

*Incremental cash-flow analysis

- It's a technique that can be used whenever attempting to choose among Investments on the basis of their IRRs.
- **Steps to take is called an algorithm:**
 1. Think of them as in a pot, and **pick any two from the pot**.
 2. Find the **highest net positive cash-flow total** (sum of its all cfs) so called '**defender**', and the other one the '**challenger**'.
 3. Subtract the cash flows of the challenger from those of the defender, the resulting stream the '**incremental cash flows**'.
 4. Find the **IRR of the incremental cash flows**.
 5. If the IRR of the incremental cash flows is **greater than** hurdle rate, keep the defender, and throw out the challenger.

If the IRR of the incremental cash flows is **less than** the hurdle rate, keep the challenger, and throw out the defender.

6. Keep the survivor and return to the pot, pick another investment, and begin the algorithm at step 2. When all available projects have been tested, you will have a single survivor '**winner**'.
7. Calculate the IRR of the winner.

If it exceeds the hurdle rate, accept the winner; if the winner's IRR is lower than the hurdle rate, reject the winner and all other projects that were in the pot.

('Crossover rate')

is the IRR of the incremental cash flows & the rate at which the NPVs of defender and challenger is equal to zero.

- **Drawback of incremental cash-flow method:**
 1. When the incremental cash flows that you calculate have more than one change of sign across time. The algorithm does not fix it.
 2. When the projects differ in risk or financing, so that they require different hurdle rates.
 3. Algorithm is complex in comparison simply to using the NPV, which always works well.

*Capital Rationing:

- Company would accept all available investments having positive NPVs as long as the investments were not mutually exclusive.
- When there is **not enough money available** for all profitable investments a corporation wishes to undertake, so Financial analysts have some method for choosing the group of projects that will **maximize shareholder wealth** while using the funding available (we accept the set of desirable projects that both is within the '**budget constraint**' and **yields the highest NPV**).
- The company has a number of divisions that are semi-autonomous and evaluates investments independently but that depend upon the centralized headquarters.
- Headquarters decides in general how much money invest in each division in that period "**capital budget**"

-Technique: There are many techniques that financial analysts use, ranging from the quite straightforward to the very sophisticated.

1. Exhaustive enumeration (*no particular analytical problem*)

We simply look at all possible combinations of investments that **lie within the budget constraint** and choose the package that **has the greatest NPV**.

2. The commonly used methods of *dealing with the capital-rationing problem when there are many projects*

- Calculate the **profitability index** for the all investments, and to list them in declining order of **PI**.
- The investments are then accepted in order of **PI**, until the budget has been exhausted.

- being under capital rationing in the first place is an **undesirable situation**

It means either that you have not been able to solve your internal organization and communication problems, or you have been unconvincing to the capital market about your prospects.

They imply that you will be forced to forego investments that would have increased the wealth of your shareholders.

- **Soft capital rationing** → within the organization.
- **Hard capital rationing** → outside the org. → capital markets.

***Investment interrelatedness:**

When the *acceptance* or *rejection* of one investment affects the cash flows that can be expected on some other investment, we say the investments are economically interrelated.



- **Pure contingency:**

The perfect form of positive economic relatedness Occurs when the cash flows of a particular Project cannot exist unless those associated with another investment are accepted.

e.g Record shop & the rock concert arena.

- **Mutual exclusivity**

Perfectly negative relatedness in which the acceptance of a particular alternative implies the rejection of the cash flows of the other (*only one can be accepted*)

e.g Funeral parlour & Rock concert arena

- **‘somewhat positive’ and ‘somewhat negative’ relatedness’s**

Acceptance or rejection of any of the project does not **necessarily** imply the acceptance or rejection of any other. But there are significant alterations in the cash flows among the projects depending upon the mix of those accepted.

Somewhat +ve → Mall & kids playing area

Somewhat - ve → chilli's & fish market

- **Economic independence**

It implies that the acceptance or rejection of one project has no effect upon the cash flows of the projects.

e.g New piece of efficient machinery and investing in government bonds.

***Renewable Investments:**

Companies must often choose among investments in real assets where the initial asset purchased will eventually wear out and be replaced by another of the same type.

If the investment is a *‘cost minimizing’* one, the choice would be of the one with the least negative NPV (the 2 investments have the *same duration*).

If the investments have *different durations*, use *equivalent annual cost technique*:

- Calculate NPV for each investment.
- Find the annuity PV factor for number of years at the discount rate.
- Find the *equivalent annual cost* = NPV/ annuity PV factor for each investment.
- Choose the one with lowest cost

Inflation and Company Investment Decisions

***Inflation** is an increase in price unaccompanied by any other changes (such as quantity, quality)
We must pay more money across time to acquire the same goods and services.

$$(1 + \text{Nominal return}) = (1 + \text{Real return}) \times (1 + \text{Inflation})$$

Nominal price → the price **after** the inflation

Real price → the price **before** the inflation took place.

