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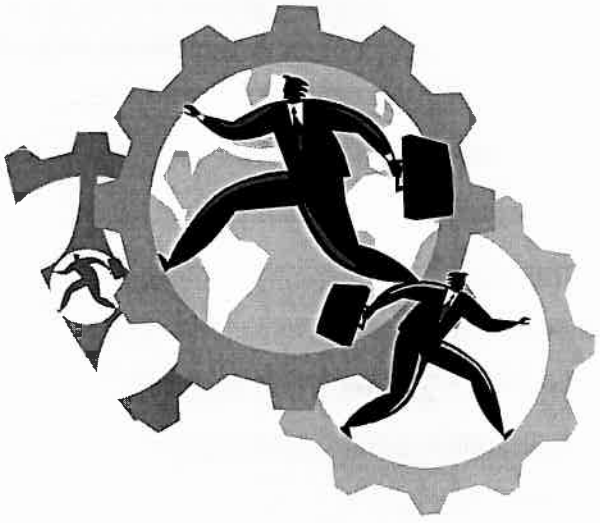
FIN3701 – Financial Management

Course revision workbook



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n/a

no calculations from SU 10, theory & definitions.

Note that this document is a summary of the work covered in the course and is not necessarily an exhaustive document. The textbook and the UNISA study guide, as well as direct communication from UNISA through the *myUnisa* system, should form the primary basis from which you cover the course material. This document should be used for revision purposes only. I am not responsible should any material appear in the exam which is not covered in this workbook.

Study Unit 1: Capital budgeting and cash flow principles

I. Introduction to the capital budgeting process

(process behind inv. decision)

Capital budgeting is the process of evaluating and selecting long-term investments (given the profile of each investment's capital expenditure and expected cash flows attributable to it over its life) that will create value for the company and its shareholders.

Motives for capital expenditure include:

1. **Expansion** – increase the productive capacity of the firm, usually through the acquisition of fixed assets
2. **Replacement** – replace existing assets with new or more advanced assets which provide the same function
3. **Renewal** – rebuild or overhaul existing assets to improve efficiency

Others include marketing initiatives, and R&D (leading to product development).

The difference between a capital expenditure and an operating expenditure is that a capital expenditure (like the purchase of manufacturing equipment) produces benefits over the long-term (i.e. over a time period of greater than one year), while an operating expenditure (like the payment of an employee's salary) produces benefits in the short-term (i.e. less than one year).

Broadly, the capital budgeting process entails the following steps:

1. Proposal generation
2. Review and analysis
3. Decision-making
4. Implementation
5. Follow-up

Or, equivalently, the four phases entailing:

I. Searching for, identifying and capitalising on investment opportunities

II. Evaluation of the project

III. Implementation

IV. Post-implementation audit

II. Capital budgeting terminology

Take a note of the following definitions, which will often come up in the capital budgeting process:

- **Independent projects**: projects whose cash flows are unrelated or independent of one another. The acceptance of one project does not eliminate the others from selection; thus, independent projects can be taken on in combination. For example, Shoprite may want to pursue expansion into Nigeria as an investment project, but this will not prevent it from expanding into Kenya at the same time if it wants (unless constrained by capital requirements). Thus, Shoprite's Nigerian and Kenyan investments are independent
- **Mutually exclusive projects**: projects that have the same function and therefore compete with one another for selection. The acceptance of one project will eliminate the others under consideration. For example, a company wanting to expand its productive capacity might do it by purchasing fixed assets outright; by acquiring another company; or by outsourcing production to another company. Clearly, choosing any one of these options will eliminate the others from consideration – choose best
- **Relevant cash flows**: when evaluating an investment opportunity, it is very important to look at the cash flows *relevant to the project:* these include the *incremental* initial cash outflow (capital expenditure) and resultant *incremental* cash flows over the life of the project up to its termination. 'Incremental' means we need to compare the cash flows to the company *without taking on the project* with the cash flows to the company *with the project taken on.* The difference in cash flows is the incremental cash flow – and this is the relevant cash flow to be used in the capital budgeting model (for example, in the NPV and IRR models to be looked at in SU2).
- **Conventional vs. unconventional cash flow patterns:** a conventional cash flow pattern entails a capital expenditure / investment outlay today (i.e. a cash outflow), followed by a series of cash inflows arising from the investment over some period in the future. Thus, there is one change in the sign of cash flows (from negative to positive).

  An unconventional pattern will have multiple changes in the sign of cash flows – for example, a project with a cash outflow today from the initial investment outlay, followed by 3 years of cash inflows as the project begins to deliver, and then perhaps another capital outlay in Year 4 to service and maintain the asset so it can continue

being used from Year 5 onwards, when it will once again deliver positive cash inflows.

- **Sunk costs**: cash outlays that have already been made and therefore have no effect on the cash flows relevant to a current investment decision. For example, if a company hires consultants to help devise the company strategy, the consulting fee the company has to pay will not be relevant to the actual evaluation of investment opportunities at the end of the day, since that cost has already been incurred.
- **Opportunity costs**: cash flows that could be realised from the best alternative use of an owned asset. As a simple example, the opportunity cost of you (the 'asset') going to university to study is the potential forgone salary you could have earned had you instead gone to work full-time.

III. Determining the relevant cash flows

To evaluate a given project/investment opportunity, the relevant CFs include:

a. The initial investment / capital expenditure

b. The incremental operating cash inflows over the life of the project

c. The terminal cash flow at the end of the project's life

a. Finding the initial investment

The initial investment / capital outlay is the *total net cost of bringing the project to realisation:*

$$\begin{aligned} &\textit{Initial investment} \\ &= \textit{Cost of new asset} + \textit{Installation costs} \\ &- \textit{After tax proceeds from the sale of the old asset} \\ &\pm \textit{Change in Net Working Capital} \end{aligned}$$

The cost of the new asset is what is actually paid for the asset itself. Installation costs include things like delivery costs and the costs of training staff to use the asset.

The after-tax proceeds from the sale of the old asset will only be relevant for renewal or replacement-type projects, where some old asset may be sold off (assuming there is a salvage value). This cash inflow will help offset the initial expenditure:

$$\begin{aligned} &\textit{After} - \textit{tax proceeds from the sale of old asset} \\ &= \textit{Selling price of old asset} - \textit{Tax on sale} \end{aligned}$$

The tax implication is found by comparing the book value of the asset with the selling price:

$$\textbf{\textit{Book value of old asset}} = \textbf{\textit{Installed cost of old asset}} - \textbf{\textit{Accumulated depreciation}}$$

There are three potential tax situations:

1. If the asset is sold for more than its book value, then a tax liability is incurred (i.e. the company has to pay tax on the sale)
2. If the asset is sold for its book value, there is no tax implication (i.e. zero tax)
3. If the asset is sold for less than its book value, the company receives a tax benefit (i.e. an offset to its tax liability)

Thus if Selling Price > Book Value, then a tax liability of *t(SP-BV)* is incurred. If Selling Price < Book Value, then a tax benefit of *t(SP-BV)* is gained (in absolute value terms).

Finally, net working capital (NWC) is defined as Current Assets – Current Liabilities. An increase in NWC is a cash outflow, so it *adds* to the initial investment / capital expenditure; a decrease in NWC is a cash inflow, so it *reduces* the level of initial investment / capital expenditure.

[Refer to the example of Hudson Industries in the textbook, pg. 351-354; example of Powell Corporation, textbook pg. 354-355 – note that the tax paid on the sale of the asset should be R84 000 and not R36 000; calculate this for yourself to see why, and thus overall the initial investment should be R1 714 000]

b. Finding the operating cash inflows

The operating cash inflows [OCF] (i.e. the *incremental* after-tax cash inflows arising from the project) are essentially the benefits of undertaking the capital expenditure. Note that we are concerned with cash flow, not accounting profits:

$$\textbf{\textit{OCF}} = \textbf{\textit{NOPAT}} + \textbf{\textit{Depreciation}}$$

where NOPAT refers to the net operating profit after taxes [such that NOPAT = EBIT(1-t)]. Depreciation is added back because it is a *non-cash* expense. Importantly, these variables must be looked at on an incremental basis.

[Refer to the comprehensive example of Powell Corporation on pg. 356-358]

c. Finding the terminal cash flow

This is the cash flow upon termination of the project at the end of its life, being the net proceeds from sales of the project's assets (i.e. the amount *net of removal and clean-up costs* expected upon termination of the project, taking into account tax considerations and changes in NWC):

$$\begin{aligned}&\textbf{\textit{Terminal cash flow}}\\&\quad=\textbf{\textit{After tax proceeds from the sale of the new asset}}\\&\quad-\textbf{\textit{After tax proceeds from the sale of the old asset}}\\&\quad\pm\textbf{\textit{Change in NWC}}\end{aligned}$$

The after-tax proceeds are calculated in the same manner as before, with the tax implication found by comparing the asset's book value to the actual sale price (this sale price is often called the 'salvage value').

Note that we only would only need to consider the after-tax proceeds from the sale of the *old asset* in the terminal cash flow for replacement decisions, the reason being that we want to look at the *incremental* cash flow arising from replacing an old asset with a new one: this will generally be derived from some estimate of what we would otherwise have sold the old asset for in the terminal year, had it not been replaced. For expansion and renewal projects, this figure is zero.

As before, net working capital (NWC) is defined as Current Assets – Current Liabilities. An increase in NWC is a cash outflow, so it *reduces* the terminal cash flow; a decrease in NWC is a cash inflow, so it *increases* the terminal cash flow. Upon termination of the project, we generally will recover the earlier outlay of NWC of some amount, which would indicate a cash inflow.

