2.4.1 Practical Aspects of Investment Appraisal

Unit: Unit 1 – Treasury Strategy

Module: Module 2 – Risk and return

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Summary: This reading covers issues which arise when the complexities of corporate life become challenging for the simple CAPM approach, including cash balances, leasing, pensions, high leverage, inflation and real options. We also look at the link between ROCE and WACC

Keywords: WACC, cash pooling, concentration, quasi debt, leasing, factor method, debt equivalent, pension, real debt, nominal debt, return on equity, beta, ring fencing, project finance, inflation, nominal data, real data, deflating of costs, Fisher effect, real options, return on capital employed, economic value added

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Learning outcomes:

1. To be able to adjust WACC for cash balances, both tactical and strategic.
2. To be able to adjust WACC for quasi debt such as leasing.
3. To be aware of the issues when approaching adjustments to WACC caused by pension deficits.
4. To consider an approach to WACC calculation in projects and divisions of different risk.
5. To be able to understand issues of financing in groups such as subsidiary capital structure and ring fencing.
6. To be able to understand approaches to project evaluation in project finance structures.
7. To be able to calculate WACC on a real and nominal basis and understand when each might be applicable.
8. To be able to know when to look at cash flows on a real or nominal basis.
9. To understand basic issues around real options.
10. To be able to link ROCE to WACC.

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1 Introduction

We have already noted in 2.2.1 that the academic theory around discounting cash flows and the necessary creation of a WACC, based on the Capital Asset Pricing Model, has many simplifications, such as one interest rate, one equity premium, an accurate beta and so on and that the real world is rather more complicated and firms are increasingly global. Different countries have different interest rates and inflation rates, the equity premium will differ, the beta is a concept which doesn't translate too well into practice and firms often comprise divisions which have different business characteristics.

We have tackled the issues around the weaknesses of beta and some further complications are addressed in this reading. More will follow in a further reading. These complications are real and treasurers need to know how to tackle them.

In this reading we will look at balance sheet adjustments, such as the modern practice of carrying cash; whether different divisions or projects should use the same WACC; issues around subsidiary structures; and the important issue of exactly whose perspective we need to make appraisals from.

Inflation is also considered, as is the important subject of real options, which some would argue is how businessmen tackle real life and where real wealth is created.

2 Balance sheet adjustments to WACC

The conventional approach to the calculation of WACC allows only two components, equity and debt. This is really because the corporate finance theories were all about the justification of leverage and how to improve returns on equity. They didn't really have the luxury to consider that corporations operate in many jurisdictions, in different business lines, also carry cash, that they lease assets and that they offered pensions. The modern corporation has all these complications, and more, and so we need to consider how to tackle them for the practical purpose of making corporate finance decisions in the real world.

2.1 Cash balances and the WACC calculation

Cash is a thorny issue in the calculation of WACC. For most practical purposes, net debt, i.e. debt less cash, can be used in the WACC calculation, especially if the value of cash relative to total debt is insignificant. Thus cash is simply negative debt. This might be a simplification too far, however. Many firms choose to hold cash, and not repay debt, for several reasons:

- Holding cash for liquidity may be cheaper than using the banking sector in the form of undrawn facilities.
- Having liquidity as undrawn facilities may be impossible for credit reasons or for banking sector reasons.
- Cash can be used to back up all sorts of liquidity requirements such as letters of credit and guarantees and derivative positions (margining).
- Companies may have a war chest for acquisitions.

- Companies may hold back on capital expenditure in anticipation of future better opportunities.
- Cash may be held to fund DB pension schemes.
- Cash may be held for regulatory reasons, e.g. airlines, banks, insurers etc.
- Cash may be drawn down from one debt source in anticipation of future debt repayments which cannot be made immediately.
- Cash may be held prior to investment.
- Cash may be trapped for reasons of foreign exchange controls
- Cash may be trapped because of tax charges on any repatriation.

Since the financial crisis, more and more companies have been increasing their cash balances. At around the beginning of 2014 the non-financials in the FTSE 100 were holding around £200 billion of cash, an enormous amount.

We recall that the cost of debt is a weighted average of all the components of debt, i.e.:

$$K_d = \frac{\Sigma_1^n \times (1 - t_n) \times d_n}{\Sigma d_n}$$

Where d_n is the market value of each debt component if available, otherwise the accounting value from the latest financial statements, i_n is the rate of interest applicable to that debt component and t_n the relevant tax rate. Cash is simply one more value of d_n, albeit a negative one.

<u>Adjusting WACC for cash</u>

Assume you have calculated WACC using net debt with a borrowing cost of K_d.

So,

$$\text{WACC} = \frac{(K_e \times E) + (K_d \times (1 - t) \times D)}{E + D}$$

where D is net debt.

Now, ignoring cases where rates have been fixed, deposit rates for cash are lower than borrowing rates, so $K_c = K_d - \theta\%$. Therefore, if we gross up the net debt, we get:

$$\text{WACC} = \frac{(K_e \times E) + (K_d \times (1 - t) \times D_g) - (K_c \times (1 - t) \times C)}{E + D_g - C}$$

where C is the value of cash from the financial statements

The WACC is higher on this basis as you should expect. If the company holds cash as well as debt, it will have to earn better returns overall to compensate for the lower return it earns on its cash balances.

But is this right? Why would a firm hold cash as well as having borrowings? Surely this is inefficient? Treasurers spend a significant amount of time trying to ensure this does not happen by setting up cash pooling and cash concentration arrangements. This is part of the problem as accounting standards do not always allow the economic reality of such arrangements to be reflected in the financial statements unless there is a legal right of set-off (which is relatively common) and an intention to actually set-off (which is certainly not the case with notional pooling arrangements). This means that cash balances with banks often cannot be offset against overdrafts and have to be shown gross in the financial statements, even though they are part of a pooling arrangement, almost certainly designed to ensure that cash balances are entirely set off against overdraft balances. *So, although there may be cash shown on the balance sheet, the associated cost is the overdraft rate, not a cash deposit rate.* In such circumstances, going to the bother of separately identifying cash serves no purpose in terms of the WACC calculation.

