.

In parallel, RR revenue growth for this year was of about 8,10% and thus beating the market.



Graph 2 - Source: Deloitte 2013 Global Aerospace and Defense Outlook.

Graph 2, presented above, translates the historical and the forecast for 2013 of production and orders of large commercial aircraft from 1981 to 2013. The seven year moving average indicates the expectation of growth in this sector, reaching a value of almost 1000 aircraft by 2013.

The continuous growth expected in this sector translates the need for RR to invest in this segment and so to keep up with the good results it has been achieving so far. The opportunities in this sector continue to be advantageous and give room for Rolls-Royce to grow and to continue to invest in technological innovation.

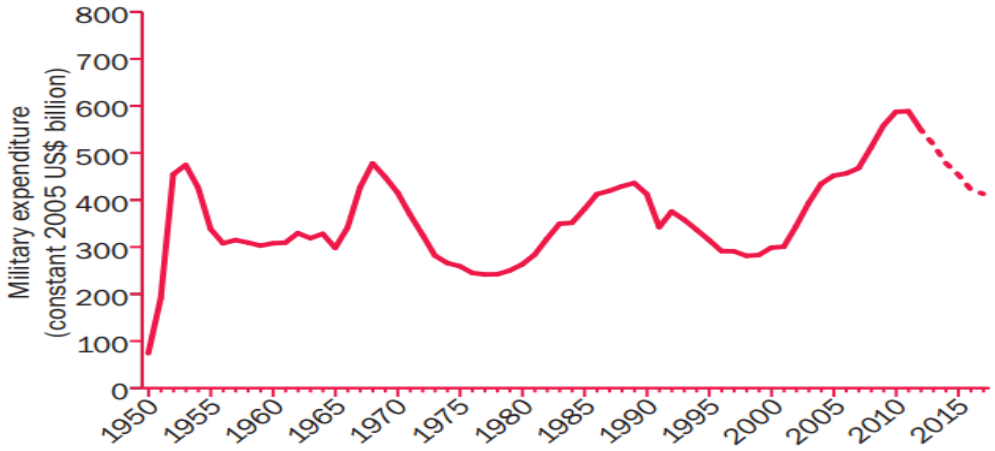
3.2. The defense sector

As mentioned above, according to Deloitte's report the defense sector is expected to face some continued declines in revenue for the third consecutive year.

One of the main reasons to justify this outlook is related to the fact that governments are currently cutting down on defense budgets. This is the case of the USA, one of the main

clients of RR. The USA estimates a reduction in their defense budget of about US$487 billion over the next ten years as a result of the Budget Control Act of 2011.

In graph 3 it is possible to observe the US military spending from 1950 until 2017 (at 2005 constant prices). The graph translates, as already mentioned, the goal of reducing military expenditures for the next years.



Graph 3 - Source: SIPRI Yearbook 2013, Armaments, Disarmament and International Security.

Along with the USA cost reduction policy, these military cuts are also being faced in the UK and the rest of Europe.

On the other hand, the aggregate expenditure in the defense sector in countries like China, Russia, India, Saudi Arabia, the United Arab Emirates and Brazil has been increasing.

In table 1 it is possible to observe the figures for the world military spending in 2012.

Region	Spending ($ b.)	Change (%)
Africa	39.2	*1.2*
North Africa	16.4	*7.8*
Sub-Saharan Africa	22.7	*–3.2*
Americas	782	*–4.7*
Central America and the Caribbean	8.6	*8.1*
North America	708	*–5.5*
South America	65.9	*3.8*
Asia and Oceania	390	*3.3*
Central and South Asia	59.8	*–1.6*
East Asia	268	*5.0*
Oceania	28.2	*–3.7*
South East Asia	33.7	*6.0*
Europe	407	*2.0*
Eastern Europe	100	*15*
Western and Central	307	*–1.6*
Middle East	138	*8.3*
World total	**1 756**	***–0.4***

Spending figures are in current (2012) US$.

Table 1: Source - SIPRI Yearbook 2013, Armaments, Disarmament and International Security.

As it can be concluded, regarding the USA, the spending has decreased 5,5% in real terms, translating the policy of cost reduction adopted by this county. In Western and Central Europe, these costs have also been felt, with a reduction of 1,6%.

In conclusion, this macroeconomic outlook translates the ongoing difficulties that this sector has been facing and is expected to continue facing in the future.

This scenario may reflect some difficulties for Rolls-Royce on what this sector is concerned.

In conclusion, according to Deloitte's 2013 Aerospace and Defense outlook, despite the fact that the defense sector is facing some drawbacks, these are compensated by the increase in revenue that comes from the commercial side of the business. Even though some countries and companies are engaging in cost saving, the aerospace sector allows for further business opportunities.

The market share of the aerospace sector has been increasing within this segment. If in the past, defense represented two thirds of the Aerospace and Defense sector, the reverse process is now being registered. Civil aerospace sector continues to improve and so it currently represents more than 45% of the total revenues in the sector, in 2012.

3.3. The marine sector

This sector represents almost 20% of RR business and the company is established as a top competitor.

RR has several important customers in this sector such as the Royal Navy, the US and it is now developing business in countries like China.

According to the UK Industries Alliance, growth opportunities, namely in renewable energy, global trade will drive merchant ship market and also the increase in demand from coastal economies for naval platform and equipment will stimulate this market.

Further, it is also indicated that the increase in global GDP will lead to greater commercial shipping.

The table below (2) introduces the markets that are considered to be the best providing opportunities regarding the naval, commercial, leisure and offshore renewable sectors. H stands for high importance and M for medium.

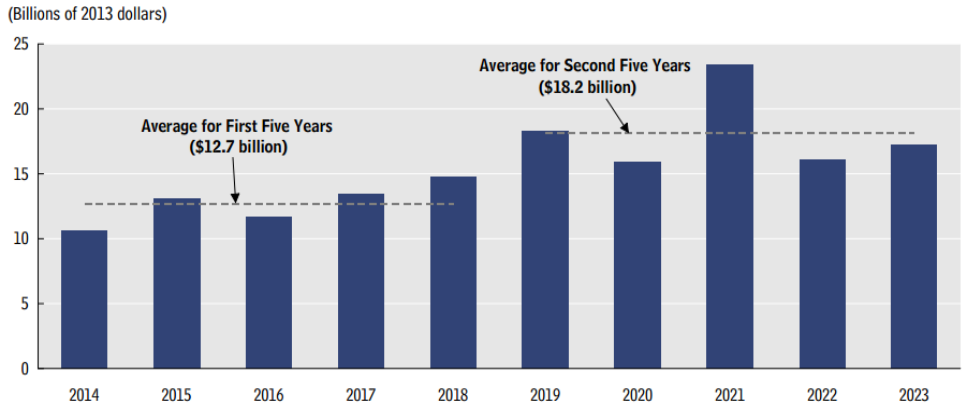
Country	Naval	Commercial	Leisure	Offshore Renewables
South Korea	H	H	H	H
Spain	H	M	H	H
Brazil	H	H	H	M
France	M	M	H	H
Canada	H		H	H
Turkey	H	H	H	
USA	H		H	H
Australia	H		H	M
China		H	H	M

Table 2 – Source: UK Marine Industries Alliance – A strategy for growth for the UK Marine Industries.

This table draws attention to the increase in importance of the BRIC countries.

Moreover, regarding the UK, there are significant opportunities related to offshore renewable energies. These opportunities are supported by the government and its leadership in licensing offshore wind, wave and tidal energy generation and research leadership. There is also expected growth in new middle classes in developing countries which creates new opportunities for the UK. In this country RR is "playing at home" and so has a competitive advantage in exploiting all these opportunities and being able to attract all the main contracts.

Regarding the U.S., The Congressional Budget Office expects a decrease in inventory in all sectors, for instance, missile submarines, ballistic submarines and warfare ships. The graph below illustrates the navy's estimates for new ship construction from 2014 to 2023. As it is possible to observe, there is not a constant trend. Nonetheless, this still indicates that RR can take advantage of the opportunities in this sector.



Graph 4 – Source: Congressional Budget Office based on data from the Department of the Navy.

Finally, as already mentioned, the marine market is also growing in developing countries and eastern powers. RR has recently celebrated a contract to design and

integrate equipment packages for two platform supply vessels in China and has also celebrated a contract to supply thrusters and deck machinery for two semi-submersible drilling rigs, in Korea.

4. Rolls-Royce PLC

4.1. Company Presentation

Trusted to deliver excellence

Rolls-Royce PLC is one of the most popular names and brands in the entire world and in the aerospace and defense sector, where it operates. The primacy for technological advance makes Rolls-Royce one of the pioneers and top competitors in the world.

Rolls-Royce was first created by Henry Royce and Charles Rolls, in 1884. The business took off with the production of cars that were known by their standard quality, in London.

With the outburst of the First World War and to respond to the military needs of the country, Rolls-Royce produced its first aero engine.

This allowed RR to grow as a company, but it was with the Second World War that RR made the transition from a small business company to a major competitor in the aero sector.

Later in the business process (2003), BMW took over the responsibility of Rolls-Royce's cars.

Rolls-Royce is today a symbol of integrity and innovation. Rolls-Royce's stocks are currently traded at the FTSE 100 and its first public offering occurred in 1993 with the issue of 242,74 million shares with a value of 1,30£. Two years later, a follow-on offering was made, with an issue of 227,30 million shares at 1,54£.

Nowadays, RR operates in four different sectors that differently contribute to the business.

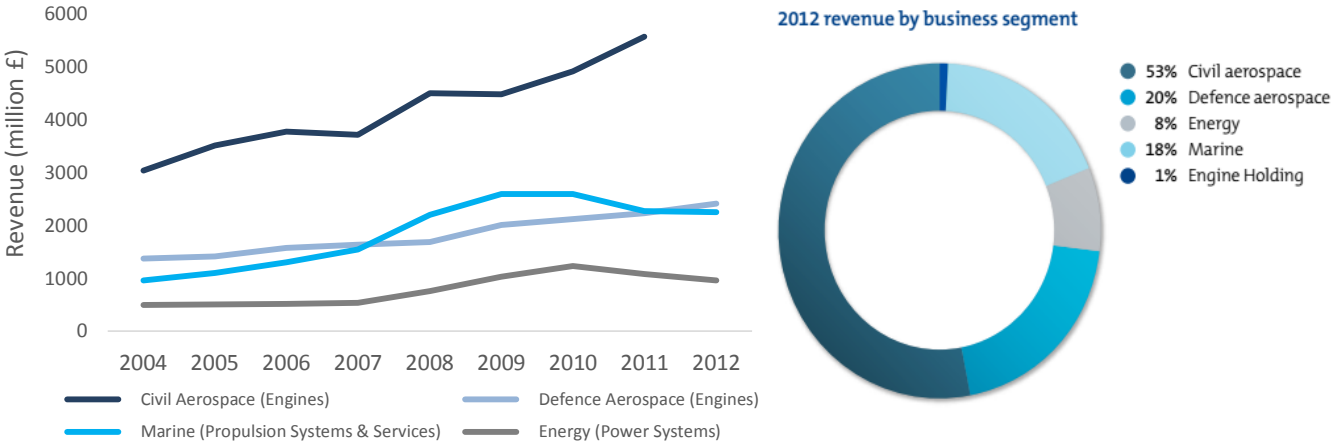
First and foremost, RR operates in the civil aero sector. This represented in 2012 more than 50% of Rolls-Royce revenues. In this sector, RR is established as a market leader, with its engines being classified as the "launch engine for the airframe it was created". Also, RR is considered to be the market leader that "powers the fastest, the longest-range, and the largest business jets".

In the defense sector, RR comes as the second largest provider of defense aero-engine products for several military sectors, for example, transport, combat, patrol and helicopters.

The third largest sector, where RR operates is the marine one. Again, Rolls-Royce comes as the market leader. Within this sector, the primary focus is directed to power and propulsion systems.

Last but not least, RR operates in the energy sector. The company powers oil platforms and also transports oil and gas through the pipelines they create. Furthermore, since 2011, RR has been developing its business in the nuclear sector.

Graph 5 below shows the behavior of revenues, allocated to each of the four sectors, since 2004 and gives an understanding of the position of each sector within the company. It is also shown the percentage of each sector, within the total revenues for the year of 2012.



Graph 5 – Source: Rolls-Royce's 2012 Financial Report

Looking into the future, the group will keep up with its investment behavior and expects a demand of US$3 trillion for the next 20 years. One should notice that the size of these sectors is related to the world GDP growth.

In conclusion, Rolls-Royce intends to keep its promise to deliver excellence and continue to be seen as a state of the art company in the fields of technological innovation.

4.2. Looking ahead into the future of Rolls-Royce

In the last decade, RR has been engaged in a successful strategy of continuous growth and profit. During this period, RR has more than doubled its revenues and profit has

increased more than five times. The prospects for the future are promising and RR expects to continue with these good results.

For the past ten years, RR was awarded with Britain's most admired company in the field of engineering, for the aerospace and defense sector and, 2013 was no exception.

It is expected that RR's order book will continue to increase and so the company is able to explore cash flow margins.

Moreover, the investor's relations director underlines the importance of further cost reduction in order to improve profit margins. Nonetheless, no specific goals were established.

Furthermore, the positive outlook already described for the airline and marine sector, as well as, the positive outlook for the energy sector, indicates that RR has several opportunities that it can explore, in the several business areas. According to the investor's relations director, the nuclear sector is the business for the future.

In the current year, RR has celebrated a large number of contracts that reinforce its position in the global market as a top leader. For instance, just at the end of 2013, RR is going to collaborate with Turkey to support its plans for a civil nuclear power station. Furthermore, it has celebrated a $57,1 million dollar contract to support the US Marine Corps and the Air Force aircraft engines. Further contracts were celebrated in China, Kuwait, Malasia, Brazil, Dubai and Qatar. This represents only a short list. Further contracts will be mentioned in this study, when necessary. In order to answer the demands in the record order book by RR, a new plant was built in Singapore, which allows RR to double its production capacity.

The industry where RR operates is highly technological and so RR assures that its competitive advantage comes from the company's highly qualified headcount.

In conclusion, in order to continue strong, a final goal from the investor relations is set – the company intends to keep its investment grade stable so that it can continue to have access to the global debt market.

4.3. Rolls-Royce Dividend Policy and UK Taxation Process

For the purpose of the dividend payment policy, Rolls-Royce does not adopt the standard policy of paying cash dividends to its shareholders, as many listed companies do. Instead, Rolls-Royce prefers to issue redeemable C shares as an alternative to paying a cash dividend. Therefore, according to the Rolls-Royce's 2012 Annual Report, the C shares of a given year are issued in the following year.

Nonetheless, as already mentioned, these C shares are redeemable and so the shareholder is presented with three options.

The first available option is to redeem all C shares for cash. In order to do so, the shareholder has to complete a payment instruction form, expressing his/her wish to do so.

The second available option to the shareholder is to redeem all C shares and use them to purchase additional ordinary shares. This comes with an advantage to the shareholder, since there is no minimum charge and so this operation becomes cheaper when compared to the one performed by the broker.

Finally, shareholders have the option of keeping all C shares. One should notice that these C shares are not listed in the London Stock Exchange and so it is not possible to sell them in the market.

Moreover, according to the Rolls-Royce's 2012 shareholder's guide, each C share has a nominal and redemption price of 0.1 pence, meaning that for instance, a thousand C shares are worth one pound.

Furthermore, C shares will yield a small dividend to Rolls-Royce's shareholders. This dividend is paid twice a year and it is fixed at 75% of Libor.

Rolls-Royce has a fixed position regarding its dividend payment policy and it is not expected that it will change in the near future. According to Rolls-Royce, this policy allows them to make payments to its shareholders without increasing its Advance Corporation Taxation (ACT) surplus.

