

Auditing Course Material

Part 27 of 61 (Chapters 2601-2700)

13. Equivalent Annual Cost (EAC)

A firm must choose between two machines. Machine A costs Rs 500 and lasts three years. There will be maintenance expenses of Rs 120 to be paid at the end of each of the three years. Machine B costs Rs 600 and lasts four years. There will be maintenance expenses of Rs 100 to be paid at the end of each of the four years.

Solution:

PV OF MACHINE A CASHFLOWS

$$= 500 + \frac{120}{1.10} + \frac{120}{1.10^2} + \frac{120}{1.10^3} = 798.42$$

PV OF MACHINE B CASHFLOWS

$$= 600 + \frac{100}{1.10} + \frac{100}{1.10^2} + \frac{100}{1.10^3} + \frac{100}{1.10^4} = 916.99$$

$$\text{EAC for MACHINE A} = \frac{798.42}{\text{PVIA}(10\%, 3)} = \frac{798.42}{2.4869} = 321.05$$

$$\text{EAC for MACHINE B} = \frac{916.99}{\text{PVIA}(10\%, 4)} = \frac{916.99}{3.1699} = 289.28$$

MACHINE B IS PREFERRED, AS EAC IS LOWER

13. Equivalent Annual Cost (EAC)

You are evaluating two different machines. The Machine I costs Rs 2,15,000, has a 3-year life, and has pretax operating costs of Rs 35,000 per year. The Machine II costs Rs 2,70,000, has a 5-year life, and has pretax operating costs of Rs 44,000 per year. For both machines, use straight-line depreciation to zero over the project's life and assume a salvage value of Rs 20,000. If your tax rate is 35 percent and your discount rate is 12 percent, compute the EAC for both machines. Which do you prefer?

Solution:

AFTER TAX SALVAGE VALUE = $20,000(1-0.35) = 13,000$	
MACHINE I	MACHINE II
OPERATING CASH FLOWS $= -35,000(1-0.35) + \frac{2,15,000}{3} \times 0.35$ = 2,333.33	OPERATING CASH FLOWS $= -44,000(1-0.35) + \frac{2,70,000}{5} \times 0.35$ = -9,700
NPV = -2,00,142.58	NPV = -9,97,589.78
EAC = $\frac{-2,00,142.58}{PVIFA(12\%, 3)} = -83,329$	EAC = $\frac{-9,97,589.78}{PVIFA(12\%, 5)} = -82,554.30$
MACHINE II IS PREFERRED	

13. Equivalent Annual Cost (EAC)

A company must choose between two copiers, the Sony or the HP. The Sony costs Rs 900 and will last for three years. The copier will require a real aftertax cost of Rs 120 per year after all relevant expenses. The HP costs Rs 1,400 and will last five years. The real aftertax cost for the HP will be Rs 95 per year. All cash flows occur at the end of the year. The inflation rate is expected to be 5 percent per year, and the nominal discount rate is 14 percent. Which copier should the company choose?

Solution:

$$(1 + \text{NOMINAL RATE}) = (1 + \text{REAL RATE})(1 + \text{INFLATION RATE})$$
$$1 + 0.14 = (1 + 2)(1 + 0.05)$$
$$\Rightarrow r = 0.0857 \quad 8.57\%$$

SONY	HP
$\text{NPV} = -900 - 120 \times \text{PVIFA}(8.57\%, 3)$ = -1206.09	$\text{NPV} = -1400 - 95 \times \text{PVIFA}(8.57\%, 5)$ = -1773.66
$\text{EAC} = \frac{-1206.09}{\text{PVIFA}(8.57\%, 3)}$ = -472.84	$\text{EAC} = \frac{-1773.66}{\text{PVIFA}(8.57\%, 5)}$ = -450.94
<u>PREFER HP</u>	

14. NPV, IRR and Discount Rate

Consider the following two statements for testing your knowledge:

1. It is necessary to know the discount rate to calculate the NPV of a project, whereas you can compute the IRR without directly referring to the discount rate.

2. Therefore, the IRR rule seems simpler to apply compared to the NPV rule since you don't explicitly utilize the discount rate when calculating IRR.

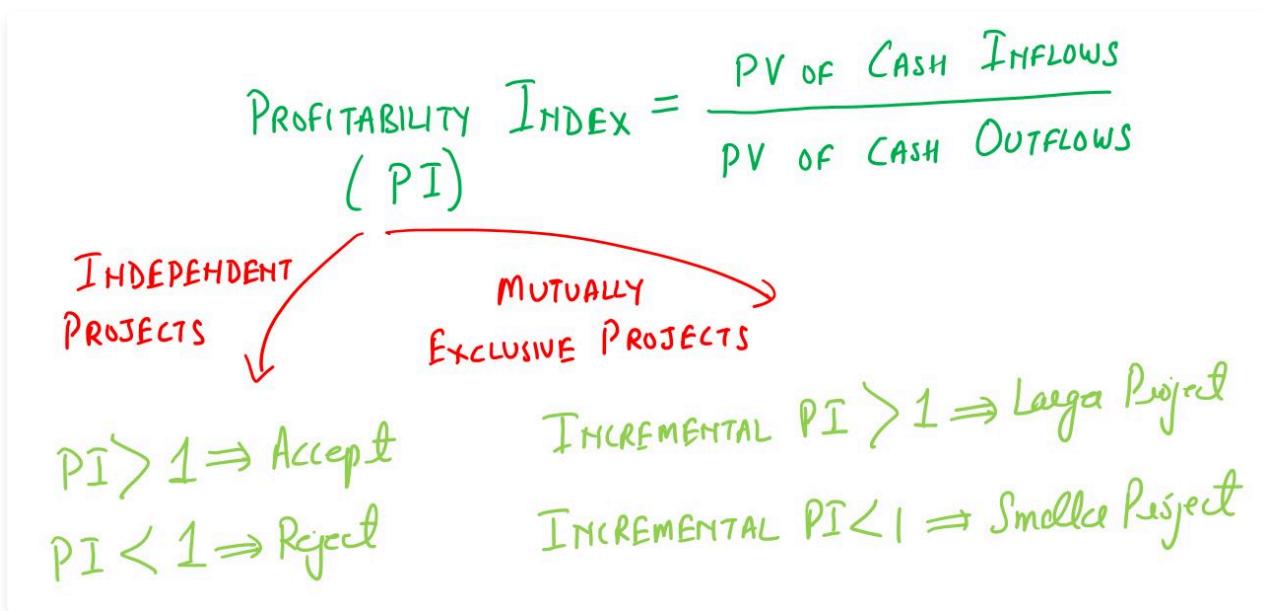
The first statement is accurate. Calculating NPV requires the discount rate. However, IRR is derived by finding the rate at which the NPV equals zero, without explicitly mentioning the discount rate in the computation process.

Nonetheless, the second statement is incorrect. In applying the IRR rule, you must compare the internal rate of return with the discount rate.

Thus, the discount rate remains essential for decision-making under both the NPV and IRR approaches.

15. Profitability Index method

Another method utilized for project evaluation is known as the profitability index (PI). It is also called Desirability Factor or Present Value Index Method or Benefit-Cost ratio.



It represents the ratio of the present value of future expected cash flows after the initial investment to the initial investment amount.

For independent projects, the decision rule based on the PI is straightforward: Accept an independent project if the PI is greater than 1; reject it if the PI is less than 1.

When dealing with mutually exclusive projects, the PI confronts the same scale problem as the IRR, potentially leading to conflicts between NPV and PI recommendations. To address this issue, incremental analysis can be employed. This involves calculating the incremental cash flows by subtracting the cash flows of the smaller project from those of the larger project.

If the profitability index (PI) derived from the incremental cash flows is greater than 1.0, the larger project should be chosen; otherwise, the smaller project should be selected.

15. Profitability Index method

The initial cash outlay of a project is Rs.50000 and if it generate cash inflows of Rs. 16000, 19000, 22000, 13000 in four years. Ascertain the profitability index of the proposed investment assuming 10% rate of discount.

Solution:

<u>YEAR</u>	<u>CASH INFLOW</u>	<u>PV OF CASH INFLOW</u>
0		
1	16000	$16000 \times 0.909 = 14544$
2	19000	$19000 \times 0.826 = 15694$
3	22000	$22000 \times 0.751 = 16522$
4	13000	$13000 \times 0.683 = 8879$
		<u>55639</u>
$PI = \frac{PV \text{ of INFLOWS}}{PV \text{ of OUT FLOWS}}$		$= \frac{55639}{50,000}$
		$= 1.1$
		<u>BECAUSE PI > 1</u>
		<u>⇒ ACCEPT</u>

15. Profitability Index method

Bikram plans to open a Gym. The equipment will cost Rs 3,85,000, to be paid immediately. Bikram expects aftertax cash inflows of Rs 84,000 annually for seven years, after which he plans to scrap the equipment and close the gym. The first cash inflow occurs at the end of the first year. Assume the required return is 13 percent. What is the project's PI? Should it be accepted?

Solution:

$$\begin{aligned} \text{PV of ALL CASH INFLOWS} &= 84000 \times \text{PVIFA}(13\%, 7) \\ &= 84000 \times 4.42605 \\ &= 371788 \end{aligned}$$

$$\text{PV of ALL CASH OUTFLOWS} = 385000$$

$$PI = \frac{371788}{385000} = 0.965$$

Because PI is less than 1, the project should NOT be accepted.

15. Profitability Index method

Suppose the following two independent investment opportunities are available to a manager. The appropriate discount rate is 10 percent.

Year	Project Alpha	Project Beta
0	-2300	-3900
1	1200	800
2	1100	2300
3	900	2900

- (i) Compute the profitability index for each of the two projects.
(ii) Which project(s) should the manager accept based on the profitability index rule?

Solution:

$$\text{PI of ALPHA} = \frac{\frac{1200}{1.10} + \frac{1100}{(1.10)^2} + \frac{900}{(1.10)^3}}{2300} = 1.164$$

$$\text{PI of BETA} = \frac{\frac{800}{1.10} + \frac{2300}{(1.10)^2} + \frac{2900}{(1.10)^3}}{3900} = 1.233$$

According to the profitability index, we would accept Project Beta, because Beta has higher value of PI.

However, it may be noted that the profitability index rule can lead to an incorrect decision when ranking mutually exclusive projects.

16. Capital Rationing

Capital Rationing occurs any time there is a budget ceiling, or constraint, on the amount of funds that can be invested during a specific period, such as a year. Such constraints are prevalent in a number of firms, particularly in those that have a policy of internally financing all capital expenditures.

Another example of capital rationing occurs when a division of a large company is allowed to make capital expenditures only up to a specified budget ceiling, over which the division usually has no control. With a capital rationing constraint, the firm attempts to select the combination of investment proposals that will provide the greatest increase in the value of the firm subject to not exceeding the budget ceiling constraint.

Steps in Capital Rationing:

1. Identify Available Projects:

- Compile a list of all potential investment projects.
- Include details such as initial investment, projected cash flows, and expected returns.
- Calculate evaluation metrics for each project, such as Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index (PI).

2. Rank Projects by Internal Rate of Return (IRR):

- Arrange the projects in descending order of IRR.
- Select the top projects until the fund availability constraint is reached.
- Compute the total NPV of the selected projects.

3. Rank Projects by Profitability Index (PI):

- Arrange the projects in descending order of PI.
- Select the top projects until the fund availability constraint is reached.
- Compute the total NPV of the selected projects.

4. Rank Projects by Net Present Value (NPV):

- Arrange the projects in descending order of NPV.
- Select the top projects until the fund availability constraint is reached.
- Compute the total NPV of the selected projects.

5. Compare NPV Results:

- Compare the NPVs obtained from the rankings in steps 2, 3, and 4.
- Identify which method yields the highest NPV.

6. Select Optimal Combination:

- Choose the combination of projects that maximizes the total NPV, adhering to the fund constraints.
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17. A Compariosn

NPV is superior to the other methods of analysis presented in the text because it has no serious flaws. The method unambiguously ranks mutually exclusive projects, and it can differentiate between projects of different scale and time horizon. The only drawback to NPV is that it relies on cash flow and discount rate values that are often estimates and thus not certain, but this is a problem shared by the other performance criteria as well.

Assuming conventional cash flows, if a project has a positive NPV for a certain discount rate, then:

- (i) it will also have a positive NPV for a zero discount rate; thus, the payback period must be less than the project life.
 - (ii) since discounted payback is calculated at the same discount rate as is NPV, if NPV is positive, the discounted payback period must be less than the project's life.
 - (iii) the present value of future cash inflows is greater than the initial investment cost; thus, PI must be greater than 1.
 - (iv) the IRR must be greater than the required return.
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18. Buying Decisions

Capital budgeting methods serve as invaluable tools for firms grappling with decisions regarding their existing facilities. Let us explore some specific scenarios where these methods come into play.