Additionally, in some jurisdictions, the cash balance is inflated due to cash in transit, although this is becoming less of an issue as more and more payments are made electronically. However, it can still be a period end issue. For example, a cheque may be received, but too late to bank. This will be accounted for as cash with debtors correspondingly reduced. Bear in mind too that financial statements are a snap shot in time and may not be representative of the average picture throughout the period which should really concern us in project evaluation.

Of course there are circumstances where companies do hold cash and you might need to consider adjusting WACC, even if only on a temporary basis, as shown above.

Since the amounts shown for cash in the balance sheet may be grossed up and are only a snapshot, some practitioners use the interest income figure from the profit and loss account to determine the average level of cash throughout the year, although to do this, they need to estimate the interest rate applicable to cash balances. This can be a sensible approach if the interest receivable figure relates to deposits.

2.2 Quasi Debt and the WACC calculation

Quasi debt mainly refers to operating leasing[1]. While in due course, as IFRS 16 is applied, leases will be classified as debt for accounting purposes, but economically, of course, operating leasing is debt because the assets acquired in this way are usually required in the business over the life of the asset. An exception might be for really short use assets where the use is a very small proportion of the usual life of that asset.

Example 1: Aircraft operating leases

Brilliant Airlift SA operates many aircraft on profitable long haul routes. Some are owned outright but most are on operating leases. If BASA could not lease the aircraft, it would have to buy them. If it had to return the aircraft to the lessor, this would destroy the business model, so this form of finance is economically debt.

[1] Read 2.4.1a Capitalisation of operating leases by credit rating agencies.

For a number of years rating agencies have adjusted financial statements to treat operating lease obligations as another form of financing. Many analysts will take a similar approach, as will credit officers in banks. Initially both the major agencies used an NPV model of the lease obligations to calculate a debt equivalent, although Moody's now use a Factor Method, their rationale being that this more properly reflects the acquisition of the asset which still has value and might stay in use beyond its lease term.
Moody's Factor method multiplies the annual operating lease rental by a factor depending on the industry sector (5x, 6x or 8x representing the average economic life of assets) and adds this to the firm's other borrowings to arrive at a total debt figure. This is the amount which should be included in WACC using an appropriate interest rate for this type of finance. Adjustments must also be made to the interest calculation and to EBITDA or earnings. An equivalent approach can be used for Standard & Poor's NPV method.

For completeness, when using Moody's Factor method, the rental expense in the profit and loss account is reclassified as 1/3 interest expense and 2/3 depreciation.

Example 2: Operating leasing, NPV method
KMB Inc has operating leasing with the following characteristics:

Rental	USD 1 million, paid in advance
Rental period	4 years
Asset life	6 years
Assumed discount rate	8%

Ignoring complications from tax, the NPV of the lease rentals is about USD 3.58 million. The following adjustments are made to KMB's credit measurements:

Debt	Increased by USD 3.6 million
Assets	Increased by USD 3.6 million
Earnings	Increased by USD 1 million per annum, but
Depreciation	Increased by USD 0.714 million
Interest	Increased by USD 0.286 million

Note: figures illustrative only

Example 3: Operating leasing, Factor method
KMB Inc has operating leasing with the following characteristics:

Rental	USD 1 million, paid in advance
Rental period	4 years
Asset life	6 years
Assumed discount rate	8%

Ignoring complications from tax, the lease rentals are multiplied by 6 to reach an equivalent debt. This is USD 6 million. The following adjustments are made to KMB's credit measurements:

Debt	Increased by USD 6 million
Assets	Increased by USD 6 million

Earnings	Increased by USD 1 million per annum, but
Depreciation	Increased by USD 0.67 million
Interest	Increased by USD 0.33 million

Note: figures illustrative only

2.3 Pension deficits and the WACC calculation

Some practitioners also argue that the WACC should be adjusted for pension deficits. They argue that the deficit is in essence a loan. Some go even further and argue that the deficit should be further analysed into assets and liabilities and each characterised as an asset or debt. That approach increases debt even further. The jury is out on this one and we will discuss this issue again later in the MCT course.

For the time being, we will look briefly at both sides of the argument about just the deficit being categorised as debt.

2.3.1 Pension deficits as debt

We can see loan elements in the pension deficit. After all, if there is a plan to reduce the deficit, each payment will effectively increase the firm's real debts and reduce the pension deficit. Arguably there is a transfer of one debt to another. Trying to work out the cost of the deficit is a bit difficult, but the liabilities are discounted to calculate the deficit and as they get nearer payment, they increase in value, in the same way that a zero coupon bond increases in value. Many liabilities have both real and nominal interest rate characteristics, so the calculation of interest cost is not straightforward. The asset side of that is slightly more difficult to assess, however.

2.3.2 Pension deficits not classified as debt

The deficit is made up of the difference between the assets and liabilities of the scheme and so depends on many things, including particularly investment performance, the volatility of which will often dwarf the interest effect of the time value of money. The cost of the deficit cannot therefore be defined in terms of interest alone, which is a key feature of debt, then the deficit cannot be debt. The pension deficit is thus no different from any other liability.

However, rating agencies routinely adjust their own models for pension deficits, as do banks and other analysts, so the treasurer does not really have much choice here.

Perhaps of more relevance is that share prices should already reflect all disclosed information. The pension deficit will already be reflected in the company's equity value and its beta. PricewaterhouseCoopers published a paper in November 2005, Paying off Pension Fund Deficits – Impact on company behaviour, share prices and the macro-economy. They used a regression analysis with changes in beta linked with pension deficits for 245 companies in the FTSE350 with occupational pension schemes. PwC estimated that 75% of the average deficit was already factored in. The standard error was large, but they were 96% confident that the effect of pension deficits was at least half factored into share prices.

