# Principles of Finance Report:

## WACC Estimation

B712482 & F019736

## Word Count:

1,483

# Cost of Debt and Corporate Tax Estimation

**Note: Refer to Appendix 1 for definitions of all symbols. All data used in the estimation of WACC was obtained from the latest Financial Statements on Eikon.**

The first step in calculating the cost of debt, is identifying the total debt of Company A through the Balance Sheet. This equates to £143.3 million for the latest financial year. To determine how $R_d$ is calculated, the structure of the company's debt needs to be examined. If the company issues bonds, the yields need to be accounted for whereas with loans, the interest payments need to be accounted for.

In the case of Company A, the debt structure is exclusively loans which means $R_d$ is found by dividing the interest paid by the total debt accrued by the company:

$$R_d = \frac{Interest\ expenses}{Total\ Debt} \tag{1}$$

The calculated $R_d$ is 2.99%.

The effective corporate tax rate of Company A also needs to be estimated. This can be done by dividing the year's tax expenses by the company's earnings before interest and tax (EBIT):

$$T_c = \frac{Tax\ expenses}{EBIT} \tag{2}$$

$T_c$ was estimated to be 22.64%. This was calculated using the total current tax expense found in the Income Statement. It includes deferred tax since the current tax is calculated based on earnings for this financial year. The amount of deferred tax does not influence the taxation rate, it only influences how much tax will be paid by Company A at the end of this year.

# WACC Estimation

The Weighted Average Cost of Capital (WACC) is vital to evaluating the profitability and viability of a new project. It is the discount rate used when calculating the Net Present Value (NPV), which is ultimately used to decide whether a project should be chosen.

To estimate the WACC, the equation below was used:

$$R_p = (1 - G)R_e + GR_d(1 - T_c) \tag{3}$$

The first step for the calculation of WACC is the evaluation of the gearing ratio of Company A:

$$G = \frac{D}{(D + E)} \tag{4}$$

Using Eikon, the total debt was evaluated at £143.9 million, while the total equity was given to be £508.8 million (both values were obtained from the Balance Sheet for 2020). $G$ is calculated as 22.05%.

The cost of equity of Company A also needs to be evaluated using the Capital Asset Pricing Model (CAPM) equation:

$$R_e = R_f + \beta_e(R_m - R_f) \tag{5}$$

$R_f$ is assumed to 1.1%, while the $(R_m - R_f)$ is determined as 5.8%. The $\beta_e$ for Company A is unknown, since there is no data on a project like this, which was taken on by Company A. It needs to be calculated using information taken from Company B (the comparison company), which is established in this sector. The evaluation of $\beta_e$ is achieved by using the equation below:

$$\beta_e = \frac{(1 - G^*)\beta_e^*}{(1 - G)} \tag{6}$$

Equation 6 can be used only if $G$ and $G^*$ are similar. If this holds true, then the assumption can be made that the beta of debt for both companies is equal to zero. This assumption allows for the use of equation 6.

$$\beta_d \approx \beta_d^* \approx 0 \tag{7}$$

Using equation 4, $G^*$ was estimated at 26.56%, as the value for total debt was £607.5 million and total equity was £1,680 million. This means that the assumption is valid, since gearing for both companies is similar. $\beta_e^*$ was taken directly from Eikon, which was calculated using monthly data for the past 5 years. This value was given as 1.37 on 10/12/2020. Therefore, using equation 6, $\beta_e$ was calculated as 1.29.

Now that $\beta_e$ has been obtained, $R_e$ can be evaluated. By using equation 5, it was computed to be 8.59%.

Since all variables for equation 3 have been determined, the WACC can be evaluated. The value for the WACC is estimated as 7.20%.

The above calculations are only estimations of each value. This suggests that there are multiple sources of error.

As mentioned in the first section, the method of calculation for the cost of debt is dependent on the debt structure of the company. For this reason, since Company A's debt comprises loans only, equation 1 needs to be used. Compared to data available, the value is close to the arithmetic mean of all costs of debts calculated for the previous 3 years (only 0.22% higher). This suggests that there is a possibility that the cost of debt estimation has a satisfactory degree of accuracy.

There is variation in the corporation tax paid year on year, most likely due to tax deductible items. The value of these items is likely to change each year, hence the amount deducted from Company A's earnings is different each year. Despite the 2020 value giving the lowest tax rate out of the Balance Sheet values, it is the closest to the benchmark value for corporate tax stated on the UK government website. The corporation tax rate in the UK is 19%[1].