[Refer to the example of Powell Corporation on pg. 359-360 of the textbook]

Study Unit 2: Capital budgeting techniques

In SU1 we looked at how to derive the relevant CFs attributable to an investment opportunity/project over its life. In SU2, we will look at the next step in the capital budgeting process: how to evaluate investment opportunities, rank them in order of preference, and select the most desirable from the set of alternatives.

I. Payback period

The payback period is the amount of time required for the firm to recover its initial investment, as calculated from its expected future operating cash inflows. The payback period is then compared to how long the company (and its investors) are willing to wait to recover its investment.

The decision criteria:

- If the payback period is *less* than the maximum acceptable payback period, **ACCEPT** the project
- If the payback period is *greater* than the maximum acceptable payback period, **REJECT** the project

[Refer to Textbook, example pg. 382-383; Study Guide example pg. 14]

The payback period is fairly popular and widely used: it is simple and intuitive. But it fails to take into account the time value of money, and thus does do not indicate whether or not projects will increase firm value (and to what extent). It also fails to take into account cash flows in the long-term, which may create substantial value [see the example of Rashid Company in the textbook, pg. 385).

For these reasons, payback is a somewhat theoretically weak methodology: it is considered 'unsophisticated'. As we shall see, 'sophisticated' techniques take into account the time value of money by applying a discount rate to a stream of future CFs, in order to find the present value (i.e. the value *today* of these CFs).

II. Net present value (NPV)

This technique is considered 'sophisticated' because it explicitly takes into account the time value of money. The NPV of a project is found by subtracting the project's initial investment (CF_0) from the present value of its expected future CFs, using the relevant discount rate *r*:

$$NPV = PV(Future\ CFs) - Initial\ Investment$$

$$= \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0$$

The NPV-rule decision criteria:

- **If NPV>0, ACCEPT the project** – creates value for firm
- **If NPV<0, REJECT the project** – destroys value in firm

NPV>0 indicates positive value/wealth will be created for shareholders by the project (i.e. it will have a positive impact on company's market value). NPV<0 indicates value will be destroyed / shareholder wealth reduced by taking on the project (i.e. it will have a negative impact on company's market value). When comparing alternatives, the higher the NPV, the more desirable is the project.

The CFs that are applied to the NPV model are the relevant incremental cash flows applicable to the project over its life: the initial investment (capital expenditure), the expected future net operating cash flows, and the terminal cash flow. Deriving these CFs was discussed in detail in SU1.

It is important to select an appropriate discount rate *r*: this rate should be the relevant cost of capital for the investment/project, and must reflect the sources of capital used to fund the project (see SU4-5) as well as the underlying level of risk of the investment/project (see SU3 - the greater the project's riskiness, the greater should be the discount rate, and vice-versa).

[Refer to the Textbook, example of Bennett Company, pg. 386-387; Study Guide example, pg. 14]

III. Internal rate of return

WACC <= accept; WACC >= reject

IRR is another 'sophisticated' and widely used capital budgeting technique, considered slightly more popular than NPV. The IRR of a project is the discount rate that equates the NPV of the investment opportunity with zero (because it causes the PV of future CFs to equal the initial investment). It can be interpreted as the compound annual rate of return that the firm will earn if it invests in the project and receives the given CFs, *assuming that*

these CFs can be reinvested at the IRR rate. In simple terms, it is an estimate of the rate of return on the project.

To calculate IRR, set $\sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0 = 0$ and solve for *r*.

This involves reiterative trial-and-error if done manually, but it is easily done using a financial calculator.

The IRR-rule decision criteria:

- If the IRR is greater than the hurdle rate, **ACCEPT** the project
- If the IRR is less than the hurdle rate, **REJECT** the project

The higher the IRR, the more desirable is the project. The 'hurdle rate' to be used is the relevant cost of capital for the project.

[Refer to the Textbook, example of Bennett Co. pg. 388-389; Study Guide pg. 14]

IV. Comparing the NPV and IRR techniques

The ability to rank alternative investment projects in order of preference is important (especially when looking at mutually exclusive projects and/or when capital is rationed), as it allows the firm to tell which projects are the best and most desirable to take on from a financial (value) standpoint.

But note that applying the NPV and IRR techniques to investment evaluation can sometimes lead to conflicting rankings. Refer to the example of Bennett Co. as discussed in the textbook. There our evaluation leads to a conflict in ranking: Project A is preferred under the NPV technique (pg. 386), while Project B is preferred when IRR is used (pg. 389).

Why does this conflict arise? For one, the size of the project and the length of its life can play a role in driving conflicts in ranking.

Another important reason is that each model makes a different implicit assumption about the returns earned on the reinvestment of intermediate CFs: the NPV technique assumes that intermediate CFs are reinvested to earn the cost of capital, while the IRR technique assumes that intermediate CFs are reinvested to earn the IRR rate.

Which is the better and more realistic assumption? If the IRR is very high (say 30%), it would be unrealistic to assume that CFs can be reinvested at that high rate elsewhere in the company or in external securities. In general, it would be more realistic to assume that CFs will be reinvested at the cost of capital. On this basis, NPV is preferable.

Another problem with IRR is that when the project has an unconventional CF pattern (i.e. multiple changes in the sign [±] of project cash flows), you will obtain multiple IRRs in your solution that can differ greatly in sign and magnitude. For example, you evaluate a project and using a spreadsheet model, you might obtain multiple IRRs of -8%, 13% and 117%. Which is the correct IRR to use when making the investment decision? It can be ambiguous and the project would need to be examined further. NPV wouldn't have this problem.

Thus, although IRR is widely used in practice, NPV may have a stronger theoretical foundation and is the better model to use, assuming that the goal is to maximise shareholder value. This doesn't mean that IRR is a 'bad' model, but an understanding of its pitfalls is important when implementing it.

V. Other capital budgeting techniques

a. Modified internal rate of return (MIRR) → n/a.

MIRR is a variant of the IRR approach that attempts to overcome the weaknesses of the IRR approach as discussed above. It more realistically assumes reinvestment at the cost of capital, and avoids the problem of multiple IRRs.

The steps are:

1. Estimate the project's CFs over its life
2. Calculate the future value of the project's cash flows at the end of the project's life, using the CoC as the growth rate
3. Find the IRR (the *r*) that causes the present value of the total of the FV of CFs to be equal to the initial investment at time zero

Note that this approach is not widely used in practice.

[Refer to Study Guide example, pg. 18]

b. Profitability index (PI)

The use of the PI is a method of selecting and ranking investment alternatives by comparing the present value of future cash flows with the initial investment on a relative basis. The PI figure tells one how many Rands are being generated (in terms of PV of future cash inflows) per Rand of initial investment:

$$PI = \frac{PV(Future\ CFs)}{Initial\ Investment}$$

The decision criteria:

- If PI>1, **ACCEPT** the project
- If PI<1, **REJECT** the project

The PI is very similar to NPV, the difference being that PI measures the project's benefits on a *relative* basis, while NPV measures benefits on an *absolute* basis.

Study Unit 3: Risk and refinements in capital budgeting

SU3 further refines the capital budgeting process by more explicitly incorporating the role of risk into the analysis; looking at the investment decision when potential projects have unequal lives; and introducing the role of capital rationing.

These refinements are important:

- All companies face a variety of risks through their operations, and must assess the risks of conducting its current business and the risks associated with new projects. This study unit looks at how to assess projects on the basis of **different levels of risk**
- Mutually exclusive projects with **unequal lives** are not strictly comparable on a straight NPV basis. This study unit looks at techniques to compare such alternatives
- Some companies may have insufficient capital to invest in all prospective projects. This study unit looks at how limited capital **(capital rationing)** is incorporated into the capital budgeting process

I. Risk-adjustment techniques

In the capital budgeting process, risk refers to the uncertainty of the level of future cash flows arising from the investment opportunity. Recall that we can only *estimate* what we believe are the expected cash flows arising from the project in the future, but there will always be some degree of uncertainty. It is important to evaluate and measure this uncertainty, and incorporate it into the valuation.

One straightforward technique to incorporate uncertainty into the estimation of future cash flows is **scenario analysis**, which uses a range of possible alternative outcomes to obtain a sense of the variability of project returns. Potential outcomes are weighted by their probabilities of occurrence to ascertain the level of expected future cash flows.

> *[Refer to Textbook, example of Treadwell Tire Company pg. 413-414; also, see example pg.29-30 in the Study Guide]*

Once we have this stream of expected future cash flows attributable to the project and have a feel for what the riskiness of the project is, we find the risk-adjusted value of the investment opportunity using the following techniques:

a. Risk-adjusted discount rate

The higher the risk or uncertainty of a given investment (stream of future CFs), the higher should be the discount rate *r* applied to those CFs. One can think of a discount rate being made up of two components: 1) the risk-free rate; and 2) a risk premium. The greater an investment's risk, the greater should be the level of the premium for risk, and thus the higher the discount rate applied.

As an illustration, recall the logic of the Capital Asset Pricing Model (CAPM):

$$E(r) = RFR + \beta\underbrace{(R_M - RFR)}_{\text{Market risk premium}}$$

The higher is β (in other words, the greater is the level of market risk exposure), the higher is the risk premium incorporated into the overall rate and the thus higher is the discount rate.

The general approach to finding a project's discount rate is to use the following formula, which is based on the idea of CAPM:

$$r = RFR + \textit{Risk coefficient}\ (\textit{Risk premium})$$

This risk coefficient directly measures the riskiness of the project. For example: Anglo American wants to evaluate a new mining project. The project has substantial risk and you believe its risk-coefficient should thus be 1.6. Assuming a risk-free rate of 5% and a risk premium of 6.5%, the project's risk-adjusted discount rate is 0.05 + 1.6(0.065) = 15.4%

Once we have a risk-adjusted discount rate (*r*), we proceed with a standard NPV calculation as before:

$$NPV = PV(\textit{Future CFs}) - \textit{Initial Investment}$$

$$= \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - CF_0$$

Greater risk means a higher discount rate (r), and so the lower will be the PV of future CFs, and thus the lower will be the NPV (and vice-versa). This lower NPV (i.e. lower value of the project) is an implicit compensation for the greater risk.