The ACT was a former tax that was imposed on corporations when they were about to distribute dividends. This tax policy was abolished in 1999. At the time, companies were taxed at a rate of 33% on their profits. The tax was then paid in two installments. The first referred to the ACT and was paid after the company had paid its dividends and it was related to the amount that was distributed, the second installment was paid nine months after the end of the company's accounting period.

In order to understand Rolls-Royce's choice not to distribute dividends, there is a need to understand that the company has a surplus ACT. According Freeman et al (1993), a surplus occurred when *a company pays out a dividend that exceeds its taxable profits, or it has not paid enough UK tax on its profits to be able to offset the ACT*[11]. According to Bond et al (1996), a company could end up with a surplus if it paid dividends out of

[11] Freeman, H., Griffith, R.1993."Surplus ACT – A Solution Insight?", The Institute of Fiscal Studies, p.3.

reserves, for example, in a recession, in order not to cut down on dividends, or the company earned a large portion of their dividends overseas. By explaining it simply, when the company paid an ACT, it would get a credit that it could not reclaim but only postpone into the future to be offset when paying corporate taxes. If the ACT was larger than the corporate tax, the last one would come to zero and the company would get a surplus.

Notice that even though the ACT tax does not exist anymore, it is possible to recover the ACT surplus if the company had incurred in ACT prior to 1999. Under the old system, if the company distributed dividends, the ACT would be paid; the ACT surplus would increase and slow down the payment of corporation tax that would be offset by the first.

The problem that now arises is that a "shadow ACT" is created and so the company that has a surplus can offset less of the ACT surplus against corporate tax. Therefore, if it pays dividends, more corporate taxes will be paid.

By paying to shareholders through C-shares, Rolls-Royce is able to reduce the ACT surplus and consequently reduce the mainstream corporation tax payments. Future cash flows will then be improved, beneficiating the shareholder. In the case of Rolls-Royce, the group's unrecovered surplus ACT is 175 million pounds.

A final note regarding this issue is that C shares must be treated as capital and so a sale of C shares is considered capital redemption and it is consequently subject to Capital Gains Tax, at a rate of 18%. This benefits shareholders that are considered higher tax rate payers.

4.4. The Peer Group Selection

A proper computation of the peer group is essential to conduct an accurate valuation based on the multiples analysis. In order to estimate the right peer group, the first step was to take into account the set of companies considered by the Investor's Relations Office of Rolls-Royce PLC. (Annex1). It was indicated a set of seven companies that were considered to be Rolls-Royce's peers – BAE Systems, EADS, Cobham PLC, Meggitt PLC, QinetiQ, United Technologies Corp and Boeing.

Moreover, the next step was to consider other companies that could also be in the same peer group. The purpose of it was to start with a larger group, so that from then, it was possible to estimate a new peer group.

In order to do so, the peer group from Bloomberg was chosen. However, some restrictions were imposed. The first criteria that was established was only to select the top 20 firms that had the closest revenue to Rolls-Royce PLC. This was done in order to avoid having in the group companies that had very different revenues and so were not truly competitors.

The second condition that was imposed was to select only companies that belong to the same sector as Rolls-Royce, that is, Aerospace & Defense, according to the Industry Classification Benchmark (ICB). This system was chosen mainly because it is adopted by the London Stock Exchange.

Therefore, it was possible to obtain a first group that was composed from both the companies presented by Rolls-Royce and also the companies delivered by Bloomberg (Annex 1).

Nonetheless, the first group that was created was still "contaminated" and so it was necessary to make a deeper selection.

The next selection was conducted based on the characteristics of each company's economic activity. For instance, it would not be accurate to have in the same peer group as Rolls-Royce PLC a company as Dassault Aviation SA that manufactures several components of the airplane, but not the engine.

Consequently, for each company in the first group that was obtained, the percentage of each activity/sector within each firm was analyzed, in relation to their total revenues. Companies whose activity/sector was not based on the Civil and Defense Aerospace (the criteria established was more than 30% of revenues) were excluded from the peer group.

In the end, it was possible to end up with ten companies that were more similar to Rolls-Royce PLC and so would be used as a starting point to the cluster analysis.

As mentioned before, the final peer group to be presented was computed using the cluster analysis methodology.

In order to do so, five variables were chosen – Debt to Total Assets, R&D to Net Sales, CAPEX to sales, Return on Assets and Return on Equity. The main purpose of this was to choose variables that were related to the firm's capital structure, the investment that the firm undertakes and also the measures of profitability. (Annex 1).

Moreover, three centroids were chosen to the allocation.

The cluster analysis was repeatedly made until the centroids were stabilized. In the end, the peer group obtained was not the same presented by the Rolls-Royce's Investor Relations and ended up excluding some of these companies.

The peer group to be used in this study is presented as follows – Boeing, United Technologies Corp, Cobham PL, Meggit PLC, Safran SA, Singapore Tech Engineering, Teledyne Technologies INC and MTU Aero Engines AG.

From the peer group introduced by Rolls-Royce PLC, only four companies belong to the peer group computed in this study.

In conclusion, the cluster analysis was able to provide a cohesive peer group that, despite being different from the one presented by Rolls-Royce PLC, will be used in the multiples valuation of this study.

5. The Weighted Average Cost of Capital

5.1. Cost of debt

Rolls-Royce PLC has recently issued two bonds, both bullet ones, meaning that the face value will be paid at maturity date.

These bonds were issued with different coupons and different maturities, the first with an annual coupon of 2,125%, £(M)636.000 outstanding and eight years maturity while the second bond was issued with an annual coupon of 3,375%, £(M)375.000 outstanding and thirteen years maturity.

Moreover, RR PLC also bears an unsecured loan, expected to reach maturity in March 2014, with 200.000£ outstanding. Furthermore, RR PLC still has two other bullet bonds, with maturity in 2016 and 2019. Rolls-Royce PLC's debt structure is presented as follows:

Issuer Name	Coupon(%)	Issue Date	Maturity	Rating (S&P)	Mty Type	Amount Outstanding (£M)
Rolls-Royce PLC			02/03/2014		Unsecured Loan	200.000
Rolls-Royce PLC	7,375	14/06/2000	14/06/2016	A	BULLET	200.000
Rolls-Royce PLC	6,75	30/04/2009	30/04/2019	A	BULLET	500.000
Rolls-Royce PLC	2,125	18/06/2013	18/06/2021	A	BULLET	636.000
Rolls-Royce PLC	3,375	18/06/2013	18/06/2026	A	BULLET	375.000

Table 3 – Source: Bloomberg

Given the aforementioned debt structure presented by Rolls-Royce PLC, it was possible to estimate the cost of debt. Since the thesis presented is based on 30th September of

2013, the yields for each bond on this precise date were taken from *Bloomberg Platform* and are presented as follows.

Issuer Name	Coupon	Rating (S&P)	Mty Type	Yield
Rolls-Royce PLC			Unsecured Loan	1,38%
Rolls-Royce PLC	7,375	A	BULLET	1,38%
Rolls-Royce PLC	6,75	A	BULLET	2,43%
Rolls-Royce PLC	2,125	A	BULLET	2,14%
Rolls-Royce PLC	3,375	A	BULLET	3,65%

Table 4 – Source: Bloomberg

In order to compute the before tax cost of debt for the Weighted Average Cost of Capital, a weighted average between the amount of debt outstanding and the yield of each bond was taken. This allows to take into consideration both short term and long term debt maturities and so to obtain a cost of capital of 2,35%.

It should be mentioned that the effective tax rate used in order to compute the after tax cost of capital was a simple average of the effective tax rate that was observed from 2008 to 2013, yielding an effective tax rate of 23,16%.

This allowed to obtain an after tax cost of capital of 1,81%. Since Rolls-Royce is given an A rating in every type of debt security it issues, this is a reasonable cost of debt that proves the credibility and easiness of Rolls-Royce PLC being financed in the markets.

5.2. The risk free rate and the market risk premium

In order to latter introduce the computation of the cost of equity, it is relevant to present first the calculations and estimations for both risk free rate and market risk premium.

Firstly, in order to compute the risk free rate, the UK ten year government bonds Index (GUKG10 Index) was used. The data was weekly data, from January 2009 to September 2013 and thus excluding the crisis peak of 2008. Since the returns of the index were annualized, there was a need to compound them to weekly frequency. In the end, the risk free used was the one registered on 30th September and with an annualized value of 2,72%.

Regarding the market risk premium, the first step taken towards its computation was to obtain the market returns. Since RR PLC is listed in the FTSE100, this index was used as a proxy for the market returns. The data used was, once again, weekly data. Finally, the market risk premium was computed as the average of historical (from 2009-

September 2013) market risk premium. The annualized market risk premium obtained was of 6,32%. This value arises as a reasonable one for the United Kingdom market and comes close to the one presented by Fernandez, 2013, of a market risk premium of 5,5%.

The market risk premium to be used in further computations will be the one calculated historically of 6,32%.

5.3. The cost of equity

In order to estimate the cost of equity to be used, the Capital Asset Pricing Model (CAPM) was used. The regression is given as follows:

$$R_e = r_f + \beta_L * MRP$$

The data selected was weekly data, from January 2009 to September 2013. By computing the weekly equity risk premium for Rolls-Royce PLC and regressing the market risk premium, it was possible to obtain the beta for the company.

$$r_i - r_f = \alpha + \beta * MRP$$

Consequently, it was possible to obtain a beta of 0,98. The beta measures the volatility of the company in relation to the market (beta equal to 1).

Therefore, it is possible to conclude that Rolls-Royce follows the movements of the market very closely.

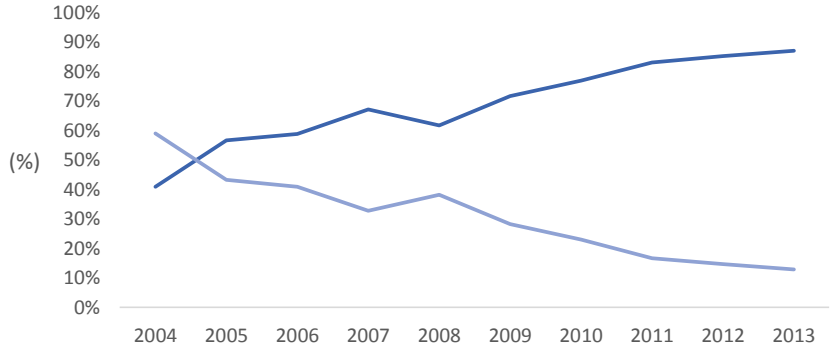
In conclusion, it was possible to estimate a cost of equity of 8,89% for RR PLC.

5.4. The Weighted Average Cost of Capital

In order to compute the Weighted Average Cost of Capital, it was important to start by understanding the behavior of RR's capital structure. The market value of debt was estimated by dividing the interest paid by the cost of debt. For 2013, the company is expected to pay 56 million pounds and, at a cost of debt of 1,81%, it yields a market value of debt of £3.096,41 million. On the other hand, the equity value was computed by multiplying the number of shares outstanding for the year by the stock's closing price.

In the figure (graph 6) it is possible to observe the historical behavior of the RR's capital structure. As it can be concluded, the equity value has been increasing in the past years and there has been a clear reduction in the percentage of debt in the total value. For 2013, the company registered an Equity to Value of 87,1% and so Debt to Value

12.9%. Since there is no indication that this pattern will reverse, it will be assumed in this thesis that this structure will be stable for the next years.



Graph 6 – Source: Historical Behavior of RR capital structure (own calculations)

In conclusion, given the parameters indicated before, it was possible to compute a weighted average cost of capital equal to 7,91%.

6. Valuation Overview

As already mentioned, Rolls-Royce PLC is composed of four different sectors, that differently contribute to the company as a whole – Civil, Defense, Marine and Energy.

In order to compute the final price for RR, the method to which was given primacy was the Enterprise Discounted Cash Flow. The steps that were taken for the computation of the several inputs used in the DCF methodology will now be introduced.

6.1. Revenue estimation

As already indicated, the revenues have been increasing in the past nine years, in each of the four sectors.

According to the RR's 2012 Financial Reports, the revenues have doubled in the past ten years and this tendency of increasing revenues is expected to continue in the next years.

Despite the fact that RR is positioned in markets whose tendency to grow is not favorable, like the European Union or the US, RR has been able to contradict this tendency and thus to keep up with the good results.

6.2. The Civil Aerospace Sector

As already indicated, the civil aerospace sector is the one that represents almost 50% of the revenue generated by RR and is the sector that most contributes to the potential growth of the company.

Therefore, the demand on this sector is dependent on several factors, namely, the world GDP growth, the aircraft productivity, the operating costs, the travel passenger growth and the environmental issues.

The position of RR in emerging markets, such as Asia and the Middle East, indicates that they will continue to grow and so does the sector.

Given this outlook and also the macroeconomic one that was presented in the beginning of this thesis defending the growth of the civil aerospace sector, revenues are expected to increase.

Moreover, the revenues for the civil sector were estimated using a simple average between three different parameters. The first one considered was the estimated average of passenger growth in each continent, by the International Air Transport Association – it was possible to yield a growth rate of 5,77%. The second parameter used was the estimated yearly growth rate of production of commercial aircraft by Deloitte of 2,26%. Nonetheless, because the average of these two does not meet RR capabilities and historical growth performance, the latest was used as the third parameter. In the end, it was possible to estimate that RR's civil revenues will grow at 6,62% (from one year to the next). It is important to notice that the expected revenues were also adjusted for the UK forecasted inflation, in each estimated year.

6.3. The defense sector

Following the same pattern as the civil sector, the defense revenues have also been increasing.

Despite the challenging environment that is felt in this sector worldwide, according to RR, there are still a large number of opportunities to be explored in this sector, thus leading to the belief that in the next years, the revenues will continue to increase.

Therefore, the growth rate used was a simple average between the estimated CAGR, for the defense sector (2012-2017), by the Global Defense Spending Report of 3,2% and the historical CAGR of RR revenues for the defense sector.

It was possible to reach a growth rate of 4,78%. Once again, the estimated values were also adjusted to the expected inflation rate of the UK.

6.4. The marine sector

The marine sector is the third most contributive sector for RR. According to RR, the price pressures and other adverse movements in the exchange rate have been harming this sector in the past year.

Nonetheless, there are future opportunities to be explored. RR is and is expected to continue to be a world leader in the marine sector, being an expert in developing certain capabilities as the design, supply and support of power and propulsion systems.

According to the RR's Financial Report, RR will continue to explore opportunities in the offshore oil and gas sector and it is expected to strength its position in Brazil and Korea.

Therefore, the estimated growth rate from one year to the next, for this sector, was computed as a simple average of the DNV's yearly estimated seaborne trade growth, up until 2016, indicating a rate of 6,2%. Further, it is also estimated by the DNV that the world's total fleet will increase 3% per year, until 2020. Therefore, using these two estimations, it was possible to reach a growth rate of 4,65% for the marine sector. Once again, the inflation rate for the UK was also considered.

6.5. The energy sector

The energy sector is currently the smallest one for the RR business.

