

# Ascertaining the divisional Beta for project evaluation -the Pure Play Method- a discussion

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## < EXECUTIVE SUMMARY >

◆ The determination of the cost of capital of a firm is an essential prerequisite for assessing the viability or otherwise of any project that it wishes to embark upon. However, there are certain fallacies in taking the cost of capital of the firm as the benchmark measure when the firm has many projects. The riskier projects will result in taking the firm Beta upwards and this will result in the weighted-average cost of capital getting higher. Consequently, the firm, will ultimately approve of only the riskier projects (those having the higher beta and higher return under CAPM), to the exclusion of low

risk low return project. We are likely to take erroneous decisions this way, because the average cost of capital may not always reflect the extreme cases. The better alternative would be to analyse each project separately and determine the divisional betas. By doing so, we will be able to evaluate each project separately. However, the difficulty here is that we may not be able to estimate the costs of capital of each project separately since it is difficult to get project-wise Betas. The pure play technique is a method by which the divisional Betas can be estimated with a great degree of accuracy.



While evaluating a project undertaken by a Company, the estimated rate of return there from is compared with its cost of capital. If the estimated return from the project exceeds the hurdle rate, the project is viable, otherwise not. This would be the straightforward procedure in the normal course. However, when the Company undertakes a number of different projects having different levels of risk, the appraisal becomes a little complicated.

One approach in such circumstances would be to take a composite cost of capital of the firm and accept proposals the returns from which exceed this limit. However, as demonstrated in the box alongside, this would effectively mean that we would prefer riskier projects to less riskier ones.

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Assume that a Company is considering three projects - A, B and C, having identical outlays.

A has an expected return of 24%, B 18% and C 19%.

The weighted average cost of capital of the firm is 22%. (its present Beta being 1.8). Only Project A satisfies the base criterion and will be accepted. Projects B and C will be rejected.

Further analysis reveals that Project C is almost risk less, while Project A is highly risky. Project B is of average risk.

In ascertaining the weighted average cost of capital, the CAPM approach has been taken and the weighted average Beta has been taken as the basis for ascertaining the risk premium. The respective Betas for the projects A, B and C were 3, 1 and 0.80 respectively. The market rate of return was 10% and risk free rate 4%.

### Cost of Divisional Capital

Given that Beta of Projects A, B and C are 3, 1.6 and 0.80 respectively, the risk-free rate is 4% and the market return is 14%, the required return under CAPM for the three projects are:

$$A = 4\% + (14 - 4) \times 3 = 34\%$$

$$B = 4\% + (14 - 4) \times 1.6 = 20\%$$

$$C = 4\% + (14 - 4) \times 0.80 = 12\%$$

Assuming equal weights for the on-going projects and the three projects shown above, and further assuming that the on-going projects have a Cost of Capital of 22%, the Weighted Average Cost of Capital (WACC) will work out to  $(34 + 24 + 12) / 3 = 23\%$ .

By taking the composite Beta for the Company as a whole as the criterion, we will be accepting only those projects that have a return of more than 22%.

Instead if we had assessed each project separately, we would have had different results. For instance, the cost of capital of Project A would have been 34%. Comparing this with the expected return of 24%, we would have rejected the project. Project B has a cost of capital of 20% and would have, therefore, been rejected. Project C would have a cost of capital of 12% and since it has an expected return of 19%, would have been accepted.

Project	Cost of Capital	Return	Accept/Reject
A	34%	24%	Reject
B	20%	18%	Reject
C	12%	19%	Accept

The above illustration shows the fallacy of evaluating projects on the basis of composite cost of capital. What this implies is that when the firm takes up a project which is more risky than its present level, the overall risk of the firm goes up and the shareholders will then expect a higher return commensurate with the risk and this will result in increase

The Capital Assets Pricing Model (CAPM) determines the required rate of return of a firm or a project as the sum of the risk free rate of interest and the market risk premium. In turn, the market risk premium is calculated by multiplying the difference between the market return and the risk free rate of interest with the Beta of the project. Beta is the measure taken to show the extent of systematic risk in the project. Higher the systematic risk the greater the return. Of course, unsystematic risk is not considered at all since it is capable of being diversified away. The required rate of return of a firm or project as the case may be is taken as the cost of capital.

in the cost of capital. We find that decision-making would have been much better if we had relied on the respective cost of capital. However, the important question we have to address is whether it is possible to estimate the divisional cost of capital in this way.