[Refer to Study Guide example pg. 27-28; Textbook example, pg. 421-422 (Bennett Company)]

b. Certainty equivalent

Under this method of risk-adjustment, the estimated future CFs are reduced to a conservative level by applying a correction factor called the 'certainty equivalent co-efficient' (CECE). The more risky or uncertain is a particular future CF, the lower will be its CECE, and thus the lower will be its certainty equivalent:

$$\textbf{Certainity equivalent} = \textbf{Cash flow} \times \textbf{CECE}$$

Applying this coefficient to future CFs adjusts them for risk. For example, when adjusted for risk, a future uncertain cash flow of R1million (given a CECE of 0.85) has a certainty equivalent of R850 000.

Once each expected future cash flow has been adjusted for risk and its certainty equivalent found, we then proceed with an NPV-type calculation, as before, using the risk free rate as the discount rate (because the risk-adjustment has already been made).

[Refer to Study Guide, example on pg. 29]

II. Comparing projects with unequal lives

Often the case will be of selecting the best from a group of projects with unequal lives. This is not a concern when investment opportunities are independent. But when projects with unequal lives are mutually exclusive, the impact of differing lives must be considered, because the projects do not provide service over comparable time periods.

Two approaches to compare projects with different lives are:

a. The replacement chain (common life) approach

This technique extends one (or both) projects until an equal life is achieved, with this extension being up to the lowest common multiple of the lives of the projects. They are then comparable on an NPV basis, with some refinements. Note that only applies to mutually exclusive projects.

For example, if we want to compare Project A with a life of 2 years and Project B with a life of 5 years, we would need to extend both projects out to 10 years (since this is the lowest common multiple of 2 and 5). Over 10 years, we would take on Project A five times (once every two years for ten years) and Project B twice (once every five years for ten years).

The 'adjusted NPV' for each alternative is found by working out the project's NPV given the cash flow profile for the project over full the ten year period. For Project A, each successive version of the project will entail an initial investment when it is initiated, and we then receive the cash flows over the following two year period. Thus, the overall cash flow profile consists of the capital outlay at the beginning of every second year (at t=0,2,4,6,8), plus the two years of cash flows following on from each investment outlay (at t=1,2,3,4,5,6,7,8,9,10). Similarly, for Project B, the overall cash flow profile consists of the capital outlay today and at the end of the fifth year (at t=0,5), plus the five years of cash flows following on from each investment outlay (at t=1,2,3,4,5,6,7,8,9,10).

These adjusted NPVs are comparable. As before, the alternative with the higherNPV is the more desirable alternative.

[Refer to Study Guide example, pg. 30-31]

b. The equivalent annual annuity (EAA) approach

The previous approach can be cumbersome to implement (for example, if we had to compare a 4 year project with a 7 year project, we would have to do a replacement chain analysis over 28 years). In such a case, the EAA approach is better (also known as the annualised NPV approach). It entails the following three steps:

1. Determine each project's NPV over its original life
2. Find the EAA (annualised NPV) of each project using $\frac{Project\ NPV}{PVIFA_{i,n}}$ where *i* the discount rate and *n* is the length of the project in years (given *i* and *n,* PVIFA is obtained from Textbook Appendix A, Table A-4; these tables will be provided in the exam)
3. Assuming infinite replacement, find the infinite horizon/perpetuity NPV using $\frac{Project\ EAA}{Cost\ of\ capital}$

These infinite horizon NPVs are then compared; the higher, the more desirable.

[Refer to Study Guide, example on pg. 32]

aka. Constrained Capital

III. Capital rationing

how to select when capital constrained?

Many firms will operate under capital rationing – that is, they have more acceptable investment opportunities than they can afford to invest in. In other words, capital is constrained. The objective of capital rationing is to select the group of projects that taken in combination provides the highest overall NPV without overspending the capital budget. Note that here, we are primarily concerned with independent projects. Mutually exclusive projects by definition cannot be taken on in combination.

There is no 'formula' for capital rationing: it is an iterative process of looking at what the total NPVs of different combinations of projects are, and the combination with the highest total NPV is the most desirable choice to invest in. Combinations that overspend the budget are not possible and must be disregarded, so it is important to look at what the total capital outlay is for each combination and compare this to the capital budget to see if it is possible to take on.

A good place to start is by ranking the individual opportunities by order of preference. Two approaches to ranking can be taken:

i. The IRR approach (rank in order of highest-to-lowest IRR)

ii. The NPV approach (rank in order of highest-to-lowest NPV)

Once alternatives have been ranked, you need to play around with the different combinations of projects and find the combination with the highest collective NPV, bearing in mind the total capital outlay for each combination relative to the capital budget.

[Refer to Study Guide, example on pg. 32-34]

Tutorial questions for Study Units 1-3

*Taxed on capital gain when selling (find Book Value)

1. Thebes Industrials is contemplating the purchase of a new piece of manufacturing equipment to replace an existing machine, which was purchased two years ago at an installed cost of R60 000 and depreciated over a 5-year straight-line period. It is expected to have a usable life of 5 more years. The old machine can be sold today for R45 000, but will otherwise have a market value of zero at the end of the next 5 year period.

   The new machine will cost R105 000 and requires an additional R5 000 in installation costs. It will have a usable life of 5 years and will be depreciated over a 5-year straight-line period. Additionally, the purchase of the new machine will require an increase in inventories by R30 000, trade and other receivables by R40 000, and trade and other payables by R58 000. After this 5 year period, we expect to sell the new machine for R29 000 and will recover the full amount of net working capital

   Taking on the new machine will cause the company's EBIT to incrementally rise by R28 000 per year for the next 5 years.

   The company faces a tax rate of 30%, and its cost of capital is 12%. The company targets a maximum payback period of 4 years on its investments.

   depreciation on total installed cost

   a) Calculate the initial investment - 79700
   b) Calculate the incremental operating cash flows for Year 1 to 5 41 600
   c) Calculate the terminal cash flow in Year 5 BV800 73 900
   d) Calculate the NPV, IRR, profitability index and payback period of the project. Should Thebes invest in the new machine?

   * Pg. 356-357 EXAMPLE & EXPLANATION

2. Sibaya Metals and Minerals Group is looking to potentially invest in the following independent projects, each of which would require an initial investment of R100m:

Expected cash inflows		
Year	**Phalaborwa**	**Sishen**
1	R10m	R15m
2	R20m	R25m
3	R35m	R30m
4	R45m	R30m
5	R45m	R40m
6	R50m	R45m

• adjust for different levels of risk

Sibaya calculates the appropriate cost of capital for each of its projects using the following model:

$$Cost\ of\ capital = RFR + \beta(Risk\ premium) = 0.10 + \beta(0.04)$$

*MCQ - risk adj. technique

where β is the risk factor. Project Sishen is considered less risky, having a risk factor of 0.9; the Phalaborwa project has a greater level of uncertainty, with a risk factor of 1.5.

Additionally, we estimate the following certainty equivalent co-efficients for each project's future cash flows as follows:

↑ Risk = ↓ Co-efficient

Certainty equivalent coefficients		
Year	**Phalaborwa**	**Sishen**
1	0.9	0.95
2	0.85	0.9
3	0.8	0.85
4	0.75	0.8
5	0.7	0.75
6	0.65	0.7
	16%	13.6%

a) Calculate the appropriate discount rate for each project
b) Calculate the NPV for each project using the risk-adjusted discount rate
c) Calculate the NPV for each project using the certainty equivalent method
d) Calculate the IRR for each project (using its unadjusted expected cash flows)
e) Should Sibaya invest in these projects?

3. CCDU Corporation is looking to invest in a new processing machine. It has to select one of the following options:

Hitachi Processor: it will cost R1.5m and deliver incremental operating cash inflows of R850 000 per year over a three year period, after which time it will be worthless and would need to be replaced

Allianz Processor: it will cost R3.5m and deliver incremental operating cash inflows of R1.1m per year over a six year period. After that time, it will have a market value of zero.

Assume that CCDU Corp faces a cost of capital of 11%. Using both the equivalent annual annuity (annualised NPV) approach and the replacement chain approach, recommend which processor CCDU should invest in

CAPITAL RATIONING:

4. Monsanto has a capital budget of R3bn for 2013 and has the choice of the following (independent) investment opportunities:

Project	Initial investment	NPV
A	R800m	R120m
B	R1.2bn	R150m
C	R750m	R100m
D	R1.8bn	R220m
E	R750m	R110m
F	R1.4bn	R50m
G	R1bn	R180m

a) Rank the projects in order of NPV – Good starting point
b) Which combination of projects should Monsanto take on?

Study Unit 4: Calculating the cost of capital

Study Units 1-3 focused on the process of evaluating potential projects/investment opportunities in order to decide where the company should best invest its capital. This broad topic is known as 'making the investment decision'.

We next look at the other side of the coin: given a company's investment decision and its desired projects, how does the company capitalise their investments? In other words, how are these investments financed, and does the way in which projects are financed matter for the value of the company? This is known as the 'financing decision'. In Study Units 4-7 we will look at the various forms of financing a company can used to capitalise its investments; how to derive the underlying costs of each source of capital; how to find the company's overall weighted average cost of capital (WACC), given its particular capital structure; and finally, examine the dynamics behind the actual capital structure decision, and how it will affect earnings per share (EPS), WACC and firm value.