In recent weeks, the FTSE 100 has reached new heights at the same time as the pension deficits for the same companies have also scaled new heights. This contradiction deserves a newer, similar study.

2.4 Real and nominal debt

The calculations of the cost of debt have all been made so far on the basis that the debt has a nominal interest rate. This means that the rate is fixed for the life of the loan or the basis of the loan is a nominal benchmark such as LIBOR, EONIA etc. This feeds through into a nominal WACC. We look at inflation as a separate topic but here we highlight the complication where a firm issues both debt with nominal interest rates and debt offering a real return. Utilities often issue such debt and while this is beyond this syllabus, it is worth being aware of the complication when a firm has both types of debt.

The cost of equity, with a risk free component based on nominal yields, is also a nominal measure.

3 Project risk adjustments

The classic approach to discounted cash flow is to use one WACC as the hurdle rate to assess all projects. If a project achieves a positive NPV it should be accepted. Cash is shared across the firm with surpluses from one project being used to meet deficits on another. This is arguably true across legal entities and even across borders where there is no real intention of allowing loss making subsidiaries to fail or because of cross guarantee structures common in many groups; they are all supported by the group balance sheet.

3.1 Looking at project risk with beta adjustments

However, let us consider an example.

Example 4: Riskiness of projects
A firm has two alternative projects. Project A is a venture into a new market, has a return of 24% but is very risky. Project B is capex to improve a production line with a certain return of 10%. The company's WACC is 12%.

In Example 4 it is likely that the firm will select riskier projects over less risky projects as only those will pass the hurdle rate. This may not be ideal and may upset the approach to risk appetite in the firm.

However, a common view (and that generally taken throughout the MCT syllabus) is that a riskier project requires a higher beta than a riskless project in order to reflect the higher returns demanded by shareholders for taking on additional risk. The same is true of low risk projects, although these don't appear to cause as much concern.

Example 5: Adjusting beta to reflect the riskiness of projects

Fossil Inc is a utility company, generating electricity with conventional power stations but is considering participation in a nuclear generation project. Fossil's existing beta is inappropriate and so to assess the project it researches the beta of firms whose sole business is nuclear power generation and uses that beta to assess the project.

We are very familiar with a similar approach being taken by banks when lending to firms. Clearly a risky loan has to have a greater margin than a very secure loan. In the case of banks, the usual approach is to seek a suitable, but similar, return on equity from each type of loan, i.e. the test is against equity rather than against WACC.

The following example shows how a calculation could be done inside a firm using a conventional WACC approach, adjusted for risk. The main method for establishing an appropriate beta for a project is to find comparable firms or projects and use their beta as a proxy for the project beta, as in Example 5.

Example 6: Adjusting beta to reflect the riskiness of projects[2]

AKO Inc 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 observed market Beta has been taken as the basis for ascertaining the risk premium. The respective Betas for the projects A, B and C were 3, 1.6 and 0.80, following observations of firms operating exclusively in the sectors of the projects. The market rate of return was 10% and risk free rate 4%.

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) x 3	=	34%
B=	4% + (14-4) x 1.6	=	20%
C=	4% + (14-4) x 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+20+12)/3)=22%.

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

[2] If you have time, see Further Reading *2.4.1b Ascertaining the divisional Beta for project evaluation – the Pure Play Method - a discussion* from The Chartered Accountant, India, November 2002, from which Example 6 has been adapted.

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

We have looked at this problem on the basis of individual projects and their betas. However, an equally valid approach is to use a different beta for each type of business in a firm, perhaps by division. This approach still might need adjustment for different types of project and one risk of this approach is that it might not add back to the overall firm beta.

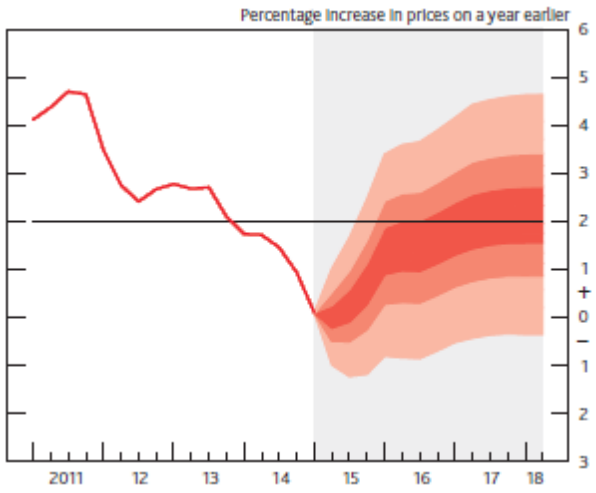
Some of this might be difficult to explain and implement, but the practically minded treasurer should know what questions to ask in investment appraisal.

3.2 Looking at project risk with scenario assessments

Using betas to assess projects (as we have described in 3.1) with different risks means that a project is described by one set of cash forecasts and then that single cash flow is discounted at a rate which reflects the riskiness of those cash flows.

However, many firms are moving to looking at the future by examining a range of outcomes. Exhibit 1 shows an example of this approach from the Bank of England and shows their forecast for CPI inflation in their quarterly report. A central forecast has wider bands added representing lower probability but more extreme outcomes. A wider set of outcomes shows more risk than a narrow set.

Exhibit 1: Inflation expectations, Bank of England



A similar approach could be taken to describing project cash flows. A classic example might be to use the volatility of a commodity to create such a chart. Alternatively, the volatility of past sales could be used to predict the distribution of cash flows in a project.

Such an approach then creates the difficulty of how to discount each of these outcomes and how then to make the investment decision.

Further reading: 2.4.1d: Making better decisions about the risks of capital projects.

4 Financing risk adjustments

There are two issues here. Firstly, is the case where the actual capital structure is different from the desired capital structure, for whatever reason. Secondly is where some projects have debt taken on specifically for them and so could be seen to have an 'individual' capital structure.