-Best way to deal with inflation in corporate investment decisions is to use Nominal cash flows & Nominal discount rates to get accurate NPV.

***The effect of the inflation on the productive Asset:**

- When inflation occurs, the costs of productive assets will increase across time more or less with other cash flows, but depreciation expenses for assets bought in the past will not lead to.
- Taxes increase across time faster than the inflation rate.
- **Taxes will increase faster than the inflation rate and free cash flow will increase at a rate less than inflation.**

*** There is one type of investor who is concerned about inflation & required rates: the debt suppliers**

- If **inflation** is **higher** than expected, **debt suppliers** will be **hurt** (equity holders are now paying off the debt promise cheaper nominal amounts).
- It would seem that this is a chance for equity holders to increase their wealth at the expense of debt, or vice versa.

Leasing:

'Leasing' is a contractual arrangement between an asset owner (the lessor) and a company that will actually operate the asset without owning it (the lessee).

- Lessee must pay the lessor lease payments.
- Many **types of lease** contracts that companies can pursue (**financial** or **capital lease**)
- The lessor is usually in the business of leasing assets, and not in the business of actually operating the asset that is leased.

The cash flows required for leasing are the

- **Cost of the machine** – a **cash inflow(+)** because you are not buying the equipment
- **Depreciation tax shield** – a **cash outflow (-)** because you do not get the tax shield as you have not bought the machine.
- **Lease payment** – a **cash outflow (-)**, this is the payment to the lessor.
- **Lease tax shield** – a **cash inflow (+)**, this is the lease payment times the tax rate.

It is wrong to discount the cash flows with the WACC (The cash flows are not risky company cash flows, but are safe, certain contractual cash flows).

If the result is negative it means it is more expensive to lease and you should purchase the equipment. A positive result means you are better off leasing.

Complications of lease:

1. If there is salvage value

-Calculate salvage value after tax = salvage – tax

-Then calculate PV of the salvage value = salvage after tax
 $(1 + \text{WACC})^n$

It will be discounted by the **company WACC** as it is a risky cash flow. If this cash flow is present it can turn a positive lease NPV into a negative NPV

-Then NPV of lease – PV of the salvage value = if +ve go for lease

If -ve go for purchase

2. If there is maintenance charges

Calculate **maintenance charge after tax** = maintenance charge – tax

Then calculate PV of the **maintenance charge after tax** value = $\frac{\text{maintenance after tax}}{(1 + WACC)^n}$

Then NPV of lease + PV of the maintenance value = if +ve go for lease

Advantages:

- 1. Leasing allows for higher tax benefits than the alternative of borrowing and purchasing an asset.*
- 2. 'Information asymmetries' exist on certain types of assets, and leasing can serve to lower the costs of such information problems.*
Expensive high-tech equipment such as large computers and complex medical devices, are subject to the frequent and uncertain timing of obsolescence.
A lease can be written in such a manner as to allow the lessee to take advantage of 'new and improved' or upgraded assets, and thus avoid the risk of costly obsolescence.
- 3. There are 'economies of scale' in the management of specialized asset leasing.*
Company in the business of leasing a particular kind of asset (say, Tayar) can be more efficient than a potential lender (say, a commercial bank) because the leasing company is more familiar with the asset to be leased.

Misconceptions:

1. Leasing saves money for the lessee because the lessor is paying for the asset and the lessee therefore does not have to make the large initial purchase outlay for the asset. Wrong.

It is true that the lessee does not have to make a large initial outlay as the lessee would do if it purchased the asset, but the lessee is contracting to make a stream in lease payments, which is same essential promise as a debt claim.

2. Leasing helps the lessee's balance sheet, because the lessee does not need to borrow money to buy the asset, and so the lessee's debt capacity is higher than it would otherwise be and therefore the company is less risky. Wrong.

Financial market participants who are interested in a company's balance sheet relationships and financing abilities are unlikely to be fooled into thinking that a lease contract is not similar to a debt contract.

Calculating Cash Flow

1st method :

- Operating profit + change in capital expenditure + change in net working capital – taxes = FCF
– (Capex) change in capital expenditure (including asset sales)
Plant & Equipment (–t0) (t1–t0) (t2–t1)
– change in net working capital
Total current assets– Total current Liabilities = Net working capital
Then we calculate change in net working capital (–t0) (t1–t0) (t2–t1)
- FCF - interest tax shield (interest payment * tax rate) = FCF*
- Calculate NPV

2nd method

- Start a tax calculation
operating profits - annual depreciation + any sale of fixed asset = TAX
OP + Capex + change in net working capital – TAX = FCF*
- Calculate NPV

29. Explain the strengths and weaknesses of the following capital budgeting evaluation techniques; IRR, EVA, PI, AROI.

IRR, EVA & PI all use time value of money as the basis for their calculation, so in that sense they are good techniques to use.