I. An introduction to the cost of capital

The overall cost of capital for a particular company is the discount rate that should be applied to its future CFs (in an NPV model), and is essentially the minimum rate of return that the company must earn on its investments/projects in order to maintain the market value of its equity. Recall the idea behind IRR:

- If the firm earns a rate of return on its investments above the cost of capital (IRR>CoC), it will increase firm value
- If the firm earns a rate of return on its investments below the cost of capital (IRR<CoC), it will decrease firm value

The actual level of the cost of capital will depend on the underlying forms of capital used by the company, the embedded cost of each, and the relative proportion of each form of capital within the firm's whole capital structure. Calculating the overall cost of capital – the WACC – is covered in detail in SU5.

Broadly speaking, the sources of long-term financing ('capital') include

- Debt
- Equity (a.k.a ordinary shares/common stock)
- Preferred stock (a.k.a preference shares)
- Retained earnings
  ↳ portion of profit held for re-investment

SU4 is devoted to calculating the individual cost of each form of capital.

a. The cost of debt (r_d)

The cost of debt is the cost of raising long-term funds through borrowing. Because of the tax-deductibility of interest payments, we need to be concerned with the after-tax cost of debt. There are two basic approaches for determining the *before-tax* cost of debt:

i. The IRR approach

ii. The approximation approach

i. The IRR approach

This approach calculates the IRR on the cash flows of bonds (debt) issued by the company. This IRR is interpreted as the before-tax cost of debt.

[Refer to Textbook example, pg. 456]

ii. The approximation approach

Assuming a bond with a face (par) value of R1000, the before-tax cost of debt can be approximated using the equation:

short cut:

$$r_d = \frac{I + \frac{\mathbf{R1,000} - N_d}{n}}{\frac{N_d + \mathbf{R1,000}}{2}}$$

where r_d = before-tax cost of debt

I = annual interest in rands

N_d = net proceeds from the sale of the bond (net of flotation and transaction costs)

n = number of years to the bond's maturity

[Refer to Textbook example, pg. 457]

iii. The after-tax cost of debt

Interest payments are tax-deductible, which means that debt offers a tax advantage over equity or preferred stock (whose dividends are not tax-deductible). Thus, the effective cost of debt must be looked at on an after-tax basis (given a tax rate of t):

$$After - tax\ cost\ of\ debt = r_d \times (1 - t)$$

[Refer to Textbook example, pg. 458]

b. The cost of equity (r_e)

The cost of equity is generally viewed as the rate of return investors require on a firm's common stock, given its underlying risk. There are three approaches for measuring the cost of equity:

i. The Gordon growth model

ii. The Capital Asset Pricing Model (CAPM)

iii. The bond-plus approach

i. The Gordon growth model

The Gordon model is a method of valuing a share in a company that assumes that a share earns dividends that grow at a constant, perpetual rate *g*:

$$P_0 = \frac{D_1}{r - g}$$

where P_0 is the stock's current market price

D_1 is the dividend to be received in one year

g is the growth rate in dividends (or earnings)

r is the cost of equity

The above formula can be rearranged to solve for the cost of equity (and taking into account underwriting and flotation costs):

$$r_e = \frac{D_1}{P_0 - F} + g$$

where *F* are the flotation and underwriting costs per share, which the company should have to incur any time it goes into the external capital market to raise new shares. This is also known as the cost of new equity (i.e. equity that still has to be raised from the external capital market). If all earnings are paid out as dividends, then $D_1 = EPS_1$ and theoretically g = 0 (unless some assumed growth rate is given or must be calculated from past earnings/dividend growth).

[Refer to Textbook example, pg. 460]

ii. The Capital Asset Pricing Model (CAPM)

CAPM derives the cost of equity as follows:

$$r_e = RFR + \underbrace{\beta(R_M - RFR)}_{\text{Market risk premium}}$$

where r_e is the cost of equity

β is the share's beta coefficient (a measure of its market risk exposure), measured against an appropriate market index

RFR is the risk-free rate

[Refer to Textbook example, pg. 461]

iii. The bond-plus approach

This is a simple approach that finds the cost of equity by taking the company's after-tax cost of debt and adding a risk premium (to account for the greater risk of an equity investment over a debt investment):

$$r_e = r_d(1 - t) + \textbf{\textit{Risk Premium}}$$

[Refer to Study Guide example, pg. 44]

c. The cost of preference shares (r_p)

The cost of preferred stock r_p is found using the formula:

$$r_p = \frac{d_p}{N_p}$$

where d_p is the annual preference share dividend (Par Value x Preference Yield)

N_p is the net proceeds from the sale of preference shares (net of flotation costs)

[Refer to Textbook example, pg. 459]

d. Cost of retained earnings (r_{re})

Since retained earnings is implicitly a form of equity capital and represents equity-holders' claim on the accumulated net profit of the company that hasn't been paid out to

shareholders in the form of dividends, it is essentially a form of 'old equity' or 'existing equity'. Thus, the cost of retained earnings is often assumed to be the same as the cost of 'existing' equity (i.e. equity that doesn't need to be raised in the external market, and thus there are no flotation or underwriting costs involved).

Following the Gordon model (and with F = 0), the cost of retained earnings r_{re} is thus given as:

$$r_{re} = \frac{D_1}{P_0} + g$$

For some practice for SU4, look at ST11-1 (*Part a*) on pg. 473-474 in the Textbook

Study Unit 5 – The WACC, WMCC and IOS

Having looked at the individual types of capital and how to derive their underlying costs in SU4, we next move on to how to calculate a firm's overall cost of capital, given its particular capital structure, and how this is then applied to the evaluation of investment opportunities.

I. The weighted average cost of capital (WACC)

A company's overall cost of capital is the weighted average of the individual costs of capital, weighted according to the relative proportions of each source of financing within the company's capital structure:

$$WACC = (w_d \times r_d \times [1 - t]) + (w_p \times r_p) + (w_e \times r_e) + (w_{re} \times r_{re})$$

where r_d, r_p, r_e and r_{re} are the costs of debt, preference shares, equity and retained earnings, respectively (derived as per SU4); t is the tax rate (which is used to calculate the after-tax cost of debt); and w_d, w_p, w_e and w_{re} are the relative proportions in the capital structure of debt, preference shares, equity and retained earnings, respectively.

In the WACC context, these weights are usually assumed to be derived on a historical basis – that is, based on the firm's historical capital structure. The essential assumption here is that the firm's capital structure should be maintained going into the future.

There are two approaches to derive these weightings:

1. Book value weights: divide the **book value** of each capital component by the total of the book values of all capital sources

2. Market value weights: divide the **market value** of each source of capital by the total market value of all sources of capital

Technically, the use of market weights is more appealing since market values more accurately depict the actual level of Rands that the company can raise from investors in capital markets.

Alternatively, a firm may have a target capital structure for a particular project or investment opportunity. These target weights may be different from the company's historical capital structure weights, and represent the company's *desired* capital structure (i.e. financing pattern) for that project.

[Refer to Study-guide, example on pg. 51-52; Textbook example, pg. 464-465]

II. The weighted marginal cost of capital (WMCC)

*Q in 2013 exam.

External capital (such as new equity) has a higher cost than internal capital (such as retained earnings), due to flotation and underwriting costs associated with the acquisition of new capital. Thus, a company's weighted cost of capital will increase for each unit of new external financing.

Intuitively, when looking to invest, a company will use its lower-cost sources of financing (internal funds) first, and should only move on to more costly external sources of financing (such as equity or debt) when internal funds are exhausted. The greater the level of investment a company wishes to pursue, the greater will be its financing requirements, and thus the greater will be its need for costly external financing. This implies that a company's cost of capital is an increasing function of the size of its required level of investment and financing.

This concept lies behind the **WMCC schedule** – it is a schedule or graph that relates a firm's cost of capital (WACC) to the level of financing required (see graph in the Study Guide, pg. 55). The WMCC provides an indication of the appropriate level of WACC (i.e. discount rate) required in the capital budgeting process, given the level of financing required to fund the initial investment. The WMCC can be interpreted as the WACC associated with an additional Rand of total new financing.

The process to calculate the WMCC is as follows:

1. Determine the cost and percentage proportion of each source of capital to be used as financing

2. Compute the **breaking points** on the WMCC curve where the WACC will increase, using the formula:

$$BP = \frac{\textbf{\textit{Maximum amount of the lower cost source of capital}}}{\textbf{\textit{Percentage financing provided by that source}}}$$

3. Calculate the weighted cost of capital over the range of total financing between break points

4. Construct a WMCC schedule that shows the weighted cost of capital for each level of total new financing

In this course, we will generally focus on retained earnings being the lower cost source of capital. So example, if we have R20million in retained earnings on hand and 20% of our investment is financed by retained earnings, the breaking point is (20m / 0.2) = R100million. This means that for any level of investment less than R100m, retained earnings will be sufficient to meet the need for financing and we won't have to issue costly new equity. But if we require more than R100m in financing, then we will run out of retained earnings and need to issue costly new equity. This will increase the WACC, for levels of financing of R100m and onwards.

The WMCC is used in conjunction with the firm's **investment opportunities schedule (IOS) –** which is basically a summarised outline of the value of the firm's investment opportunities in terms of their IRRs. As long as a project's IRR is greater than the WMCC, the project is acceptable. The point at which the IRR intersects the WMCC gives the optimal capital budget (i.e. level of total capital expenditure that the company should undertake).

[Refer to the Study Guide, example on pg. 53-55]

For additional practice, look at ST11-1 (*Part b-d*) on pg. 473-474 in the Textbook

Study Unit 6: Leverage

I. Introduction to leverage

a. Leverage defined

Leverage is defined as the use of fixed-cost assets or fixed-cost sources of capital (such as debt) to magnify returns to the firm's owners. Generally, increases in leverage result in increased financial risk and higher expected returns (ROA/ROE), while less leverage ('deleveraging') results in less financial risk and lower expected returns.