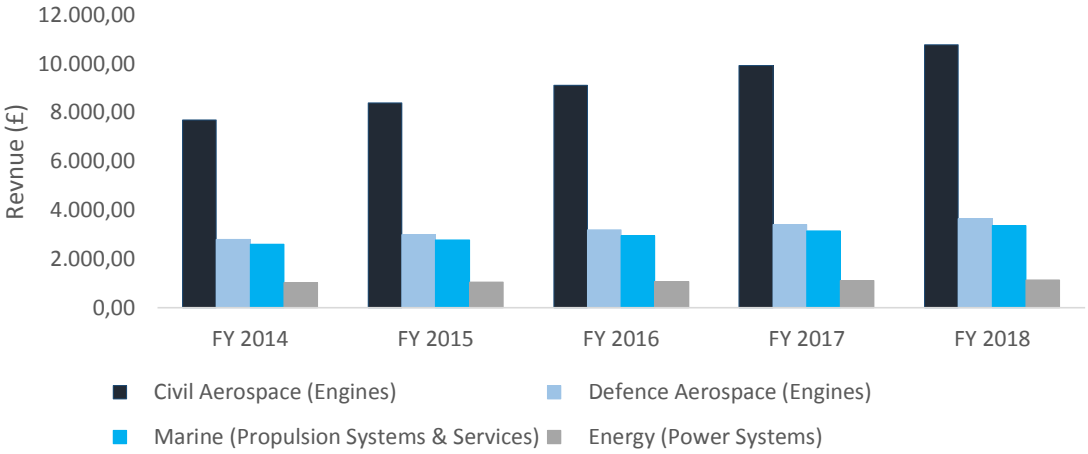
Regarding this sector, RR operates by powering offshore oil platforms all over the globe. Furthermore, it also provides gas turbines for both oil and gas applications.

Its position in the nuclear sector has also become stronger in the past years.

Despite the fact that this is a small sector, RR is expected to continue to enhance its position and so the revenue is also expected to increase.

The growth rate of the revenues for this sector was computed using a simple average between the estimated growth rate for the renewable energies (3%), the nuclear sector (3%) and the natural gas (2%). These are estimations from the International Energy Outlook from 2013. In the end, it was possible to estimate that the revenues for this sector will grow at 2,23% per year. The inflation rate for the UK, for the correspondent period, were also taken into consideration.

Graph 7 illustrates the revenues for RR, allocated to each sector, for the estimated period.



Graph 7 - Source: Own calculations.

6.6 The estimation of the Cost of Sales

In order to make an estimation of the cost of sales, the same procedure was adopted across every type of segment.

First, the percentage of revenue of each sector was analyzed in relation to the total revenue. This was done for the period from 2004 to 2013.

As expected, the civil aerospace sector represented, on average, 50,05% of the total revenue, followed by the defense (20,77%), the marine (20,52%) and the energy(8,66%).

Since the cost of sales was not allocated to each type of sector, it was necessary to assume that, historically, this would be done according to the percentage that each sector had on the total revenue, for that given year. It was then possible to estimate the cost of sales, by sector, for the period from 2004 to 2013.

To estimate the cost of sales for the given period, it was then calculated, once again historically, the percentage that the costs of sales for each sector had on the total costs of sales.

By using a simple average, it was possible to estimate the costs of sales as being the revenue estimated for that sector in a given year, multiplied by the historical average percentage that each sector's costs had on the total costs (annex 6).

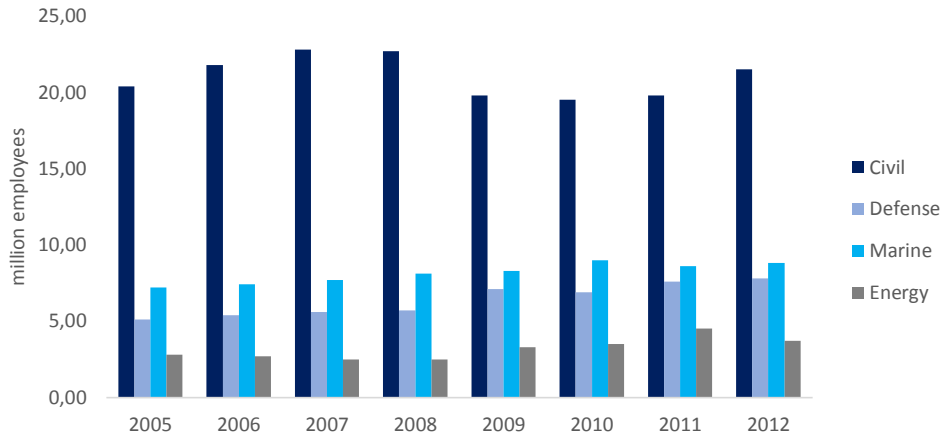
One should notice that these costs do not include costs with research and development.

In conclusion, as revenues increase, in each sector, so do the cost of sales.

6.7. Commercial and Administrative Costs

In order to estimate the commercial and administrative costs the main assumption made was that these costs would depend on the headcount of the company (Annex 7 –Table 3).

In graph 8, it is possible to observe the number of employees allocated to each segment of business. As it can be concluded, the civil sector, as expected, is the one that presents the largest headcount. Nonetheless, a common pattern is observed and it is related to the fact that the number of employees in each sector has been increasing.



Graph 8 - Source: Rolls-Royce PLC's Financial Reports (2004-20012)

Therefore, for each sector segment, a GAGR was computed. Civil employees were assumed to have a growth rate of 0,66%, Defense of 5,45%, Marine 2,54% and Energy 3,55%. Thus, it was possible to estimate the number of employees expected in each industry (Annex 7 – Table 4).

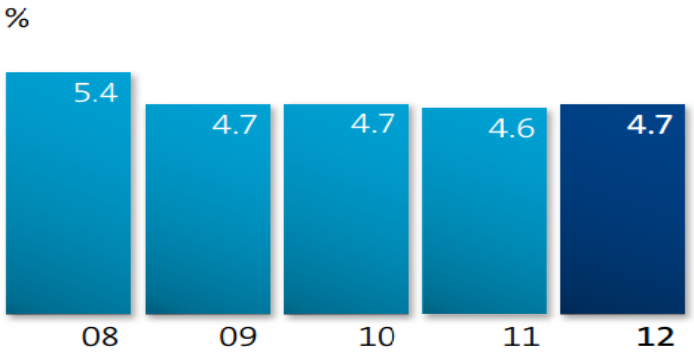
Finally, to estimate the commercial and administrative expenses by sector, the costs by employee were first computed and then weighted by the number of employees of each sector. This was done from 2006 to 2013 (Annex 7 – Table 5).

Then, to estimate the commercial and administrative costs from 2014 to 2018, it was assumed that they would grow at CAGR. Therefore, the costs of the civil sector are expected to grow at 4,68%, defense at 10,54%, marine at 7,51% and energy at 9,71% (Annex 7 – Table 5 & 6).

6.8. Research and development costs

As it is possible to observe in graph 9, from 2008 to 2012, R&D expenses have represented around 4,7% of the total revenues.

According to the company, around 5% is expected to be spent in R&D in relation to the total value. This is the assumption made for the estimated period.



Graph 9 – Source: Rolls-Royce PLC's 2012 Financial Report.

6.9. Share results of joint ventures

Some of the business that RR conducts is based on joint ventures. According to the RR's 2012 financial report, a venture is considered "an entity in which the Group holds a long-term interest and which is jointly controlled by the Group and one or more joint ventures under a contractual agreement".

With that settled, the percentage that the total joint ventures' results have on the total gross profit was calculated. A simple average of 4,13% of the total gross profit was achieved (Annex 8 – Table 7&8).

The 2014-2018 joint ventures' results were then estimated according to the previous average percentage, in relation to the estimated total gross profit. The results can be observed in Annex 8 – Table 9.

Finally, because the Group does not allocate these results according to the segments in which the company operates, there is a need to do so. The computation was done by assuming that the results of a joint venture that a given sector will have, will be equal to the percentage that same sector has on the total gross profit.

6.10. Capital Expenditure

CAPEX has been increasing over the past 9 years, at a steady rate. According to the Group, this tendency is expected to continue gradually, as a percentage of revenues. However, this percentage is not disclosed by the company.

Therefore, the estimated total CAPEX was computed by assuming the average it had in relation to total estimated revenues (3,45%). This average was assumed constant through the years.

Then, the allocation of CAPEX according to each business segment was done by assuming the same percentage each segment has on the total revenue.

As it is possible to observe in the table 5, CAPEX will continue to increase in every segment, given the increase in revenues.

Million (£)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average % of Total Capex
Civil	114,37	160,25	205,69	232,08	243,58	265,94	289,50	314,84	342,40	372,37	52,56%
Defense	51,30	69,16	82,50	87,14	89,89	96,45	103,18	110,28	117,87	125,97	19,70%
Marine	66,08	84,41	83,83	81,09	83,53	89,51	95,64	102,09	108,98	116,32	19,73%
Energy	26,24	40,17	39,98	34,68	34,90	35,68	36,48	37,30	38,13	38,98	8,00%
Total	258,00	354,00	412,00	435,00	451,90	487,58	524,81	564,51	607,37	653,65	100%

Table 5 – Source: Own calculations

6.11. Depreciation and Amortization

Both total assets and property, plant and equipment, have been increasing trough time. This increase was specially felt in 2012, due to the refreshment and development of facilities, as the Group is preparing for increased production in volumes.

Therefore, because the group does not make the allocation of PPE to each sector, this was done, for the period from 2006 to 2012, according to the percentage that the assets of each sector have on the total assets.

Furthermore, to estimate the total PPE, the disinvestment which the company may engage in was first estimated. Therefore, the PPE per year would be given as PPE_{t-1}, multiplied by the average of disposal of PPE over total PPE in $year_{t-1}$ (average from 2009 to 2012). Then, net CAPEX was computed as the difference between CAPEX and disposal of PPE.

This allowed the estimation of PPE as the sum of the previous year PPE and net CAPEX.

Then, for the period from 2009 to 2012, the weight of each sector's PPE on total the PPE was taken into account and assumed constant for the remaining estimated years.

Therefore, the PPE for a given sector will be given by the latest average multiplied by the total PPE.

Finally, the total depreciation was computed as the average from 2009 to 2012 depreciation and amortization over the total PPE times the total PPE for the year. Depreciation was then allocated using the same weights that were used to allocate PPE. In annex 9 it is possible to observe the computations for this segment.

6.12. The Net working Capital

The working capital was computed as the sum of the inventory, the accounts receivable and the taxation recoverable minus the accounts payable and the current tax liabilities. Historically, the value of the net working has not been constant and, in the last few years, it has been increasing. This is explained by the fact that the company does not want, in any way, to let its costumers down and so it has increased its inventory level.

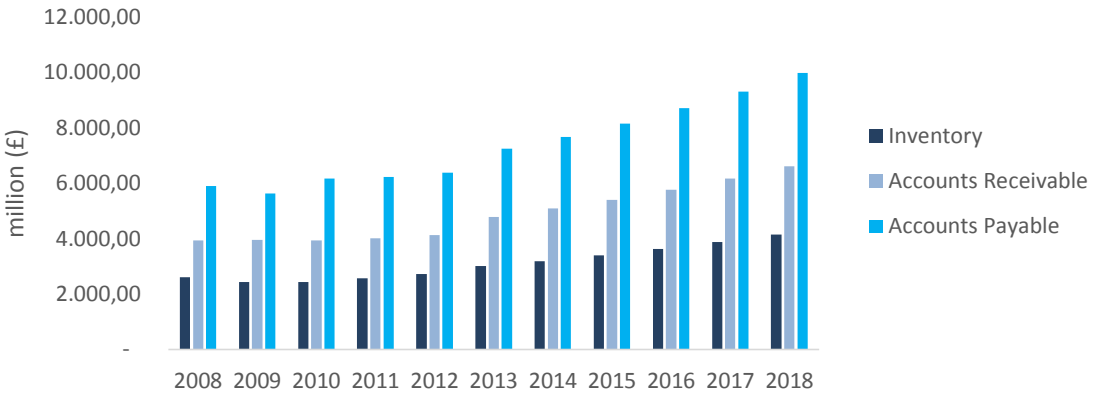
According to the 2013 press release, there is scope for improvement in the working capital and a main component that is identified is the inventory and the inventory turnover.

In this thesis, the performance of inventory was measured using Days Sales to Inventory. As it is possible to observe in annex 10 – Table 10&11, this ratio does not present a constant trend and, in 2012, a figure of 73 days to turn inventory into sales was reached.

As the intention of the Group is to improve this ratio, a cautious assumption will be made. For further predictions, not only regarding the inventory, but also the accounts receivable and payable, an average of the days from 2009 to 2012 will be assumed and, it will be assumed to be constant through time. Therefore, DSI is expected to be equal to 73 days, on average, DSO to 92 days and DPO to 174 days, on average. The allocation of the inventory, the accounts receivable and the accounts payable was done according to the revenues and the cost of goods sold attributed to each industry.

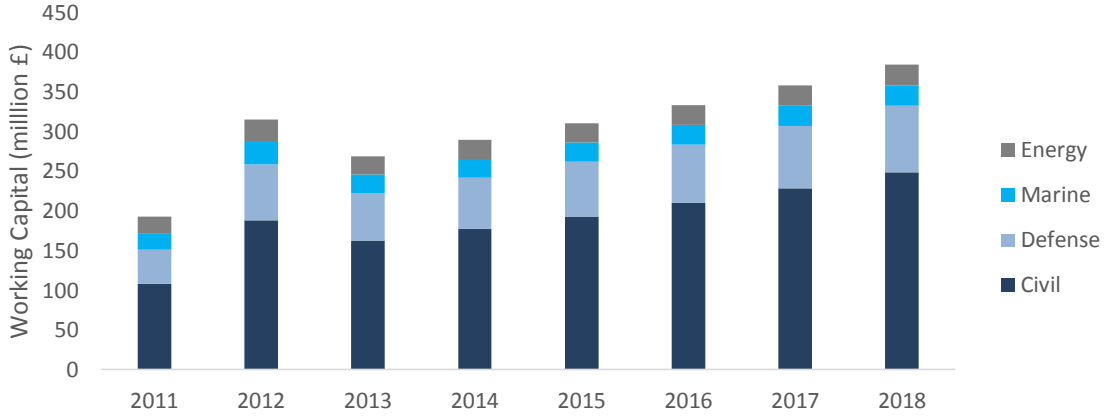
Furthermore, the allocation of the recoverable taxation and the taxation liabilities was done according to the percentage they had on total revenues.

Graph 10 translates the behavior of the main components of working capital. As it is possible to observe, even though there is an improvement in the inventory, this is not very significant and thus affecting the performance of working capital.



Graph 10 – Source: Own calculations.

As it is possible to conclude in the graph 11, working capital (Annex 10- Table 12&13) is expected to increase through time, translating the effort of the company. Nonetheless, this increase will be very smooth through time.



Graph 11 – Source: Own calculations.

It is important to outline that this small improvement of working capital can be explained, once again, by the small improvement of inventory trough time.

As already mentioned, the assumptions made on the performance of this indicator are conservative and so, they can explain the behavior of the working capital. As stated by the Group, changes to the inventory and its performance are needed but for a large company this takes time.

6.13. Provisions

According to Rolls-Royce PLC's financial report, the provisions are, in general, related to the products sold and covered for a period of three years.

Therefore, future expected provisions will be computed based on the revenues estimated, for each segment.

An average of provisions in relation to the total revenues was taken and assumed constant for the future predictions (3,6% in relation to the total revenue). Then, so as to have the provision allocated to each business sector, the ratio was multiplied by the revenues of the given sector.

As expected and since provisions are related to the sales made by the company, they will increase through time as revenues growth (Annex 11).

7. The Discounted Cash Flow Method

The choice of this method is related to the fact that RR is a stable company and it is not expected that the capital structure of the firm will change in the future, as it has been previously explained.

Given this fact, the WACC that was computed before is not expected to change from one year to another. Therefore, the usage of the DCF method is accurate and applicable for this case.

In order to better understand how much each sector contributed to the overall value of the firm, there was a need to evaluate each sector separately and finally to stress test it.

7.1. The Free Cash Flow to the Firm

As already mentioned in section 2.3 of the Literature Review, the FCFF was computed by taking into account all sources of cash, discounting all expenditures. The formula was given as follows and used across all four segments:

$$FCFF = EBIT - taxes\ on\ EBIT + Amortization + \Delta Provisions - \Delta NWC - CAPEX$$

7.2. The Terminal Value

The formula used to compute the terminal value was the one introduce in section 2.8 of the literature review.