Both companies' gearing ratios are another source of possible error within the estimation of WACC. Company A's gearing ratio is less than 1% different from the arithmetic mean of the gearing ratios calculated for all years from 2017 to 2020. This suggests that Company A's

gearing is likely estimated to a good degree of accuracy. The gearing for Company B, on the other hand, is the lowest value compared to previous years.

Lastly, the beta of equity for Company B likely contains the highest degree of inaccuracy. The accuracy of estimation for $\beta_e^*$ heavily depends on the time period, over which it was calculated and the frequency of the collection of data. The $\beta_e^*$ taken directly from Eikon is calculated over a 5-year period, with information taken monthly. The accuracy of estimation for Company B's beta of equity would most certainly increase if either the time period or the frequency of data was to increase.

## Sensitivity Analysis

The role of sensitivity analysis in capital budgeting is to prepare for circumstances in which the devised calculations and estimates are deemed unreliable. By using Company B as a benchmark to calculate the required WACC, Company A creates a realistic model for their purposes of project valuation. However, as Company B has been established in the field of food manufacturing for over 45 years, they have a much more efficient process of reducing overhead costs, variable costs, and fixed costs on their production. To base the entire WACC off their current financials would create a certain margin for error. In order to prepare for this uncertainty, the sensitivity analysis provides an in-depth look at input variables that would influence the overall WACC.

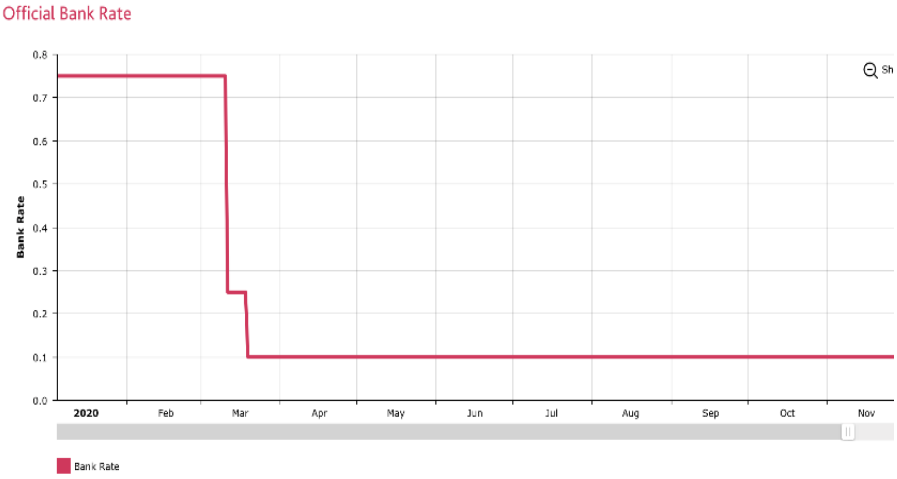


Figure 1: Official Bank Rate over the year 2020

The biggest impact on the WACC is the capital structure taken on to finance the project of Company A. Although the tax benefits of debt financing are attractive, the uncontrollable residual impacts of Brexit and COVID could lead to unpredictable outcomes. The Bank of England has currently agreed to hold the rate at .10% (until the next addendum) when just recently interest rates had dropped from .75% to .25%[2] in March[3] due to the bearish impact of COVID. To account for the 8-year maturity of the project and the unpredictable trend in interest rates, an upper bound was set for the WACC from changes in the cost of debt as a contingency. The values for the cost of debt were compared to the industry average (food wholesale) which was roughly 3.3%.[4] By inputting numbers in small increments along this range, we found that a realistic upper bound for the WACC is 8.74%.

Table 1: WACC estimation using various values for Cost of Debt

| | Cost of Debt Input | WACC |
|---|---|---|
| **Min:** | 1% | 6.87% |
| **Industry average** | 3.27% | 7.25% |
| **Calculated** | 2.99% | 7.21% |
| **Increment 1** | 5% | 7.55% |
| **Increment 2** | 10% | 8.40% |
| **Max** | 12% | 8.74% |

As seen in the figure below, using a range of equity premiums caused the overall WACC to vary by nearly 10%. In a study conducted by KPMG[5], analysts suggested using a market premium of 6.75%[6] as investors would require a higher return over the risk-free rate to hold stock in the current financial environment. By inputting incremented[7] values along this range[8], we found that equity premium impacts not only the cost of equity but the overall WACC very significantly. This calculation was used to set the lower bound of the WACC at 5.52%.