### Project Betas

The determination of cost of capital under the CAPM approach involves the estimation of Beta, risk-free rate and market return. Beta is generally determined by comparing the return of the firm or the project as the case may be with the market return and ascertaining the relationship. The historical Beta is the first step in the determination of the ex-ante Beta. Either the historical Beta can be accepted as the proxy for the future Beta or modifications can be made to it to conform to the future.

If we are thinking of a new Company for a single project, we will have no historical records to go by. We would then compute the Beta of companies of the same size and about the same lines of business and after making necessary adjustments to it; take it as the Beta for the firm. In case the Company has been existence for some time, first taking the historical records of this as well as other similar Companies and then by modifying the findings, we can determine Beta.

An existing Company going for a new project is confronted with a special problem. In order to appraise the project correctly, it would be required to know the cost of capital of the project in isolation. The fact that the project is a part of the Company would make it perhaps easier for it to avail certain financial facilities and probably the cost of capital will be lower that way. However, to be in the right perspective, we have to estimate the Beta and cost of capital of the project separately and take that as the yardstick for evaluation.

One way would be to pretend that the project is the only one to be pursued by a new Company. That way, we would try to compile the position in other competing Companies of similar size and take it as the basis for estimating the parameters for the project. One of the ways that this can be done is the Pure Play Method that is illustratively discussed a little later on. But before that, let us look at an illustration of the usefulness of knowing divisional cost of capital.

## An illustration

Let us assume that a Company has a Beta of 1.2. The risk-free rate of interest is 5% and the expected return on the market is 12%. The cost of capital of equity of the Company under the CAPM model would work out to 13.4% as follows:

$$5\% + (12 - 5)1.2 = 13.4\%$$

Let us also assume that the Debt-Equity ratio is 60:40 and that the cost of debt post-tax is 10%. The weighted average cost of capital would then be

$$(10 \times 60 / 100) + (13.4 \times 40 / 100) = 11.36\%$$

Now a new project is being considered for expansion of activities. That project has a Beta of 3.6 and on being taken up would require 25% of the total resources of the Company.

We can thus gather that the Beta of the Company as a whole after taking up the project would be

$$(1.2 \times 75\%) + (3.6 \times 25\%) = 1.8$$

So, the new cost of equity would be

$$5\% + (12 - 5)1.8 = 17.6\%$$

Consequently the new WACC would be

$$10 \times 60\% + 17.6 \times 40\% = 13.04\%$$

In order to meet the WACC of 13.04%, the new project must generate 18.08% as follows:

Let the return from the new project be x

$$0.75 \times 11.36 + 0.25 \times x = 13.04\%$$

Solving, we get  $x = 18.08\%$

## An alternative approach

The required return of 18.08% can also be ascertained by another method. Taking each project as a separate entity, we can arrive at their respective costs of capital. The equity component of the new project then will have a cost of  $5\% + (12 - 5)3.6 = 30.2\%$ . The weighted average cost of capital of the new project alone will thus be  $30.2 \times 40\% + 10 \times 60\% = 18.08$

This illustration shows us the importance of ascertaining divisional costs so that decision making can be carried out in the right perspective. The key factor is our ability to assess the Beta of each project separately. If we are able to do that we can assess what each project's cost is and accordingly form decision parameters.

## The Hamada formula for adjusting the Leverage factor

The Beta that we impute to a project is likely to undergo changes with the change in the capital structure of the Company. If the Company is entirely equity

based, its Beta is likely to be lower than if it undertakes a borrowing. A number of factors like default risk, bankruptcy risk and agency costs contribute to this phenomenon.