In a manufacturing company, aging machinery is leading to increased maintenance costs and production inefficiencies. The management is contemplating whether to invest in upgrading the equipment to modernize the production process. Through capital budgeting methods, they assess the present value of expected cost savings resulting from reduced maintenance expenses and higher productivity against the initial investment required for the equipment upgrade. If the NPV is positive, indicating that the present value of benefits exceeds the cost, the company may proceed with the investment.

Consider a retail chain considering the installation of energy-efficient lighting systems across its stores to lower electricity bills and enhance sustainability efforts. By calculating the IRR, the company determines the discount rate at which the present value of expected cash inflows (savings from reduced energy costs) equals the present value of cash outflows (investment in the lighting systems). If the calculated IRR exceeds the company's cost of capital or hurdle rate, the investment is deemed financially attractive.

We will understand similar use cases, with the help of a few examples.

18. Buying Decisions

We are considering automating some part of an existing production process. The necessary equipment costs Rs 80,000 to buy and install. The automation will save Rs 22,000 per year (before taxes) by reducing labor and material costs. For simplicity, assume that the equipment has a five-year life and is depreciated to zero on a straight-line basis over that period. It will be worth Rs 20,000 in five years. Should we automate? The tax rate is 34%, and the discount rate is 10%.

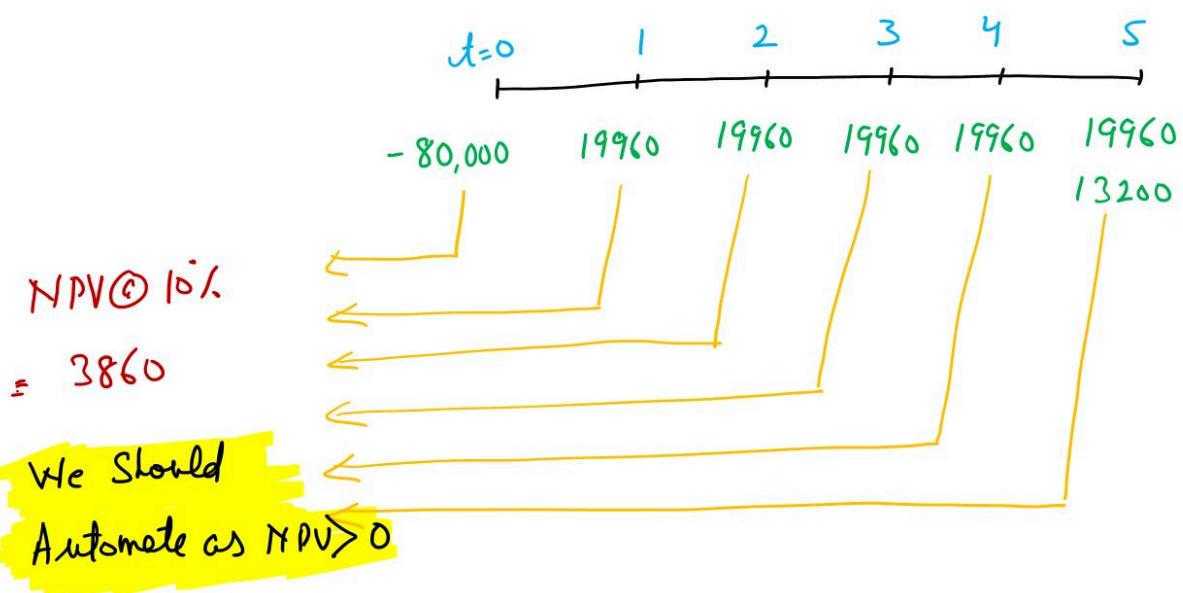
Solution:

$$\text{AFTER TAX CASH FLOWS} = 22000 (1 - 0.34) = 14520$$

$$\text{DEPRECIATION TAX SAVINGS} = \frac{80,000}{5} \times 0.34 = 5440$$

$$\text{OPERATING CASH FLOW} = 14520 + 5440 = 19960$$

$$\text{AFTER TAX SALVAGE VALUE} = 20,000 (1 - 0.34) = 13200$$



18. Buying Decisions

We are considering the purchase of a Rs 2,00,000 computer-based inventory management system. It will be depreciated straight-line to zero over its four-year life. It will be worth Rs 30,000 at the end of that time. The system will save us Rs 60,000 before taxes in inventory related costs. The relevant tax rate is 39%. Because the new setup is more efficient than our existing one, we can carry less total inventory, thereby freeing up Rs 45,000 in net working capital. What is the NPV at 16 percent?

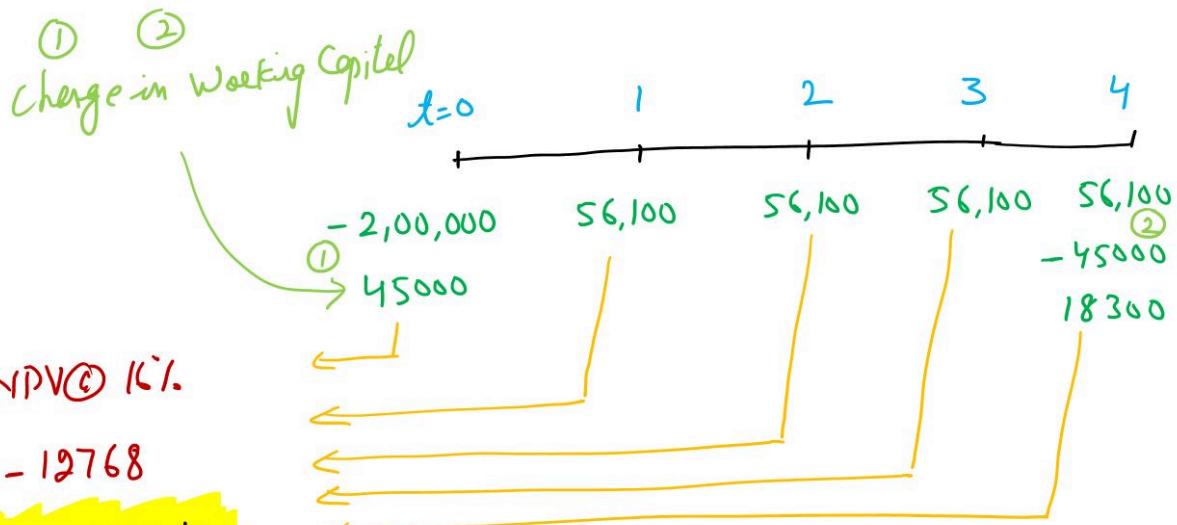
Solution:

$$\text{AFTER TAX Cost Savings} = 60,000 (1 - 0.39) = 36,600$$

$$\text{Savings BECAUSE OF DEPRECIATION} = \frac{2,00,000}{4} \times 0.39 = 19500$$

$$\text{OPERATING CASH FLOWS} = 36600 + 19500 = 56,100$$

$$\text{AFTER TAX SAVAGE VALUE} = 30000 (1 - 0.39) = 18300$$



18. Buying Decisions

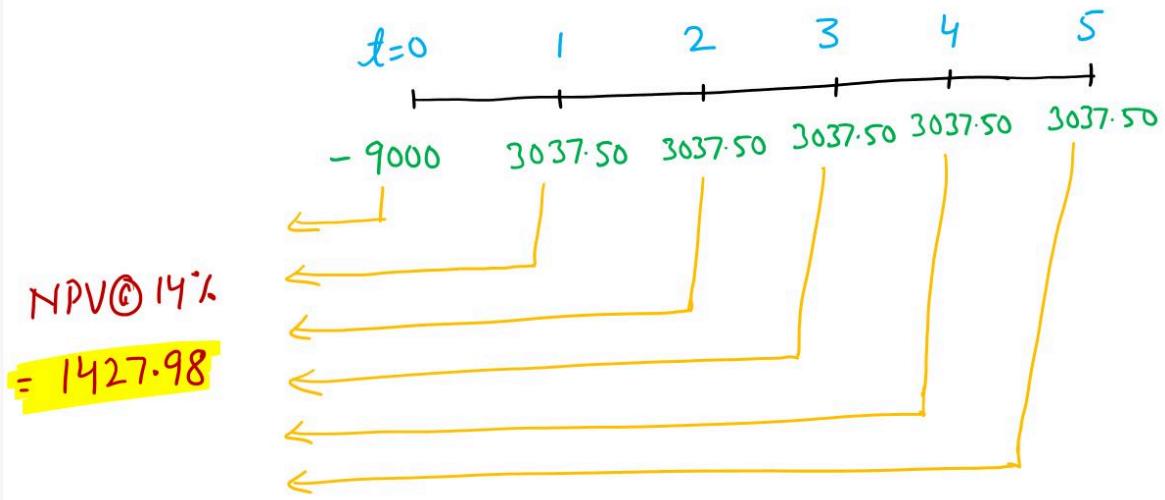
A manager is considering the purchase of a Rs 9,000 machine. The machine has an economic life of 5 years and will be fully depreciated by the straight-line method. The machine will produce 1,500 pieces per year, with each costing Rs 2.30 to make and priced at Rs 4.75. Assume that the discount rate is 14% and the tax rate is 34%. Should the Manager make the purchase?

Solution:

$$\text{AFTER TAX CASHFLOWS} = \left[(4.75 - 2.30) \times 1500 \right] (1 - 0.34) \quad \textcircled{1}$$

$$\begin{aligned} \text{TAX SAVING DEPRECIATION} &= \text{SAVINGS} \\ &= \frac{9000}{5} \times 0.34 \quad \textcircled{2} \end{aligned}$$

$$\text{OPERATING CASH FLOWS} = \textcircled{1} + \textcircled{2} = 3037.50$$



The NPV is positive. Yes, the Manager should make the purchase.

18. Buying Decisions

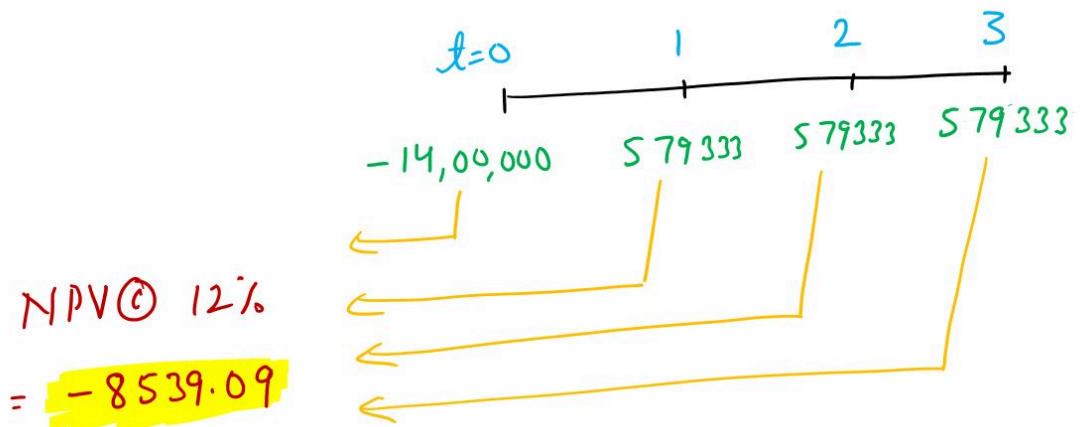
Varun beverages is considering a new 3-year expansion project that requires an initial fixed asset investment of Rs 14 lakhs. The fixed asset will be depreciated straight-line to zero over its 3 year tax life, after which it will be worthless. The project is estimated to generate Rs 11,20,000 in annual sales, with costs of Rs 4,80,000. The tax rate is 35% and the required return is 12%. What is the project's NPV?

Solution:

$$\text{AFTER TAX CASHFLOWS} = (11,20,000 - 4,80,000)(1 - 0.35) \quad \text{--- (1)}$$

$$\text{DEPRECIATION TAX SHIELD} = \frac{14,00,000}{3} \times 0.35 \quad \text{--- (2)}$$

$$\text{OPERATING CASH FLOWS} = (1) + (2) = 5,79,333.33$$



18. Buying Decisions

Your firm is contemplating the purchase of a new Rs 6,70,000 computer-based order entry system. The system will be depreciated straight-line to zero over its 5-year life. It will be worth Rs 50,000 at the end of that time. You will save Rs 2,40,000 before taxes per year in order processing costs, and you will be able to reduce working capital by Rs 85,000 (this is a one-time reduction). If the tax rate is 35%, what is the IRR for this project?

