The unlevered and levered CAPM betas: Real-life example of Adyen 2022

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Summary

The Capital Asset Pricing Model (CAPM) is widely used in finance to calculate the cost of equity. Despite its reliance on assumptions, the model remains prevalent. A key element in CAPM is beta, measuring systematic risk based on the covariance of a stock's return with the market return. The beta can be unlevered or levered. The unlevered beta reflects business risk, excluding the impact of debt, while the levered beta incorporates both business and financial risk.

Moreover, the article delves into the transition from the Leverage Formula to the Hamada Formula, emphasizing the influence of debt on a firm's cost of capital. The practical application of the Hamada Formula is demonstrated using the example of Adyen in 2022, with a calculated levered beta of 1.12. This beta is used in the CAPM formula to determine Adyen's 2022 cost of equity at 8.36%. This percentage reflects the return investors seek to justify the added risk of holding Adyen's stock compared to a risk-free investment.

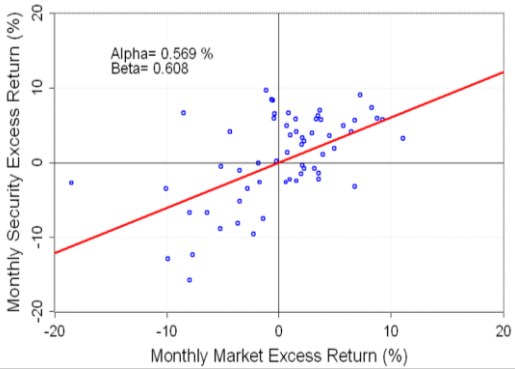
How can Amsshare support

The information provided in this article is well-known by Amsshare. Hence, Amsshare can support firms with projects within this area.

Introduction

The Capital Asset Pricing Model (CAPM) is a method that can be used for the calculation of the cost of equity. The formula is as follows: $E_{(r_i)} = r_f + \beta_i(E_0 r_m - r_f)$. Even though the CAPM formula is dependent on multiple assumptions, this method is still widely used in the field of Finance. An important component of the CAPM formula is the beta (β_i). The beta is the covariance of a stock return with the market return, so it merely measures systematic risk. The formula for the beta is: $\beta_i = \frac{cov(r_i, r_m)}{\sigma^2(r_m)}$. Figure 1 presents the beta of AT&T with respect to the total stock market.

Figure 1. AT&T vs. Total Stock Market



Source: *Tutorial: The Capital Asset Pricing Model. The Calculating Investor*. (2011).

As mentioned earlier, the linear line (the beta) merely measures the systematic risk. The idiosyncratic risk is visualized as the vertical distances between the linear line and the different dots. In this example the beta is equal to 0.61, meaning that when the total stock market increases or decreases by 1%, the AT&T stock increases or decreases by 0.61%. This positive correlation can be obtained from the graph, since the linear line (the beta) is increasing.

Unlevered and levered betas

The risk profile of a firm consists of (1) business risk and (2) finance risk. The same holds for the CAPM beta. To make a fair comparison of betas between peers, only the business risk should be incorporated in the beta. This means that merely the cash machine of a firm is incorporated in the comparison, leaving the different financial structures out of the comparison. When the beta of a firm only includes business risk, this beta is also called the 'unlevered' beta. The unlevered beta reflects the sensitivity of the company's equity returns to market movements, excluding the effects of debt. It represents the inherent risk of the company's core business operations.

Once the unlevered betas of all peers are calculated, the average of the unlevered betas can be used as benchmark. In the next step, the levered betas need to be calculated since a firm-specific CAPM beta is preferred. This means that one adds the firm-specific leverage effect to the unlevered beta in order to obtain a firm-specific levered beta. The Leverage Formula can be transformed into the Hamada Formula to perform this calculation. The next chapter will address this transformation.

Leverage Formula vs. Hamada Formula

Modigliani & Miller are two famous researchers in the literature of Finance. They came up with two propositions:

I. In a neo-classical framework, the company value is independent of the financing decision. (*Myers, 2003*).

II. In a neo-classical framework, the total cost of capital is independent of the financing decision. (*Myers, 2003*).

The second proposition resulted in the famous weighted average cost of capital (WACC) formula, which is equal to $R_E \frac{E}{E+D} + R_D \frac{D}{E+D}$. In this formula, the return on equity and return on debt are multiplied by the percentual amount of equity and debt, respectively. This results in a 'weighted average' cost of capital, the WACC. The WACC is primarily used as a discount rate in the company valuation process. In this method, the Free Cash Flows (FCF) are discounted by the WACC to determine the present value and, consequently, the valuation of the company. By mathematically changing the WACC formula, the Leverage Formula can be obtained. This formula is equal to $R_E = R_A + (R_A - R_D) * \frac{D}{E}$. The Leverage Formula shows that any attempt to substitute 'cheap' debt for 'expensive' equity fails to reduce the overall cost of capital, because it makes the remaining equity still more expensive. Just enough more expensive to keep the overall cost of capital constant (*Myers, 2003*). When D (debt) increases, the Financing Risk increases because the firm becomes more sensitive to Business Risk.