Once again, the formula used was the same across all industries.

Furthermore, in relation to the perpetual growth rate used to account for the terminal value, this was calculated to be equal to the nominal world GDP growth rate estimations. This should be the most accurate rate, given that, according to the Group, among other variables, the size of the business segments depends on the world GDP.

Moreover, it is important to state that the nominal GDP growth rate was computed taking into account the predictions of the UK CPI. Again, this assumption is related to

the fact that all accounting is made in pounds and the core business is based on this currency.

In table 6, it is possible to observe the estimations for the GDP growth. The growth rate used was the one that is expected for 2018 and yields a value of 4,86%.

	2013	2014	2015	2016	2017	2018
Real GDP growth (a)	2,00%	2,70%	2,80%	2,80%	2,80%	2,80%
GDP Deflator at market prices	2,10%	2,00%	1,80%	1,80%	1,70%	1,70%
Nominal GDP growth	4,86%	5,16%	4,96%	4,86%	4,86%	4,86%
UK CPI (b)	2,80%	2,40%	2,10%	2,00%	2,00%	2,00%

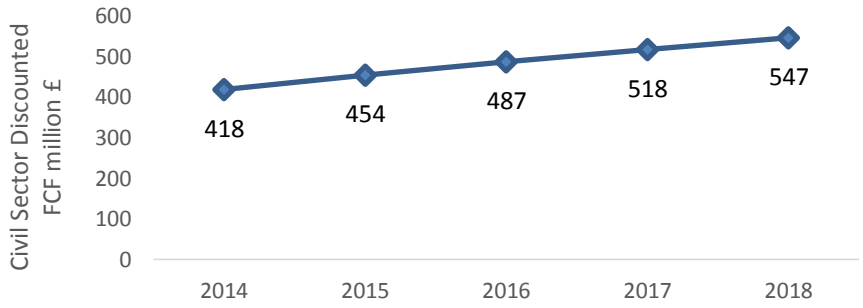
Table 6 – Source: (a) The Economist Intelligence unit; (b) Office for Budget Responsibility, Economic and Fiscal Outlook, March 2013

7.3. Civil Aerospace

Annex 12 presents the DCF analysis for the civil aerospace sector. The components presented are estimated according to the assumptions described before in section 6.2. of valuation overview.

As it is possible to observe, the free cash flow is positive through time and is expected to continue to increase. This translates the good performance that this sector has on the total value of the company.

Graph 12 indicates the behavior of the discounted cash flows. This sector has a terminal value of £18.707,61 million and an estimated value of £21.131,80 million.



Graph 12 – Source: Discounted Cash Flow for Civil Aerospace (own calculations).

7.3.1. Civil Aerospace – Sensitivity analysis

The aim of this section is it to understand how the value of this segment changes when two of the main components of the DCF model change.

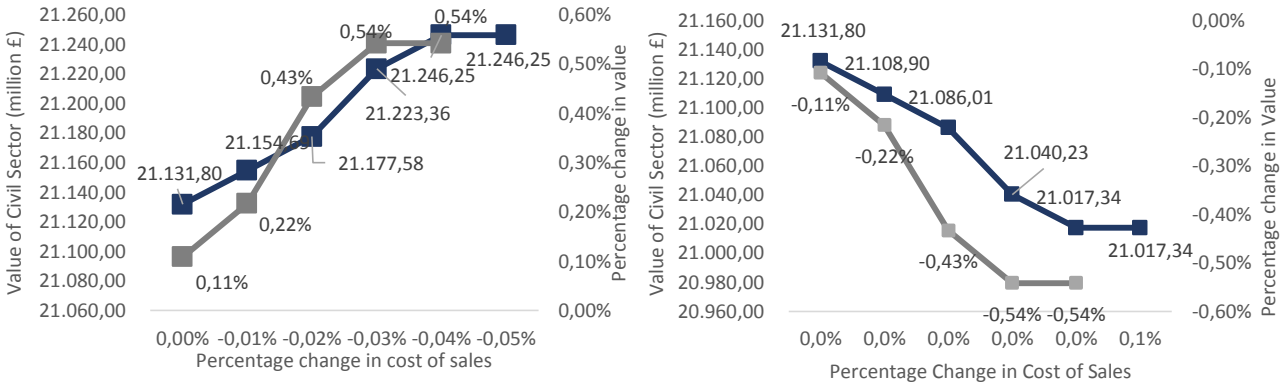
Therefore, a sensitivity analysis was made, imposing percentage changes in both WACC and growth rate. The table (7) below illustrates the set of estimated values for the civil sector.

Value of Civil Sector									
WACC|g	**3,00%**	**3,50%**	**3,86%**	**4,00%**	**4,50%**	**4,86%**	**5,00%**	**5,50%**	**5,86%**
6,00%	23.089,93	27.314,45	31.578,45	33.651,23	44.212,53	57.553,11	65.335,12	128.702,92	454.594,44
6,50%	19.710,80	22.672,05	25.498,69	26.817,79	33.036,41	39.861,72	43.400,76	64.129,48	99.109,18
6,92%	17.539,55	19.822,59	21.928,36	22.887,50	27.218,89	31.639,44	33.806,23	45.032,53	59.673,32
7,00%	17.177,77	19.357,48	21.356,71	22.263,77	26.332,56	30.439,38	32.435,75	42.607,74	55.456,56
7,50%	15.208,78	16.872,78	18.353,94	19.012,22	21.864,81	24.587,74	25.858,43	31.848,87	38.423,73
7,92%	13.864,88	15.220,90	16.404,05	16.922,85	19.122,44	**21.151,24**	22.075,32	26.248,39	30.507,36
8,00%	13.634,57	14.941,30	16.077,58	16.574,71	18.674,80	20.601,01	21.474,93	25.395,11	29.351,92
8,50%	12.347,48	13.397,05	14.292,80	14.679,85	16.283,36	17.710,65	18.345,01	21.093,87	23.717,79
8,92%	11.434,96	12.320,71	13.066,84	13.386,48	14.693,39	15.833,68	16.333,69	18.453,61	20.408,92

Table 7– Source: Own calculation

As it is possible to observe, for small changes in WACC and growth rate, the value of the civil sector seems to be relatively stable. Marked in blue are the values that seem reasonable for this segment.

Moreover, since of cost of sales represent a large percentage of revenues and because the company is engaged in increasing profit margins by reducing costs, a sensitivity analysis of this segment was also conducted.



Graph 13 – Source: Own Calculations.

The graphs above represent the value (blue line) of civil sector when cost of sales increases/decreases by the percentages observed in the horizontal axis. The grey line indicates the percentage change in relation to the original expected value. For increases

in 0,05% in the cost of sales, the value of the sector decreases by 0,54%. When the cost of sales decreases by 0,05%, the value of civil sector increases by the same amount.

7.4. Defense Aerospace

The discounted cash flows for the defense segment resulting from the DCF analysis are, as expected, lower than the one of the civil sector. This expresses the difficulties that this sector is facing and will continue to face in the near future, mainly related to the defense budget austerity that governments are planning for the next years. Therefore, discounted cash flows are expected to decrease over time. The main reason behind this is related to the fact that the costs of sales increase at the same rate as the revenues.

In conclusion, the terminal value of this sector is £2.521,12 million, yielding a value for this sector of £2.924,92 million. The full DCF analysis is presented in annex 13.

7.4.1. Defense Aerospace – Sensitivity analysis

Table 8 presents the sensitivity analysis for the defense sector for simultaneous changes in WACC and growth rate.

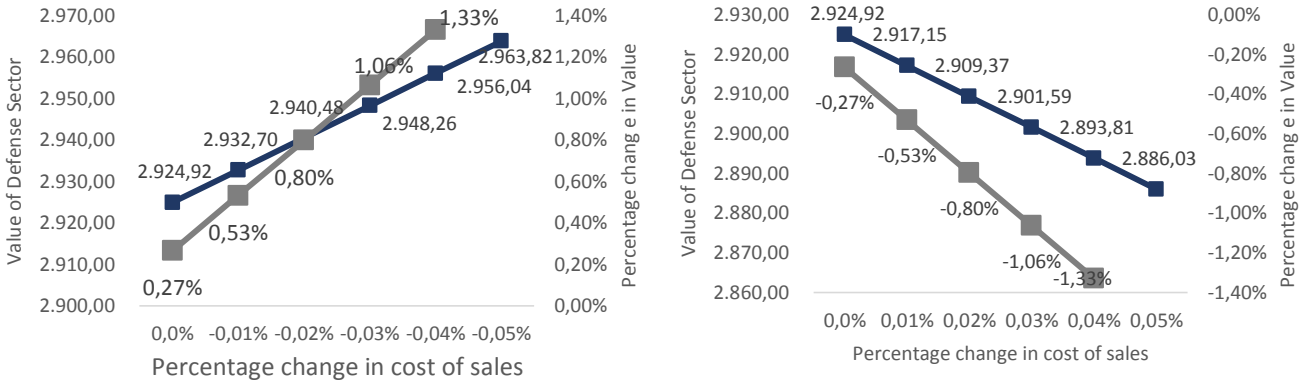
Value of Defense Sector									
WACC|g	**3,00%**	**3,50%**	**3,86%**	**4,00%**	**4,50%**	**4,86%**	**5,00%**	**5,50%**	**5,86%**
6,00%	3.191,66	3.760,97	4.335,61	4.614,94	6.038,23	7.836,07	8.884,80	17.424,52	61.343,08
6,50%	2.735,51	3.134,58	3.515,51	3.693,28	4.531,33	5.451,14	5.928,07	8.721,57	13.435,58
6,92%	2.442,28	2.749,95	3.033,73	3.162,99	3.746,71	4.342,44	4.634,45	6.147,35	8.120,41
7,00%	2.393,40	2.687,15	2.956,58	3.078,81	3.627,14	4.180,60	4.449,64	5.820,46	7.552,02
7,50%	2.127,32	2.351,57	2.551,17	2.639,89	3.024,32	3.391,27	3.562,51	4.369,81	5.255,87
7,92%	1.945,60	2.128,35	2.287,79	2.357,71	2.654,13	**2.927,54**	3.052,08	3.614,46	4.188,41
8,00%	1.914,45	2.090,55	2.243,68	2.310,68	2.593,69	2.853,28	2.971,05	3.499,35	4.032,59
8,50%	1.740,28	1.881,73	2.002,44	2.054,60	2.270,70	2.463,05	2.548,54	2.918,99	3.272,60
8,92%	1.616,72	1.736,09	1.836,64	1.879,72	2.055,84	2.209,51	2.276,89	2.562,58	2.826,09

Table 8 – Source: Own Calculations

Again, for small changes in both variables the value of this sector seems to be stable. However, for larger changes in the growth rate and smaller changes in WACC, the value of the defense sector becomes very sensitive.

Again, the values in blue represent the ones that can better represent the value of this sector.

For changes in the costs of sales, an increase of 0,05% in the latest measure, represents a decrease of 1,33% in the value of the civil sector. On the other hand, a decrease in the same amount reflects an increase of 1,33% in value. Compared to the civil sector, changes in costs in the defense sector further affect the value of the sector.



Graph 14 – Source: Own calculations

7.5. Marine Sector

Regarding the marine sector, a decrease is also expected in the discounted FCF. Despite the fact that RR is a world leader in this field, the decreasing cash flows can be explained by the large increase in CAPEX, that is expected every year. This results from the already mentioned investments and strengthened position in new markets including, for instance, Korea and Brazil. Moreover, RR is engaged in several contracts at the end of the year, for example, the company won the project to build the world's first gas power tug. Furthermore, regarding this sector RR has also been engaged in investment projects in order to improve the environmental performance of its projects.

Therefore, this sector is valued at £ 3760,68. The DCF analysis is presented in annex 14.

7.5.1. Marine Sector – Sensitivity analysis

As observed in table 9, the marine sector is sensitive to large increases in the growth rate and smaller values of WACC. Again, the values in blue represent the ones that, for this sector, would make sense to be presented as the total value of the sector.

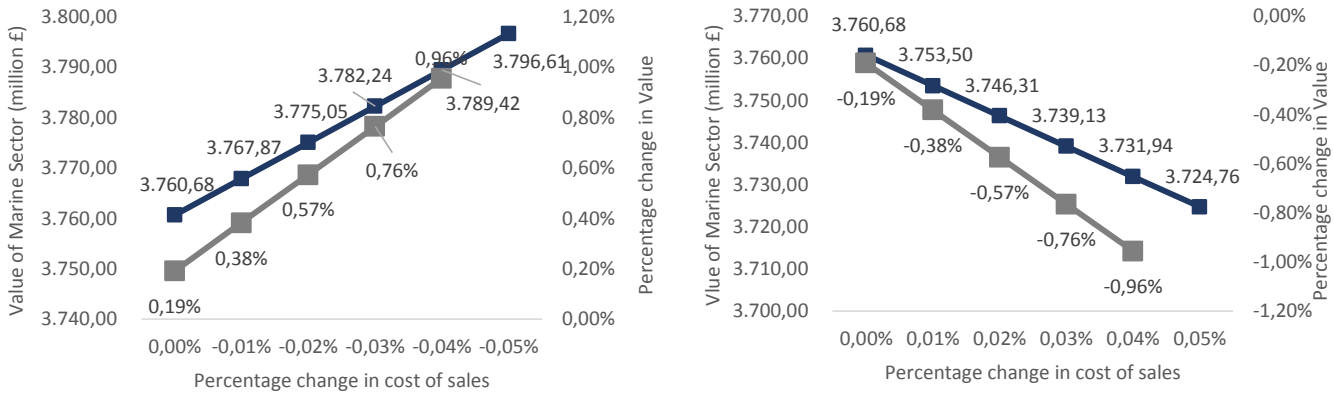
However, for this sector, values seem to respond more abruptly to changes in WACC and growth, when compared to the other two sectors.

Value of Marine Sector									
WACC|g	**3,00%**	**3,50%**	**3,86%**	**4,00%**	**4,50%**	**4,86%**	**5,00%**	**5,50%**	**5,86%**
6,00%	4.107,63	4.853,95	5.607,24	5.973,43	7.839,23	10.196,02	11.570,82	22.765,60	80.338,75

6,50%	3.510,39	4.033,54	4.532,90	4.765,94	5.864,54	7.070,32	7.695,54	11.357,55	17.537,19
6,92%	3.126,58	3.529,92	3.901,93	4.071,37	4.836,57	5.617,52	6.000,31	7.983,59	10.570,09
7,00%	3.062,63	3.447,71	3.800,90	3.961,14	4.679,95	5.405,47	5.758,16	7.555,18	9.825,10
7,50%	2.714,52	3.008,49	3.270,15	3.386,45	3.890,40	4.371,44	4.595,92	5.654,21	6.815,75
7,92%	2.476,88	2.716,44	2.925,46	3.017,11	3.405,70	**3.764,11**	3.927,37	4.664,60	5.417,00
8,00%	2.436,15	2.667,00	2.867,74	2.955,57	3.326,58	3.666,87	3.821,26	4.513,81	5.212,84
8,50%	2.208,51	2.393,94	2.552,18	2.620,56	2.903,84	3.155,99	3.268,06	3.753,68	4.217,23
8,92%	2.047,09	2.203,57	2.335,39	2.391,86	2.622,74	2.824,19	2.912,52	3.287,03	3.632,47

Table 9 – Source: Own calculations.

Regarding the sensitivity costs analysis, for an increase in 0,05% in costs of sales, the value of the sector decreases by 0,96%. The same happens for movements in the opposite direction.



Graph 15 – Source: Own calculations.

7.6. The Energy Sector

As already mentioned, this is the sector where RR is not established as a top world competitor. However, the company is working to reach this position, especially in the Civil Nuclear Sector.