Solution:

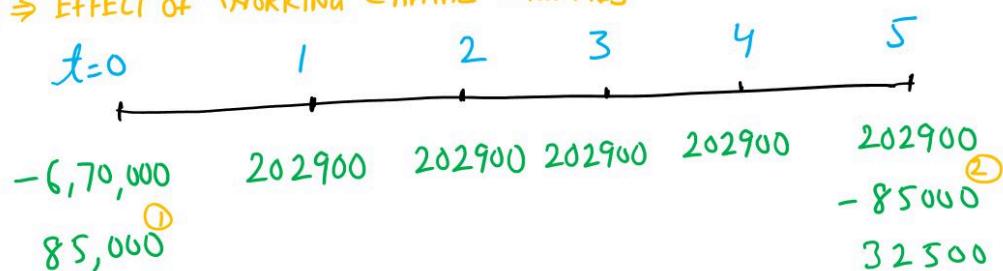
$$\text{AFTER TAX CASH FLOWS} = 2,40,000 (1-0.35) \quad \textcircled{1}$$

$$\text{DEPRECIATION TAX SHIELD} = \frac{6,70,000}{5} \times 0.35 \quad \textcircled{2}$$

$$\text{OPERATING CASH FLOWS} = \textcircled{1} + \textcircled{2} = 9,09,900$$

$$\begin{aligned}\text{AFTER TAX SALVAGE VALUE} &= 50,000 \times (1-0.35) \\ &= 32,500\end{aligned}$$

$\textcircled{1}, \textcircled{2} \Rightarrow$ EFFECT OF WORKING CAPITAL CHANGES



$$\text{IRR} = 20.06\%$$

19. Accounting Rate of Return

The Accounting rate of return (ARR), also known as return on investment (ROI), measures the annual accounting profits generated by an investment as a percentage of the initial investment amount. Unlike some other investment appraisal methods such as net present value (NPV), which focus on cash flows, ARR assesses profitability solely based on accounting profits.

$$\begin{aligned}\text{ACCOUNTING RATE OF RETURN} &= \frac{\text{AVERAGE NET PROFIT}}{\text{AVERAGE INVESTMENT}} \\ &= \frac{\text{AVERAGE NET PROFIT}}{\text{AVERAGE Book VALUE}}\end{aligned}$$

For instance, if the ARR is calculated to be 5%, it means that the project is expected to yield a profit of five cents for every dollar invested per year. This percentage indicates the return generated on the initial investment.

ARR offers several benefits:

Simplicity: ARR is straightforward to calculate using readily available accounting data, making it accessible to managers and financial analysts.

Ease of Interpretation: The concept of profit is familiar and easily understood by managers. Consequently, they can interpret the ARR result intuitively to determine if the project meets the required accounting return.

Consideration of Project Lifespan: Unlike some methods like the payback period, which may only focus on the time required to recoup the initial investment, ARR evaluates the entire lifespan of the project. This comprehensive view provides a holistic assessment of profitability over time.

However, ARR also has its limitations:

Ignored Cash Flow Timing: ARR does not account for the timing of cash flows, which can lead to inaccurate assessments, particularly when cash flows occur unevenly throughout the project's lifespan.

Relative Measure: ARR is a relative measure that does not consider the size of the investment. Therefore, it may not accurately reflect the efficiency of larger investments compared to smaller ones.

Time Value of Money Ignored: ARR disregards the time value of money, meaning that future cash flows are not discounted to reflect their present value. As a result, the impact of inflation and the opportunity cost of capital are not factored into the analysis, potentially leading to misleading conclusions about project profitability.

19. Accounting Rate of Return

A company is considering investing a project which requires an initial investment in a machine of Rs 40,000. Net cash inflows of Rs 15,000 will be generated for each of the first two years, Rs 5,000 in each of years three and four and Rs 35,000 in year five, after which time the machine will be sold for Rs 5,000. Calculate the Accounting Rate of Return (ARR).

Solution:

$$\text{Cash Inflows} = 15000 \times 2 + 5000 \times 2 + 35000 = 75,000$$

$$\text{Cash Outflows} = 40000 - 5000 = 35000$$

$$\text{Net Profit} = 75000 - 35000 = 40000$$

$$\text{Average Net Profit} = \frac{40000}{5} = 8000$$

$$\text{ARR} = \frac{8000}{\frac{40000 + 5000}{2}} \times 100 = 36\%$$

19. Accounting Rate of Return

XYZ Company is considering investing in a project that requires an initial investment of Rs 1,00,000 for some machinery. There will be net inflows of Rs 20,000 for the first two years, Rs 10,000 in years three and four, and Rs 30,000 in year five. Finally, the machine has a salvage value of Rs 25,000. Compute the Accounting Rate of Return.

Solution:

$$\text{Cash Inflows} = 20000 \times 2 + 10000 \times 2 + 30000 \\ = 90,000$$

$$\text{Depreciation} = 1,00,000 - 25,000 = 75,000$$

$$\text{Net Profit} = 90,000 - 75,000 = 15,000$$

$$\text{Average Net Profit} = \frac{15,000}{5} = 3000$$

$$\text{Average Investment} = \frac{1,00,000 + 25,000}{2} = 62,500$$

$$ARR = \frac{3000}{62500} \times 100 = 4.8\%$$

20. Cash Flows Estimation

In capital budgeting, it is required to **estimate future cash flows** accurately for a project. Let us note some of key rules, while arriving at Operating Cash Flows (OCF) for capital budgeting decisions.

Rule 1: Discount cash Flows and not Earnings (accounting income)

All capital budgeting techniques focus on discounting cash flows. It may be noted that we discount cash flows rather than earnings. This is because earnings do not equate to tangible cash. You cannot utilize earnings for spending, sustenance, or dividend payments. These actions are only feasible using actual cash flows.

In the evaluation of individual projects, the cash flows derived from those projects are discounted. When assessing the overall value of a firm, dividends (rather than earnings) are discounted because dividends represent the actual cash flows received by investors.

For example, a company made a capital investment by purchasing a building for Rs. 1 crore in cash. This Rs. 1 crore represents an immediate cash outflow for the company. However, considering straight-line depreciation over 20 years, only Rs. 5 lakhs (Rs. 1 crore / 20) is recognized as an accounting expense in the current year. As a result, current earnings are reduced by only Rs. 5 lakhs. The remaining Rs. 95 lakhs is depreciated over the subsequent 19 years. From a capital budgeting perspective, the relevant cash outflow at the beginning (Date 0) is the entire Rs. 1 crore, not just the reduction in earnings of Rs. 5 lakhs.

Rule 2: Consider Incremental Cash Flows

We need to look at the incremental impact of a project. We compare the cash flows with and without the project. For example, if a new product might compete with existing ones, we shouldn't just look at total sales. We must consider the additional sales from the new product minus any sales lost from existing products ("cannibalization").

Similarly, if not investing in a new project could lead to loss of market share or reduced cash flows, we should include this in our analysis. The key is to compare the situation with and without the new investment, considering all relevant costs and benefits. Only the *incremental cash flows*—what changes because of the new project—really matter in our decision-making process, in capital budgeting.

Suppose a consulting firm, call it Gupta Consultants, has a dedicated meeting room that incurs an annual cost of Rs. 50,000 for maintenance and upkeep. Now, the firm is evaluating a new project that is expected to contribute 10% of the firm's total revenue.

One of the executives argues that Rs. 5,000 (10% of Rs. 50,000) should be considered as the proposed project's share of the meeting room's costs. However, this approach isn't appropriate for capital budgeting. Regardless of whether the new project is accepted or not, Gupta Consultants will still incur the Rs. 50,000 maintenance cost for the meeting room.

Therefore, when evaluating the proposed project, the maintenance cost of the meeting room should be ignored because it remains constant irrespective of the project's acceptance. By focusing on the difference in cash flows with and without the project, Gupta Consultants can make a more accurate assessment of the project's financial viability.

Rule 3: Ignore Sunk Costs

Sunk costs are costs that have already been incurred and cannot be recovered. In estimating after-tax incremental operating cash flows, it's essential to ignore sunk costs because they are irrelevant to future decision-making. These costs have already been spent and should not influence future investment decisions.

Imagine you are a manager at a manufacturing company, and you're considering upgrading your production equipment. As part of your evaluation, you've already spent Rs 10,000 on a feasibility study to assess the benefits of the upgrade.

Now, you are tasked with deciding whether to proceed with the equipment upgrade, which will cost an additional Rs 5 Lakh. The new equipment is expected to improve production efficiency and reduce operating costs over the next five years.

As a savvy business manager, you need to focus on the future cash flows and benefits that the upgraded equipment will bring, rather than dwelling on the sunk cost of Rs 10,000 spent on the feasibility study. This sunk cost is irrelevant to your decision now because it's already been incurred and cannot be recovered.

Your decision should be based on whether the expected future benefits from the upgraded equipment, such as increased productivity and cost savings, outweigh the Rs 5 Lakh investment required.

Rule 4: Include Opportunity Costs

Opportunity costs represent the potential benefits that are foregone when one alternative is chosen over another. In estimating after-tax incremental operating cash flows, it's crucial to include opportunity costs. This means considering the cash flows that could have been generated by the best alternative use of resources if the project under consideration were not pursued.

For example, let us say a software company is deliberating whether to allocate its skilled workforce to develop a new product or to provide services to a client. If the company chooses to develop the new product, it foregoes the potential revenue it could have earned from servicing the client. This foregone revenue represents an opportunity cost that should be taken into account when evaluating the profitability of the new product development initiative.

Rule 5: Consider Erosion and Synergy

When evaluating a project's cash flows, side effects on other areas of the business can complicate the analysis. These side effects are either erosion or synergy.

Erosion occurs when a new product reduces the sales of an existing one. For example, a car company launching a new, affordable SUV model might see decreased sales of its higher-priced SUV, impacting overall cash flow.

Synergy happens when a new project enhances sales of other products. For instance, a coffee shop that starts selling its own branded mugs may increase coffee sales as customers use the mugs, making the mug project beneficial overall.

20. Cash Flows Estimation

Changes in working capital, such as accounts receivable, inventory, and accounts payable, can affect cash flows associated with a project. It's important to include project-driven changes in working capital, in estimating after-tax incremental operating cash flows.

For example, with the acceptance of a new project it is sometimes necessary to carry additional cash, receivables, or inventories.

Usually Working capital rises over the early years of the project as expansion occurs. However, all working capital is assumed to be recovered at the end, a common assumption in capital budgeting. In other words, all inventory is sold by the end, the cash balance maintained as a buffer is liquidated, and all accounts receivable are collected.

Increases in working capital in the early years must be funded by cash generated elsewhere in the firm. Hence, these increases are viewed as cash outflows. To reiterate, it is the increase in working capital over a year that leads to a cash outflow in that year. Even if working capital is at a high level, there will be no cash outflow over a year if working capital stays constant over that year. Conversely, decreases in working capital in the later years are viewed as cash inflows.

20. Cash Flows Estimation

Inflation can impact the purchasing power of cash flows over time. Inflation must be handled consistently in capital budgeting decisions.

One approach is to express both cash flows and the discount rate in nominal terms. The other approach is to express both cash flows and the discount rate in real terms. Both approaches yield the same calculation.

The relationship among real interest rate and nominal interest rate and inflation is given below:

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

APPROXIMATED VERSION →

$$\text{Nominal Rate} = \text{Real Rate} + \text{Inflation Rate}$$

Like interest rates, cash flows can be expressed in either nominal or real terms. A nominal cash flow refers to the actual dollars to be received (or paid out). A real cash flow refers to the cash flow's purchasing power.

$$\text{REAL CASH FLOW} = \frac{\text{NOMINAL CASH FLOW}}{(1 + \text{INFLATION RATE})^n}$$

n = NUMBER OF YEARS

Financial practitioners stress the need to maintain consistency between cash flows and discount rates.

1. Nominal cash flows must be discounted at the nominal rate.
2. Real cash flows must be discounted at the real rate.

20. Cash Flows Estimation

In capital budgeting, Operating Cash Flow (OCF) can be calculated using three different approaches: top-down, bottom-up, and tax shield. Each of these methods provides the same result but uses a distinct perspective, making them consistent with each other.

1. Top-Down Approach

This approach starts with total revenues and then subtracts cash expenses and taxes, excluding non-cash expenses like depreciation. It's a straightforward way to view cash flows by directly analyzing income.

$$OCF = Sales - Cash Costs - Taxes$$

2. Bottom-Up Approach

This method starts with net income, then adds back non-cash expenses, like depreciation, because it is an accounting expense rather than an actual cash outflow. This approach is particularly common in accounting practices.

$$OCF = Net Income + Depreciation$$

where Net Income = (Sales - Cash costs - Depreciation) (1 - Tax Rate)

3. Tax Shield Approach

The tax shield approach views OCF as the after-tax operating cash flow without depreciation, plus the tax shield from depreciation. This tax shield represents the tax savings resulting from depreciation.

$$OCF = (Sales - Cash Costs) (1 - Tax Rate) + (Depreciation \times Tax Rate)$$

The tax shield approach is just a variant of the top-down approach.