AROI is an accounting based measure, using accounting numbers that are not time or risk weighted, so AROI is a weak evaluation technique.

IRR gives an average return for a project based on time value of money.

- *If the return calculated is greater than the cost of capital, then the project is attractive.*
- *IRR just gives you a percentage return figure; it does not indicate the amount of wealth created.*
- *It assumes the cash flows generated by the project can be invested at the IRR rate, which is usually not the case.*
- *IRR cannot handle projects where the cash flow signs change more than once; you will end up with multiple IRRs.*
- *Having said that, IRR remains very popular on the back of its simplicity as a technique.*

Economic Value Added (EVA) is a technique for measuring the amount of wealth created from the investments made by a company.

- *The amount of invested capital has an economic charge applied to it (using the cost of capital), then the return that is generated by the company is compared to the amount of the economic charge.*
- *If the return is greater than the charge, there has been economic value added created and the share price should be rising. If the return is less than the charge, wealth has been destroyed and the share price should be falling.*
- *The return that the company makes (earnings) has to be adjusted to present it as close as possible to a cash flow figure.*
- *EVA can be calculated for the company as a whole, taking in all the investments they have made, or it can look at new investments that a company is making.*
- *If managers are rewarded on the basis of EVA, they may be reluctant to take on certain new projects, these would be projects where the benefits come later than sooner. In this case the EVA in the short term will be poor.*

PI is the ratio of the present value of inflows divided by the initial investment.

- *This gives you a measure of the return per £ of investment. Used on its own it does not give you a measure of the wealth created by a project.*
- *It should be used in conjunction with the NPVs of projects. PI can be used to rank projects in capital rationing situations, where there is a budget cap in a company.*
- *It will not necessarily be the case that projects will be accepted on a rigid descending scale of PI. The company should select the projects that maximise the NPV for the company, while using up the budget and this might not mean sticking to the PI ordering.*

Average accounting return on investment (AROI) uses accounting earnings and book values of investments.

- *The earnings figures do not correspond to cash flow figures and they are not discounted, so there is no adjustment for risk.*

-The tenth year of earnings has the same weight as the first year of earnings. It is a poor method for evaluating projects.

1. Explain how you would treat each of the following for project capital budgeting cash flow analysis:

- interest payments

Not included these are payments to capital suppliers.

This effect is caught in the discount rate (WACC)

- project overheads

if they are directly related to the project they would be included, otherwise overheads are excluded.

- general company fixed costs

These would be incurred anyway whether the project went ahead or not, so they would be excluded

- working capital

Initial investment in working capital is a year 0 cash flow, then any change in working capital year on year would be included in the cash flow, and working capital would be returned at the end of the project.

2. You own a large industrial site, part of which has been developed but isn't used. To use up this extra space you decide to run a single five year project on it. Explain if there are any capital budgeting concerns regarding the use of this company owned land.

The land is not free, there is an opportunity cost to using it – it could be used for another project or it could be sold. You would enter an opportunity cost in year 0 for the land, being the value of its best alternative use, for example being sold.

If you ran the project, at the end you would have an opportunity cash flow in the form of the revenue you could get if you sold the land at the end of the project.

3. 3. Two companies plan new product launches: Samsung plan to launch a new mobile phone to replace their current best seller; Sky decides to launch a new dedicated sports channel – this time offering 'live chess' on TV.

What are the associated cash flow costs of these two ventures? Explain how you would decide on the relevant cash flows in decisions like this?

These are associated costs – potential product cannibalisation costs. In the case of Samsung they would lose sales if they did not launch a new product – rivals would – it is an intensely competitive sector. For Sky there would be a small drop in their original product cash flows – no-one else would launch a channel like this and they would probably take away some (small amount) of their own sales from other channels.

4. Taking two investment decisions from the last couple of years; Apple launching its 'i-pad', and Carphone Warehouse taking over AOL's European operations. Carphone Warehouse already had an internet offering to the UK household market, then added AOL to it. Discuss what you think the associated cash flow considerations would be in these cases? What about Apple's earlier products like the ipod and iphone? Can you think of other examples like this?

Is the i-pad a new segment of the market that won't steal sales away from existing Apple products or is it a substitute ipod for some people?