We will look at the dynamics of three types of leverage

1. **Operating leverage**: the relationship between revenue and operating profit (EBIT) - effect on OP when ΔR
2. **Financial leverage**: the relationship between operating profit (EBIT) and earnings per share (EPS)
3. **Total leverage**: a combination of the above two, that is concerned with the relationship between revenue and EPS

b. Break-even analysis

Break-even analysis is an important starting point when examining the effect of leverage. The **operating break-even point** is the level of sales at which no operating profit or loss results (i.e. zero operating profit). Determining this level requires us to break down costs into two components: i) variable costs (costs that vary in direct proportion to changes in sales volume); and ii) fixed costs (costs that are constant regardless of volume). This is the type of break-even point you will most commonly be asked to look at.

The break-even point is found by setting sales equal to the total of variable plus fixed costs. Denote:

X = sales volume in units

P = selling price per unit

V = unit variable cost

FC = fixed operating costs

We derive $X = \frac{FC}{P-V}$; in other words, we need to sell 'X' units in order to break-even

i.e. $$\boldsymbol{Break-even\ sales\ in\ units} = \frac{\boldsymbol{Fixed\ operating\ costs}}{\boldsymbol{Unit\ selling\ price - Unit\ variable\ cost}}$$

[Refer to Textbook, example on pg. 490-491; Study Guide pg. 62]

A firm's break-even point is sensitive to changes in these underlying variables: increases in fixed and variable costs will increase the break-even point, and increases in sales price per unit will decrease the break-even point.

[Refer to Textbook, pg. 491-492]

A related concept is that of the **cash break-even point**: the volume of sales that will cover all cash expenses in a period. To do this, we subtract any non-cash charges, like depreciation, from fixed costs (because they don't represent a *cash* expense) and proceed as before:

$$\textbf{Cash break} - \textbf{even sales in units} = \frac{\textbf{Fixed operating costs} - \textbf{NCC}}{\textbf{Unit selling price} - \textbf{Unit variable cost}}$$

[Refer to Study Guide, example on pg. 62]

Finally, one may be interested in an **overall break-even point**, being the level of sales where earnings (a.k.a. net income) is zero. Fixed financing costs (incl. interest expense and preference share dividends) are added to fixed costs to find this point. Fixed financing costs are calculated as $Interest\ expense + \frac{Preference\ dividends}{1-t}$, and the overall break-even point as:

$$\textbf{Overall break} - \textbf{even sales in units} = \frac{\textbf{Fixed operating costs} + \textbf{Fixed financing costs}}{\textbf{Unit selling price} - \textbf{Unit variable cost}}$$

Note that the level of fixed financing costs is equivalent to what is called the 'financial breakeven point': the level of EBIT for which EPS = 0. So for example, if fixed financing costs are R7million, then EBIT of R7million will result in zero earnings.

II. Operating leverage

This is a measure of **operating risk.** It measures the effect that a change in sales has on operating profit (EBIT). Note that operating leverage increases as the level of fixed costs (and the use of fixed-cost assets) increases.

For a given level of sales of X units, it is calculated as:

$$\textbf{Operating leverage for X units of sales} = \frac{(P-V)X}{(P-V)X-FC}$$

This figure tells us 'for 1% increase in sales, by how many percent does operating profit (EBIT) change?'. If this figure is greater than 1, then operating leverage exists in the company; if it is less than 1, operating leverage does not exist.

Note that $(P-V)X-FC$ is equivalent to EBIT

[Refer to Study Guide, example on pg. 62-63; Textbook, example pg. 493-496]

III. Financial leverage

Financial leverage is a measure of **financial risk.** It measures how earnings per share (EPS) are affected by changes in operating profit (EBIT). Financial leverage arises from increasing the relative amount of debt (or other forms of capital that pay fixed financial costs, such as preference shares) in the company's capital structure. With IC denoting total fixed financing costs (calculated like before as $IC = Interest\ expense + \frac{Preference\ dividends}{1-t}$):

$$\textbf{Financial leverage for X units of sales} = \frac{(P-V)X-FC}{(P-V)X-FC-IC}$$

This value tells us 'for a 1% increase in EBIT, by how many percent does EPS increase?'

If this figure is greater than 1, then financial leverage exists in the company; if it is less than 1, financial leverage does not exist.

Financial leverage and capital structure are very much linked. For a fixed capital budget, the amount of debt used will determine how many shares (i.e. how much equity) must be issued in order to finance the full capital budget. This will affect EPS: the more debt that is used (and thus the higher the degree of financial leverage), the less shares will need to be issued in order to make up the capital budget, and so EPS will increase. But this does come at the cost of increased financial risk. This concept will be looked at in SU7.

[Refer Study Guide, example on pg. 63; Textbook, example on pg. 496-498]

IV. Total leverage

This is a measure of **total risk** that implicitly combines operating and financial risk. It measures how earnings per share (EPS) are affected by changes in sales:

$$\textit{Total leverage for X units of sales}$$

$$= \textit{Operating leverage} \times \textit{Financial leverage}$$

$$= \frac{(P-V)X}{(P-V)X-FC} \times \frac{(P-V)X-FC}{(P-V)X-FC-IC}$$

This value tells us 'for a 1% change in sales, by how many percent does EPS change?'

If this figure is greater than 1, total leverage exists in the company; if it is less than 1, then total leverage does not exist.

[Refer to Study Guide, example on pg. 64; Textbook pg. 500]

Study Unit 7: Capital structure and firm value

This is an important part of the course. Make sure you read through and understand the theory underlying capital structure (Parts I-III to follow). The analytical procedure as outlined in Part IV is very important.

I. The capital structure decision: an introduction

impact on financial statements & EPS

- proportion of debt: equity

Capital structure refers to the mix of debt and equity (as well as preferred stock and hybrids) that a company uses to finance its operations and investments. Thus the capital structure decision comes down to asking, "What proportion of debt vs. equity vs. preferred stock should the company use to finance itself?"

There are a number of factors that affect this decision. Firms in the same industry are likely to have similar characteristics and be exposed to common risk factors, and thus have similar capital structures. But across different industries, the drivers behind the capital structure decision will change, and so will D/E ratios – for example, see Table 12.8 pg. 503 in the Textbook.

In coming to grips with this decision, it is important to recognise the unique characteristics of debt and equity

- LEAVE OUT PG. 73-80

- Debt represents a **legally-binding contractual agreement between the borrower and lender**: the lender agrees to lend a certain amount under a promise from the borrower to **make interest payments as well as a repayment of principal over an agreed definite time horizon**. If the borrower fails to meet these conditions, it may fall into a position of **bankruptcy**, where the company's assets may be **liquidated** to pay off its debt-holders
- Equity, on the other hand, has an indefinite horizon. As the **residual owners** of the company, equity-holders receive their claim on the firm's income only **after interest payments to debt-holders have been made** (think of the position of earnings/net income on the income statement relative to interest expense). This makes an equity investment in a company relatively **more risky** than a debt investment. Unlike debt-holders, equity-holders **control** the company (with an individual shareholder's degree of controlling power dependent on the percentage of the company's shares they own). In the event of bankruptcy and liquidation, **debt-holders are paid off before anything goes to equity-holders**

A company's cost of capital will depend on its exact capital structure: specifically, on the relative proportion of each source of capital. Recall the WACC formula (here looking at debt and equity only):

$$WACC = \left(\frac{D}{D+E}\right) r_d(1-T) + \left(\frac{E}{D+E}\right) r_e$$

The capital structure decision is often thought of as determining what mix of debt and equity will maximise firm value. Assuming constant EBIT:

$$Firm\ Value = \frac{EBIT \times (1-t)}{WACC}$$

In other words, what is the optimal capital structure (D/E ratio) that will minimise the WACC and thus maximise firm value?

Leave Out

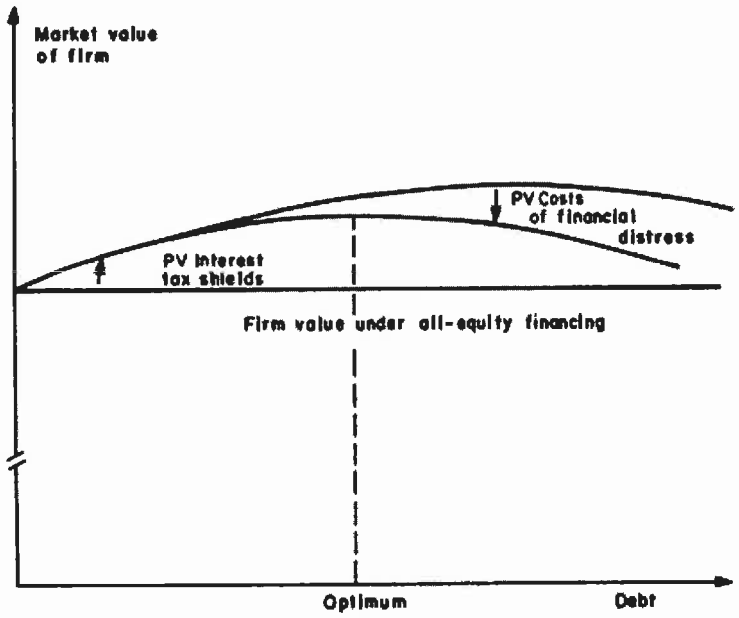
Essentially, the idea behind the optimal capital structure is that the target D/E ratio that maximises firm value / minimises WACC is obtained by trading off the marginal benefits and marginal costs of additional debt financing:

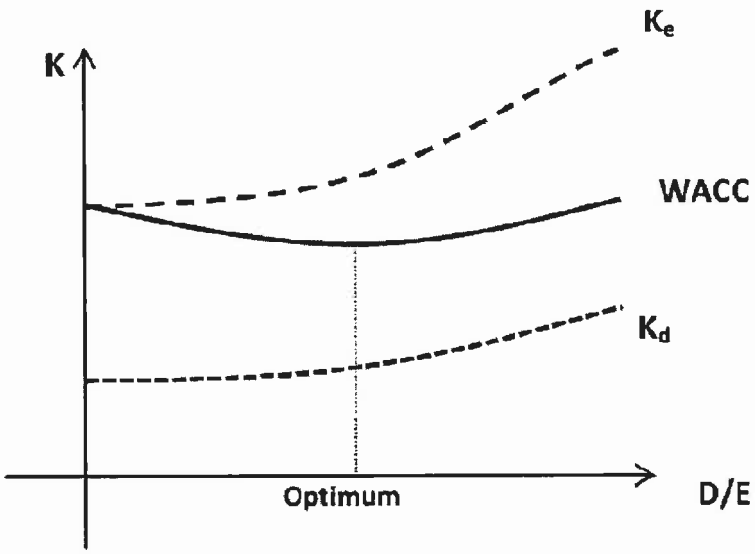
- Marginal benefits of debt
  - Tax deductibility of interest payments
  - Managerial discipline (Jensen's Free Cash Flow theory)
- Marginal costs of debt
  - Increased probability of bankruptcy and costs of financial distress

- Agency costs (monitoring costs)

[See the discussion in the Textbook on pg. 504-511 for more detail]

This is graphically depicted by the following diagrams:





II. Views on the effect of capital structure on firm value

Broadly, there are four theoretical views of what the effect of the capital structure decision is on firm value:

a. Net operating income (NOI) approach

This approach suggest that the firm's overall cost of capital, k_0, and the overall value of the firm, V, are independent of the degree of leverage (i.e. they do not change as the D/E ratio changes). The key insight is that k_0 remains constant regardless of changes in capital structure. Although the cost of equity k_e will increase as leverage increases, k_0 will remain constant.

[See Study Guide, pg. 75, Example 7.1]

b. Net income (NI) approach

Unlike the NOI approach, the NI approach suggests that the cost of capital k_0 and the market value of the firm V will be affected by changes in leverage. The key assumption here is that the cost of debt k_i and the cost of equity k_e do not change as leverage changes. This approach results in the insight that the cost of capital decreases and firm value increases as leverage increases.

[See Study Guide pg. 76-77, Example 7.2]

c. Traditional approach

Perhaps the most realistic approach, and the one that forms the basis of the discussion in Part I of SU7 (see previously). Under this approach, there is a capital structure target at which the cost of capital is minimised and firm value is maximised. Here, k_0, k_i and k_e will change as leverage changes

[See Study Guide pg. 78-79, Example 7.3]

d. Miller-Modigliani approach

This closely follows the insight of the NOI approach, and advocates that:

- Market value of the firm and the cost of capital are independent of its capital structure

- Changes in k_e and k_i as leverage changes exactly offset each other to leave k_o unchanged
- The cut-off rate for investment decisions (the hurdle rate - recall the IRR rule) is unaffected by the way in which the investment is financed

III. Factors that will affect a company's desired capital structure

The following are some practical factors that will affect a particular company's capital structure decision:

i. Growth rate of future sales

ii. Stability of future sales

iii. Competitive structures in the industry

iv. Asset make-up of the individual firm

v. Attitude of owners and managers towards risk

vi. Control position of owners and management

vii. Lender's attitude towards the industry and the particular firm

Leave Out

IV. EBIT-EPS analysis

Recall the concept of financial leverage from SU6. Increasing the relative proportion of debt in a company's capital structure will have two effects on equity-holders: i) a change in the level of earnings per share (EPS) for a given level of EBIT; and ii) an increase in risk affecting EPS. The second effect (financial risk) is measured by the degree of financial leverage, as in SU6. Here we will look at the first effect using **EBIT-EPS analysis.**

In choosing between different capital structure alternatives, the company may want to choose the option that maximises EPS, given the company's level of sales and EBIT. Thus, we need to determine the EPS for the different financing alternatives. The process here is that one simply puts together a simple income statement for each financing alternative and then looks at which alternative maximises EPS. The alternative that maximises EPS should be the preferred choice. It is important to remember the basic format behind an income statement and how one moves from EBIT to arrive at the bottom line (earnings or net income) to get EPS.

[Refer to Study Guide, example on pg. 64-67; example on pg. 81-82, example pg. 83-85]

Alternatively, the goal may be to maximise firm value / shareholder wealth. The process in this case will be to simply calculate WACC under each alternative, using the formula:

$$\boldsymbol{WACC = (w_d \times r_d \times [1 - t]) + (w_p \times r_p) + (w_e \times r_e)}$$

The alternative that results in the lowest WACC will maximise firm value, and should be chosen.

• Bond = Unit of debt.

Tutorial questions for Study Units 4-7

1. You are analysing DataTech and want to estimate its cost of capital. You gather the following information:
    - DataTech's bonds have a par value of R1 000, pay an annual coupon of 9%, 7 years to maturity and currently trade in the market at R1 034
    - Its preference shares are issued at a par value of R100, have a yield of 11%, and flotation costs (cost to issue) are estimated at 4% of par value
    - The current market price of DataTech's common stock is R75 per share. Its most recent dividend was R3.50 per share, and you expect their dividends to grow at a constant rate of 6% per year. Flotation costs of any new shares are estimated at 5% per share

    You expect that DataTech will target a capital structure over the coming year of 40% debt, 10% preference shares, 20% retained earnings and the rest will be made up of new equity. The company currently has EBIT of R108m and faces a tax rate of 35%.

    SUG. a) Calculate the cost of debt, preference shares, retained earnings and new equity for DataTech

    * b) What is DataTech's WACC given its target capital structure?

    c) Estimate the overall firm value of DataTech

2. Ocean Holdings targets a capital structure made up of 60% debt and 40% equity. Retained earnings currently sit at a level of R40m.
    - It faces an after-tax cost of debt of 8.2%, which is fixed at this level regardless of the amount of financing required
    - Its most recent EPS was R12.00 per share, it has a payout ratio of 65%, and earnings are expected to grow at 5% per year

- The current market price of a share in Ocean Holdings is R80
- Any newly issued shares will carry a flotation cost of R4.50 per share. The company will look to issue new equity only when its retained earnings have been exhausted

a) At what level of total financing will Ocean Holdings need to issue new equity?
b) Calculate the WACC for Ocean Holdings at either side of this breakpoint and illustrate on a graph (with WACC on the y-axis and the level of total financing on the x-axis)

3. The following information applies to Capitol Semiconductors:

SU6:

- It costs Capitol R850 to manufacture a single semiconductor, which it sells to at R2350 per unit
- Sales are currently at 49 000 units per year
- Capitol faces fixed operating costs of R27million
- The company uses a combination of debt and preference shares as its fixed-cost capital base. Interest expense is estimated at R18m, while preference dividends are at R7.5m
- The applicable tax rate is 30%

Calculate the following:

focus*

a) The operating break-even point
b) The overall break-even point
c) The degree of operating leverage
d) The degree of financial leverage
e) The degree of total leverage

4. Pearson Industrials is currently financed entirely by equity (no debt), with a total capital value of R200m (made up of 2 million shares, each with a value of R100). The company faces a tax rate of 35% and its level of EBIT is currently (eps profit) R28m. It is looking to raise an additional R50m in capital, and is considering the following four options:

I. Raise R50m entirely from new shares
II. Raise R50m in debt, carrying an interest rate of 9%
III. Raise R50m in preference shares, carrying a yield of 11%
IV. Raise R30m from new shares, and the remaining R20m in new debt carrying a 9% interest rate

Which financing option maximises EPS?

5. MicroFin is currently financed with 25% debt and 75% equity, for a total capital value of R80m. The company has 1.5m shares outstanding. It currently earns EBIT of R15m and faces a tax rate of 30%. Its before-tax cost of debt is 8% and its cost of equity is 13% at present.

   It is considering restructuring its balance sheet such that it will arrive at a capital structure made up of 50% debt and 50% equity. This is a leverage-increasing transaction: new debt will be raised and used to repurchase shares. This will increase its average cost of debt to 8.5% and its cost of equity to 14% due to the greater level of financial risk.

   a) What is MicroFin's WACC and EPS before the restructuring?
   b) How much debt will MicroFin need to raise to reach the capital structure target?
   c) How many shares will be repurchased?
   d) What is its WACC and EPS after the restructuring?
   e) If the goal is to maximise EPS, should management pursue the restructuring?
   f) If the goal is to maximise firm value, should management pursue the restructuring?

Study Unit 8: Dividend policy

I. Fundamentals of dividend policy

Dividends represent the portion of earnings generated by the firm that are paid out to shareholders instead of being retained within the firm for reinvestment. They are usually paid on a quarterly, semi-annual or annual basis. Dividends can take the form of either a cash dividend or a stock dividend. For the purposes of this course, we will focus on cash dividends.

Generally you find that the more stable are a firm's earnings, the more regular will be its issue of dividends. An important aspect of dividend policy is that dividends are 'sticky', with managers being reluctant to decrease dividends, and will only look to increase dividends when the company can afford it and the increase is sustainable.