4.1 What proportions of debt and equity should be used in WACC?

The answer here is that it depends on the circumstances. Many companies, in pursuit of ratings or other reasons, target particular capital structures. At times they might have more debt than they would wish to carry and at other times they may have too little debt. The key point is that they manage their debt and equity over the medium term to keep broadly within their target range.

In such a scenario, most practitioners would weight the components of WACC using the target ratios. This makes sense as projects last for several years and over the course of the average project life, we would expect the company to achieve its targeted capital structure.

However, there are some instances, most probably as the result of an acquisition or a very large project, where a new capital structure will be targeted. In these cases, the WACC should be adjusted for this and future projects to reflect the new capital structure.

Of course, the firm may decide to target a different capital structure independently of a particular project. Again, in these circumstances, a WACC reflecting the new target should be used for future projects. Planned changes in the capital structure should be incorporated into any evaluation by using different WACCs. This is straightforward in spreadsheet models.

4.2 Should individual projects have their own capital structure?

Most firms have taken an approach to financing where cash is available freely around the group, so that cash generated in one subsidiary is freely available to all others in the group, through dividends, capitalisations and intercompany loans. Of course if different businesses operate inside one legal entity this achieves the same effect. This is the classic approach to liquidity management which uses pooling techniques and is the 'centralisation' model of modern treasury. This approach generally gives credit strength and while not always required for investment grade borrowers, the concept is often followed up in bank finance by the liberal use of upstream, downstream and cross guarantees.

In such circumstances, it does not matter how the investment for a particular project was funded. In normal circumstance projects are funded from debt draw downs and cash balances, even if it might appear that some projects are funded entirely by debt, e.g. when a specific drawing is made to fund a project. It might also be that a particular subsidiary is funded almost entirely by debt, external or inter company, to manage a particular project. These all disguise the point that the whole of the firm's capital is supporting this project.

Example 7: Debt funded subsidiaries
ACG plc manufactures parts for the aerospace industries and has identified an opportunity in Asia, where it will open a new manufacturing plant in Singapore. The capital structure of the new Singaporean subsidiary is to be low equity and high debt, subject to tax rules on thin capitalisation.

Local management prepare management account information and psychologically assume that the hurdle rate for their project is the cost of the debt finance. Local subsidiary profitability is a key measure of success for them. They produce a profit without realising that they need to meet a WACC in the project and not a cost of debt.

While many firms are so financed, that is not universally the case. Many firms operate some form of ring fencing or operate with other than close to 100% ownership of subsidiaries. In these cases, group subsidies are not possible. These situations are characterised by an inability to extract cash easily, make loans (subsidising the minority shareholders) etc.

Example 8: Ring fencing
Bronchial Gases plc operates in many different sectors, from the supply of medical gases to gases for domestic supply. The business making domestic supply is regulated (BG Reg) and part of the requirements of regulation is that this business is ring fenced from all other (riskier?) operations of BG. BG Reg raises its own finance without recourse to the rest of the group and is not permitted to make loans to the rest of the group. The only cash permitted upstream is dividends on a complicated basis of capital structure and profitability tests.

BG has to work out a way to assess projects inside BG Reg and a way to assess equity capital injections into BG Reg.

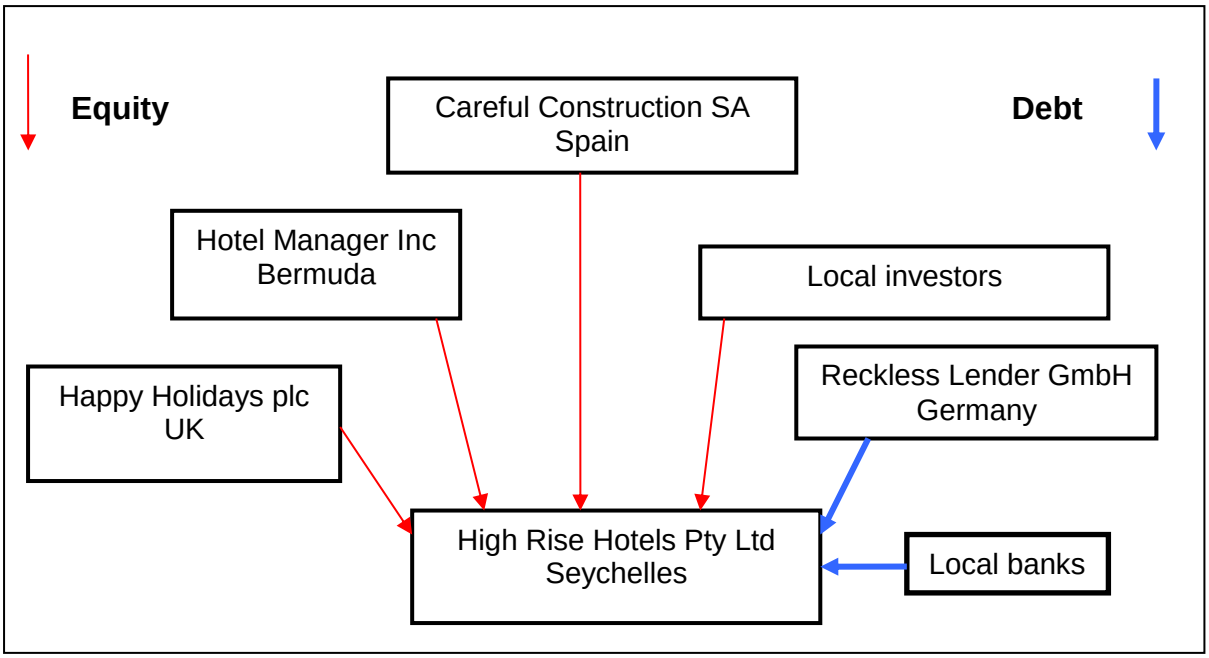
This problem is arguably at its most extreme in the case of project finance, where a small equity stake is taken in a project. We look at this in the next section.