The i-pad would steal sales away from ipod products. The i-pad is unlikely to make many people go out and buy an ipod, but buyers who would be making a computer purchase decision, may buy an Apple computer as a result of buying the i-pad. So there may be a mixture of revenue enhancement and revenue cannibalization from the introduction of the i-pad.

Earlier Apple product launches had similar impacts. It was argued that the 'i-phone' might steal sales from the existing i-pods that were available, but an alternative view was that Apple was *extending the range into a new segment of the market*, if Apple didn't do this the mobile phone manufacturers would encroach more and more into the main i-pod market and steal sales away from Apple.

Carphone Warehouse with the takeover has become the No.3 operator in broadband in the UK. AOL is being maintained as a separate company and they have to pay a royalty to the US AOL parent company. So Carphone's AOL unit is in competition with its main broadband unit for new customers. AOL originally offered a free laptop or a Sony PS3 to new customers (including existing Carphone customers) if they signed up for a 2 year contract. They were stealing sales from themselves.

5. What are mutually exclusive projects and can you give some examples?

You must choose either one or the other of the projects on offer, you cannot undertake both projects. Company has a plot of land; it can build an office development or a leisure complex, but not both, on that plot of land.

If a project has a different risk to the parent company how would you work out a WACC for the project?

-You need to construct a tailor made WACC that reflects the risk of the project.

-One route to achieving this can be (if the figures are given for this method) to ungear the parent company beta.

-The ungeared beta is just the weighted average of the company's debt and equity betas.

-Once you have the company ungeared beta (or asset beta) you would adjust for project – company differences in revenue volatility and operational gearing.

-The revenue volatility adjustment is to multiply the company ungeared beta by Project revenue volatility divided by company revenue volatility.

-The multiply the resulting beta by $1 + \text{project fixed costs} / 1 + \text{company fixed costs}$.

-This will give you the project ungeared beta.

-If the project is funded 100% by equity, then you would just use this beta directly in the capm calculation; $r_e = r_f + \beta(r_m - r_f)$. This would be the cost of capital for the project.

-If the project was part funded with debt, then you would need a debt beta and an equity beta. If this was a question you would be given the debt beta and debt or equity weighting and you would work out the equity beta from that information (the project ungeared beta would just be the weighted average of the debt and equity betas and the only missing item would be the equity beta, so you could rearrange the formula to solve for the missing equity beta). Once you have the equity and debt betas, they can be used in the CAPM formula to calculate the costs of equity and debt and then these put into a WACC calculation.

Another route to get a project cost of capital if it is in a different line of business to the parent company is to use a proxy company.

There may be a company listed on the stockmarket that only does what the project is going to do (eg parent company is a games software company and launches a project in retailing – this has a different risk profile to the parent company.

Look to the quoted games retailers for a cost of capital).

The beta of the proxy company would be ungeared by multiplying the equity and debt betas by their weights in the capital structure and adding together.

What you have then is the ungeared beta for a project of that risk.

In capital budgeting you have to use a discount rate that reflects the risk of the project being undertaken – the parent WACC doesn't do this, but using a proxy company in that area allows you to establish an ungeared beta that represents the riskiness of the project.

That would then be adjusted to match the capital structure of the project (you would follow the process outlined in the paragraph above if the project is not 100% equity funded.).

So two methods have been outlined; one is to adjust the parent ungeared beta for the different risk profile of the project, and the second is to use a proxy company, ungear its beta and adjust for funding that is being used for the project.

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(d)In evaluating a project, real option analysis is applying new practices to try and give more flexibility to managers in running the business. Discuss four of the traditional capital budgeting evaluation methods and highlight their strengths and weaknesses.

(8 marks)

The different evaluation methods are traditional NPV, internal rate of return (IRR), payback, average accounting rate of return (AARR), and profitability index (PI).

-NPV, IRR, and PI are all methods that use discounting techniques, so they consider the time value of money. This is a strength in project analysis.

-IRR and PI have failings in that they are ratios; they do not give an absolute measure of the wealth created as NPV does.

- With IRR there are problems when there is more than one change of sign in the cash flows. This will result in multiple IRRs. The IRR also assumes that you can invest the interim cash flows at the IRR rate, which is unrealistic.

-Payback and AARR are non-time value methods, so distant cash flows are given the same weight as near cash flows (payback can be adapted to become discounted payback, using discounted cash flows).

-Payback may be useful in screening out projects that take a long time to return cash in companies where liquidity is important.

However, NPV should be used as the main evaluation technique.

- AARR is poor because it uses the wrong numbers. It uses accounting earnings rather than cash flow.

-NPV is the best technique but it too can be manipulated. You have to be sure of the accuracy of the cash flows being used and also the discount rate. Manipulation of these two elements can turn a poor project into what looks like a good project.