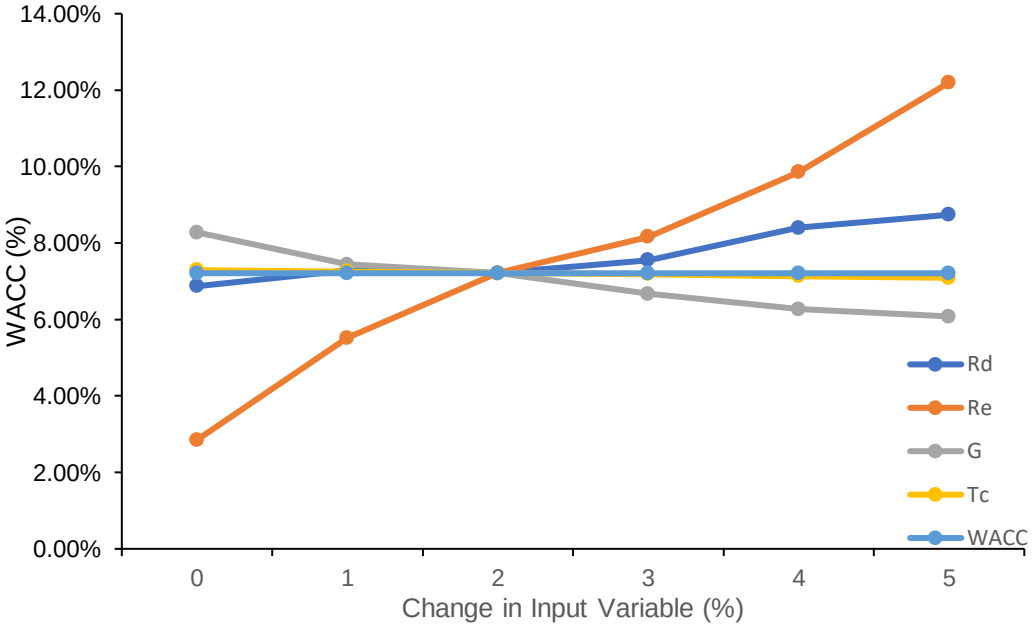


Figure 2: Standard deviation of the WACC based on changes in the input variables

Table 2: WACC estimation using various values for Cost of Equity

| | Cost of Equity Input | WACC |
|---|---|---|
| **Min:** | 3% | 2.85% |
| **Industry average** | 6.43% | 5.52% |
| **Calculated** | 8.59% | 7.21% |
| **KPMG value** | 9.81% | 8.16% |
| **Increment 1** | 12% | 9.86% |
| **Max** | 15% | 12.20% |

In addition, to understand the impact that changes in the gearing ratio and tax rate would have, we calculated various WACC percentages for different input levels of these variables. The

result as seen in the graph above dictates that while the corporate tax rate had insignificant impact, the gearing ratio caused impactful changes to the WACC. However, as these fluctuations weren't as volatile, Company A's WACC appeared to be less sensitive to these two factors and therefore were not used in setting upper or lower bounds for WACC estimates.

Table 3:WACC estimation using various values for Gearing ratio

| | Gearing ratio input | WACC |
|---|---|---|
| **Min** | 5% | 8.28% |
| **Increment 1** | 18.40% | 7.44% |
| **Industry average** | 30.53% | 6.67% |
| **Calculated** | 22.05% | 7.21% |
| **Increment 2** | 40% | 6.08% |
| **Max** | 37% | 6.27% |

Table 4: WACC estimation using various values for effective corporate tax rate

| | Tc Input | WACC |
|---|---|---|
| **Min** | 10% | 7.29% |
| **Industry average** | 15% | 7.26% |
| **estimated** | 22.64% | 7.21% |
| **Increment 1** | 25% | 7.19% |
| **Increment 2** | 33% | 7.14% |
| **Max** | 40% | 7.09% |

From the conducted sensitivity analysis, it can be inferred that the optimal discount rate to use for this project appraisal lies between 5.52% and 8.74%. When suggesting a discount rate for the purpose of capital budgeting, the upper and lower bounds will provide a realistic range for where the cost of capital may be found. By extrapolating from historical data as well as firms already established in the field, in addition to Company B's financials, the calculated estimates and set bounds appear to be apt. In short, the calculated WACC range appears to be the most appropriate discount rate to present to management in consideration for undertaking this project.