5 Project finance case study

In this case study we will use some of the techniques from this and earlier readings to analyse a minority investment (i.e. 50% or less) by a firm in a project (or where the investor does not have total control, arguably in every case where the investor does not control 100% of the equity) with highly geared non-recourse finance.

We consider in this case study, the following structure.

Exhibit 2: Careful Construction SA, Project Finance



In this case study, Careful Construction SA ("CCSA"), a conservatively geared quoted construction business in Spain, is taking a minority stake in High Rise Hotels Pty Ltd ("HRH"), a private Special Purpose Entity ("SPE") in the Seychelles which is highly geared. The purpose of the SPE is to build and operate a luxury resort.

We want to consider the position of both CCSA and HRH. Hotel Manager Inc and Happy Holidays plc are other investors in a similar position to CCSA, although they will need to undertake their own investment analysis to ensure that their returns as adequate. There are also local shareholders in the Seychelles.

5.1 The perspective of High Rise Hotels (1)

Some practitioners argue that we should assess HRH on the basis of the un-geared cash flows of HRH using the WACC of CCSA. However there is a danger of mixing different betas (hotels v construction), different WACCs (because of the different levels of debt) and different WACCs over time, so is probably of little relevance in such a scenario. HRH is not a subsidiary of CCSA and its lenders have no recourse to CCSA, therefore CCSA's WACC is largely irrelevant. It is more important to establish a WACC which is applicable to HRH. However, we need to deal with the issue of changing WACC because one of the difficulties of using a single WACC is that it assumes stable gearing. This first perspective really assesses the basic viability of the project which comprises HRH. It looks at the project almost from the point of view of HRH management as a public company with remote shareholders would use a WACC.

This initial assessment will be based on the un-geared cash flows of HRH discounted at HRH's WACC at the outset.

We should note that in the real world it is common practice to only undertake un-geared analysis and the numerical evaluation would end here.

However the ungeared perspective is not this straightforward as the WACC changes from period to period as the proportion of debt in the capital structure falls.

5.2 The perspective of High Rise Hotels (2)

Rather than calculate a series of WACCs for different project gearing levels over time, we could look at the geared cash flows, i.e. post debt servicing. This automatically corrects for the impact of changing gearing because we look at the cash flows from the point of view of the equity investors in HRH. So this second perspective assesses the return to shareholders of HRH using the project's cost of equity at the outset.

The HRH shareholder evaluation is based on geared cash flows (broadly retained profits, although we should exclude any interest that arises because retained profits are not distributed – this avoids double counting) and discounted at the cost of equity of HRH at the outset. If the project is not viable at this level, we may need to calculate the cost of equity in each period.

5.3 The perspective of CCSA

Finally, we consider the perspective of CCSA. If CCSA has free access to the cash flows of HRH, the perspective 2 above probably applies. However, if CCSA does not have free access to the cash flows of HRH (which is more likely as it is only a minority shareholder), it should base its evaluation on the cash flows actually received, most probably in the form of dividends.

As with the HRH shareholder evaluation, the dividends are discounted at the cost of equity of HRH at the outset (investor expectation is the same as the cost of equity to the firm). If the project is not viable at this level, we may need to calculate the cost of equity in each period.

The following data applies to CCSA:

A stable capital structure with 30% debt and 70% equity
Risk free rate is 5%
Borrowing rate is 6%
Equity risk premium is 4%
Beta is 1.1
Tax rate is 30%

The equivalent figures for HRH are:

An initial capital structure with 80% debt and 20% equity
Risk free rate is 7%
Borrowing rate is 9%
Equity risk premium is 4.5%
Tax rate is 20%
HRH's asset beta is approximately 1.5x that of CCSA

5.4 How to assess returns on this project for CCSA

We assume that the beta provided for CCSA is a geared or equity beta. Also, in the absence of clear information about the market values of equity and debt and marginal tax rates, we use the data provided. On this basis, the un-geared beta of CCSA using the Hamada formula is:

$$\beta u = \frac{\beta g}{1+(1-t)\times D/E} = \frac{1.1}{1+(1-30\%)\times 30\%/70\%} = 0.846$$

We are told that HRH's asset beta is 1.5x CCSA's, so HRH's asset beta is 1.269. Making similar assumptions about the data provided for HRH, we gear up HRH's asset beta to estimate HRH's geared beta, although we should be a little wary of using Hamada in a highly leveraged situation.

$$\beta g = \beta u \times \left(1+(1-t)\times D/E\right) = 1.269 \times \left(1+(1-20\%)\times 80\%/20\%\right) = 5.33$$

Therefore, CAPM gives the cost of equity for HRH at the project outset as follows:

$$Ke = Rf + \beta(Rm - Rf) = 7\% + 5.33 \times 4.5\% = 31\%$$

reflecting the very high level of debt.

And the initial WACC of HRH is:

WACC = 31% ×0.2 + 9% × (1-20%) × 0.8 = 12.0%

As pointed out in *HRH perspective 1* the project is unlikely to get off the ground if it does not make sense at this level, so this is an important aspect of CCSA's analysis. However, we cannot properly assess its viability on the basis of the required returns at the outset only.

The following table shows the impact on the cost of equity and WACC under different capital structures as the debt is paid down[3].

High Rise Hotels Pty Ltd

The effect on Cost of Equity (Ke) and WACC of reducing debt in the capital structure

Debt %	80%	70%	60%	50%	40%	30%	20%	10%	0%
Equity %	20%	30%	40%	50%	60%	70%	80%	90%	100%
βu	1.269	1.269	1.269	1.269	1.269	1.269	1.269	1.269	1.269
Tax	20%	20%	20%	20%	20%	20%	20%	20%	20%
Rf	7%	7%	7%	7%	7%	7%	7%	7%	7%
Kd	9%	9%	9%	9%	9%	9%	9%	9%	9%
Rm - Rf	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
βg	5.33	3.64	2.79	2.28	1.95	1.70	1.52	1.38	1.27
Ke	31.0%	23.4%	19.6%	17.3%	15.8%	14.7%	13.9%	13.2%	12.7%

[3] See the HRH tab on the accompanying project finance case study data worksheet.