These three methods all arrive at the same OCF.

20. Cash Flows Estimation

Raphael Restaurant is considering investing in a Rs. 9,000 pasta maker. The pasta maker has an economic life of five years and will be fully depreciated using the straight-line method. The machine is expected to produce 1,500 plates of pasta per year, with each plate costing Rs. 2.30 to make and sold for Rs. 4.75. Assume the discount rate is 14 percent and the tax rate is 34 percent.

Based on these parameters, compute the Operating cash flows from the project?

SOLUTION:

OPERATING CASH FLOWS (OCF)

$$\begin{aligned} &= [SALES - COSTS](1-t) + D \times t \\ &= [(4.75 - 2.30) \times 1500] (1 - 0.34) + \frac{9000}{5} \times 0.34 \\ &= Rs 3037.50 \end{aligned}$$

ANNUAL DEPRECIATION
TAX RATE

20. Cash Flows Estimation

A Company is considering a new investment opportunity. The financial projections for the investment are summarized in the table below. The corporate tax rate is 34 percent. Assume all sales revenue is received in cash, all operating costs and income taxes are paid in cash, and all cash flows occur at the end of each year. All net working capital is expected to be recovered at the end of the project.

Year	Investment (INR)	Sales Revenue (INR)	Operating Costs (INR)	Depreciation (INR)	Net Working Capital Spending (INR)
0	24,000	-	-	-	300
1	-	12,500	2,700	6,000	350
2	-	13,000	2,800	6,000	400
3	-	13,500	2,900	6,000	300
4	-	10,500	2,100	6,000	?

- a. Compute the incremental net income of the investment for each year.
- b. Compute the incremental cash flows of the investment for each year.

SOLUTION:

We will use the bottom-up approach to calculate the operating cash flow for each year. We also must be sure to include the net working capital cash flows each year. So, the net income and total cash flow each year will be:

Details	Year 0	Year 1	Year 2	Year 3	Year 4
Sales	-	12,500	13,000	13,500	10,500
Costs	-	2,700	2,800	2,900	2,100
Depreciation	-	6,000	6,000	6,000	6,000
EBT	-	3,800	4,200	4,600	2,400
Tax (34%)	-	1,292	1,428	1,564	816
Net Income	-	2,508	2,772	3,036	1,584
OCF	-	8,508	8,772	9,036	7,584
Capital Spending	-24,000	0	0	0	0
NWC	-300	-350	-400	-300	1,350
Incremental Cash Flow	-24,300	8,158	8,372	8,736	8,934

1. Introduction

In the previous chapter about Capital Budgeting, we assumed that accepting any investment wouldn't change how risky the company seems to managers. This let us use one rate to decide which projects the company should pick.

But different projects can have different levels of risk. Even if a project promises big profits, it might also make the company look riskier to investors.

Imagine a company is considering two projects: Project A promises a high return but is very risky, while Project B offers a lower return but is safer. If the company only focuses on returns and picks Project A, investors might worry about the increased risk, affecting the company's reputation and ability to attract capital. So, managers need to consider both the potential return and the level of risk to make the best decision for the company's long-term success.

In this chapter, we look at ways managers can figure out how risky a project or group of projects is. Our main goal is to understand how risk affects the value of projects. When managers have info about how risky an investment is and what return to expect, they need to make a decision. They'll decide whether to accept or reject the investment based on how risky it is and what return investors want.

This chapter helps managers gather the info they need to evaluate risky investments, in context of Capital Budgeting.

2. Sensitivity Analysis

Sensitivity analysis plays a crucial role in the realm of capital budgeting by assessing the risk associated with investment decisions. Essentially, it delves into project's underlying assumptions regarding revenues and costs to gauge how changes in these factors could impact the Net Present Value (NPV) calculation.

Also referred to as **what-if analysis** or **BOP (Best, Optimistic, and Pessimistic) analysis**, sensitivity analysis provides valuable insights into the sensitivity of an NPV calculation to alterations in underlying assumptions.

To illustrate, let's consider a scenario where a company is evaluating a potential investment opportunity. This investment's success hinges on various factors influencing revenue and cost projections.

On the revenue side, these factors could include market share, market size, and the price of the product or service. Meanwhile, cost projections are contingent upon variables like variable costs and fixed costs. These estimations represent the company's expectations or best guesses regarding these parameters.

However, recognizing the inherent uncertainty in such projections, the company's analysts also develop optimistic and pessimistic forecasts for each variable. These forecasts help to create a spectrum of potential outcomes, allowing for a more comprehensive understanding of the project's risk profile.

In sensitivity analysis, the NPV is calculated not only based on the expected scenario but also for both the optimistic and pessimistic scenarios for each variable. This entails running NPV calculations multiple times, adjusting one variable while holding others constant, to observe how changes in assumptions ripple through the project's financial performance.

By conducting sensitivity analysis, decision-makers gain valuable insights into the potential impact of changes in assumptions on the project's profitability. This allows them to make more informed decisions, considering a range of potential outcomes and mitigating the risks associated with investment decisions.

3. Scenario Analysis

Sensitivity analysis, while useful, has its limitations.

It tends to analyze each variable in isolation, overlooking the interconnectedness of different factors. For instance, if costs spiral out of control due to ineffective management, it's probable that both variable and fixed costs will increase simultaneously (not just one). Similarly, if the market rejects a new product, both market share and price would likely decline together. Sensitivity analysis fails to capture these complex relationships, potentially leading to incomplete or misleading insights into the overall risk profile of an investment.



To address this issue, managers often turn to **scenario analysis**, a variant of sensitivity analysis that offers a more holistic approach. Unlike sensitivity analysis, which examines changes in individual variables, scenario analysis considers how multiple factors interact in different plausible scenarios.

For example, let's consider a company evaluating the investment potential of a new technology. In one scenario, they might envision a future where the technology is widely embraced, leading to high market demand and premium pricing. In another scenario, they might explore a scenario where regulatory hurdles stifle adoption, resulting in sluggish market growth and downward pressure on prices.

Additionally, scenario analysis allows for the consideration of unexpected events or shocks. For instance, imagine a scenario where a major natural disaster, such as a hurricane or earthquake, disrupts supply chains and infrastructure critical for manufacturing. This unforeseen event could lead to production delays, increased costs, and decreased consumer demand due to economic uncertainty. By incorporating such unexpected shocks into scenario analysis, companies can better prepare for and mitigate the potential impacts on their investment decisions in capital budgeting.

By examining a range of scenarios, each involving a confluence of factors, managers gain a more comprehensive understanding of the potential risks and opportunities associated with their investment decisions. This helps them make more informed choices and develop robust strategies that are resilient to uncertainties in the dynamic landscape of capital budgeting.

3. Scenario Analysis

We are evaluating a project that costs Rs. 644,000, has an eight-year life, and no salvage value. Depreciation will be straight-line to zero over the project's life.

Projected annual sales are 70,000 units at a price of Rs. 37 per unit. The variable cost per unit is Rs. 21, and fixed costs amount to Rs. 725,000 per year. The tax rate is 35 percent, and the required return on this project is 15 percent.

- (i) Calculate the operating cash flows (OCF).
- (ii) Compute the NPV.
- (iii) What is the sensitivity of NPV to changes in the sales figure?
- (iv) What is the sensitivity of OCF to changes in the variable cost figure?

SOLUTION:

- (i) Calculate the operating cash flows (OCF).

$$\begin{aligned} \text{OPERATING CASH FLOWS (OCF)} \\ &= [(P - V.C.) \times Q - F.C.] (1 - t) + D \times t \\ &= [(37 - 21) \times 70,000 - 725,000] (1 - 0.35) + \frac{6,44,000}{8} \times 0.35 \\ &= \text{Rs } 2,84,925 \end{aligned}$$

- (ii) Compute the NPV.

$$\begin{aligned} \text{NPV} &= -\text{INITIAL INVESTMENT} + \text{OCF} \times \text{PVIFA}(15\%, 8) \\ &= -6,44,000 + 2,84,925 \times \text{PVIFA}(15\%, 8) \\ &= \text{Rs } 6,34,550 \end{aligned}$$

- (iii) What is the sensitivity of NPV to changes in the sales figure?

OCF at $Q = 71,000$

$$= [(37-21) \times 71,000 - 7,25,000] \times (1-0.35) + \frac{6,44,000}{8} \times 0.35$$

$$= \text{Rs } 2,95,325$$

NPV at $Q = 71,000$

$$= -6,44,000 + 2,95,325 \times PVIFA(15\%, 8)$$

$$= \text{Rs } 6,81,218$$

$$\frac{\Delta NPV}{\Delta Q} = \frac{6,34,550 - 6,81,218}{71,000 - 70,000} = \text{Rs } 46.67$$

for Change of 1 $Q \uparrow$

\Rightarrow Change in NPV = $\text{Rs } 46.67 \uparrow$

(iv) What is the sensitivity of OCF to changes in the variable cost figure?

OCF at $VC = \text{Rs } 22$

$$= [(37-22) \times 70,000 - 7,25,000] \times (1-0.35) + \frac{6,44,000}{8} \times 0.35$$

$$= \text{Rs } 2,39,425$$

$$\frac{\Delta OCF}{\Delta VC} = \frac{2,39,425 - 2,84,925}{22-21} = -45,500$$

for change of VC by 1 \uparrow

\Rightarrow Change in OCF = $\text{Rs } 45,500 \downarrow$

4. Break Even Analysis

In capital budgeting, break-even analysis helps determine the sales volume needed for a project to cover its costs. By calculating break-even points, analysts can assess a project's risk and understand how much sales can fall before the project begins to incur losses.

There are two primary types of break-even analysis: accounting break-even and financial break-even.

1. Accounting Break-even

Accounting break-even is the sales level at which a project's total revenue covers its accounting costs, including fixed costs and depreciation, but does not consider financing costs or any required rate of return. This point represents the level of sales needed for the project to generate zero net accounting profit.

Depreciation is allocation of the project's initial investment over its useful life.

It may be noted that taxes have been ignored in the calculation of accounting break-even point. The reason is that a firm with a pretax profit of Zero will also have an aftertax profit of Zero because no taxes are paid if no pretax profit is reported. Thus, the number of units needed to break even on a pretax basis must be equal to the number of units needed to break even on an aftertax basis.

ACCOUNTING BREAK EVEN POINT

$$= \frac{F.C. + D}{P - V.C.}$$

FINANCIAL BREAK EVEN POINT

$$= \frac{EAC + F.C. (1-t) - D \cdot t}{(P - V.C.) (1-t)}$$

F.C. = FIXED COSTS

D = DEPRECIATION

P = SALE PRICE

V.C. = VARIABLE COST
(PER UNIT)

EAC = EQUIVALENT
ANNUAL COST

t = TAX RATE

2. Financial Break-even

Financial break-even goes beyond accounting break-even by incorporating the project's opportunity cost of capital, or the required rate of return. Financial break-even is concerned with meeting not only the project's operating and depreciation costs but also achieving a positive Net Present Value (NPV).

Therefore, the financial break-even point requires a higher level of sales than the accounting break-even because it includes the cost of capital.

The equivalent annual cost (EAC) is used to spread the cost of capital evenly over the project's life.

4. Break Even Analysis

You are considering investing in a company that cultivates exotic mushrooms for sale to local restaurants.

Use the following information:

Sales price per kilogram of mushrooms: Rs. 35

Variable costs per kilogram: Rs. 6.10

Fixed costs per year: Rs. 3,75,000

Depreciation per year: Rs. 1,20,000

Tax rate: 35%

Discount rate: 15%

Initial investment: Rs. 8,40,000

Project's economic life: 7 years

The equipment is depreciated on a straight-line basis over the project's life.

(i) What is the accounting break-even level for the project?

(ii) What is the financial break-even level for the project?