Regarding the discounted cash flows, these are expected to increase from 2013 until 2016. This behavior can be explained by the projects that RR got involved in this past year, namely, to boost domestic oil production in Abu Dhabi and the contract celebrated with China to strengthen this country's energy infrastructure. What is more, during the past recent years, RR has worked in order to grow in the Civil Nuclear market.

Nonetheless, after 2016 the business seems to slow down, indicating that the sector should be reaching a steady state position.

Finally, for this sector it is expected a terminal value of £862,91 million and a value of £1.018,71 million. The DCF computed for this sector is presented in annex 15.

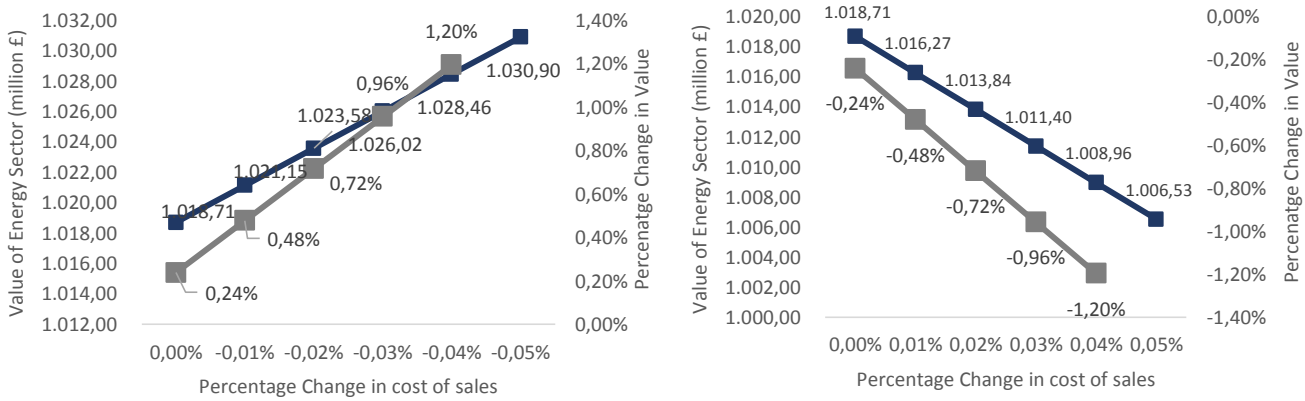
7.6.1. Energy Sector – Sensitivity analysis

Table 10 presents the sensitivity analysis for the energy sector. The value of this sector is, as observed, very sensitive to large changes in growth rate and smaller changes in WACC. On the other hand, the value of the sector also becomes very small for large changes in WACC and smaller growth rate.

Value of Energy Sector									
WACC|g	**3,00%**	**3,50%**	**3,86%**	**4,00%**	**4,50%**	**4,86%**	**5,00%**	**5,50%**	**5,86%**
6,00%	1.110,64	1.305,50	1.502,18	1.597,79	2.084,94	2.700,29	3.059,25	5.982,16	21.014,28
6,50%	954,35	1.090,94	1.221,32	1.282,16	1.569,00	1.883,83	2.047,07	3.003,21	4.616,69
6,92%	853,84	959,15	1.056,28	1.100,52	1.300,31	1.504,21	1.604,16	2.121,98	2.797,31
7,00%	837,08	937,63	1.029,84	1.071,68	1.259,36	1.448,79	1.540,88	2.010,07	2.602,74
7,50%	745,85	822,60	890,92	921,29	1.052,86	1.178,46	1.237,07	1.513,39	1.816,66
7,92%	683,52	746,06	800,64	824,57	926,03	**1.019,61**	1.062,23	1.254,72	1.451,17
8,00%	672,83	733,10	785,51	808,44	905,31	994,16	1.034,47	1.215,30	1.397,81
8,50%	613,06	661,47	702,79	720,64	794,60	860,44	889,70	1.016,49	1.137,53
8,92%	570,63	611,49	645,91	660,65	720,93	773,53	796,59	894,38	984,57

Table 10 – Source: Own calculations.

In what the cost analysis is concerned, an increase in costs of 0,5%, results in a decrease in value of 1,20%. However, a decrease in costs of the same amount, results in an increase in value of 1,20%, as can be observed in the graph below.



Graph 16 – Source: Own calculations.

7.7. Roll-Royce's Value

From the separate analysis that was conducted to each sector of business owned by RR, it was possible to value the company at an expected value of £28.836,11 million.

As it is expected that Rolls-Royce will keep the same stable capital structure, the market value of debt yielded for 2013 is expected to continue stable through the next years and at £3.096,41 million. Therefore, the equity value for this company is expected to be £25.739,70.

Since the number of shares issued has not changed abruptly historically, they are expected to be constant and equal to 1880,278076 million.

In conclusion, by using the DCF valuation method, Rolls-Royce PLC is valued at £13,69. Moreover, on 30 September 2013 (date in which this thesis sets its foundations), the market values Rolls-Royce's shares at £11,12. Consequently, according to the valuation yielded by the DCF method, the stock is undervalued, revealing a buying opportunity.

8. Multiples Valuation

As mentioned in section 2.1 of the literature review, the multiples are computed as a second stage valuation. In order to complete the valuation to RR using DCF, in this thesis the valuation using multiples is also presented.

To achieve it, the peer group that was used was the one presented in section 4.4. Therefore, the group of eight companies was used as a basis to conduct the multiples' valuation.

Information on the price to earnings ratio, enterprise value over EBITDA, enterprise value over EBIT and price over sales of this company was taken from Bloomberg. In annex 17, it is possible to observe the value of the aforementioned multiples, for each company for the years of 2012, 2013 and the forecast for 2014.

The price to earnings ratio, is computed by taking the ratio of the last price and the twelve months trailing earnings from continuous operations. The EV/EBITDA refers to the ratio between the current enterprise value and the trailing twelve months EBITDA. The EV/EBIT is also related to the trailing twelve months EBIT and finally, the P/Sales multiple is computed by taking the stock's last price over the sales per share. The multiples are computed using the same methodology across the whole peer group.

Following the line introduced in the literature review, the valuation was conducted using the harmonic mean, as suggested by Liu et al, since it yields more reasonable results regarding the performance of the company.

The valuation of RR using the multiples methodology is presented below, in table 11.

After computing the harmonic average for each year, the estimated value for RR was computed by multiplying the average group's multiple by the respective driver.

As it can be seen, and as already stated in the literature review, the forward multiple seems to yield better results when compared to the ones achieved in 2012.

Nonetheless, it is possible to observe an exception in the price to earnings ratio. Using this multiple, in 2012 the RR's stock price was, according to this methodology, of £11,61 while in 2013 it is expected that this value will be £9,88. The lower value in 2013 can be explained by the fact that from 2012 to 2013 the company's net income has decreased. This is explained by the fact that in 2012, the profit on disposal of business reached a value of £699 million. According to the RR's 2012 Financial Report, the company has engaged in the dilution of 49% of the existing shareholder of Rolls-Royce Fuel Cell Systems Inc and also RR disposed the equity, the programme share and the goodwill of International Aero Engines AG. This is the reasoning behind the better behavior of the P/E ratio on 2012.

	Peer Harmonic Average	2012 Value	Price Per Share (£)
P/E	14,50	21.744,29	11,61
EV/EBITDA	8,26	11.120,62	4,43
EV/EBIT	11,60	12.639,51	5,24
P/SALES	1,16	13.943,05	5,94
PEG ratio	8,62	12.928,96	6,91
Number of Shares *(million)*		1872,297485	
	Peer Harmonic Average	**2013 Value**	**Price Per Share (£)**
P/E	17,08	18.579,38	9,88
EV/EBITDA	10,27	13.670,72	5,62
EV/EBIT	13,18	13.460,08	5,51
P/SALES	1,47	19.178,93	8,55
PEG ratio	10,15	11.047,13	5,88
Number of Shares *(million)*		1880,278076	
	Peer Harmonic Average	**2014 Value**	**Price Per Share (£)**
P/E	15,63	18.208,80	9,68
EV/EBITDA	9,38	13.904,13	5,75
EV/EBIT	11,96	13.308,63	5,43
P/SALES	1,44	19.562,80	8,76
PEG ratio	9,29	10.826,79	5,76
Number of Shares *(million)*		1880,278076	

Table 11 – Source: Bloomberg and own calculations.

Moreover, as it is possible to observe and as it is expected, the multiples valuation does not yield the same prices as the DCF one. The problem that now arises is to identify the multiple that best applies to the RR's case.

As mentioned in the literature review, the disadvantage of the price to earnings ratio is related to the fact that it is very sensitive to changes in the capital structure. Nonetheless, RR's capital structure is stable and is expected to continue stable in the future. Therefore, this does not seem to be a problem in the case that is being presented in this thesis.

Regarding the EV/EBITDA and also the EV/EBIT, according to Liu et al. (2001), the usage of the enterprise value instead of the equity value reduces the company performance. This is clearly observed in the table represented above, when these two multiples are compared against the P/E ratio and the P/SALES.

Moreover, the P/SALES multiple is, according to Liu et al. (2002), the set of multiples that performs worse and does not express profitability until expenses are taken into consideration. Therefore, this multiple will not be further considered in this valuation.

Finally, the PEG ratio was also computed. The earnings growth rate of 2012 (168,18%) were taken into consideration and they were assumed stable through the years. Despite the fact that this multiple takes into consideration the earnings' growth rate, it creates other problems that should be questioned. The first issue is related to the fact that there is not an established timeframe from which the growth rate should be accounted for. The second one implies that if the company's earnings are not expected to grow, its value will be set to zero. Moreover, this ratio should be used for companies with a small growth rate, which is not the case of RR. Therefore, this multiple will not be considered in this valuation.

Giving the reasoning presented before, the multiple that seems more reasonable to use in this valuation is the price to earnings ratio. Using the forward multiple for 2013, the company is valued at £9,88. This value is smaller when compared to the one computed by the DCF valuation (£13,69). Nonetheless, this appears to be reasonable, since multiples do not take into consideration the growth and cash flow potential of the company.

In conclusion, with this approach the company is considered to be overvalued and represents a selling opportunity.

According to Damodaran, when a case like the one that is presented in this dissertation happens (the discounted cash flow yields an undervalued stock and the multiples an overvalued one), it is an indication that the market, namely the companies used in the peer group are underpriced. This is also explained by the fact that the discounted cash flow valuation assumes that the market makes mistakes across sectors or even across the whole market, which are corrected over time. On the other hand, multiples valuation assumes that even though markets make mistakes on individual stocks," they are correct, on average".

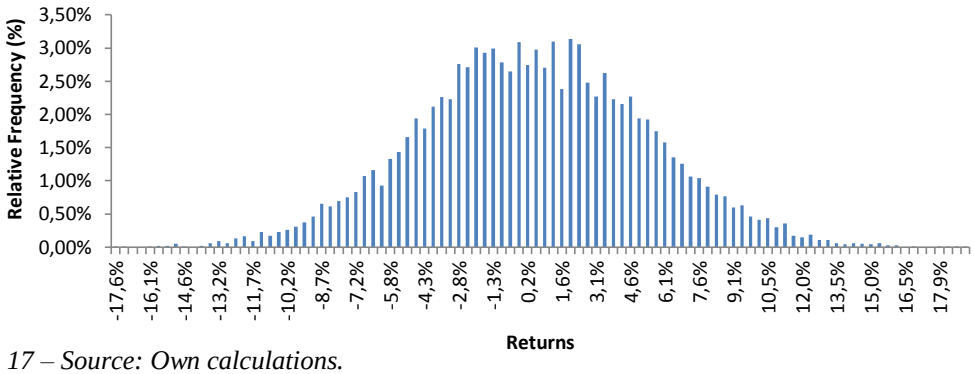
9. **The Value at Risk**

The value at risk is a recent tool for risk measure. Therefore VaR measures the potential loss of a stock or portfolio for a given confidence level. Notice that, even though this measure is more popular across financial services' companies, it has started to become widely accepted within non-financial companies and valuation analysis.

There are several ways to compute the VaR – using assumptions on returns and market risk, using variance covariance matrix and using Monte Carlo Simulations. The last one is the one that is presented in this thesis.

The data used was the weekly price returns from 2000 to 11/10/2013.

Then, because returns do not follow a normal distribution and are, as expected, skewed to the left, a normal random generator was used with the same mean and standard deviation as the sample (mean of 0,30% and standard deviation of 4,88%). The simulations were done 10.000 times. The histogram representing the distribution of returns is presented below.



Graph 17 – Source: Own calculations.

By computing the Jarque-Bera test to the simulated returns it is possible to obtain a value of 1,11 which is smaller than the critical value of a two degree freedom chi-

squared with 90% confidence (4,60). Therefore, it is not possible to reject the hypothesis that the simulated returns are not normally distributed.

The purpose of this analysis was, as mentioned before, to analyze the VaR for RR's stocks. Therefore, for a 90% confidence level, the weekly VaR is -5,97% (1000 lowest observation) and one should expect losses in excess of this value in 10% of the cases. In this case, the stock price limit would be 0,82£.

Nonetheless, a more conservative analysis can be made and for a 99% confidence level, the weekly VaR is -11,21% and so there is a 1% probability that the value of the stock will fall more than -11,21%, that is, more than 1,53£.

10. **Valuation Comparison: J.P. Morgan**

The report that is used as a comparison basis in this thesis is the one published by J.P. Morgan on 13th May 2013 by the European Equity Research team. This report presents predictions for the years between 2013 and 2016 and thus introducing estimations for a smaller period than the one that is presented in this thesis.

Furthermore, it is important to notice that this report presents a different valuation methodology than the one that is considered in this dissertation (multiples vs DCF, respectively). Moreover, the assumptions that are made are different between the two sets of analysis. This thesis builds its assumptions on the historical behavior of the main financial indicators, estimations and expectations for the sectors where RR operates and on information from the investors relations while, the report of JPM sets its roots mainly in the RR's CEO statements.

Even though there is no justification for the usage of multiples in the report, it is possible to understand that this methodology is simpler and more straight forward than the one that uses discounted cash flows, either WACC or APV.

In table 12, a summary of the main conclusions of the two valuations compared one with the other is presented.

	Thesis Valuation	**J.P. Morgan Report**
Method	DCF – WACC	Multiples
Period	2013-2018	2013-2016
Estimated price (p)	1369	1420
Reccomendation	Buy	Buy

Table 12 – Source: Own calculations and J.P. Morgan Report

One should notice that even though the multiples valuation was done in this thesis, it is not the main valuation methodology and so the comparison will be made against the price yielded from the DCF. Nonetheless, a comparison between the multiples will also be made.

10.1. Financial indicators estimations' comparison

In order to better understand the difference in prices, it is important to analyze the differences that arise in the computation of the main financial drivers.

Starting with revenues, the JPM report estimates that revenue will grow (from one year to the next) at 11,30%, on average. This rate is much larger than the one that is assumed in this thesis (8,00%), on average, of total estimated revenues, thus making the analysis in this thesis more conservative. It is possible to indicate that the revenues' estimations of JPM are 15% higher than the ones computed in this study.

Regarding costs, the JPM report considers that RR will be able to reduce its costs, a commitment made by the CEO. Nonetheless, RR did not publish any specific goals regarding this objective and so, in this thesis it was assumed that costs depend on revenues (as already explained) and so no engagement in cost saving was considered. Consequently, the EBITDA estimated by JPM is larger than the one estimated in this thesis.

Moreover, the depreciation and the amortization estimated by JPM are smaller than the ones estimated in this thesis (5% on average). There is no indication in the JPM's report regarding the assumptions behind these estimations.

Furthermore, the effective tax rate that is used is slightly different across both valuations. JPM considers a tax rate of 24,5%. Once again, the report provides no explanation on this rate.

Given the aforementioned analysis, as expected, the net income that is estimated by JPM is, on average, 29% greater than the one computed in this thesis. The main difference derives from the abnormal difference in the estimation of revenues.