WACC	12.0%	12.1%	12.1%	12.2%	12.3%	12.4%	12.5%	12.6%	12.7%

Note that WACC rises as gearing falls, albeit not significantly. So, unlike the cost of equity which clearly falls as gearing falls, we cannot make the same assumption about WACC. As you can see WACC is relatively constant and a linear function. You might think this is odd, but remember that the cost of debt has been kept constant, a not unreasonable assumption in a project finance scenario where the margins may well be set for the duration of the project. In more normal circumstances one might expect the cost of debt to fall as gearing falls.

So, it the project has a positive NPV at 12.7%, it is potentially viable.

HRH's cost of equity falls rapidly as debt is repaid. So, if the project's geared cash flows return a positive NPV at 31%, we know it is viable. However the NPV will be understated because the cost of equity falls over the life of the project.

How will we assess the returns to CCSA? We will use the approach outlined in the *CCSA perspective*. This should be at the cost of equity for HRH, i.e. 31%.

Thus if the NPV of cash flows from the project, i.e. dividends, is positive when discounted at 31%, the project is viable. Note, however, that as well as the equity investment in the project finance company, CCSA will also benefit from the construction contract which is done at the outset of the project. It could be argued that the benefit of those cash flows should be included in the assessment and even that the shareholding gives an option on the construction contract and vice versa.

Note that the shareholders might be in slightly different positions. For example, if the tax treatment of dividends is different due to different treaty arrangements, this will affect returns. Additionally if there are capital controls, the local shareholders might be in a better position. The application of withholding taxes may also vary between resident and non-resident shareholders.

6 Inflation

There are two major aspects concerning inflation and its influence on investment appraisal:

- The inflation of revenues and costs
- The inflation assumptions in the discount rate

We have seen the issue around issuing debt with other than nominal costs, i.e. at fixed real interest rates, but that is quite rare and is also in usually small amounts in relation to the overall capital structure.

The issue is most important when considering long term projects. The vast majority of investment appraisals are for relatively short term projects of say up to five years or so, where the inflation effect may be less important and perhaps more visible. But for longer projects, it becomes very important. Infrastructure projects such as wind farms, property transactions etc will always face the conflict between the uncertainty of inflation over that time, which partly

dictates revenues and the certainty of interest rates, which tend to be fixed for such long term projects.

DB pension schemes are another area where real interest rates are important. In some calculations where benefits are raised with inflation, nominal rates are irrelevant.

The issue is also important when inflation is high.

6.1 Using real or nominal data in revenues and costs

Generally, when a company assesses a project its managers will state the cash flows in nominal terms, that is, including inflation. Although the project originator is probably aware of the inflation and sales growth assumptions included in a particular project (indeed he may well model them separately), the picture is less clear to financial analysts and decision makers reviewing the project. Without additional calculation, it is not apparent how much of the sales growth is due to inflation and how much is due to real growth. Therefore, some companies undertake project analysis in real terms.

Example 9: A long project with low inflation

Consider a 20-year project where inflation is running at 2%pa. If sales in Year 1 are predicted to be €100m, then the sales in Year 20 will have to exceed €148.6m if there is any real growth.

$$€100\text{m} \times (1 + 2\%)^{20} = €148.6\text{m}$$

Example 10: High inflation

Consider a 5-year project where inflation is running at 25%pa. If sales in Year 1 are predicted to be 100m, then the sales in Year 5 will have to exceed 305.2m if there is any real growth.

$$€100\text{m} \times (1 + 25\%)^{5} = €305.2\text{m}$$

In both Examples 9 and 10, it is much easier to analyse growth assumptions using real data. It is generally better to work the cash flows in nominal terms even if some of the key assumptions are initially defined in today's values and then inflated. First, most business managers, unless they are trained economists, tend to use nominal cash flows intuitively when they are forecasting. Second, one of the biggest issues is the differential impact of inflation on various cost and revenue elements in the cash flows. For example, in the recent past labour costs have tended to rise faster than revenues or other costs. It is essential to reflect these differences and it is easier to do so working in nominal terms. Tax calculations should be based on nominal figures as in real life; working in real terms nearly always introduces errors.

Aside from project appraisal purposes, nominal data is required for other purposes e.g. for assessing the impact of the project on the profit and loss account (and for the financial statements more generally) and to facilitate post-implementation audits. In addition most financing packages will be based on nominal figures, especially if modelled as part of a geared analysis.

6.2 Deflating nominal revenues and costs

We use the following relationship to deflate nominal costs (or to inflate real costs)

Nominal Cash Flow = Real Cash Flow × (1 + Inflation)

or, more usefully in its rearranged form:

$$\text{Real Cash Flow} = \frac{\text{Nominal Cash Flow}}{1 + \text{Inflation}}$$

6.3 The discount rate

As we have seen, for NPV analysis we generally analyse un-geared cash flows in nominal terms and discount these using the WACC which is also stated in nominal terms. If we recall the WACC calculation, it has a risk free rate, which is nominal and a cost of debt, also nominal.

***Read page 104 from Applied Corporate Finance, by Aswath Damodaran, 4th edition,* where he indicates that the equity risk premium rose in the period of high inflation in the 1970s.** It is arguable that the equity risk premium in early 2010s is lower in the low interest rate environment of the time. We have seen this in the private equity research in the work around betas.

However, if the cash flows are stated in real terms, we need to use a real terms WACC to discount those cash flows. Interest rates and inflation are linked through the **Fisher Effect**:

(1 + real interest rate) x (1 + inflation) = (1 + nominal interest rate)

Example 11: Fisher effect

Shergar plc borrows at 4% over 3 month Libor. 3 month Libor is 4.03% and inflation is expected to be 2.6%. What is the real interest rate?

Shergar's borrowing rate is 8.03%. This is a market rate and it is stated in nominal terms.