The Hamada Formula is an application of the Leverage Formula. The Hamada Formula replaces the variables with betas. The formula is as follows: $\beta_E^L = \beta_A + (\beta_A - \beta_D) * \frac{D}{E} * (1 - T)$, where β_E^L is the levered beta, β_A is the unlevered beta and β_D is the debt beta. Note that the taxes (T) are now included in the formula, so the 'no tax' assumption from the neo-classical world is relaxed.

The Hamada Formula in practice

The Hamada formula needs to be used to calculate the levered beta of a firm. The unlevered betas are already known from the second chapter. In most cases the debt beta is assumed to be zero. This means that one makes the assumption that the firm is not in distress. If one calculates the levered beta of a firm that is in distress, the debt beta is not equal to zero. Now the D and E compositions are the only unknowns in the Hamada formula. There are two options for selecting the amounts of D and E:

1. Use the current and firm-specific D/E
2. Use the average D/E of all peers

In most cases, the average D/E of all peers is used in the Hamada Formula. The reason for this is that in the long run the D/E of a firm should always result in the average of the peers. Now all variables are known and they can be inserted in the Hamada Formula to obtain the levered beta of the firm. The levered beta gives insights into the correlation between the firm and the market. Moreover, the levered beta should be inserted into the CAPM formula so the cost of equity can be determined.

Real Life Example – Adyen

Two external documents are used for this example:

1. The Annual Report 2022 of Adyen
2. KPMG Cost of Capital Study 2022

In this example, the levered beta of Adyen in 2022 will be calculated. Thereafter, the levered beta will be inserted into the CAPM formula to obtain the cost of equity of Adyen. An overview of the steps is listed below.

Steps to calculate the levered beta:

1. The unlevered beta needs to be calculated or obtained from a reliable source where this is already done
2. The debt beta needs to be determined. In most cases this is equal to zero.
3. The D/E composition of the industry needs to be calculated or obtained from a reliable source where this is already done.
4. The tax rate needs to be calculated from the Annual Report
5. The numbers need to be inserted into the Hamada Formula in order to obtain the levered beta

Steps to calculate the cost of equity:

1. The risk-free rate and market risk premium need to be calculated or obtained from a reliable source where this is already done. The levered beta is already calculated in the previous steps.
2. The numbers need to be inserted into the CAPM Formula in order to obtain the cost of equity.

Calculating the levered beta of Adyen in 2022

The formula that needs to be filled in for the levered beta is the Hamada Formula:

$$\beta_E^L = \beta_A + (\beta_A - \beta_D) * \frac{D}{E} * (1 - T)$$

The average unlevered beta (β_A) of the technology sector in 2022 was 1.06 (*KPMG Report, 2022*). In this example, the debt beta (β_D) is assumed to be zero since Adyen is not in distress. For the D/E ratio, the sector average will be used. The average debt ratio for the technology sector in 2022 was 7.2% (*KPMG Report, 2022*). This means that the average equity ratio was equal to 100% – 7.2% = 92.8%. The tax rate can be obtained from the Annual Report of Adyen. The income taxes of Adyen was equal to €155.800.000 and the income before income taxes was equal to €719.939.000. The tax rate can be calculated by dividing the income taxes (€155.800.000) by the income before income taxes (€719.939.000). This results in a tax rate of 21.64% for Adyen in 2022.

These numbers need to be inserted into the Hamada Formula:

$$\beta_E^L = 1.06 + (1.06 - 0) * \frac{0.072}{0.928} * (1 - 0.2164) = 1.12$$

The levered beta of Adyen was in 2022 equal to 1.12. This means that when the market increases or decreases by 1%, Adyen increases or decreases by 1.12%.

Calculating the cost of equity of Adyen in 2022
The cost of equity can be calculated by using the CAPM formula:

$$E_{(r_i)} = r_f + \beta_i(E_0 r_m - r_f)$$

The risk-free rate (r_f) was equal to 0.3% in 2022 (*KPMG Report, 2022*). The levered beta (β_i) is already calculated, this is equal to 1.12 for Adyen in 2022. The Market Risk Premium ($E_0 r_m - r_f$) is the excess return of the market with respect to the risk-free rate. This was equal to approximately 7.2% in 2022 (*KPMG Report, 2022*). Now the numbers can be inserted into the CAPM formula:

$$E_{(r_i)} = 0.3\% + 1.12 * 7.2\% = 8.36\%$$

According to this calculation, the cost of equity of Adyen was equal to 8.36% in 2022. This means that investors require an 8.36% return to justify the additional risk of holding this stock compared to holding a risk-free investment.

References

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