Regarding the projections of changes in net working capital, even though the estimations are considerably different, both reflect the volatility that exists in net working capital and the room that still exists to improve this item.

There is also a difference in the estimated CAPEX. The one estimated by JPM is 19,50% larger than the one computed in this thesis. Since the company indicates that

CAPEX is directly related to revenues, this discrepancy should come from the difference in the estimated revenues by both reports.

In conclusion, the dissimilar computations indicated come as the main reasoning for the difference in the estimated price of about £0,51.

10.2. Multiples comparison

As referred above, the valuation of JPM was conducted using multiples analysis. To begin with, JPM does the valuation of multiples, where the average of each multiple (P/E, EV/EBITA and EV/sales) is computed for several sectors – civil, defense, Europe defense, UK defense, US defense and US civil. In this thesis, there was no sectorial analysis, since the peer group would end up being very small and thus the analysis would be more limited.

As expected, the peer group computed by JPM is very different from the one presented in this thesis – only five companies belong to both peer groups. This is the case of Meggitt PLC, Safran SA, MTU Aero Engines AG, Cobham PLC and Boeing. There is no explanation regarding the assumptions made in order to compute the peer group in the JPM report.

Since the multiples computed by JPM are estimated for several different types of groups, the comparison becomes more difficult to establish. Regarding the simple P/E for 2013, the average indicated by JPM ranges from 10,8 (US defense) to 17,6 (Americas Civil engine). The multiple introduced in this thesis is of 17,08 and thus still belonging to the predictions by JPM.

Finally, JPM indicates that it uses a target JPM defined clean P/E and P/E of 17,8 in 2014 and a target EV/EBITA, for the same period, of 14. This builds the roots for the estimated price of 1420p.

In conclusion, despite the different methodologies and prices, the recommendation provided by both parts is the same. Nonetheless, it seems that JPM has high expectations regarding the behavior of RR's financial measures and its ability to fulfill the non-specific commitment of cost saving. This reasoning may justify the high price that they establish and expect RR's stocks to reach at the end of this year.

11. Conclusion

In conclusion, this dissertation made it possible to understand that several valuation methodologies can be applied to valuate the same company. No valuation technique is

more accurate than other. The assumptions made and the type of company being valuated define the accuracy of the valuation made. Moreover, different valuations can yield to different results and interpretations. This was proved in this thesis.

In this dissertation it was possible to value Rolls-Royce at £13,69 using the DCF – WACC methodology.

This thesis highlights the position of Rolls-Royce as a stable company with a promising future ahead. The performance of the several financial measures and the ability of Rolls-Royce to explore the opportunities that arise in the sector where it is inserted, as well as its position as a market leader were analyzed in this dissertation, placing Rolls-Royce as a good investment opportunity.

12. **Annex**

Annex 1 - The peer group selection: Table 1 represents the original peer group collected from Bloomberg and also the companies presented by RR's Investors Relations. The criteria defined were to first select the twenty companies whose revenue was closest to RR's and that would belong to the same sector according to the ICB.

Ticker	Name
RR/ LN Equity	ROLLS-ROYCE HOLDINGS PLC
BA US Equity	BOEING CO/THE
PCP US Equity	PRECISION CASTPARTS CORP
TXT US Equity	TEXTRON INC
UTX US Equity	UNITED TECHNOLOGIES CORP
BEAV US Equity	B/E AEROSPACE INC
MOG/A US Equity	MOOG INC-CLASS A
BBD/B CN Equity	BOMBARDIER INC-B
BA/ LN Equity	BAE SYSTEMS PLC
COB LN Equity	COBHAM PLC
MGGT LN Equity	MEGGITT PLC
AM FP Equity	DASSAULT AVIATION SA
SAF FP Equity	SAFRAN SA
ZC FP Equity	ZODIAC AEROSPACE
EMBR3 BZ Equity	EMBRAER SA
TGI US Equity	TRIUMPH GROUP INC
000768 CH Equity	AVIC AIRCRAFT CO LTD-A
STE SP Equity	SINGAPORE TECH ENGINEERING
SAABB SS Equity	SAAB AB-B
TDY US Equity	TELEDYNE TECHNOLOGIES INC
COL US Equity	ROCKWELL COLLINS INC
QQ/ LN Equity	QINETIQ GROUP PLC
MTX GR Equity	MTU AERO ENGINES AG
SPR US Equity	SPIRIT AEROSYSTEMS HOLD-CL A
UNAC RM Equity	UNITED AIRCRAFT CORP JSC
EADS IX	EADS

Table 1 – Source: Bloomberg and Rolls-Royce's Investors Relations

Table two presents the final companies selected to the cluster analysis, as well as, the criteria defined to perform the analysis. Marked in blue are the companies that were considered to be in the same peer group as RR.

Non standardized variables						
Ticker	**Name**	**Debt/Total Assets**	**R&D/Net Sales**	**CAPEX/Sales**	**ROA**	**ROE**
RR/ LN Equity	**ROLLS-ROYCE HOLDINGS PLC**	**7,63%**	**4,84%**	**3,58%**	**3,66%**	**14,58%**
BA US Equity	BOEING CO/THE	11,71%	4,04%	2,08%	4,84%	63,08%
UTX US Equity	UNITED TECHNOLOGIES CORP	25,97%	4,11%	2,41%	7,71%	25,40%
MOG/A US Equity	MOOG INC-CLASS A	24,62%	4,71%	4,33%	4,74%	10,84%
COB LN Equity	COBHAM PLC	26,32%	4,31%	2,76%	5,80%	13,69%
MGGT LN Equity	MEGGITT PLC	19,24%	2,80%	2,21%	6,05%	12,40%
SAF FP Equity	SAFRAN SA	13,84%	4,90%	3,08%	6,42%	25,75%
STE SP Equity	SINGAPORE TECH ENGINEERING	15,93%	1,50%	3,74%	7,27%	33,12%
TDY US Equity	TELEDYNE TECHNOLOGIES INC	23,20%	17,12%	3,07%	7,65%	14,95%
MTX GR Equity	MTU AERO ENGINES AG	14,52%	3,34%	2,93%	3,08%	12,47%
EADS IX	EADS	5,19%	5,56%	5,79%	1,36%	12,75%

Table 2 – Source: Bloomberg

Annex 2 – Roll's Royce's Income Statement for 2004-2012: The table below introduces the income statement. The source of this data is provided by Bloomberg and Rolls-Royce's Financial Reports. It is important to refer that revenues include the ones yielded from the four main sectors analyzed in this study.

million (£)	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Total Revenues	**5.866,00**	**6.525,00**	**7.156,00**	**7.435,00**	**9.147,00**	**10.108,00**	**10.866,00**	**11.161,00**	**12.065,00**
Civil Aerospace (Engines)	3.040,00	3.510,00	3.775,00	3.718,00	4.502,00	4.481,00	4.919,00	5.572,00	6.437,00
Defence Aerospace (Engines)	1.374,00	1.413,00	1.569,00	1.636,00	1.686,00	2.010,00	2.123,00	2.235,00	2.417,00
Marine (Propulsion Systems & Services)	963,00	1.097,00	1.300,00	1.542,00	2.204,00	2.589,00	2.591,00	2.271,00	2.249,00
Energy (Power Systems)	489,00	505,00	512,00	539,00	755,00	1.028,00	1.233,00	1.083,00	962,00
Engine Holding								331,00	287,00
Unallocated					-65,00	-306,00	-219,00	-153,00	-48,00
Eliminate Intra-Segment Revenue								-215,00	-143,00
Financial Services	81,00	78,00							
Growth Revenues (Seq)	3,91%	11,23%	9,67%	3,90%	23,03%	10,51%	7,50%	2,71%	8,10%
- Cost of sales	**4.744,00**	**4.924,00**	**5.566,00**	**6.003,00**	**7.278,00**	**8.303,00**	**8.885,00**	**8.676,00**	**9.416,00**
Cost of sales as % revenues	80,87%	75,46%	77,78%	80,74%	79,57%	82,14%	81,77%	77,73%	78,04%
Civil	2.458,53	2.648,77	2.936,23	3.001,90	3.582,11	3.680,82	4.022,21	4.331,39	5.023,69
Defense	1.111,19	1.066,30	1.220,38	1.320,90	1.341,50	1.651,07	1.735,95	1.737,38	1.886,32
Marine	778,81	827,84	1.011,15	1.245,01	1.753,66	2.126,68	2.118,63	1.765,36	1.755,21
Energy	395,47	381,09	398,24	435,19	600,73	844,43	1.008,21	841,87	750,78
Gross Profit	**1.122,00**	**1.601,00**	**1.590,00**	**1.432,00**	**1.869,00**	**1.805,00**	**1.981,00**	**2.485,00**	**2.649,00**
Other Operating Revenue	73,00	60,00	57,00	50,00	79,00	89,00	95,00	69,00	33,00

Operating Expenses	887,00	928,00	1.002,00	1.034,00	1.102,00	1.119,00	1.258,00	1.447,00	1.578,00
Growth Operating Expenses (Seq)	0,80%	4,62%	7,97%	3,19%	6,58%	1,54%	12,42%	15,02%	9,05%
Commercial & Administartive Costs	599,00	646,00	632,00	653,00	699,00	740,00	836,00	984,00	989,00
Research and Development Costs	288,00	282,00	370,00	381,00	403,00	379,00	422,00	463,00	589,00
R&D as % Revenues	4,91%	4,32%	5,17%	5,12%	4,41%	3,75%	3,88%	4,15%	4,88%
Share of results of joint ventures & associates	19,00	46,00	47,00	66,00	74,00	93,00	93,00	116,00	173,00
Operating profit (loss)	**327,00**	**779,00**	**692,00**	**514,00**	**920,00**	**868,00**	**911,00**	**1.223,00**	**1.277,00**
Profit on disposal of business	9,00	-2,00	1,00	-2,00	7,00	-2,00	4,00	3,00	699,00
Profit Before Finance Costs	**336,00**	**777,00**	**693,00**	**512,00**	**927,00**	**866,00**	**915,00**	**1.226,00**	**1.976,00**
Finance Income	372,00	566,00	1.196,00	762,00	435,00	2.276,00	453,00	456,00	1.112,00
Finance Costs	-425,00	-837,00	-498,00	-496,00	-3.186,00	-491,00	-884,00	-540,00	-479,00
Net Financing	**-53,00**	**-271,00**	**698,00**	**266,00**	**-2.751,00**	**1.785,00**	**431,00**	**84,00**	**633,00**
Profit before taxation	**283,00**	**506,00**	**1.391,00**	**778,00**	**-1.824,00**	**2.651,00**	**484,00**	**1.142,00**	**2.609,00**
- Income Tax Expense (Taxation)	336,00	777,00	693,00	512,00	927,00	866,00	915,00	1.226,00	1.976,00
Profit For the year	**372,00**	**566,00**	**1.196,00**	**762,00**	**435,00**	**2.276,00**	**453,00**	**456,00**	**1.112,00**
									1.566,00

Annex 3– Rolls Royce's Income Statement for 2013-2014: The table below introduces the income statement for the explicit period. The assumptions behind these calculations were explained in this study.

million (£)	FY2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Total Revenues	**13.089,37**	**14.122,89**	**15.201,08**	**16.351,06**	**17.592,56**	**18.933,02**
Civil Aerospace (Engines)	7.055,34	7.702,99	8.385,45	9.119,43	9.917,66	10.785,76
Defence Aerospace (Engines)	2.603,53	2.793,55	2.988,65	3.194,25	3.413,99	3.648,85
Marine (Propulsion Systems & Services)	2.419,48	2.592,75	2.770,29	2.957,10	3.156,49	3.369,33
Energy (Power Systems)	1.011,02	1.033,60	1.056,69	1.080,28	1.104,41	1.129,08
Engine Holding	309,00	309,00	309,00	309,00	309,00	309,00
Unallocated	51,80	51,80	51,80	51,80	51,80	51,80
Eliminate Intra-Segment Revenue	-179,00	-179,00	-179,00	-179,00	-179,00	-179,00
Growth Revenues (Seq)	8,49%	7,90%	7,63%	7,57%	7,59%	7,62%
- Cost of sales	**10.385,90**	**11.205,96**	**12.061,46**	**12.973,93**	**13.959,00**	**15.022,61**
Cost of sales as % revenues	79,35%	79,35%	79,35%	79,35%	79,35%	79,35%
Civil	5.598,14	6.112,02	6.653,52	7.235,91	7.869,28	8.558,08
Defense	2.065,80	2.216,57	2.371,38	2.534,51	2.708,87	2.895,22
Marine	1.919,76	2.057,25	2.198,12	2.346,34	2.504,55	2.673,44
Energy	802,21	820,12	838,44	857,16	876,31	895,88
Gross Profit	**2.703,47**	**2.916,93**	**3.139,62**	**3.377,14**	**3.633,55**	**3.910,41**
Other Operating Revenue	28,64	30,91	33,26	35,78	38,50	41,43
Operating Expenses	1.710,87	1.835,12	1.967,20	2.108,96	2.261,89	2.426,93
Growth Operating Revenues(Seq)	8,42%	7,26%	7,20%	7,21%	7,25%	7,30%
Commercial & Administartive Costs	1.056,40	1.128,98	1.207,15	1.291,40	1.382,26	1.480,28
Research and Development Costs	654,47	706,14	760,05	817,55	879,63	946,65
R&D as % Revenues	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%
Share of results of joint ventures & associates	111,55	120,36	129,55	139,35	149,93	161,35
Operating profit (loss)	**1.132,79**	**1.233,08**	**1.335,23**	**1.443,31**	**1.560,10**	**1.686,27**
Profit on disposal of business	2,25	2,25	2,25	2,25	2,25	2,25
Profit Before Finance Costs	**1.135,04**	**1.235,33**	**1.337,48**	**1.445,56**	**1.562,35**	**1.688,52**
Finance Income	847,56	847,56	847,56	847,56	847,56	847,56
Finance Costs	566,89	566,89	566,89	454,91	454,91	454,91
Net Financing	**280,66**	**280,66**	**280,66**	**392,64**	**392,64**	**392,64**
Profit before taxation	**1.415,71**	**1.515,99**	**1.618,15**	**1.838,20**	**1.954,99**	**2.081,16**
- Income Tax Expense (Taxation)	327,84	351,06	374,72	425,68	452,72	481,94
Profit For the year	**1.087,87**	**1.164,93**	**1.243,43**	**1.412,53**	**1.502,27**	**1.599,22**

Annex 4 – Effective Tax Rate

There is no information regarding the prospects for effective tax rate. Therefore, the explicit period tax rate is computed using a simple average from 2013 to 2006. The table below illustrates the historical effective tax rate that was provided by RR's Financial Reports.

	2014-18	2013	2012	2011	2010	2009	2008	2007	2006
Effective tax Rate	23,16%	23,57%	15,16%	23,26%	22,65%	25,03%	28,91%	18,14%	28,54%

Annex 5 – Inflation Rate and GDP growth Rate

The table below presents the CPI and GDP growth rate (both real and nominal) for the year of 2013 and the later explicit period.