Using Fisher, we get:

$$1 + \text{Re}\,al\ \text{int}\ erest\ rate = \frac{1 + No\,\text{min}\ al\ \text{int}\ erest\ rate}{1 + \text{inf}\ lation} = \frac{1 + 8.03\%}{1 + 2.6\%} = 1.0529$$

Therefore:

Real interest rate = 1.0529 – 1 = 0.0529 = 5.29%

A quick & dirty calculation would suggest that Shergar's real interest rate will be around 5.43% (= 8.03% - 2.6%). This is not the recommended approach for MCT, but it can be a useful approximation.

Note that there is an argument that it is only Libor which is stated in nominal terms. The borrowing margin is determined by credit issues and supply and demand factors and is not affected by inflation. You can probably see this more clearly if you consider a company with a multicurrency borrowing facility where the margin is the same irrespective of the currency of borrowing. It is the reference rate, e.g. Libor for Sterling or Euribor for €, which changes, principally to reflect different levels of expected inflation. (If you think about it, this is also the approach taken in the quick & dirty approach.)

However, this is probably one of those cases where it could be argued that we are trying to over-refine the project evaluation technique.

We can deflate WACC or the Cost of Equity in the same way. So in simple terms:

$$\text{Real WACC} = \frac{1 + \text{Nominal WACC}}{1+\text{inflation}} - 1$$

$$\text{Real Ke} = \frac{1 + \text{Nominal Ke}}{1+\text{inflation}} - 1$$

7 Real options

You will recall the simple NPV financial decision rule - accept all positive NPV projects, reject those with negative NPVs.

However, projects don't exist in isolation and there are sometimes embedded options which are not captured in the cash flows. If a project has embedded options, NPV analysis based on the project cash flows alone will not include any option premium and the present value of the project will be understated. These embedded options are referred to as **real options** to distinguish them from financial options since the underlying asset, i.e. the project, is a real asset.

Real options fall into 3 main categories:

1. the option to delay
2. the option to expand
3. the option to abandon

At MCT you are expected to have an awareness of real options as opposed to a detailed understanding. With this proviso in mind, you should ***read pages 255 - 266 (Options embedded in projects) from Applied Corporate Finance, by Aswath Damodaran, 4th edition.*** This reading looks at each category of real option – the sections on *Intuitive Applications* are particularly helpful.

8 Discount or hurdle rates in practice

In practice companies do not use their current WACC as the hurdle rate for general investment analysis (although they may do so in the case of an acquisition or major project). Even if a company used constant ratios of debt and equity in line with its long term capital structure target, it would find that its hurdle rate was constantly changing.

Most companies appear to set investment hurdle rates which will apply over the medium term. Ideally these would be set with reference to WACC and periodically checked. Some companies clearly set their hurdle rates at a level above WACC, possibly reflecting uncertainties in the calculation of beta, but more probably to ensure a) it does not have to be changed too often, and b) marginal projects will be automatically rejected.

Most companies also appear to set consistent hurdle rates across the group. Others use different rates for different businesses which makes sense if the business risks are substantially different. Additionally, some companies require a higher rate of return in particular circumstances, e.g. for a new product or for a new market. The general approach seems to be to keep things simple to avoid confusion.

8.1 ROCE and the link to WACC

ROCE is a very useful measure in companies for assessing divisional performance. However, as we know, the more appropriate return measure is WACC.

How can we ensure that ROCE targets are appropriate?

If we look at the formula for ROCE, we see that the numerator is usually operating profit at divisional level, i.e. it is pre-tax, although a post-tax figure is sometimes used when looking at the firm as a whole. The denominator is capital employed. We need to consider three applications:

- individual project
- whole firm
- division

For an individual project, the capital employed will normally be the cash investment, although there may be some differences, e.g. sunk costs may also be included. However, for the firm as a whole, capital employed will comprise shareholders funds plus debts, all broadly stated at book value[4]. For a division, the picture is more complicated. In general, the funding side of a divisional balance sheet is often meaningless, yet it still reflects the book values of all the assets employed in that division, again broadly book value figures.

The aim is to provide divisional finance managers with a return target for new projects and for the existing business. The main adjustments are for tax and market values and these are made centrally before the divisional targets are issued. As the aim is to keep matters simple

[4] The figures may include goodwill arising on consolidation, purchased goodwill and the effects of property revaluations.

and ideally to use data from management accounts, we generally use operating profits after tax as a proxy for NOPLAT cash flows, i.e. we do not adjust for depreciation, capex and working capital. Of course, managers can further refine the process if they wish.

This is a simplification of the approach used by Stern Stewart & Co in their **Economic Value Added** or **EVA** concept. Stern Stewart make myriad adjustments to accounting profits whereas we have simply used operating profits.

Looking at the 3 cases in turn:

8.1.1 The individual project

An acceptable project must produce a return greater than the cost of capital. This is equal to the capital employed in the project multiplied by the WACC (which can be adjusted to reflect divisional risk if necessary), i.e.

Operating profit × (1- effective tax rate) > Capital Employed × WACC

i.e. $\frac{\text{Project Operating Profit}}{\text{Project Capital Employed}} = \text{Project ROCE} = \frac{\text{WACC}}{1 - \text{effective tax rate}}$

i.e. the ROCE target should be the WACC grossed up for the effective tax rate – probably an appropriate rate for the division where the project is located.