SOLUTION:

The accounting and financial break-even levels are computed as below:

ACCOUNTING BREAK EVEN POINT

$$= \frac{F.C. + D}{P - V.C.} = \frac{3,75,000 + \frac{8,40,000}{7}}{35 - 6.10} = 17,128 \text{ UNITS}$$

FINANCIAL BREAK EVEN POINT

$$\begin{aligned} &= \frac{EAC + F.C. (1-t) - D \cdot t}{(P-V.C.) \times (1-t)} \\ &= \frac{2,01,903 + 3,75,000(1-0.35) - \frac{8,40,000}{7} \times 0.35}{(35-6.10)(1-0.35)} = 21,488 \text{ UNITS} \end{aligned}$$

WHERE:

$$\begin{aligned} EAC &= \frac{\text{INITIAL INVESTMENT}}{\text{PVIFA}} = \frac{8,40,000}{\text{PVIFA}(15\%, 7)} \\ &= \frac{8,40,000}{4.1604} = \text{Rs } 2,01,903 \end{aligned}$$

4. Break Even Analysis

Green Leaf Ltd. has invested in a Rs. 390,000 machine to produce eco-friendly water bottles. The machine is depreciated on a straight-line basis over a five-year economic life. Each bottle sells for Rs. 25, with a variable production cost of Rs. 11 per bottle. The company faces fixed annual costs of Rs. 280,000. The corporate tax rate is 34 percent, and the project's discount rate is 12 percent.

Determine the financial break-even point for Green Leaf Ltd.

SOLUTION:

FINANCIAL BREAK EVEN POINT

$$= \frac{EAC + FC(1-t) - D \times t}{(P-VC)(1-t)}$$
$$= \frac{1,08,190 + 2,80,000(1-0.34) - \frac{3,90,000}{5} \times 0.34}{(25-11)(1-0.34)}$$
$$= 28,839 \text{ UNITS}$$

WHERE :

$$EAC = \frac{\text{INITIAL INVESTMENT}}{\text{PVIFA}(12\%, 5)} = \frac{3,90,000}{3.60478} = \text{Rs } 1,08,190$$

5. Monte Carlo simulation

Monte Carlo simulation is another powerful technique used in capital budgeting to account for uncertainty and variability in project outcomes.

This technique used to model the probability distribution of outcomes in situations where there is uncertainty or variability. It is named after the Monte Carlo Casino in Monaco, known for its games of chance, as the technique relies on random sampling to generate possible outcomes.

In Monte Carlo simulation, the problem is modeled using mathematical equations and probabilistic distributions to represent uncertain variables. Random samples are then drawn from these distributions, and the model is run multiple times with different sets of sampled values. By aggregating the results of these simulations, analysts can estimate the likelihood of different outcomes and understand the range of possible scenarios.

Here are the general steps involved in conducting Monte Carlo simulations for capital budgeting decisions:

1. Identify Key Variables

Determine the key variables that will influence the outcome of the capital budgeting decision. These variables could include project revenues, costs, investment etc.

2. Define Probability Distributions

Assign probability distributions to each key variable based on historical data, expert judgment, or other sources of information.

3. Generate Random Samples

Use a random number generator to generate a large number of random samples from the probability distributions defined for each variable. The number of samples generated should be sufficient to capture the variability and uncertainty in the project's outcomes.

4. Calculate NPV for Each Sample

For each random sample generated, calculate the Net Present Value (NPV) of the project. Once NPV values have been calculated for all random samples, analyze the distribution of NPV values to understand the range of potential outcomes and their likelihood of occurrence. This could involve plotting histograms, cumulative distribution functions, or other graphical representations of the NPV distribution.

5. Draw Conclusions

Based on the results of the Monte Carlo simulation, draw conclusions about the project's risk profile and make informed decisions about whether to proceed with the investment. Consider factors such as the probability of achieving a certain level of return, the potential downside risk, and the impact of different scenarios on the project's profitability.

6. Real Options

Our conventional approach to capital budgeting has revolved around projecting cash flows out to a certain point in the future and then discounting them back to their present value. It is a solid method, but it has its limitations.

One major drawback is its assumption that once an investment decision is made and a project is underway, everything remains static. In reality, managers often find themselves in situations where they need to adapt and make changes to the project based on evolving market conditions, technological advancements, or other unforeseen circumstances.

This ability to make changes and adapt existing decisions in response to new information or changing conditions is referred to as managerial flexibility or real options. These options can significantly enhance the value of an investment project. Essentially, the more flexibility a project has and the more uncertain the outcomes of these decisions are, the more valuable the project becomes. This is because uncertainty increases the likelihood that these options will be exercised, thus increasing their value.

$$\begin{aligned} \text{VALUE OF PROJECT} \\ = \text{NPV VALUE} + \text{OPTION VALUE} \end{aligned}$$

Managerial options come in various forms, each offering a unique strategic advantage:

1. The **option to expand** or contract production capacity allows firms to adjust their output levels based on market demand. If demand is high, they can scale up production; if it's low, they can scale it down.

Example: A manufacturing company has the option to increase its production capacity during the holiday season to meet the surge in demand for its products. Conversely, during slower periods, it can reduce production to avoid excess inventory buildup.

2. The **option to abandon** a project provides a safety net for the project owner. If the project doesn't perform as expected, they have the flexibility to cut their losses and move on. *Abandonment value* refers to the worth of a project if its assets were sold to external parties or if those assets were utilized elsewhere within the firm, representing its opportunity value in an alternate scenario.

Example: A tech startup realizes that its new software product is not gaining traction in the market despite significant investment. They decide to abandon the project and reallocate resources to develop a different product with higher potential for success.

3. The **option to postpone** involves delaying investment decisions until more information becomes available. This allows firms to make more informed decisions and reduces the risk of investing in projects with uncertain outcomes.

Example: A pharmaceutical company is considering investing in a new drug development project. However, they decide to postpone the investment until they have completed additional research and clinical trials to better assess the drug's efficacy and market potential.

While these options are often considered informally, their impact on project value can be substantial. However, valuing managerial options is challenging and requires different approaches than traditional financial options. Unlike financial options, which have well-defined formulas for valuation, managerial options are more complex and may not fit neatly into existing frameworks.

As a result, analysts often resort to methods such as **decision trees**, which visually represent decision scenarios and potential outcomes, or simulations, which allow for the exploration of different possible futures through computational modeling.

7. Decision Tree approach

The **Decision Tree approach** for capital budgeting is used to evaluate investment decisions by mapping out different possible scenarios and their associated outcomes in a structured and visual manner.

The first step is to identify decision points in the investment process. These are critical junctures where managers must make choices that will impact the project's outcome. For example, a decision point could be whether to invest in a new product line or not.

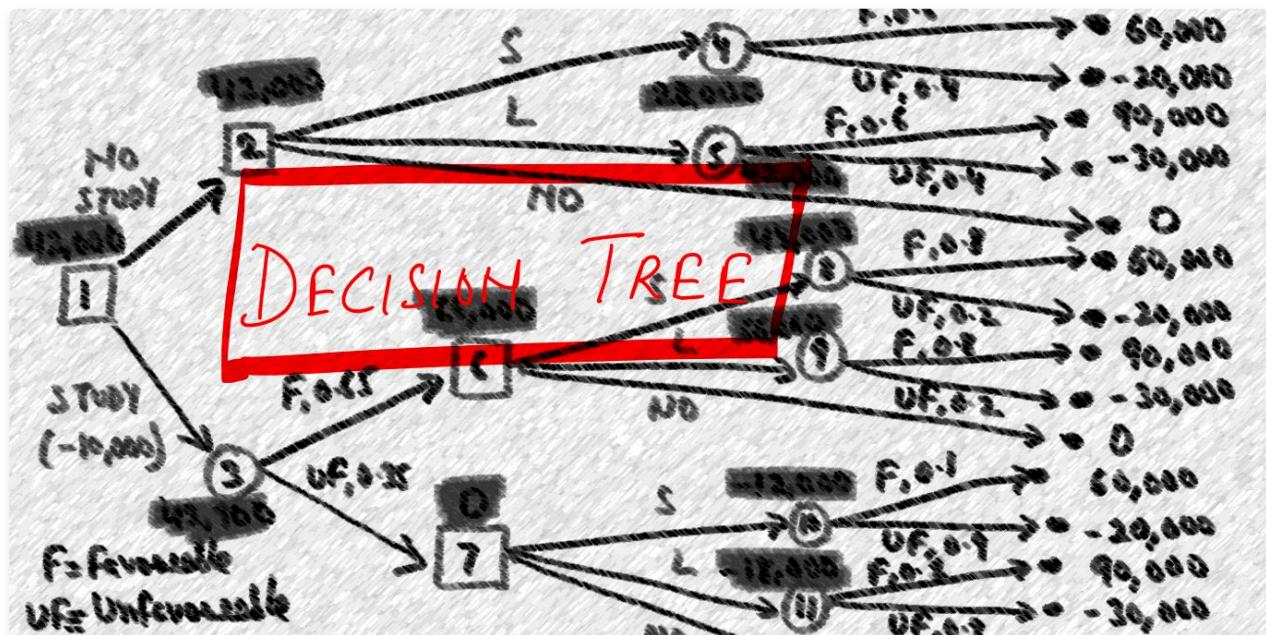
At each decision point, various possible outcomes are identified. These outcomes represent different scenarios that could result from the decision made at that point. For instance, if the decision is to invest in the new product line, possible outcomes could include high market demand, moderate demand, or low demand.

Probabilities are assigned to each possible outcome to represent the likelihood of its occurrence. These probabilities are based on historical data, market research, expert opinions, or other sources of information. For instance, if historical data suggests a 60% chance of high demand, 30% chance of moderate demand, and 10% chance of low demand, these probabilities would be assigned accordingly.

For each decision point, the expected value of each possible outcome is calculated. This is done by multiplying the probability of the outcome by its associated payoff, such as the net present value (NPV) of the project under that scenario. The expected value represents the average value of the decision considering the probabilities of different outcomes.

Decision Trees allow managers to compare different investment alternatives by evaluating their expected values at each decision point. By tracing the branches of the tree and calculating the expected value of each alternative, managers can identify the option that maximizes expected value or minimizes risk.

8. Making Decision Tree



A decision tree is a graphical representation of decision-making processes, outlining various alternatives, decision points, and potential outcomes in a tree-like structure. The name derives from the tree-like appearance of the model.

Decision trees aid in evaluating various alternatives and potential outcomes, helping businesses choose optimal paths. In marketing, decision trees can guide product launches by analyzing market conditions and customer preferences. In finance, they assist in risk assessment for investments and financial planning. In customer service, decision trees streamline issue resolution processes, enhancing efficiency.

You need to note 3 things, while making a diagram of decision tree:

1. **Square nodes** represents decision points or alternatives.
2. **Circular nodes** indicates chance events with associated probabilities. These are States of Nature.
3. **Conditional payoffs**, representing the outcomes of each alternative-event combination, are assigned to the end points.

After drawing a decision tree, we solve it by working from right to left, calculating the expected payoff for each node as follows:

1. For an event node (represented by circle), we multiply the payoff of each event branch by the event's probability. We add these products to get the event node's expected payoff.
2. For a decision node (represented by square), we pick the alternative that has the best expected payoff. If an alternative leads to an event node, its payoff is equal to that node's expected payoff (already calculated). We "saw off" or "prune" the other branches not chosen by marking two short lines through them. The decision node's expected payoff is the one associated with the single remaining unpruned branch. We continue this process until the leftmost decision node is reached. The unpruned branch extending from it is the best alternative to pursue.

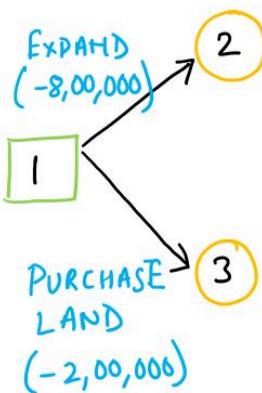
Let us understand this with the help of few examples.

9. Process of Decision Tree

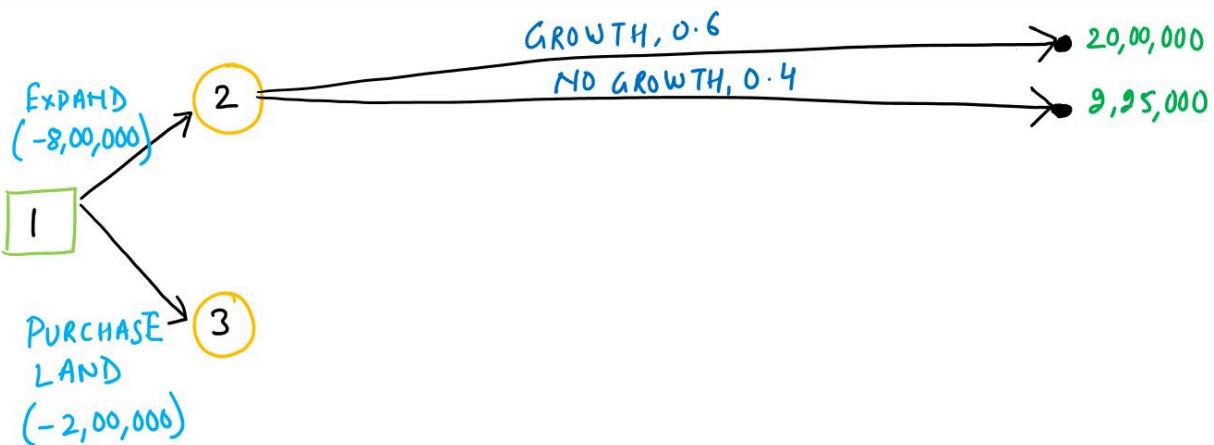
The students should carefully note the steps of below illustration, to understand, how to work with decision tree problems. In next illustration, we will learn, how to use these learnings in Capital budgeting (NPV Analysis)

Tata motors is considering two alternatives: to expand its existing production operation to manufacture a new line of cars; or to purchase land on which to construct a new facility in the future. Each of these decisions has outcomes based on product market growth in the future that result in another set of decisions (during a 10-year planning horizon). The figure shows node 1 with two alternatives, expand and purchase land.

