Introduction to Finance
FIN-401

Working results of case study

Marriott Corporation: The Cost of Capital

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1) Overall weighted average cost of capital for the Marriott Corporation?

Part a

In order to calculate the cost of equity of Marriott Corporation, we need to figure out the weighted average of three divisions of Marriott: Lodging, Contract Services and Restaurants.

Firstly, as for the risk-free rate r_f for these divisions, we selected the 30-year US government interest rate as the risk-free rate of lodging, $r_f^L = 8.95\%$. And the 1-year US government interest rate as the risk-free rate of Restaurant and Contract Services, $r_f^R = r_f^S = 6.90\%$. The reason is that the former usually tends to have a rather longer project lifespan while the latter two are much shorter.

Secondly, we weight the divisions by their corresponding share of identifiable assets (Exhi.2). We obtain following table then calculate the risk free rate of Marriott Corporation assuming risk-free rate in every division is constant therefore we can use the weighted average of every division's risk-free rate as the risk-free rate of the whole corporation:

	Hotel	Restaurant	Contract Service
weight w	60.61%	12.39%	27.01%

$$r_f^M = w^L r_f^L + w^R r_f^R + w^S r_f^S = 8.14\%$$

Furthermore, to calculate the risk premium, we choose the arithmetic average of S&P500 Composite Stock Index returns in 1926 - 1987 as the return of the market r_m which is 12.01% (Exhi.4). Therefore the market risk premium of each division is calculated as:

$$r_{pre}^L = r_m - r_f^L = 12.01\% - 8.95\% = 3.06\%$$
$$r_{pre}^R = r_m - r_f^R = 12.01\% - 6.90\% = 5.11\%$$
$$r_{pre}^S = r_m - r_f^S = 12.01\% - 6.90\% = 5.11\%$$

Lastly, we calculate the weighted market risk premium of Marriot Corporation as $r_{pre}^M = 3.87\%$.

Part b

We calculate Marriott's cost of debt by adding corresponding debt rate premium above government which is 1.30% (tabl. A) to its risk free rate:

$$r_D^M = r_f^M + 1.30\% = 9.44\%$$

Part c

We know that the weighted average cost of capital (WACC) is calculated as:

$$r_{wacc} = \frac{D \times (1 - \tau_c)}{D + E}\, r_D + \frac{E}{D + E}\, r_E \tag{1}$$

for computing r_{wacc}^M for Marriott, now the unknown variables are τ_c and r_E^M, given the cost of debt from *Part b* and leverage. We use income taxes and income before income taxes in Exhi.1 of the year

1987 to calculate $\tau_c = 0.4409$.

For convenience, we list following formulas frequently involved in calculations in following contents of the report, hence we will only reference formula identifier for conciseness:

$$leverage = \frac{D}{D+E} \tag{2}$$

$$\beta_A = \frac{1}{1+\frac{D}{E}(1-\tau_c)}\ \beta_E \tag{3}$$

$$r_E = r_f + \beta_E\ r_{pre} \tag{4}$$

Equation (2) is applied to determine $\frac{D}{E}$. Equation (3) is utilized to unleverage/releverage β and we assume that $\beta_D = 0$. In equation (4), r_f is the risk free rate and r_{pre} is the market risk premium. They are calculated and listed in *Part a* for every division as well as Marriott as a whole.

From Exhi.3 we know that the market leverage is 41% and equity β_E^M is 1.11 for Marriott, hence we utilize (2)(3) to calculate the unleveraged β_A^M. Next we use the obtained β_A^M and the target debt ratio which is 60% (tabl. A) to compute the releveraged β_E^M via using (2)(3) again. We then calculate r_E^M followed by calculating r_{wacc}^M. Following table summaries our results:

	β_A^M	target $\frac{D}{E}$	β_E^M	r_E^M	r_{wacc}^M
Marriott	0.7994	1.5000	1.4698	0.1382	0.0870

Table 1: Calculating summary of Marriott as a whole

Hence the overall weighted average cost of capital for the Marriott Corporation is 8.700%.

2) Single corporate hurdle rate?

Intuitively using one single corporate hurdle rate, i.e. 8.700%, is a bad choice for this corporation. We illustrate this observation through a figure and we need to borrow calculation results from Question 3) and 4) then we have $r_{wacc}^M = 8.700\%$, $r_{wacc}^L = 7.61\%$, $r_{wacc}^R = 9.90\%$ and $r_{wacc}^S = 13.04\%$. We then can draw following figure:

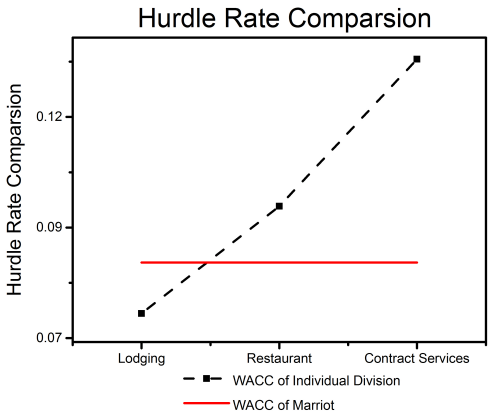

Figure 1: Hurdle rate of divisions and Marriott

We can observe that using the single corporate hurdle rate only can give wrong decision in undertaking

projects. For example, for restaurant and contract service, we may accept projects that the division-vised hurdle rate will actually reject. And for lodging, we may reject some positive NPV projects if use corporate hurdle rate only. This is bad for development of the corporation. Hence, for projects involves one division, we should use corresponding hurdle rate. If all divisions involved, we should use the overall hurdle rate.