8.1.2 The whole firm

We need to ensure that the firm as a whole makes a return to cover its cost of capital, i.e.:

NOPLAT > Market Value of Capital Employed × WACC

Again, using operating profits after tax as a proxy for NOPLAT cashflows, we see

Firm Operating profit × (1- effective tax rate) > Market Value of Firm Capital Employed × WACC

i.e. Firm Operating profit × (1- effective tax rate) > Book Value of Firm Capital Employed ×φ × WACC

where $\varphi = \frac{\text{Market Value of Firm Capital Employed}}{\text{Book Value of Firm Capital Employed}}$

$\therefore \frac{\text{Firm Operating profit} \times (1\text{- effective tax rate})}{\text{Book Value of Firm Capital Employed}}$ = Firm ROCE (Post- tax) > φ × WACC

ie the post tax ROCE target should be the WACC, but adjusted to reflect the ratio of market value of capital employed to the book value

and $\frac{\text{Firm Operating profit}}{\text{Book Value of Firm Capital Employed}}$ = Firm ROCE (Pre- tax) > $\frac{\varphi \times \text{WACC}}{(1\text{- effective tax rate})}$

i.e. the pre-tax ROCE target should be the WACC adjusted for market values as above, but also grossed up to reflect the firm's effective tax rate.

8.1.3 For a division

This is similar to the whole firm scenario. Essentially:

Division Operating profit × (1- effective tax rate) > Market Value of Division Capital Employed × WACC

This equals the following ONLY if the relationship between the book value of the division's capital employed and its market value is the same as for the whole firm. This is probably the simplest approach, although it is probable that some divisions contribute more to the uplift in value than others. If necessary this should be adjusted for.

$$\frac{\text{Division Operating profit}}{\text{Book Value of Division Capital Employed}} = \text{Division ROCE (Pre- tax)} > \frac{\varphi \times \text{WACC}}{(1\text{- effective tax rate})}$$

Note that we could also adjust WACC to reflect different divisional betas.

Example 12: ROCE v WACC for a division

Rocky Returns (Gibraltar) Ltd consolidated profit and loss account and balance sheet are set out below together with the financial statements for its main operating division, Sahara View

Pty Ltd. The risk free rate in Gibraltar is 4%, the market premium is 5% and the marginal tax rate is 30%. Rocky Returns' beta is estimated at 1.2.

		Rocky Returns (Gibraltar) Ltd		**Sahara View Pty Ltd**
Operating profit		340		200
Interest		(90)		(192)
PBT		250		8
Tax @	22.0%	(55)	25.0%	(2)
PAT		195		6
Fixed Assets		3,000		2,200
Working capital		1,000		800
Debt	6.0%	(1,500)		
		2,500		3,000
Share Capital		120		10
Intragroup Loan			8.0%	2,400
Reserves		2,380		590
		2,500		3,000
Market Cap		3,900		
P/E		20.0		
Book Gearing		60.0%		

Using CAPM, Rocky Returns' Cost of Equity = 4% + 1.2 × 5% = 10%

and its WACC = $\frac{3{,}900 \times 10\% + 6\% \times (1\text{-}30\%) \times 1{,}500}{3{,}900 + 1{,}500} = 8.39\%$

using the book value of debt as a proxy for market value.

Since Sahara is the main operating division, we can assume that Rocky Returns' beta of 1.2 is appropriate for its business. We do not need to ungear and regear as we are considering divisions within the same group.

Therefore the above WACC will be used to evaluate all Sahara investment proposals.
With these assumptions, a reasonable pre-tax ROCE target for Sahara projects would be :

Sahara Project pre-tax ROCE target = $\frac{\text{WACC}}{\text{1-effective tax rate}} = \frac{8.39\%}{1\text{-}25\%} = 11.19\%$

On a ROCE basis, Rocky Returns needs to target the following returns:

Rocky Returns ROCE (Post- tax) target = $\varphi \times WACC = 1.35 \times 8.39\% = 11.33\%$

using $\varphi = \frac{\text{Market Value of Rocky Returns Capital Employed}}{\text{Book Value of Rock Returns Capital Employed}} = \frac{3{,}900+1{,}500}{2{,}500+1{,}500} = 1.35$

and Rocky Returns ROCE (Pre- tax) target = $\frac{\varphi \times WACC}{(1\text{- effective tax rate})} = \frac{11.33\%}{1\text{-}22\%} = 14.53\%$

Rocky Returns' CFO has been advised by Monkey Business, a financial boutique based in Gibraltar that Sahara is the driving force underlying Rocky's share price. A more appropriate market to book value multiplier of 1.6x has been suggested for the Sahara division.

Therefore, the divisional pre-tax ROCE performance target for Sahara should be:

Sahara Division pre-tax ROCE target = $\frac{1.6 \times 8.39\%}{(1\text{- }25\%)} = 17.9\%$

if it is to maintain its value to the Rocky Returns group.

9 Summary of approaches

To summarise the approaches we have discussed so far, a table may help:

	Situation	Beta /K_e/ WACC issues	Remarks
1	Project within the normal context of the firm with average risk and small size.	Firm's beta and WACC.	This is the default approach for projects entered into within the overall structure of the firm.
2	Project within the normal context of the firm with average risk and large size.	Proportions of debt and equity may need to be changed for this and all future average projects if the change in capital structure is permanent.	
3	Project within the normal context of the firm with non-average risk and small size.	WACC based on the appropriate beta for the project. The asset beta for the project is geared using the firm's capital structure.	This adjusts projects according to their beta and requires a higher hurdle rate for riskier projects and a lower hurdle rate for less risky projects.
4	Project within the normal context of the firm with non-average risk and large size.	This is a combination of Scenarios 2 & 3.	
5	Project ring-fenced from main firm in a SPE. Ungeared cash flows. Assumes free access to cash flows.	Beta for the project, geared up to reflect the capital structure of the SPE. The WACC weightings should be those for the project.	This evaluation assesses the basic viability of the project.
6	Project ring-fenced from main firm in a SPE. Geared cash flows.	Geared project beta and K_e for the project's shareholders.	This evaluation assesses whether the project is viable for the shareholders.
7	Project ring-fenced from main firm in a SPE. Shareholder economics.	Geared project beta and K_e for the project's shareholders.	This evaluation assesses whether the project is viable for the shareholders on the basis of cash actually received.

Clearly, one can get carried away with the detail of much of this. Being too scientific when we can't even get the base data such as betas or cost of equity and even project outcomes right, is a bit of a waste of time.