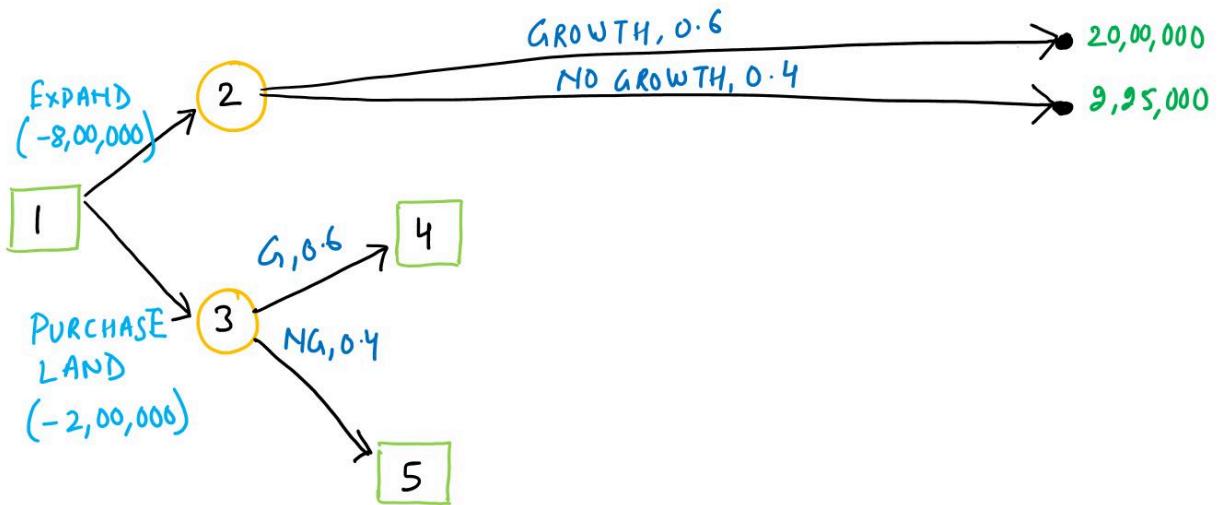
The first decision facing the company is whether to expand or buy land. The state of nature will have a cost layout of Rs. 8,00,000 and Rs. 2,00,000 respectively. The figure shows square 1 with two alternatives, expand and purchase land with cost outlays of 8,00,000 and 2,00,000 respectively. Note that these values are depicted with a negative sign in the figure because they are cash outflows.



If the plant is expanded, two states of nature are possible: The market will grow, with a probability of 0.60, or it will not grow or will decline, with a probability of 0.40. If the market grows, the company will achieve a payoff of Rs. 20,00,000 over a 10-year period. However, if no growth occurs, a payoff of only Rs. 9,95,000 will result. Accordingly, there are two probabilities from node 2 showing their respective payoffs.



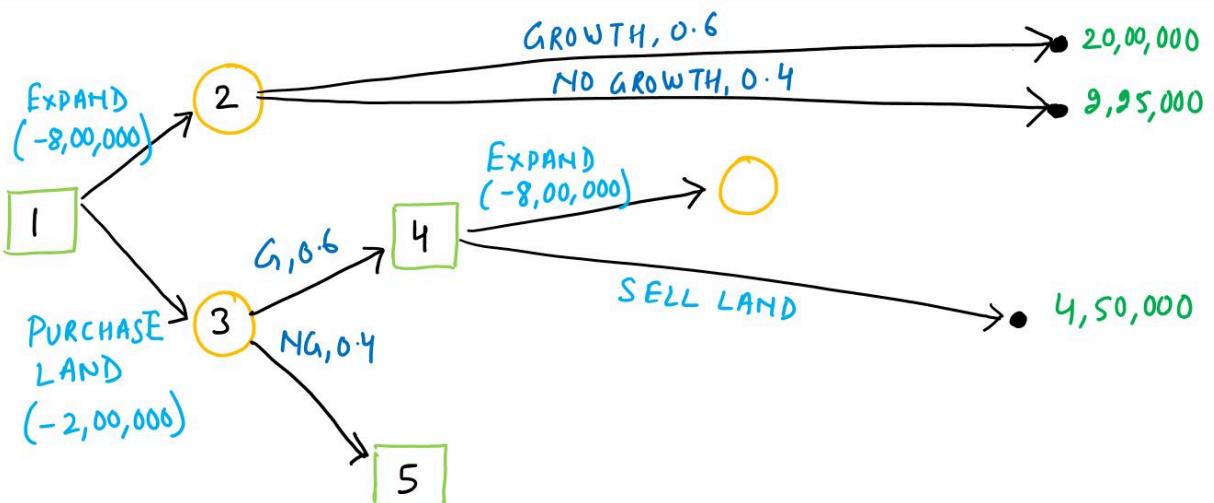
On the other hand, if the company chooses to purchase land, three years in the future another decision will have to be made regarding the development of the land. If the decision is to purchase land, two states of nature are possible. Either the market will grow or will have no growth and their probabilities are identical to expand decision however, but the payoffs are different. This is shown at node 3 in which growth and no growth branches are drawn with their respective probabilities.



$G \equiv \text{GROWTH}$

$NG \equiv \text{NO GROWTH}$

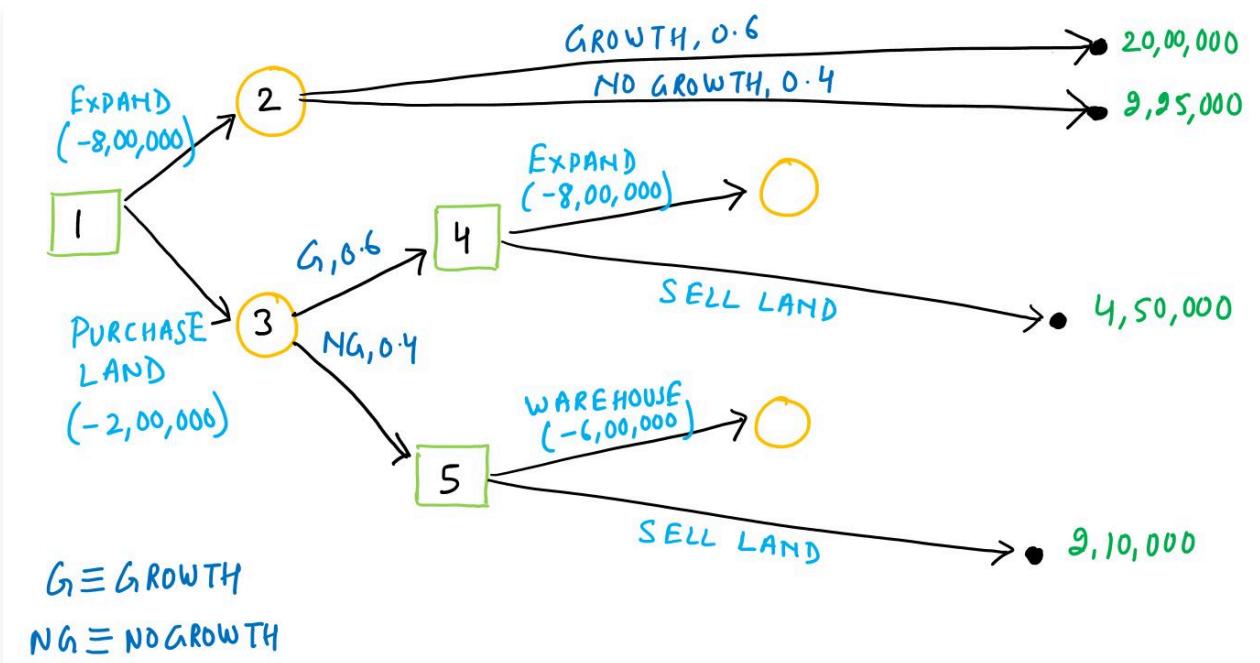
If market growth occurs for a three-year period, no payoff will occur, but the company will make another decision regarding development of the land. At that point, either the plant will be expanded at a cost of Rs. 8,00,000 or the land will be sold, with a payoff of Rs. 4,50,000. This decision situation can occur only if market growth occurs first. From the node 3 growth option node 4 is made regarding the decision of expanding the plant or selling the land with their payoffs of 8,00,000 and 4,50,000 respectively.