# References


[1] HMRC, 2020, Rates and allowances for corporation tax, Available at: https://www.gov.uk/government/publications/rates-and-allowances-corporation-tax/rates-and-allowances-corporation-tax#:~:text=At%20Summer%20Budget%202015%2C%20the,year%20starting%201%20April%202020. [Accessed December 12 2020]

[2] Bank of England, 2020, Official Bank Rate history. *Bank of England*. Available at: https://www.bankofengland.co.uk/boeapps/database/Bank-Rate.asp [Accessed December 12, 2020].

[3] Aikman, I., 2020. What Brexit and COVID-19 mean for interest rates. *Which? News*. Available at: https://www.which.co.uk/news/2020/11/what-will-the-brexit-trade-deal-and-coronavirus-mean-for-interest-rates/ [Accessed December 10, 2020].

[4] Damodaran, A., Cost of Capital by Sector . *Cost of Capital Study by NYU*. Available at: http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.htm [Accessed December 11, 2020].

[5]Castedello, M. & Schöniger, S., Cost of Capital Study 2018. *KPMG*. Available at: https://assets.kpmg/content/dam/kpmg/ch/pdf/cost-of-capital-study-2018.pdf [Accessed December 12, 2020].

[6] KPMG Advisory N.V, 2020. Equity Market Risk Premium Research Summary. *KPMG*. Available at: https://assets.kpmg/content/dam/kpmg/nl/pdf/2020/services/equitiy-market-risk-premium-research-summary-march-2020.pdf [Accessed December 9, 2020].

[7] Fenebris.com, F.M., 2020. GB - Market Risk Premia. Available at: http://www.market-risk-premia.com/gb.html [Accessed December 8, 2020].

[8] Norrestad, P.by F. & 23, N., 2020. Average market risk premium the United Kingdom 2011-2020. *Statista*. Available at: https://www.statista.com/statistics/664833/average-market-risk-premium-united-kingdom/ [Accessed December 12, 2020].

# Appendices

Appendix 1: Nomenclature:

Table 5: Nomenclature table explaining each symbol with all units

| Symbol | Definition | Units |
|---|---|---|
| $D$ | Total Debt | £ millions |
| $E$ | Total Equity | £ millions |
| $G$ | Gearing ratio for company A | % |
| $G^*$ | Gearing ratio for company B | % |
| $R_d$ | Cost of debt | % |
| $R_e$ | Cost of equity | % |
| $R_f$ | Risk-free rate | % |
| $(R_m - R_f)$ | Equity premium | % |
| $R_p$ | Weighted Average Cost of Capital | % |
| $T_c$ | Effective Corporate Tax Rate | % |
| $\beta_d$ | Beta of debt for company A | - |
| $\beta_d^*$ | Beta of debt for company B | - |
| $\beta_e$ | Beta of equity for company A | - |
| $\beta_e^*$ | Beta of equity for company B | - |

Appendix 2: Sample Calculations:

Cost of Debt:

$$R_d = \frac{Interest\ expenses}{Total\ Debt} = \frac{4.3}{143.9} = 2.99\%$$

Effective Corporate Tax Rate:

$$T_c = \frac{Tax\ expenses}{EBIT} = \frac{12.7}{56.1} = 22.64\%$$

Gearing:

$$G = \frac{D}{(D+E)} = \frac{143.9}{(143.9 + 508.8)} = 22.05\%$$

Beta of Equity:

$$\beta_e = \frac{(1-G^*)\beta_e^*}{(1-G)} = \frac{(1-26.56\%) \times 1.37}{(1-22.05\%)} = 1.29$$

Cost of Equity:

$$R_e = R_f + \beta_e(R_m - R_f) = 1.1\% + 1.29 \times 5.8\% = 8.59\%$$

WACC:

$$R_p = (1-G)R_e + GR_d(1-T_c) = (1-22.05\%) \times 8.59\% + 22.05\% \times 2.99\% \times (1-22.64\%)$$
$$= 7.20\%$$

Appendix 3: Graphs:

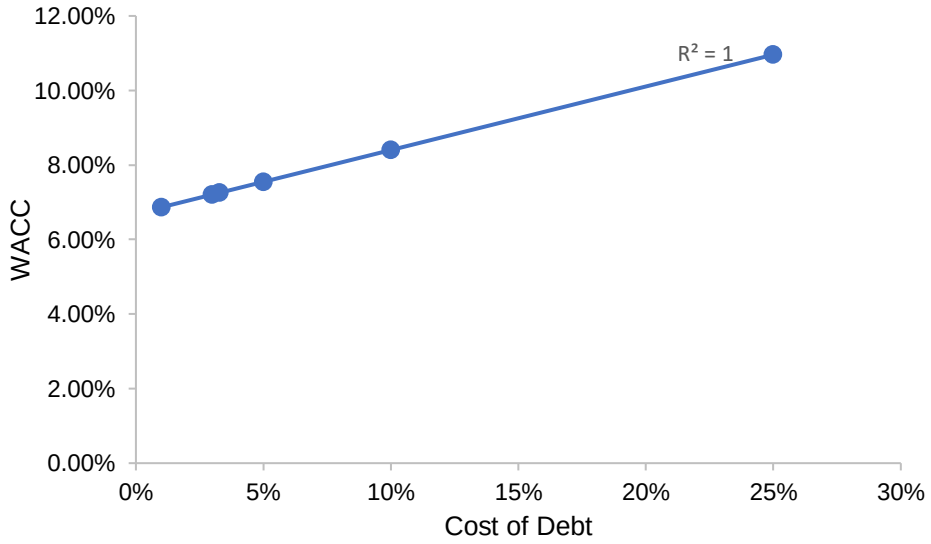


Figure 3: Cost of Debt and WACC appear highly correlated

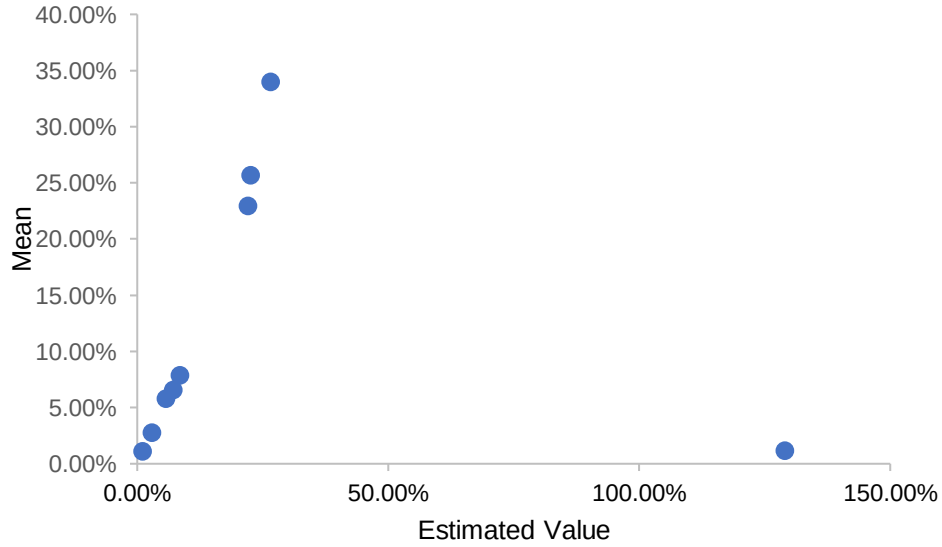


Figure 4: Mean appears highly determined by Estimated Value

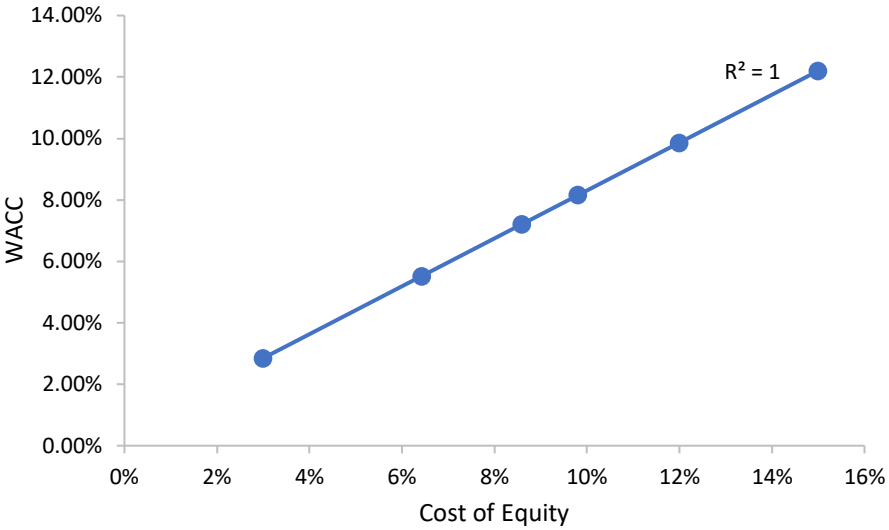

Figure 5: Cost of Equity and WACC appear highly correlated