For the sake of convenience, let us call the Beta of a firm which is levered as Levered Beta and that of a firm on an all-equity structure as Unlevered Beta. Robert Hamada has brought out formulae based on the Montigliani and Miller propositions for ascertaining Levered Beta given the unlevered beta and also to find out unlevered Beta given the levered Beta.

### Beta of a Levered Firm

$BL = BU(1 + (1 - T)D/S)$ , where

BL = Beta of a levered firm

BU = Beta of an unlevered firm

T = tax rate

D = component of Debt in capital structure

S = component of Equity in capital structure

If the Beta of a firm is available and that Beta has been estimated on the premise that the firm is unlevered, we can now ascertain the Beta of the firm should it undertake some borrowing by using the formula in the box alongside.

### Beta of a Unlevered Firm

Beta of an Unlevered Firm

$BU = BL(1 + (1 - T)D/S)$ , where

BU = Beta of an unlevered firm

BL = Beta of a levered firm

T = tax rate

D = component of Debt in capital structure

S = component of Equity in capital structure

In the same way, given the Beta of a firm which is already levered, we can ascertain what its Beta would be if it chooses on all-equity structure. This also means that if the target firm has leverage different from the structure assumed in estimating the levered Beta, this can first be converted into an unlevered Beta and then re-converted into a levered Beta using the leverage parameters relevant to the firm.

### The Pure Play technique

Having been convinced that we must have divisional Betas for determining the separate costs of capital, our next step would be to devise means of determining the Beta with a fair degree of accuracy. One method that could be used for the purpose would be the Pure Play technique.

A discussion on the Pure Play technique can be found in the article by Russell J Fuller and Halbert S Kerr titled "Estimating the Divisional Cost of Capital: An analysis of the Pure Play technique" published in the Journal of finance, December 1981 (pp.997-1009). To provide empirical support for using the technique, the study takes a sample of multidivisional firms and pure plays associated with each division is examined. It is concluded in the piece that an appropriately weighted average of the Betas of the pure play firms closely approximates the beta of the multidivisional firm

As a first step, we have to identify firms that reasonably resemble the project for which the Beta is to be estimated. The stock Beta of these firms is then taken. Their respective leverage position (ratio of debt to equity) is also considered. After duly adjusting the tax factor and applying the Hamada formula, we can determine the proxy Beta of the project assuming that it is unlevered.

The procedure is illustrated below:

Suppose there are three firms P, Q and R, which closely resemble project X that is to be embarked upon. The stock Betas of the three firms are taken and found to be 2.73, 2.23 and 1.73 respectively for P, Q and R. The Ratio of Debt to Equity for the three firms averages to 0.67. The marginal tax rate is 36%.

The average stock Beta works out to 2.23. Translating these into the Hamada formula for unlevered firms we get:

$$\begin{aligned} BU &= BL / (1 + (1-T)(D/S)) \\ &= 2.23 / (1 + 0.64)(0.67) = 1.56 \end{aligned}$$

This suggests that on an all-equity basis the Beta of the project would be 1.56. Now, if the project is proposed to be financed by 50% equity and 50% debt, we

can modify the above Beta by applying the Hamada formula for Levered firms:

$$\begin{aligned} BL &= BU((I-T)D/S) \\ &= 1.56(1+0.60)(0.5/0.5) = 2.5 \end{aligned}$$

So, on a 1:1 debt equity ratio, the Beta will be 2.5.

This Beta can be used now for determining the cost of equity for the project and its weighted average cost of capital, so that a more meaningful appraisal can be had.

### CONCLUSION

It has been established with the help of empirical testing that the weighted average of the betas of the proxy firms used for the pure play technique would approximate to a great degree of accuracy to the Beta of a division. The pure play technique is only one of the techniques that could be used for the purpose. Another method would be to estimate returns on the basis of probability distributions and simulation.

The identification of firms to act as pure play proxies and the use of the Hamada formulae for converting levered Betas into unlevered betas and the other way round are the two keys to the use of the technique. With more usage, it looks quite likely that the technique will gain popularity as an important aid to project appraisal.

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