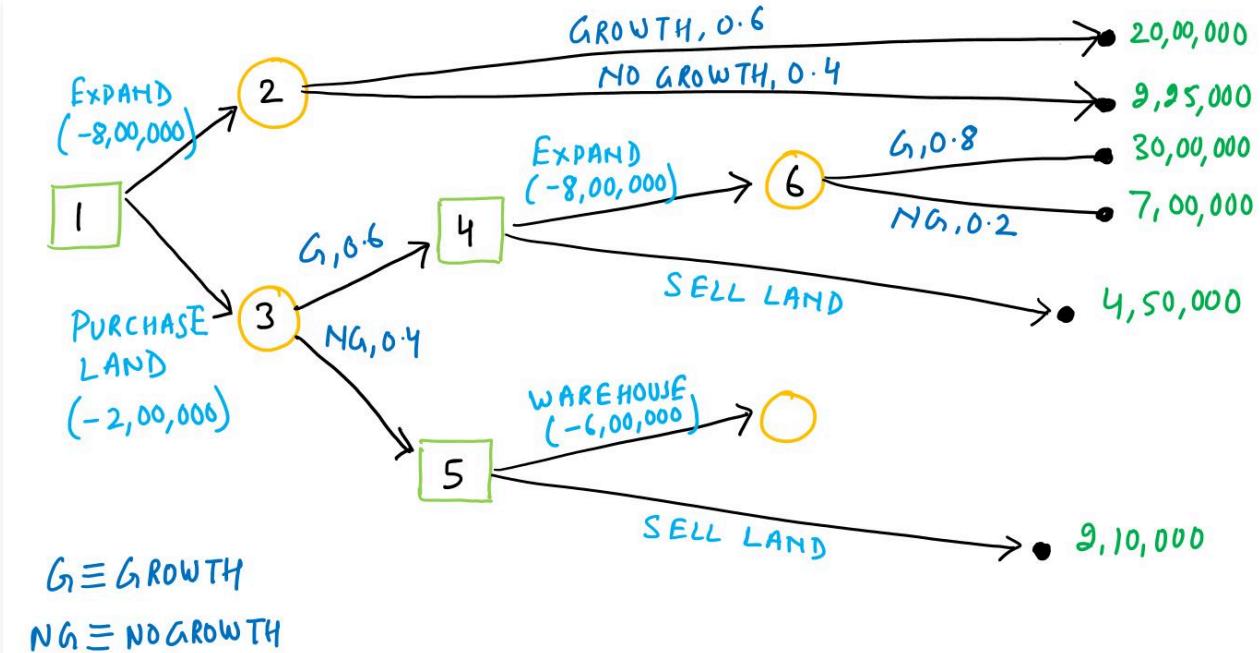
$G \equiv \text{GROWTH}$

$NG \equiv \text{NO GROWTH}$

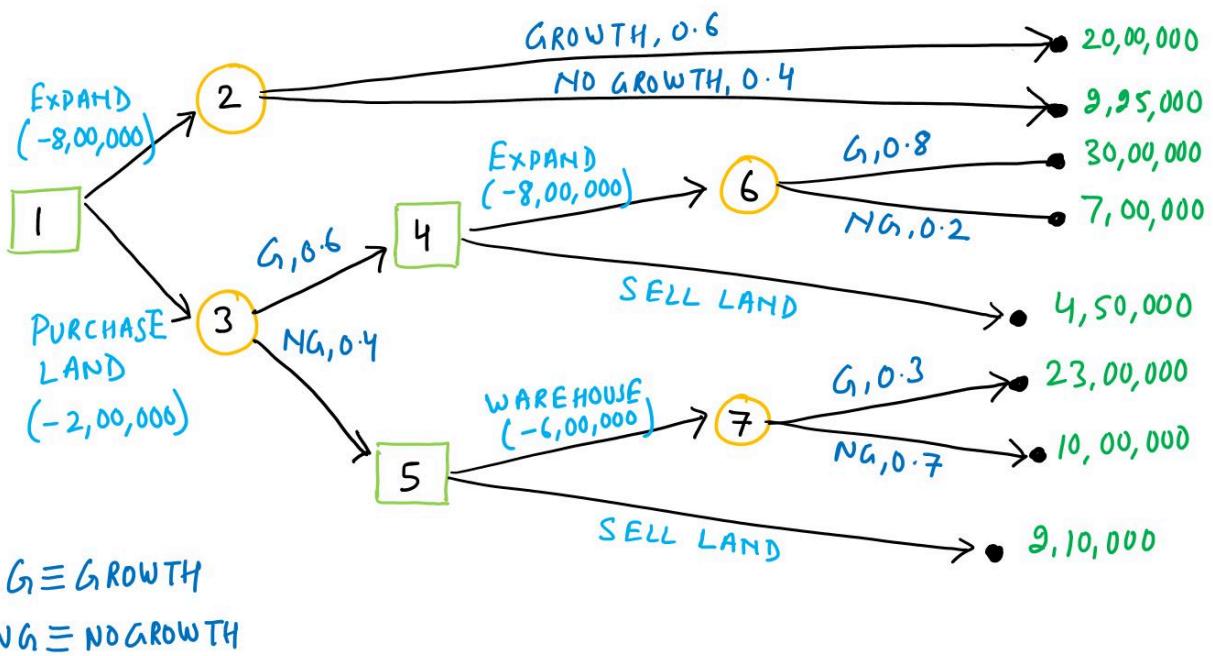
If no market growth occurs there is no payoff, and another decision situation becomes necessary which is to construct a warehouse at a cost of Rs. 6,00,000 or to sell the land for Rs. 2,10,000. (Notice that the sale of the land results in less profit if there is no market growth than if there is growth.) From the node 3 growth option node 5 is made regarding the decision of constructing a warehouse or selling the land with their payoffs of 6,00,000 and 2,10,000 respectively.



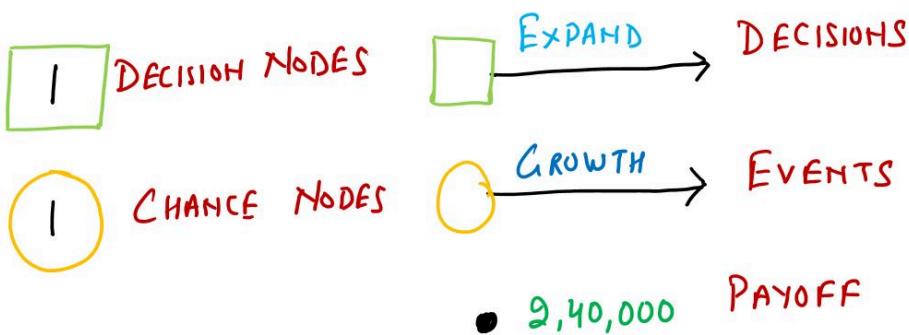
If the decision is to expand the land at a cost of Rs. 8,00,000 is made then, two states of nature are possible: The market may grow, with a probability of 0.80, or it may not grow, with a probability of 0.20. The probability of market growth is higher (and the probability of no growth is lower) than before because there has already been growth for the first three years. The payoffs for these two states of nature at the end of the 10-year period are Rs. 30,00,000 and Rs. 7,00,000, respectively. If the decision of expanding the land is taken at node 4 then, the probability of market growth or no growth are given through node 6 with their payoffs respectively.



If the company decides to build a warehouse then two states of nature can occur: Market growth can occur, with a probability of 0.30 and an eventual payoff of Rs. 23,00,000, or no growth can occur, with a probability of 0.70 and a payoff of Rs. 10,00,000. The probability of market growth is low (i.e., 0.30) because there has already been no market growth. If the decision of constructing a warehouse is taken at node 5 then, the probability of market growth or no growth are given through node 7 with their payoffs respectively.



YOU MAY NOTE :



You have to advise the company which decision should be taken.

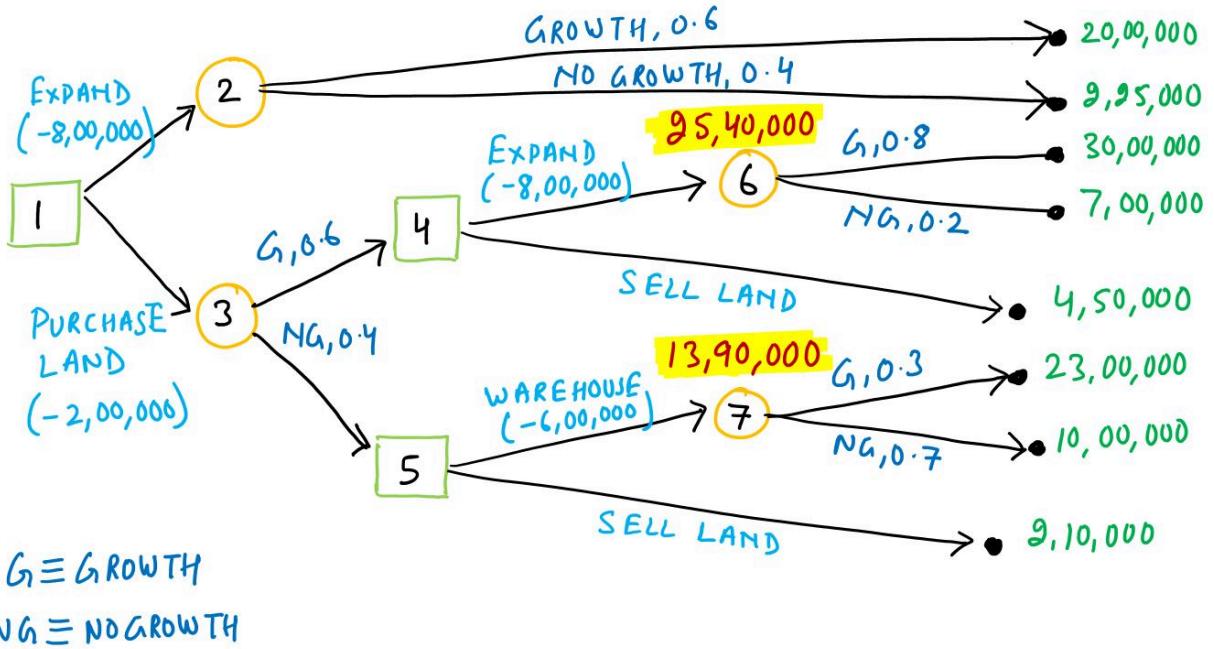
Analysis:

We start the decision analysis process at the end of the decision tree and work backward toward a decision at node 1.

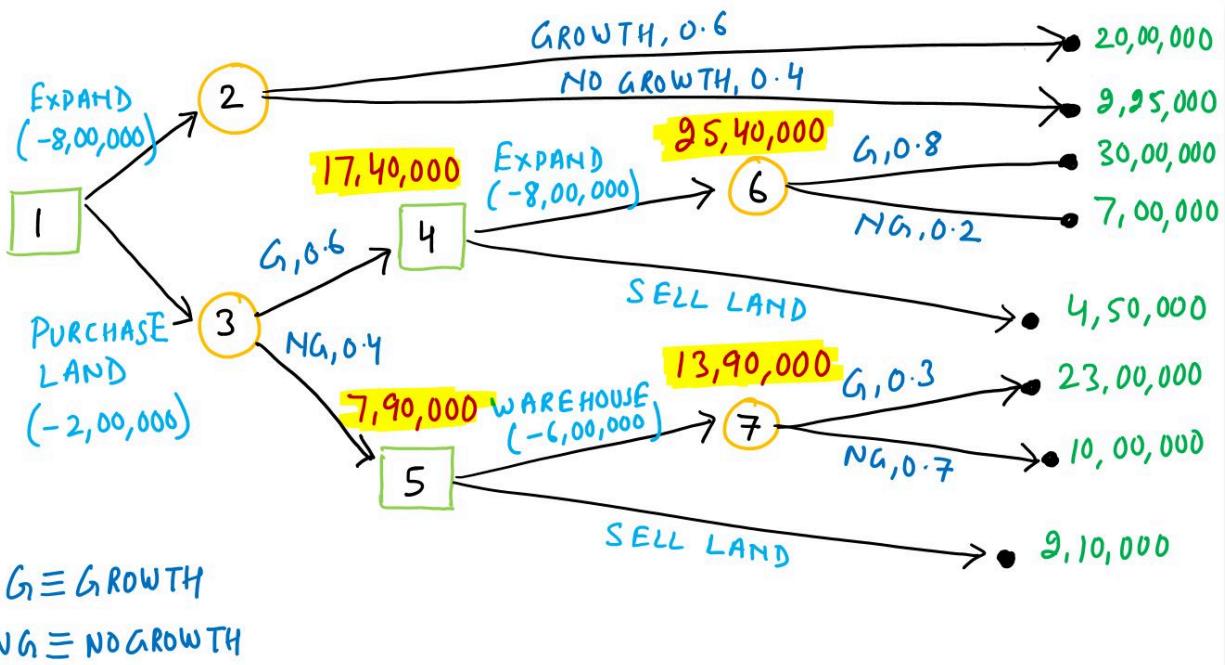
First, we must compute the expected values (EV) at nodes 6 and 7:

$$\text{EV}(\text{node 6}) = 0.80(30,00,000) + 0.20(7,00,000) = 25,40,000$$

$$\text{EV}(\text{node 7}) = 0.30(23,00,000) + 0.70(10,00,000) = 13,90,000$$



These expected values (as well as all other nodal values) are shown in highlighted colour in the figure. At decision nodes 4 and 5, a decision must be made. As with a normal payoff table, the decision is made that results in the greatest expected value. At node 4 the choice is between two values: 17,40,000, the value derived by subtracting the cost of expanding (8,00,000) from the expected payoff of 25,40,000, and 4,50,000, the expected value of selling the land computed with a probability of 1.0. The decision is to expand, and the value at node 4 is 17,40,000.



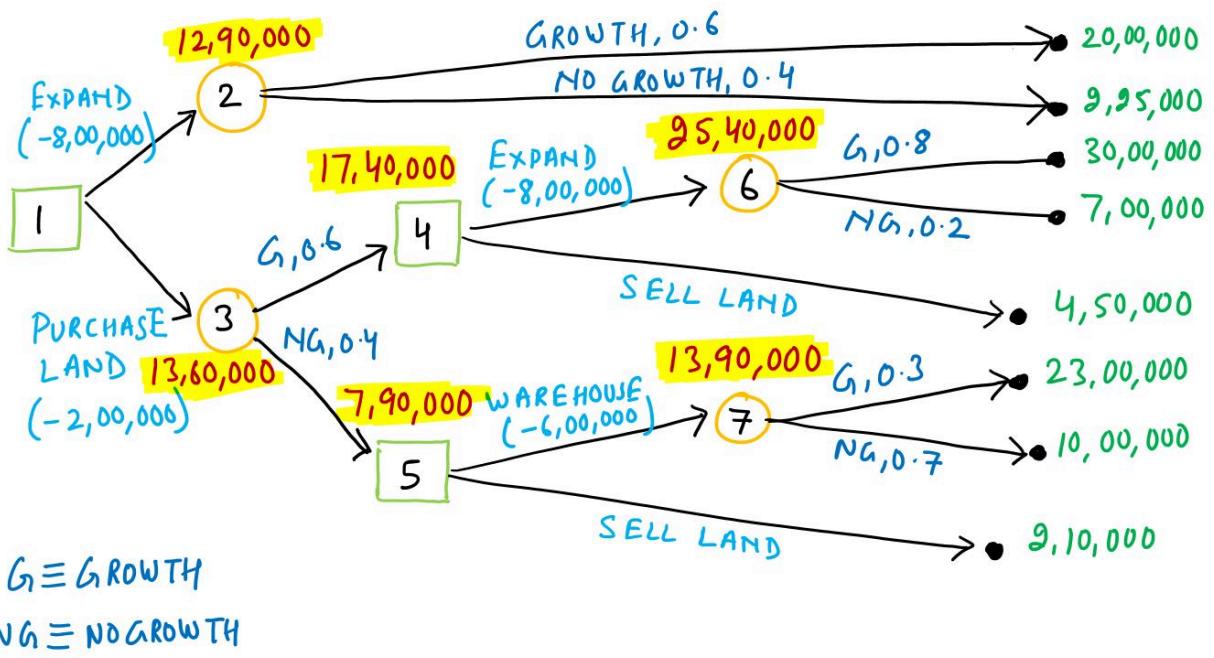
The same process is repeated at node 5. The decisions at node 5 result in payoffs of 7,90,000 (i.e., 13,90,000 – 6,00,000 = 7,90,000) and 2,10,000. Since the value 7,90,000 is higher, the decision is to build a warehouse.