The CPI rate was taken from the Economic and Fiscal Outlook (March 2013) from the Office for Budget Responsibility (UK). Furthermore, the world's real GDP growth rate was taken from The Economist Intelligence Unit. Finally, the nominal GDP was computed as follows:

$$Nominal\ GDP\ groth\ rate = (1 + inflation) * (1 + real\ GDP\ growth\ rate)$$

	2013	2014	2015	2016	2017	2018
Real GDP growth	2,00%	2,70%	2,80%	2,80%	2,80%	2,80%
CPI	2,80%	2,40%	2,10%	2,00%	2,00%	2,00%
Nominal GDP Growth	4,86%	5,16%	4,96%	4,86%	4,86%	4,86%

Annex 6 – The cost of sales. Source: Own calculations and RR's Financial Reports.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average 04-12
cost of sales	**4744**	**4924**	**5566**	**6003**	**7278**	**8303**	**8885**	**8676**	**9416**	
Civil	2.458,53	2.648,77	2.936,23	3.001,90	3.582,11	3.680,82	4.022,21	4.331,39	5.023,69	
% revenue	80,87%	75,46%	77,78%	80,74%	79,57%	82,14%	81,77%	77,73%	78,04%	79,35%
Defense	1.111,19	1.066,30	1.220,38	1.320,90	1.341,50	1.651,07	1.735,95	1.737,38	1.886,32	
% revenue	80,87%	75,46%	77,78%	80,74%	79,57%	82,14%	81,77%	77,73%	78,04%	79,35%
Marine	778,81	827,84	1.011,15	1.245,01	1.753,66	2.126,68	2.118,63	1.765,36	1.755,21	
% revenue	80,87%	75,46%	77,78%	80,74%	79,57%	82,14%	81,77%	77,73%	78,04%	79,35%
Energy	395,47	381,09	398,24	435,19	600,73	844,43	1.008,21	841,87	750,78	
% revenue	80,87%	75,46%	77,78%	80,74%	79,57%	82,14%	81,77%	77,73%	78,04%	79,35%

Cost of sales	2013	2014	2015	2016	2017	2018
Civil	5598,14	6112,02	6653,52	7235,91	7869,28	8558,08
Defense	2065,80	2216,57	2371,38	2534,51	2708,87	2895,22
Marine	1919,76	2057,25	2198,12	2346,34	2504,55	2673,44
Energy	802,21	820,12	838,44	857,16	876,31	895,88

Annex 7 –Commercial Costs

In table 3, it is possible to observe the number of employees, allocated for each sector.

millions	2005	2006	2007	2008	2009	2010	2011	2012	CAGR
Total	**35,6**	**37,3**	**38,6**	**39,00**	**38,5**	**38,9**	**40,5**	**41,8**	
Civil	20,4	21,8	22,8	22,7	19,8	19,5	19,8	21,5	**0,66%**
Defense	5,1	5,4	5,6	5,7	7,1	6,9	7,6	7,8	**5,45%**
Marine	7,2	7,4	7,7	8,1	8,3	9	8,6	8,8	**2,54%**
Energy	2,8	2,7	2,5	2,5	3,3	3,5	4,5	3,7	**3,55%**

Table 3 – Source: Rolls-Royce's Financial Report

Since there is no indication regarding the estimation of the number of employees, these were estimated using the CAGR.

Millions of employees	2013	2014	2015	2016	2017	2018
Civil	21,64	21,78	21,93	22,07	22,22	22,36
Defense	8,23	8,67	9,15	9,65	10,17	10,73
Marine	9,02	9,25	9,49	9,73	9,98	10,23
Energy	3,83	3,97	4,11	4,25	4,40	4,56
Total Employees	**42,72**	**43,68**	**44,67**	**45,70**	**46,77**	**47,88**

Table 4 – Source own calculations

Millions £	2004	2005	2006	2007	2008	2009	2010	2011	2012	CAGR
Operating Expenses	**887**	**928**	**1002**	**1034**	**1102**	**1119**	**1258**	**1447**	**1578**	6,61%
Commercial & Administartive Costs	599	646	632	653	699	740	836	984	989	5,73%
CCA/Operating Expenses	68%	70%	63%	63%	63%	66%	66%	68%	63%	
CCA per employee			16,94	16,92	17,92	19,22	21,49	24,30	23,66	
Civil			369,37	385,71	406,85	380,57	419,07	481,07	508,70	4,68%
Defense			91,50	94,74	102,16	136,47	148,29	184,65	184,55	10,54%
Marine			125,38	130,26	145,18	159,53	193,42	208,95	208,21	7,51%
Energy			45,75	42,29	44,81	63,43	75,22	109,33	87,54	9,71%
Research and Development Costs	288	282	370	381	403	379	422	463	589	
	32,47%	30,39%	36,93%	36,85%	36,57%	33,87%	33,55%	32,00%	37,33%	
R&D as % Revenues	4,91%	4,32%	5,17%	5,12%	4,41%	3,75%	3,88%	4,15%	4,88%	

Table 5 – Source: Own calculations and Rolls-Royce's Financial Report. Commercial and Administrative costs allocated by sector, depending on the number of employees of each sector.

millions £	2013	2014	2015	2016	2017	2018
Operating Expenses						
Commercial & Administartive Costs	**1.056,40**	**1.128,98**	**1.207,15**	**1.291,40**	**1.382,26**	**1.480,28**
Civil	532,49	557,41	583,48	610,78	639,35	669,26
Defense	204,01	225,51	249,29	275,57	304,63	336,74
Marine	223,86	240,68	258,76	278,21	299,11	321,59
Energy	96,05	105,38	115,62	126,85	139,17	152,69
Research and Development Costs	**654,47**	**706,14**	**760,05**	**817,55**	**879,63**	**946,65**
Civil	352,77	385,15	419,27	455,97	495,88	539,29
Defense	130,18	139,68	149,43	159,71	170,70	182,44
Marine	120,97	129,64	138,51	147,85	157,82	168,47
Energy	50,55	51,68	52,83	54,01	55,22	56,45
R&D as % Revenues	5%	5%	5%	5%	5%	5%

Table 6 – Source: Own calculation. Commercial and Administrative costs by sector are computed using the CAGR. R&D cost are computed as 5% of each sector revenues.

Annex 8 –Joint Ventures

	2004	2005	2006	2007	2008	2009	2010	2011	2012
gross profit	1122	1601	1590	1432	1869	1805	1981	2485	2649
Share of results of joint ventures & associates	19	46	47	66	74	93	93	116	173
(%) gross profit	1,69%	2,87%	2,96%	4,61%	3,96%	5,15%	4,69%	4,67%	6,53%
average (%) gross profit	4,13%								

	2013	2014	2015	2016	2017	2018
gross profit	2.703,47	2.916,93	3.139,62	3.377,14	3.633,55	3.910,41
Share of results of joint ventures & associates	111,55	120,36	129,55	139,35	149,93	161,35

Table 7 – Source: Rolls-Royce's Financial Report and Own Calculations. The forecasted share results of joint ventures are estimated as an average percentage of gross profit.

gross profit (million £)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Civil	861,23	838,77	716,10	919,89	800,18	896,79	1240,61	1413,31	1457,20	1590,97	1731,92	1883,52	2048,39	2227,68
		52,75%	50,01%	49,22%	44,33%	45,27%	49,92%	53,35%	54%	55%	55%	56%	56%	57%
Defense		348,62	315,10	344,50	358,93	387,05	497,62	530,68	537,73	576,98	617,27	659,74	705,12	753,63
		22%	22%	18%	20%	20%	20%	20%	20%	20%	20%	20%	19%	19%
Marine		288,85	296,99	450,34	462,32	472,37	505,64	493,79	499,72	535,50	572,17	610,76	651,94	695,90
		18%	21%	24%	26%	24%	20%	19%	18%	18%	18%	18%	18%	18%
Energy		113,76	103,81	154,27	183,57	224,79	241,13	211,22	208,82	213,48	218,25	223,12	228,10	233,20
		7%	7%	8%	10%	11%	10%	8%	8%	7%	7%	7%	6%	6%

Table 8 – Source: Rolls-Royce's Financial Report and Own calculation. The table above presents the percentage of gross profit each sector has on total gross profit.

million £	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Civil			24,79	33,00	36,42	41,23	42,10	57,91	92,30	60,13	65,65	71,46	77,72	84,52	91,92
Defense			10,31	14,52	13,64	18,49	18,17	23,23	34,66	22,19	23,81	25,47	27,22	29,10	31,10
Marine			8,54	13,69	17,83	23,82	22,18	23,60	32,25	20,62	22,10	23,61	25,20	26,90	28,71
Energy			3,36	4,78	6,11	9,46	10,55	11,26	13,79	8,62	8,81	9,01	9,21	9,41	9,62
Total									173,00	111,55	120,36	129,55	139,35	149,93	161,35

Table 9 – Source: Own calculations. Share Results of joint ventures are allocated to each sector according to the percentage their gross profit has on total gross profit.

Annex 9 – Property, Plant and Equipment, Depreciation & Amortization

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Disposal of PPE	55,00	47,00	68,00	82,00	38,00	31,00	30,00	37,98	46,23	55,03	64,40	74,37	85,00	
Net capex	243,00	257,00	218,00	176,00	316,00	381,00	405,00	413,92	441,35	469,77	500,11	533,00	568,65	
Total PPE	**1.328,40**	**1.480,75**	**1.482,86**	**1.538,08**	**1.665,59**	**1.817,38**	**1.904,42**	**2.318,35**	**2.759,70**	**3.229,47**	**3.729,58**	**4.262,57**	**4.831,22**	Average PPE/Total PPE
Civil	857,42	954,36	938,88	956,30	1.025,04	1.169,93	1.228,99	1.464,18	1.742,92	2.039,61	2.355,46	2.692,08	3.051,21	63,16%
Defense	149,30	156,95	135,70	151,89	178,82	189,77	202,97	241,75	287,78	336,76	388,91	444,49	503,79	10,43%
Marine	220,40	267,86	303,38	299,88	310,14	288,00	291,43	401,46	477,89	559,24	645,84	738,14	836,61	17,32%
Energy	101,27	101,57	104,90	130,01	151,58	169,69	181,03	210,95	251,11	293,85	339,36	387,86	439,60	9,10%
Disposal PPE/Total PPE	3,5%	4,6%	5,5%	2,5%	1,9%	1,7%	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	
Depreciation	**161,00**	**170,00**	**208,00**	**194,00**	**237,00**	**241,00**	**256,00**	**310,34**	**369,42**	**432,31**	**499,26**	**570,60**	**646,73**	Average
D&A/PPE	12,1%	11,5%	14,0%	12,6%	14,2%	13,3%	13,4%	13,4%	13,4%	13,4%	13,4%	13,4%	13,4%	13,4%
Civil	101,68	107,37	131,36	122,52	149,68	152,21	161,68	196,00	233,31	273,03	315,31	360,37	408,45	63,16%
Defense	16,79	17,73	21,69	20,23	24,71	25,13	26,70	32,36	38,52	45,08	52,06	59,50	67,44	10,43%
Marine	27,88	29,44	36,02	33,59	41,04	41,73	44,33	53,74	63,97	74,86	86,46	98,81	111,99	17,32%
Energy	14,65	15,47	18,93	17,65	21,57	21,93	23,29	28,24	33,61	39,34	45,43	51,92	58,85	9,10%

Annex 10 – Working capital

million £	2004	2005	2006	2007	2008	2009	2010	2011	2012
Inventory	1090	1309	1447	2203	2600	2432	2429	2561	2726
Civil	564,88	704,15	763,33	1101,65	1279,68	1078,14	1099,60	1278,55	1454,39
DCI	***58***	***67***	***66***	***92***	***90***	***74***	***69***	***74***	***73***
Defense	255,31	283,47	317,26	484,75	479,24	483,61	474,58	512,84	546,10
DCI	***58***	***67***	***66***	***92***	***90***	***74***	***69***	***74***	***73***
Marine	178,94	220,07	262,87	456,90	626,48	622,92	579,20	521,10	508,15
DCI	***58***	***67***	***66***	***92***	***90***	***74***	***69***	***74***	***73***
Energy	90,86	101,31	103,53	159,71	214,61	247,34	275,63	248,50	217,36
DCI	***58***	***67***	***66***	***92***	***90***	***74***	***69***	***74***	***73***
Accounts Receivable	2049	2047	2465	2585	3929	3948	3943	4009	4119
Civil	1061,88	1101,14	1300,36	1292,67	1933,79	1750,20	1784,98	2001,45	2197,60
DSO	***88***	***79***	***87***	***88***	***108***	***98***	***91***	***91***	***86***
Defense	479,94	443,28	540,47	568,80	724,20	785,07	770,38	802,81	825,17
DSO	***88***	***79***	***87***	***88***	***108***	***98***	***91***	***91***	***86***
Marine	336,38	344,15	447,81	536,12	946,71	1011,22	940,21	815,74	767,81
DSO	***88***	***79***	***87***	***88***	***108***	***98***	***91***	***91***	***86***
Energy	170,81	158,43	176,37	187,40	324,30	401,52	447,42	389,01	328,43
DSO	***88***	***79***	***87***	***88***	***108***	***98***	***91***	***91***	***86***
Accounts Payable	3245	3518	3844	4736	5900	5628	6160	6236	6387
Civil	1681,69	1892,44	2027,82	2368,32	2903,88	2494,96	2788,61	3113,25	3407,64
DPO	***172***	***180***	***174***	***199***	***204***	***171***	***175***	***181***	***171***
Defense	760,08	761,83	842,82	1042,11	1087,50	1119,14	1203,54	1248,76	1279,52
DPO	***172***	***180***	***174***	***199***	***204***	***171***	***175***	***181***	***171***
Marine	532,72	591,46	698,32	982,23	1421,62	1441,52	1468,85	1268,88	1190,58
DPO	***172***	***180***	***174***	***199***	***204***	***171***	***175***	***181***	***171***
Energy	270,51	272,27	275,03	343,34	486,99	572,38	699,00	605,11	509,27
DPO	***172***	***180***	***174***	***199***	***204***	***171***	***175***	***181***	***171***

Table 10 – Source: RR's Financial Report.

DCI Average	**73**
DSO Average	**92**
DPO Average	**174**
Operating Cycle	**164**
Cash Conversion Cycle	**-10**

Table 11 – Source: Own calculations. Average of DCI, DSO and DPO for 2009-2012

Million £	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Inventory	**2988**	**3224**	**3471**	**3733**	**4017**	**4323**
Civil	1611	1759	1915	2082	2264	2463
Defense	594	638	682	729	779	833
Marine	552	592	632	675	721	769
Energy	231	236	241	247	252	258
Accounts Receivable	**4758**	**5134**	**5526**	**5944**	**6395**	**6882**
Civil	2565	2800	3048	3315	3605	3921
Defense	946	1015	1086	1161	1241	1326
Marine	880	943	1007	1075	1147	1225
Energy	368	376	384	393	401	410
Accounts Payable	**7188**	**7755**	**8347**	**8979**	**9660**	**10396**
Civil	3874	4230	4605	5008	5446	5923
Defense	1430	1534	1641	1754	1875	2004
Marine	1329	1424	1521	1624	1733	1850
Energy	555	568	580	593	606	620

Table 12 – Source: Own calculations.

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Working Capital	**-219**	**-337**	**-179**	**-129**	**454**	**398**	**-220**	**216**	**353**	**301,50**	**325,30**	**350,14**	**376,63**	**405,22**	**436,10**
Civil	-113	-181	-94	-65	223	176	-100	108	188	162,51	177,43	193,15	210,06	228,44	248,44
Defense	-51	-73	-39	-28	84	79	-43	43	71	59,97	64,35	68,84	73,58	78,64	84,05
Marine	-36	-57	-33	-27	109	102	-52	44	66	55,73	59,72	63,81	68,11	72,71	77,61
Energy	-18	-26	-13	-9	37	40	-25	21	28	23,29	23,81	24,34	24,88	25,44	26,01
Change WC		-118	158	50	583	-56	-618	436	137	-52	24	25	26	29	31

Table 13 – Source Calculation.