There are a few reasons why a company's dividend policy is important:

- Dividends play an important role in **providing information** to investors about the firm's current and future performance. Generally, declines in dividend payments sends a negative signal to investors, indicating that company profitability may be falling and management is not confident or optimistic about the future. Conversely, dividend increases are a positive signal, indicating that earnings are robust and set to increase, and management is optimistic and confident about the future
- It significantly affects the firm's **financing decision**. Retained earnings (i.e. earnings held within the frim instead of being paid out) represent internal financing. The more dividends a firm pays, the lower will be its level of internal funds, and thus the greater its need for external financing – the issue of new debt, preferred stock and/or common stock
- Dividend policy interacts with the **investment decision.** All else constant, a high-growth firm with a substantial level of investment opportunities would prefer to reinvest a larger portion of its earnings instead of paying them out
- It affects a company's **cash flow position.** A company struggling with liquidity/poor cash flow (i.e. a shortage of cash) may find it necessary to restrict or cut down dividends
- Payment of dividends will **affect the D/E ratio.** Paying dividends reduces the level of equity on the balance sheet (since it will decrease the level of retained earnings), which would increase the D/E ratio

II. The timeline of dividend dates

Relevant dates associated with dividend payments are as follows:

1. **Declaration date**: the date on which the board of directors declares the dividend. From this date, the payment of the dividend becomes a legal liability of the company
2. **Ex-dividend date**: holders of the share before this date will receive the dividend. Should an investor purchase shares on or after this date, they will not be entitled to the current dividend. Generally set 4 days before the date of record. One should observe the market price of the share fall by the amount of the dividend on the ex-dividend date
3. **Date of record**: the date on which the shareholders who are entitled to receive the dividend are recorded and registered for payment
4. **Payment date**: the date on which the dividend is actually paid to shareholders

For example:

- Sasol declares a R3.65 per share dividend on 10 March 2008
- The ex-dividend date is 7 April 2008 (the share price should fall by R3.65 on this date, market fluctuations aside) – buy after 7 Apr not entitled to 3.65
- The record date is 11 April 2008
- Payment of the dividend is made on 14 April 2008

III. Is dividend policy relevant for firm value?

Miller and Modigliani (1961) make the argument that the sole drivers of a company's value should be its earning power and the risk of its assets/investments. The manner in which it splits its earnings stream between dividend payouts and reinvestment shouldn't affect firm value. Thus, a company's dividend policy is irrelevant. But their discussion assumes a perfect world with no taxes, no uncertainty, no transaction costs and no market imperfections.

How does this change when we move to a more realistic world? There are several arguments for the relevance of dividend policy for firm value:

a. The informational content of dividends

As was discussed earlier, dividends play an important role in providing information to investors about the firm's current and future performance. Generally, declines in dividend payments sends a negative signal to investors, indicating that company profitability may be

falling and management is not confident or optimistic about the future. Conversely, dividend increases are a positive signal, indicating that earnings are robust and set to increase, and management is optimistic and confident about the future. Managers may thus use dividends as an important signalling tool, and the use of this signalling tool will affect firm value.

b. The clientele effect

Firms will attract certain categories of investors depending on their payout policy.

- Investors who prefer a stable stream of income from their share investments would prefer to invest in shares that yield a solid stream of dividends. These sorts of companies are generally mature, established and consistently profitable
- Investors who prefer capital gains would prefer to invest in companies that retain a greater portion of earnings for (profitable) reinvestment. These are generally high-growth companies facing a multitude of good investment opportunities. They prefer to see their returns come through the form of share price increases instead of dividends

Thus, a company will attract a certain 'clientele' for their shares depending on their payout policy. This preference for dividends vs. capital gains is in large part determined by the taxation of dividends vs. capital gains. For example, you are taxed at a rate of 40% on dividends and 25% on capital gains. If you are entitled to a pre-tax return of R100 on your equity investment, you would receive 100(1-0.4) = R60 after tax if it came in the form of a dividend, or 100(1-0.25) = R75 if it came as a capital gain. On an after-tax basis, you would clearly prefer the company to retain and reinvest earnings instead of paying dividends.

Generally, institutional investors like pension funds do not pay taxes on dividends but they do pay taxes on capital gains, so they would prefer to invest in dividend-paying firms. Individual investors pay lower taxes on capital gains (which can also be deferred), so they would prefer to invest in companies that do not pay dividends and rather reinvest their earnings.

c. The 'bird-in-the-hand' argument

Investors may see payments of current dividends as more certain/less risky than future uncertain dividends or capital gains. So the payment of current dividends can reduce investor uncertainty about investing in a company's shares, and so they would be willing to pay more for them. Equivalently, under this line of thought, dividends will reduce a share's required rate of return/discount rate (cost of equity) and thus increase equity value. Non-payment of dividends would by implication be attached to greater uncertainty, a higher discount rate, and thus a lower equity value.

IV. Types of dividend policy

There are several approaches to the process of determining what Rand-level of dividends should be paid out:

1. **Constant payout ratio**: a fixed portion of earnings are paid out as dividends. The Rand value of the dividend per share is equal to *Payout Ratio x EPS*
2. **Regular dividend policy**: a fixed-rand dividend is paid in each period, which may increase (or occasionally decrease) at discrete points in time, depending on how management feels about the sustainability of the dividend level
3. **Stable/regular growth dividend policy**: dividends grow every year at some constant rate
4. **Low-regular-and-extra dividend**: an approach that sees the company pay some relatively low dividend that can be sustained with a high degree of certainty, and when earnings do jump and increase substantially in a given period, management will pay out a discretionary extra or 'special' dividend
5. According to the **residual theory of dividends**:
    i. Determine what level of capital expenditure should be undertaken, found where the WMCC intersects the IOS (see SU5, pg. 53-55)
    ii. According the company's particular capital structure, part of it will be financed by debt, part by equity. For the equity portion, use retained earnings first. If retained earnings are not sufficient to meet this need, issue new shares
    iii. If retained earnings are greater than this requirement, there will be a residual level of retained earnings left over. This is what should be paid out to shareholders as dividends

[Refer to Study Guide, activity on pg. 95-96]

V. Other forms of payout

Companies can explicitly compensate investors (i.e. pay out profits) not only through cash dividends. Other methods include:

1. **Share repurchases**: the company uses a portion of earnings to repurchase (buy back) shares from investors, usually at a premium to market price.

2. **Stock dividends**: the company offers current shareholders more shares in the company instead of a cash dividend. For example, Capitec might offer its shareholders 1 share for every 10 held.

3. **Stock splits**: increases the number of shares held by shareholders. For example, a 5-for-1 split will give a shareholder 5 new shares for every old share held. The share price would adjust accordingly.

Study Unit 9: Leasing

I. An introduction to leasing

There are two ways in which a company can acquire assets:

i. The outright purchase of assets by the company using its debt and equity capital

ii. 'Rent' the asset; in other words, obtain the use of the asset from its owner for which the company must make a series of contractual, fixed and tax-deductible payments. This is known as leasing. The owner of the asset is called the lessor, and the 'borrower' of the asset is called the lessee

As we shall see, the choice between leasing an asset or purchasing it outright comes down to which is the cheaper option for the company.

Read up on some of the advantages and disadvantages of leasing in the Textbook, Table 16.4, pg. 647; and how leasing will affect a company's financial ratios in the Study Guide, pg. 104.

There are two types of leases:

1. **Operating lease**

   - A contractual agreement whereby the lessee agrees to make periodic payments to the lessor, usually for a period of 5 years or less, to use the asset
   - These payments are fixed and tax-deductible, paid at predefined dates
   - Operating leases have no impact on the balance sheet: lease payments are charged as an expense to the income statement

- They are cancellable at the option of the lessee (where there may be a penalty attached)
- Assets leased under operating leases usually have usable lives that may be longer than the life of the lease, but they become relatively less efficient and technologically obsolete if leased for a longer period (e.g. a computer or machinery)
- On maturity of the lease, the lessee returns the asset to the lessor

2. **Financial (or capital) lease**

- Similar in some ways to an operating lease
  - The lessee gains the use of the asset and is obligated to make payments to the lessor in order to do so
  - Payments are fixed and tax-deductible, paid at predefined dates, and are recorded as an expense on the income statement
- But they are generally longer-term and not cancellable (without a substantial penalty)
- These types of leases are normally used for leasing land, buildings and large pieces of equipment
- Financial leases will impact the balance sheet by appearing as a liability, with the asset being leased recorded as an on-balance sheet asset

II. The lease-versus-purchase decision

When looking to gain the use of an asset, the company must compare the leasing and purchasing alternatives. This requires us to compare the present value of the after-tax cash outflows attached to each alternative. The alternative with the lower present value of expected future cash outflows (in absolute value terms) is the cheaper alternative and should be the preferred choice.

a. Calculating the cash flows under a lease

1. **Find the annual lease payment**

   It will sometimes be given to you, but you may need to calculate it.

With the first payment *made in advance* (i.e. starting at t=0) as is generally the custom with leases, use the formula:

$$A = \frac{\boldsymbol{Amount\ of\ lease}}{\mathbf{1} + \boldsymbol{PVIFA_{i,\ n-1}}}$$

where A is the lease payment; the amount of the lease is the value of the asset being leased; and $PVIFA_{i,\ n-1}$ is the present value factor of an annuity of R1 over *n-1* years, using the lessor's required return as *i,* and *n* is the length of the lease in years (see Table A-4, textbook pg. 764-765). Note that unless otherwise indicated, you should assume that payments are made in advance and thus this is the appropriate formula to use.

Alternatively, with the first payment *made in arrears* (i.e. at the end of each year, starting at t=1), use the formula:

$$A = \frac{\boldsymbol{Amount\ of\ lease}}{\boldsymbol{PVIFA_{i,\ n}}}$$

where A is the lease payment; the amount of the lease is the value of the asset being leased; and $PVIFA_{i,\ n}$ is the present value factor of an annuity of R1 over *n* years, using the lessor's required return as *i* and *n* is the length of the lease in years (see Table A-4, textbook pg. 764-765).

2. Because lease payments are tax-deductible and thus will help offset the company's tax liability, we need to calculate the **after-tax cash outflow** arising from each payment, using the formula:

$$\boldsymbol{After - tax\ cash\ outflow} = \boldsymbol{A} \times (\mathbf{1} - \boldsymbol{t})$$

Care must be taken with the timing of these tax savings when lease payments are made in advance, as is evident from the example on pg. 102-104 in the Study Guide

3. Calculate the sum of the present values of these expected after-tax cash outflows, using the company's cost of capital as the discount rate. This figure gives the **present value of the cost of the lease** over its life.