3) Cost of capital for lodging and restaurant divisions?

Part a

The risk free rate for lodging is picked as the 30-years US government interest rate while 1-year US government interest rate is chosen for restaurant division. The reason for our choices is that the lodging division usually has long term business hence it is reasonable to choose the 30-years US government interest rate. But for restaurant is much shorter. Hence we choose the one year interest rate. We then choose the risk premium as the spread between risk free rate and arithmetic average of S&P500 Composite Stock Index returns in 1926 - 1987.

Part b

We use the method same to Question 1) *Part b* where we measure the cost of debt as corresponding risk free rate plus the debt rate premium above government (tabl.A) for each division. Following table summaries calculating results. The cost of debt should be different within each division as the r_f and

	Hotel	Restaurant	Contract Service	Marriott
cost of debt r_D	10.05%	8.7%	8.3%	9.44%

Table 2: cost of debt of each division and Marriott

debt rate premium for each division is different. We believe this may come from the specific financial traits among the three different divisions .

Part c

We utilize provided information on comparable hotels and restaurants in Exhi.3 to measure the beta of lodging and restaurant division of Marriott respectively. We do following procedures:

- For each comparable company, using (2)(3) to get corresponding unleveraged beta β_A^C.
- We compute an weighted unleveraged beta, where the weight is proportional to the revenue of each comparable company (we assume the importance of a comparable company is weighted by its revenue corresponds to all revenues in one division).
- We compute the releveraged beta via calling (3).
- Calculate corresponding r_{wacc}.

Following table summaries our calculations and the cost of capital for the lodging and restaurant divisions is 7.61% and 9.90% respectively[1].

[1]You may want to refer to `github.com/FINEPFL/Intro-Finance-FIN-401/blob/master/ps/introcase2.py` for our computing script

	Hotel	Restaurant
target $\frac{D}{E}$	2.8462	0.7241
releveraged β_E	1.4127	1.3000
cost of equity r_E	13.2646%	13.5430%
r_{wacc}	7.61%	9.90%

Table 3: beta and r_{wacc} of lodging and restaurant

4) What is the cost of capital for Marriott's contract services division?

First of all, we make one more assumption that:

- The beta of whole company is the average weight three divisions' beta

Since we have already obtained the cost of capital of the whole corporation, lodging division and restaurant division, we can easily acquire cost of capital for contract division. Firstly, we have to determine the equity cost of the division. However, the publicly traded comparable companies are not available, we cannot get the market weights of Contract Service division. Based on the assumption we make before, that beta of Marriot equals to the average weight of three divisions' beta, we can get the following equation:

$$\beta^M = w^L\beta^L + w^R\beta^R + w^S\beta^S$$

$$\Rightarrow \beta^S = 1/w^S(\beta^M - w^L\beta^L + w^R\beta^R)$$

Thus, we can get the unlevered beta of contract division of contract services division is $\beta^S = 1.676$. Besides, since the market-value target-leverage debt percentage in capital is 40% (tabl. A), the target debt to equity ratio of contract services division is $\frac{D}{E} = \frac{2}{3}$. Therefore, by using (3), its beta of equity $\beta_E^S = 2.3$ Then, according to (4), we can acquire its expected return on equity $r_E^S = 18.653\%$. Furthermore, we need its cost of debt to calculate the final r_{wacc}. To calculate r_D^S, we use the formula that:

$$r_D^S = r_f^S + 1.4\% = 8.3\%$$

where 1.4% is debt rate premium above government rate of contract services division(tabl. A). Hence, by using WACC formula that:

$$r_{wacc}^S = \frac{D}{D+E} \times r_D^S \times (1-\tau_C) + \frac{E}{D+E} \times r_E^S = 13.04\%$$

5) Appropriate hurdle rate?

If a project requires participation of all three divisions of the company, it is impossible for us to determine the hurdle rate with information available in the problem since we do not know the degree of different divisions' contribution. To be more specific, the pattern of financing (ratio of debt to equity necessary to finance the project) may affect WACC of Marriott and hence the hurdle rate, which cannot be WACC of the company. This is because WACC is U-shaped and financing of new project may affect $\frac{D}{E}$ of the company and WACC subsequently. Same logic holds for each of Marriott's divisions. Therefore, we need to introduce a new variable *Degree of Participation*, in order to figure out the debt and equity raised and how their allocations:

$$r_{wacc} = P^L r^L + P^R r^R + P^S r^S$$