Annex 11– Provisions

million £	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Total	**-173,0**	**-138,0**	**-146,0**	**-121,0**	**-100,0**	**-99,0**	**-544,0**	**-502,0**	**-461,0**	**-475,8**	**-541,2**	**-581,3**	**-625,0**	**-672,7**	**-724,1**
Civil	-89,7	-74,2	-77,0	-60,5	-49,2	-43,9	-246,3	-250,6	-246,0	-252,3	-275,5	-299,9	-326,1	-354,7	-385,7
Δ		15,4	-2,8	16,5	11,3	5,3	-202,4	-4,4	4,7	-6,4	-23,2	-24,4	-26,2	-28,5	-31,0
Defense	-40,5	-29,9	-32,0	-26,6	-18,4	-19,7	-106,3	-100,5	-92,4	-93,1	-99,9	-106,9	-114,2	-122,1	-130,5
Δ		10,6	-2,1	5,4	8,2	-1,3	-86,6	5,8	8,2	-0,8	-6,8	-7,0	-7,4	-7,9	-8,4
Marine	-28,4	-23,2	-26,5	-25,1	-24,1	-25,4	-129,7	-102,1	-85,9	-86,5	-92,7	-99,1	-105,8	-112,9	-120,5
Δ		5,2	-3,3	1,4	1,0	-1,3	-104,4	27,6	16,2	-0,6	-6,2	-6,3	-6,7	-7,1	-7,6
Energy	-14,4	-10,7	-10,4	-8,8	-8,3	-10,1	-61,7	-48,7	-36,8	-36,2	-37,0	-37,8	-38,6	-39,5	-40,4
Δ		3,7	0,2	1,7	0,5	-1,8	-51,7	13,0	12,0	0,6	-0,8	-0,8	-0,8	-0,9	-0,9

Annex 12– DCF Valuation: Civil Sector

million £	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenues	3040	3510	3775	3718	4502	4481	4919	5572	6437	7055	7703	8385	9119	9918	10786
-cost of sales	2459	2649	2936	3002	3582	3681	4022	4331	5024	5598	6112	6654	7236	7869	8558
- operating costs	460	499	558	572	632	605	665	760	831	885	943	1003	1067	1135	1209
Commercial and Administrative Expenses	0	0	369	386	407	381	419	481	509	532	557	583	611	639	669
R&D	0	0	189	186	225	224	246	279	322	353	385	419	456	496	539
+ other operating revenue	73	60	57	50	79	89	95	69	33	29	31	33	36	38	41
+ Amortization and Depreciation			102	107	131	123	150	152	162	196	233	273	315	360	408
Operational EBITDA			439	302	498	407	476	702	777	797	913	1035	1168	1312	1469
EBITDA margin			12%	8%	11%	9%	10%	13%	12%	11%	12%	12%	13%	13%	14%
-Amortization and Depreciation			102	107	131	123	150	152	162	196	233	273	315	360	408
Operational EBIT			338	194	367	285	327	550	616	601	679	762	853	952	1061
effective tax rate			28,54%	18,14%	28,91%	25,03%	22,65%	23,26%	15,16%	23,16%	23,16%	23,16%	23,16%	23,16%	23,16%
-taxes			96,37	35,29	106,09	71,21	74,01	127,90	93,33	139	157	177	197	220	246
+Amortization and Depreciation			102	107	131	123	150	152	162	196	233	273	315	360	408
+ Δ provisions			-2,78	16,51	11,29	5,33	-202,38	-4,35	4,66	-6,35	-23,16	-24,41	-26,25	-28,55	-31,04
Cash Flow from Operations			340,18	283,07	403,51	341,20	200,06	569,89	688,78	651,2	732,2	834,5	944,2	1063,1	1192,4
-Capex			157,20	152,02	140,76	114,37	160,25	205,69	232,08	243,58	265,94	289,50	314,84	342,40	372,37
Working Capital			-94	-65	223	176	-100	108	188	163	177	193	210	228	248
- Δ Working Capital			87	30	288	-47	-276	207	80	-26	15	16	17	18	20
Free Cash Flow Operations			96,12	101,13	-25,22	273,84	315,83	156,78	376,19	433,40	451,30	529,28	612,44	702,31	800,00
									NPV		**418**	**454**	**487**	**518**	**547**
													Terminal Value		**18.707,61**
													NPV		**21.131,80**

Annex 13– DCF Valuation: Defense Sector

million £	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenues	1374	1413	1569	1636	1686	2010	2123	2235	2417	2604	2794	2989	3194	3414	3649
-cost of sales	1111	1066	1220	1321	1342	1651	1736	1737	1886	2066	2217	2371	2535	2709	2895
- operating costs	208	201	170	177	186	237	254	296	305	334	365	399	435	475	519
Commercial and Administrative Ex	0	0	91	95	102	136	148	185	185	204	226	249	276	305	337
R&D	0	0	78	82	84	101	106	112	121	130	140	149	160	171	182
+ other operating revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Amortization and Depreciation	36	32	17	18	22	20	25	25	27	32	39	45	52	60	67
Operational EBITDA			195	156	180	142	157	226	252	236	250	264	277	289	302
EBITDA margin			12%	10%	11%	7%	7%	10%	10%	9%	9%	9%	9%	8%	8%
-Amortization and Depreciation	36	32	17	18	22	20	25	25	27	32	39	45	52	60	67
Operational EBIT			179	139	158	122	133	201	225	204	212	219	224	230	234
Effective tax rate			28,54%	18,14%	28,91%	25,03%	22,65%	23,26%	15,16%	23,16%	23,16%	23,16%	23,16%	23,16%	23,16%
-taxes			50,99	25,14	45,69	30,52	30,04	46,80	34,15	47	49	51	52	53	54
+Amortization and Depreciation	36	32	17	18	22	20	25	25	27	32	39	45	52	60	67
+ Δ provisions			-2,13	5,39	8,19	-1,25	-86,60	5,76	8,17	-0,75	-6,80	-6,98	-7,35	-7,86	-8,40
Cash Flow from Operations			142,34	136,53	142,23	110,42	40,69	185,31	226,00	188,02	194,47	206,04	217,18	228,23	239,20
-Capex	40,99	50,89	65,34	66,89	52,72	51,30	69,16	82,50	87,14	89,89	96,45	103,18	110,28	117,87	125,97
Working Capital	-51	-73	-39	-28	84	79	-43	43	71	59,97	64,35	68,84	73,58	78,64	84,05
- Δ Working Capital		-22	34	11	112	-5	-122	86	27	-10,75	4,38	4,49	4,74	5,06	5,41
Free Cash Flow Operations			43,3	58,8	-22,6	63,7	93,7	16,6	111,4	108,88	93,65	98,37	102,17	105,30	107,81
									NPV		**86,78**	**84,46**	**81,29**	**77,63**	**73,65**
													Terminal Value		**2.521,12**
													NPV		**2.924,92**

Annex 14– DCF Valuation: Marine Sector

million £	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenues	963	1097	1300	1542	2204	2589	2591	2271	2249	2419	2593	2770	2957	3156	3369
-cost of sales	779	828	1011	1245	1754	2127	2119	1765	1755	1920	2057	2198	2346	2505	2673
- operating costs	0	0	190	207	255	289	323	322	321	345	370	397	426	457	490
Commercial and Administrative Expenses	0	0	125	130	145	160	193	209	208	224	241	259	278	299	322
R&D	0	0	65	77	110	129	130	114	112	121	130	139	148	158	168
+ other operating revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Amortization and Depreciation	34	19	28	29	36	34	41	42	44	54	64	75	86	99	112
Operational EBITDA			126	119	231	207	190	225	217	209	229	250	271	294	318
EBITDA margin			10%	8%	10%	8%	7%	10%	10%	9%	9%	9%	9%	9%	9%
-Amortization and Depreciation	34	19	28	29	36	34	41	42	44	54	64	75	86	99	112
Operational EBIT			98	90	195	173	149	183	173	155	165	175	185	195	206
effective tax rate			28,54%	18,14%	29%	25,03%	22,65%	23,26%	15,16%	23,16%	23,16%	23,16%	23,16%	23,16%	23,16%
-taxes			28,10	16,26	56,37	43,38	33,84	42,59	26,24	36	38	41	43	45	48
+Amortization and Depreciation	34	19	28	29	36	34	41	42	44	54	64	75	86	99	112
+ Δ provisions			-3,32	1,43	1,00	-1,26	-104,36	27,57	16,21	-0,59	-6,20	-6,35	-6,68	-7,13	-7,61
Cash Flow from Operations			94,92	104,23	175,62	162,29	52,24	209,85	207,43	172,17	184,71	202,91	221,70	241,53	262,56
-Capex	28,73	39,51	54,14	63,05	68,91	66,08	84,41	83,83	81,09	83,53	89,51	95,64	102,09	108,98	116,32
Working Capital	-36	-57	-33	-27	109	102	-52	44	66	55,73	59,72	63,81	68,11	72,71	77,61
- Δ Working Capital		-21	24	6	136	-7	-154	96	22	-10,07	3,99	4,09	4,30	4,59	4,90
Free Cash Flow Operations			16,64	35,42	-29,44	103,66	122,23	29,61	104,49	98,71	91,21	103,18	115,31	127,96	141,33
										NPV	**84,52**	**88,59**	**91,74**	**94,33**	**96,55**
														Terminal Value	**3.304,95**
														NPV	**3.760,68**

Annex 15– DCF Valuation: Energy Sector

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenues	489	505	512	539	755	1028	1233	1083	962	1011	1034	1057	1080	1104	1129
-cost of sales	395	381	398	435	601	844	1008	842	751	802	820	838	857	876	896
- operating costs	-	-	71	69	83	115	137	163	136	147	157	168	181	194	209
Commercial and Administrative E›	0	0	46	42	45	63	75	109	88	96	105	116	127	139	153
R&D	0	0	26	27	38	51	62	54	48	51	52	53	54	55	56
+ other operating revenue	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0
+ Amortization and Depreciation	24	9	15	15	19	18	22	22	23	28	34	39	45	52	59
Operational EBITDA			57	50	91	86	109	100	99	90	90	89	88	86	83
EBITDA margin			11%	9%	12%	8%	9%	9%	10%	9%	9%	8%	8%	8%	7%
-Amortization and Depreciation	24	9	15	15	19	18	22	22	23	28	34	39	45	52	59
Operational EBIT			42	35	72	69	88	78	76	62	56	50	42	34	24
effective tax rate			28,54%	18,14%	29%	25,03%	22,65%	23,26%	15,16%	23,16%	23,16%	23,16%	23,16%	23,16%	23,16%
-taxes			12,11	6,27	20,73	17,20	19,91	18,06	11,45	14	13	12	10	8	6
+Amortization and Depreciation	24	9	15	15	19	18	22	22	23	28	34	39	45	52	59
+ Δ provisions			0,234	1,674	0,518	-1,814	-51,661	13,018	11,953	0,60	-0,81	-0,83	-0,84	-0,86	-0,88
Cash Flow from Operations			45,19	45,44	70,42	67,38	37,91	94,54	99,37	76,65	76,16	76,78	77,06	76,96	76,45
-Capex	14,59	18,19	21,32	22,04	23,61	26,24	40,17	39,98	34,68	34,90	35,68	36,48	37,30	38,13	38,98
Working Capital	-18	-26	-13	-9	37	40	-25	21	28	23,29	23,81	24,34	24,88	25,44	26,01
- Δ Working Capital		-8	13	3	47	3	-65	46	7	-4,86	0,52	0,53	0,54	0,56	0,57
Free Cash Flow Operations			10,60	19,95	-0,01	38,13	63,18	8,63	57,50	46,60	39,96	39,76	39,22	38,28	36,90
										NPV	**37,03**	**34,14**	**31,20**	**28,22**	**25,21**
														Terminal Value	**862,91**
														NPV	**1.018,71**

Annex 16– Total Valuation

million £	2014	2015	2016	2017	2018	TV	Total NPV
Civil	418	454	487	518	547	18.707,61	21.131,80
Defense	86,78	84,46	81,29	77,63	73,65	2.521,12	2.924,92
Maritime	84,52	88,59	91,74	94,33	96,55	3.304,95	3.760,68
Energy	37,03	34,14	31,20	28,22	25,21	862,91	1.018,71
Total Value for the year	**626,50**	**661,65**	**691,50**	**717,96**	**741,92**	**25.396,59**	**28.836,11**

Annex 17 – Peer group Multiples

Source: Bloomberg	2012					2013					2014				
	P/E	**EV/EBITDA**	**EV/EBIT**	**P/SALES**	**P/BOOK**	**P/E**	**EV/EBITDA**	**EV/EBIT**	**P/SALES**	**P/BOOK**	**P/E**	**EV/EBITDA**	**EV/EBIT**	**P/SALES**	**P/BOOK**
BOEING CO/THE	14,8	6,62	8,53	0,7	9,71	21,06	11,28	14,38	1,21	12,74	18,67	10,07	12,71	1,12	9,74
UNITED TECHNOLOGIES CORP	15,1	10,31	12,36	1,27	2,91	17,77	10,91	12,69	1,59	3,39	15,96	9,92	11,45	1,52	3,1
COBHAM PLC	13,7	6,83	10,08	1,36	2,42	12,75	8,89	12,35	1,62	2,67	12,75	8,68	12,41	1,61	2,54
MEGGITT PLC	12,3	7,41	10,81	1,86	1,58	13,95	10,01	11,78	2,45	1,91	12,82	9,26	10,86	2,33	1,77
SAFRAN SA	10,4	7,37	11,53	0,99	2,24	17,87	8,54	11,38	1,31	2,83	15,56	7,56	9,92	1,22	2,55
SINGAPORE TECH ENGINEERING	20,4	14,28	17,23	1,84	6,21	21,04	14,72	17,72	1,9	6,3	19,52	13,69	16,69	1,8	6
TELEDYNE TECHNOLOGIES INC	14,6	9,08	12	1,1	2,06	19,17	11,79	15,73	1,43		17,77	10,37	13,31	1,36	
MTU AERO ENGINES AG	20,1	8,14	13,93	1,03	3,2	16,98	8,57	11,78	1,01	2,94	14,84	7,83	10,6	0,94	2,62
Maximum	20,4	14,28	17,23	1,86	9,71	21,06	14,72	17,72	2,45	12,74	19,52	13,69	16,69	2,33	9,74
Minimum	10,4	6,62	8,53	0,7	1,58	12,75	8,54	11,38	1,01	1,91	12,75	7,56	9,92	0,94	1,77
Harmonic Mean	14,50	8,26	11,60	1,16	2,76	17,08	10,27	13,18	1,47	3,30	15,63	9,38	11,96	1,39	3,01
Median	14,70	7,78	11,77	1,19	2,67	17,82	10,46	12,52	1,51	2,94	15,76	9,59	11,93	1,44	2,62
Simple Mean	15,16	8,76	12,06	1,27	3,79	17,57	10,59	13,48	1,57	4,68	15,99	9,67	12,24	1,49	4,05

13. **Acronyms List**

ACT – Advance Corporation Taxation

APV – Adjusted Present Value

CAGR – Compounded Annual Growth Rate

CAPEX – Capital Expenditure

CPI – Consumer Price Index

D – Debt

D&A – Depreciation and Amortization

DCF – Discounted Cash Flow

DDM – Dividend Discount Model

DPS – Dividend per Share

DSI – Days Sales to Inventory

DSO – Days Sales Outstanding

DPO – Days Payable Outstanding

EV – Enterprise Value

EBITDA – Earnings Before Interest, Taxes, Depreciation and Amortization

EBITA – Earnings Before Interest, Taxes and Amortization

FCFF – Free Cash Flow to the Firm

FCFE – Free Cash Flow to the Equity

G – Growth Rate

GDP – Gross Domestic Product

JPM – J.P. Morgan

MRP – Market Risk Premium

NWC – Net Working Capital

P/E- Price to Earnings

PPE – Property, Plant and Equipment

Rd – Cost of Debt

Rf – Risk Free Rate

Re – Return on Equity

Rm – Return of the Market

RR – Rolls-Royce PLC

TV – Terminal Value

T- Taxes

VaR – Value at Risk

WACC- Weighted Average Cost of Capital

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