Note: often there will be an option of purchasing the asset at the end of the lease. This cash outflow in the final year of the lease must be included in the overall cash flow profile of the lease if the option is to be exercised.

b. Calculating the cash flows from outright purchase of the asset

We need to determine the stream of after-tax cash outflows that arises from the outright purchase of the asset. Assuming that the asset is financed by a particular amortising loan, we need to determine several figures:

1. The loan repayments on an amortised basis

You may sometimes be given the level of this payment, or you must calculate it. For a loan of a certain amount (which will usually be equal to the total cost of the asset), the amortised annual loan repayment *A* is calculated as:

$$A = \frac{\boldsymbol{Amount\ of\ loan}}{\boldsymbol{PVIFA_{i,n}}}$$

where $PVIFA_{i,\ n}$ is the present value factor of an annuity of R1 over *n* years, where *i* is the interest rate on the loan and *n* is the term of the loan in years (see Table A-4, pg. 764-765).

2. Additional *cash* expenses arising from the purchase of the asset

Because we have purchased the asset outright, we need to calculate the total additional ***cash*** costs of owning the asset, including maintaining the asset and insuring it. Depreciation is not a cash expense so it is ignored at this point.

3. The tax savings arising from the series of tax-deductible expenses arising from the purchase of the asset

We need to take into account the tax-deductibility of the expenses arising from the purchase of the asset: the fact that these expenses are tax-deductible means the company will generate tax savings that reduce the ultimate actual level of cash outflow.

Tax-deductible expenses here will include depreciating, insuring and maintaining the asset, as well as the explicit interest expense component of the loan amortisation payment (recall that each amortisation payment is made up of two components: an interest payment and a repayment of principal).

The level of these tax savings is calculated as:

$$\boldsymbol{Tax\ savings = Total\ tax - deductible\ expenses} \times \boldsymbol{t}$$

4. **The after-tax cash outflow for each year**, which is the loan repayment plus the additional cash expenses, less the tax savings [i.e. (1) + (2) – (3)]:

$$\begin{aligned} &\textit{After} - \textit{tax cash outflow} \\ &\quad = \textit{Amortised loan repayment} \\ &\quad + \textit{Cash expenses} - \textit{Tax savings} \end{aligned}$$

Finally, calculate the present value of these expected after-tax cash outflows, using the company's cost of capital as the discount rate. This figure gives the present value of the cost of the outright purchase of the asset over its life.

Once the present value of the cost of the lease and the present value of the cost of the outright purchase of the asset have been calculated, the two alternatives can be directly compared. The one with the lower present value of cash outflows is the cheaper alternative, and should be the preferred choice.

[Refer to Study Guide, examples on pg. 102-104 and pg. 105-106; Textbook, example pg. 643-645]]

Study Unit 10: Mergers and acquisitions

no calculation.

I. An introduction to mergers and acquisitions (M&A)

Broadly speaking, M&A refers to process of buying and selling whole companies (or controlling stakes therein). There is a lot of terminology surrounding M&A:

- A **merger** is the combination of two (or more) companies such that the resulting company retains the identity of the acquiring firm (think of Walmart's acquisition of Massmart, or Bidvest's proposed acquisition of Adcock). It involves the acquisition of a controlling stake in the target firm by the acquirer, with payment in the form of cash and/or shares in the acquiring company. The acquirer will typically be larger than the target, and the assets and liabilities of the target firm are merged into the overall firm

important: motives for mergers.

- A **consolidation** is generally between firms of a similar size, which combine to form a completely new company. The assets and liabilities of the combining companies are usually merged into the new corporation. An example of a consolidation is that between the global pharmaceutical giants Glaxo Wellcome and SmithKline Beecham in 2000 to form GlaxoSmithKline
- A **holding company** is a corporation that has controlling stakes in several companies, called its **subsidiaries**
- Takeovers can be **friendly** (done with the co-operation of the target firm's board of directors, allowing the acquirer to negotiate directly with shareholders to purchase their ownership stake) or **hostile** (the target's board of directors opposes the takeover, forcing the acquirer to purchase a controlling stake [>50% of the target's equity] in the open market)
- Mergers can be **strategic** – they look to create value through economies of scale, increased productivity, geographical diversification, or through increased product and operation lines (among others)
- Other types of mergers are **financial** – they look to create value by restructuring the asset make-up of companies and their financial structures, in order to improve cash flow

Specific types of mergers include:

1. **Horizontal mergers**: the merger of two firms in the same line of business (for example, Shoprite's acquisition of Checkers)
2. **Vertical mergers**: the merger of companies involved in the same supply chain, so for example entailing the merger of a supplier and customer (in order to save costs). Glencore (a global commodities trader) acquiring Xstrata (a global mining and resources firm) is an example of a vertical merger
3. **Congeneric merger**: the acquisition of a firm in the same general industry, but not in the direct same line of business, and nor is it a supplier or a customer. Facebook's acquisition of Instagram is a good example: both are involved in the tech/social media sector, but are not directly related
4. **Conglomerate merger**: when firms in unrelated lines of business merge (for example, Bidvest's proposed acquisition of Adcock: the former is a diversified industrials firm, while the latter is a pharmaceuticals company)

Although one of the more important aspects of M&A is the **financial analysis of the merger** - valuing the target's equity and assets in order to estimate the value of the acquisition proposal (i.e. the price of acquiring control of the target), valuing the benefits arising from the merger (earnings synergies, etc.) and figuring out how the merger will be financed

(through debt, shares and/or cash) - it is also important to take into account the **practical integration** of the two firms (in terms of culture differences, how operations will be integrated, ensuring the smoothness of managerial transition, adhering to legal and regulatory conditions, and so on). The process of thoroughly evaluating the effects of and processes behind a merger is called **due diligence.**

II. Motives behind M&A

Some of the motives behind merging or acquiring include:

1. **Growth or diversification**
2. **Synergies**: the value of the whole is greater than the sum of its parts, i.e. earnings to the merged firm are greater than the sum of the earnings of the individual companies, from cost cutting and greater efficiencies
3. **Gain managerial skill or technology**
4. **Increase ability to raise capital and at a lower costs** when acquiring a company with low levels of debt and assets that make strong collateral
5. **Tax considerations**: buying a loss-making company will not only come at a relatively good price, but will give the acquirer a tax-loss-carry-forward which will lower tax payments
6. **Opportunistic market timing**: acquiring companies when their shares and assets are relatively cheap (undervalued) by the market; when the acquirer is sitting on a large cash pile and/or its shares are relatively highly valued, it may be motivated to make acquisitions

... and so on. At the end of the day, the overall goal is to use M&A transactions to attempt to create shareholder value through these sorts of motives.

III. Valuing a merger

The following simplified equation indicates the breakdown of value in a merger between two companies, A and B:

$$V_{ab} = V_a + V_b + Synergy$$

where V_{ab} is the combined value of the company post-merger, V_a is the value of Company A pre-merger, V_b is the value of Company B pre-merger, and $Synergy$ is the potential value realised/created by the merger (for the reasons described earlier).

It follows that the maximum price Company A should be willing to pay for Company B is the value of B on its own plus the perceived value of synergies, i.e. $V_b + Synergy$ (or equivalently, $V_{ab} - V_a$).

For example, Bidvest is looking to acquire Adcock Ingram. If Adcock has a standalone firm value of R8bn and Bidvest believes that adding it to the Bidvest group companies will create savings through the supply chain with a value of R1bn (i.e. synergies of R1bn), it follows that Bidvest should be willing to pay up to 8bn + 1bn = R9bn for the full control of Adcock.

The decision to acquire a company must be traded off against the alternative of purchasing equivalent assets directly. Like with leasing, the cheaper alternative (or equivalently, the alternative creating the most value – highest NPV) is the desirable choice. Have a look at the self-assessment question in the study guide on pg. 113-114 to see how this is done.

Tutorial questions for Study Units 8-10

1. The ICG Group has net income of R21m for the current year, up from R19.5m in the previous year (of which R8.7m was paid in dividends). The company chooses to finance its investments with 60% debt and 40% equity, and management forecasts that R8m will need to be spent on investments in the coming year.
   Calculate the dividend that the company would pay under the each of the following dividend policies:
   a) A constant payout ratio of 45%
   b) Constant growth of dividends at 6% per year
   c) A residual dividend policy, where all earnings left within the firm after taking into account upcoming investment needs are paid out

2. Palladium Extraction is looking to acquire the use of a specialised drill (valued at R2m) and is looking at the following options:
   - A leasing arrangement under which Palladium will make a series of annual lease payments (in advance) over a 4 year period. Included is an option for the company to purchase the drill at end of the contract for R700 000. The lessor will require an 10% return
   - Alternatively, Palladium will borrow the money and purchase the drill outright. The loan is paid off over 4 years on an amortised basis with a 9% rate of interest. The drill will be depreciated on a straight-line basis over the 4 years, and will have zero salvage value. Additionally, Palladium will need to pay R150 000 a year in maintenance and insurance costs for the drill

   Palladium has a cost of capital of 8% and faces a tax rate of 40%. Which option should it pursue, assuming that it will exercise the purchase option under the lease?

3. 3M (a diversified industrials conglomerate) is considering the acquisition of GenPharm (a pharmaceuticals company). As an analyst at RMB, you need to advise the board of 3M on an appropriate price to pay for the acquisition. Given your analysis of GenPharm's asset structure and growth prospects, you believe that the value of GenPharm as a standalone entity is R11bn. But because of the 3M group's logistics and manufacturing capabilities, you believe that bringing GenPharm into the fold will lead to cost-cutting and operational efficiencies that will increase its incremental operating cash flows over time, to a present value of an estimated R2.25bn.
   On this basis, what price range would you recommend 3M should offer for the acquisition of GenPharm?