Next, the expected values at nodes 2 and 3 are computed:

$$\text{EV (node 2)} = 0.60(20,00,000) + 0.40(2,25,000) = 12,90,000$$

$$\text{EV (node 3)} = 0.60(17,40,000) + 0.40(7,90,000) = 13,60,000$$

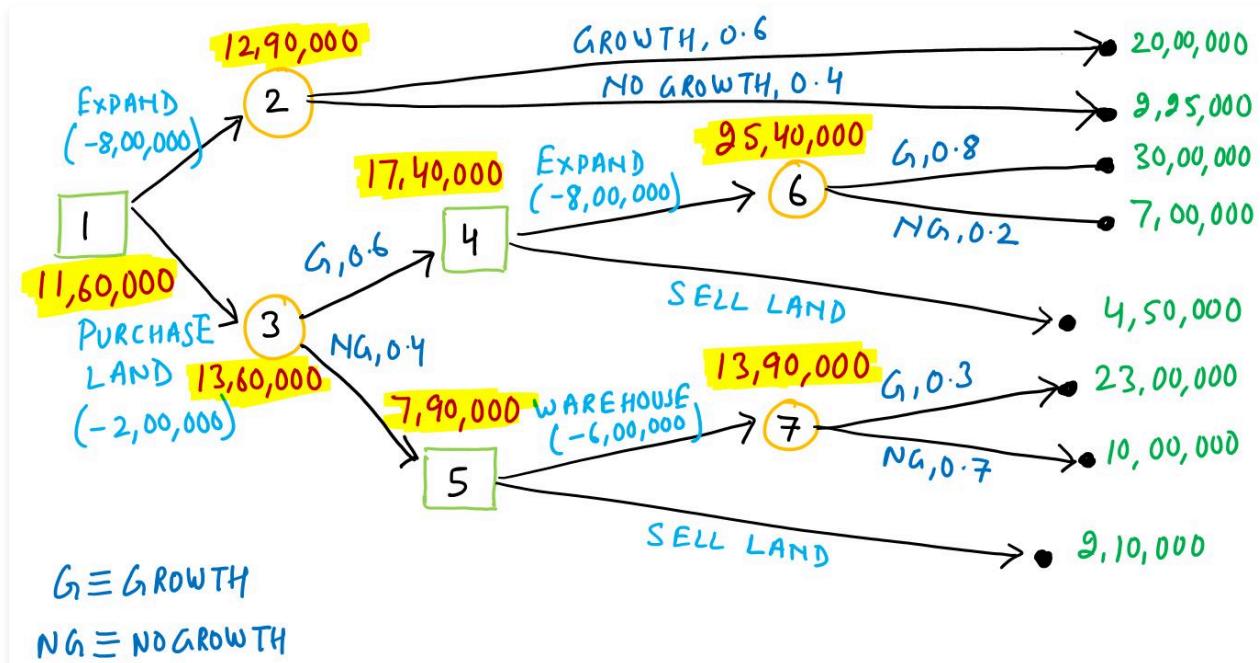
(Note that the expected value for node 3 is computed from the decision values previously determined at nodes 4 and 5.)



Now the final decision at node 1 must be made. As before, we select the decision with the greatest expected value after the cost of each decision is subtracted.

$$\text{Expand: } 12,90,000 - 8,00,000 = 4,90,000$$

$$\text{Land: } 13,60,000 - 2,00,000 = 11,60,000.$$



Since the highest net expected value is 11,60,000, the decision is to purchase land, and the payoff of the decision is 11,60,000.

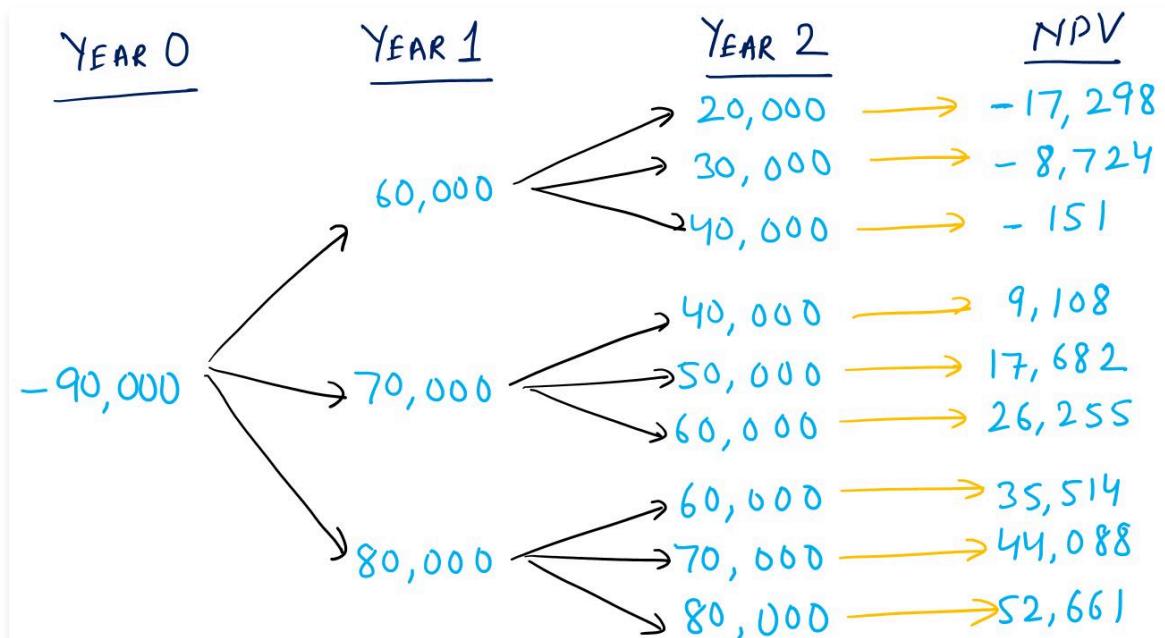
9. Process of Decision Tree

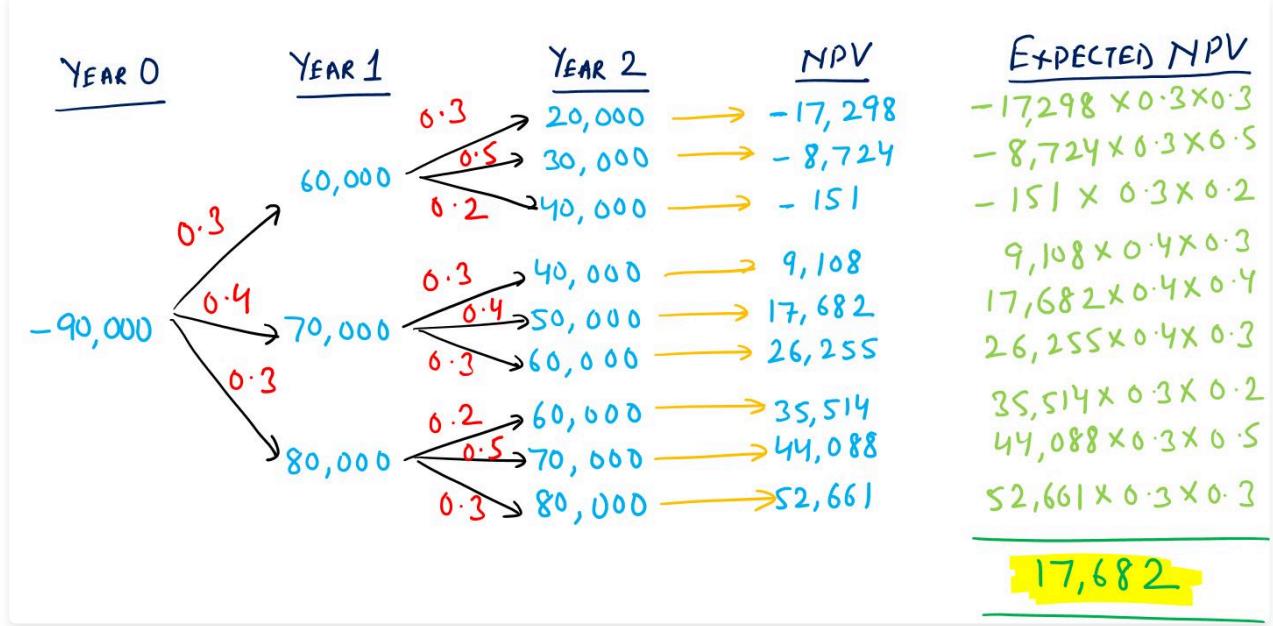
A company is contemplating a project that demands an initial investment of Rs 90,000. The project is anticipated to span two years, with no anticipated salvage or terminal value afterward. The company's stipulated rate of return for this endeavor stands at 8%. The potential after-tax cash flows over the project's duration, along with their associated probabilities of occurrence, are as follows:

Year 1		Year 2	
Cashflow	Initial Probability	Cashflow	Conditional Probability
60000	30%	20000	30%
		30000	50%
		40000	20%
70000	40%	40000	30%
		50000	40%
		60000	30%
80000	30%	60000	20%
		70000	50%
		80000	30%

Calculate the expected net present value of this project.

Solution:



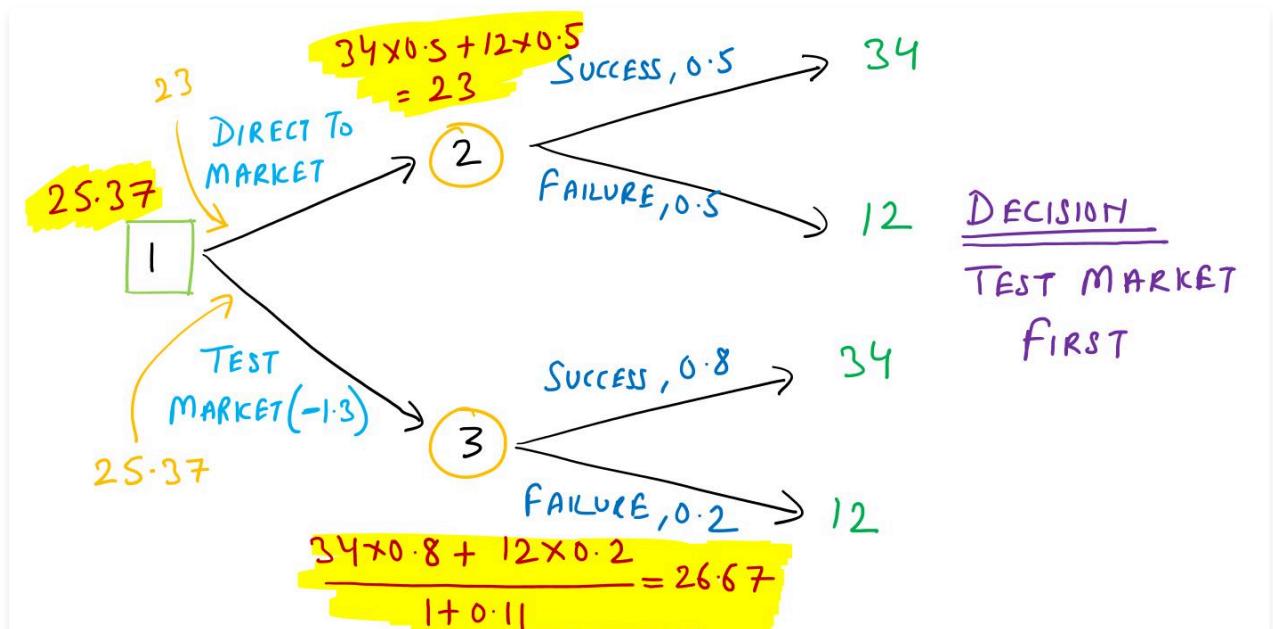


9. Process of Decision Tree

A company has developed a new home security system. If the system is successful, the present value of the payoff (when the product is brought to market) is Rs 34 lakhs. If the system fails, the present value of the payoff is Rs 12 lakhs. If the product goes directly to market, there is a 50 percent chance of success. Alternatively, the company can delay the launch by one year and spend Rs 1.3 lakhs to test market the system. Test marketing would allow the company to improve the product and increase the probability of success to 80 percent. The appropriate discount rate is 11 percent. Should the firm conduct test marketing?

Solution:

We need to calculate the NPV of the two options, go directly to market now, or utilize test marketing first.

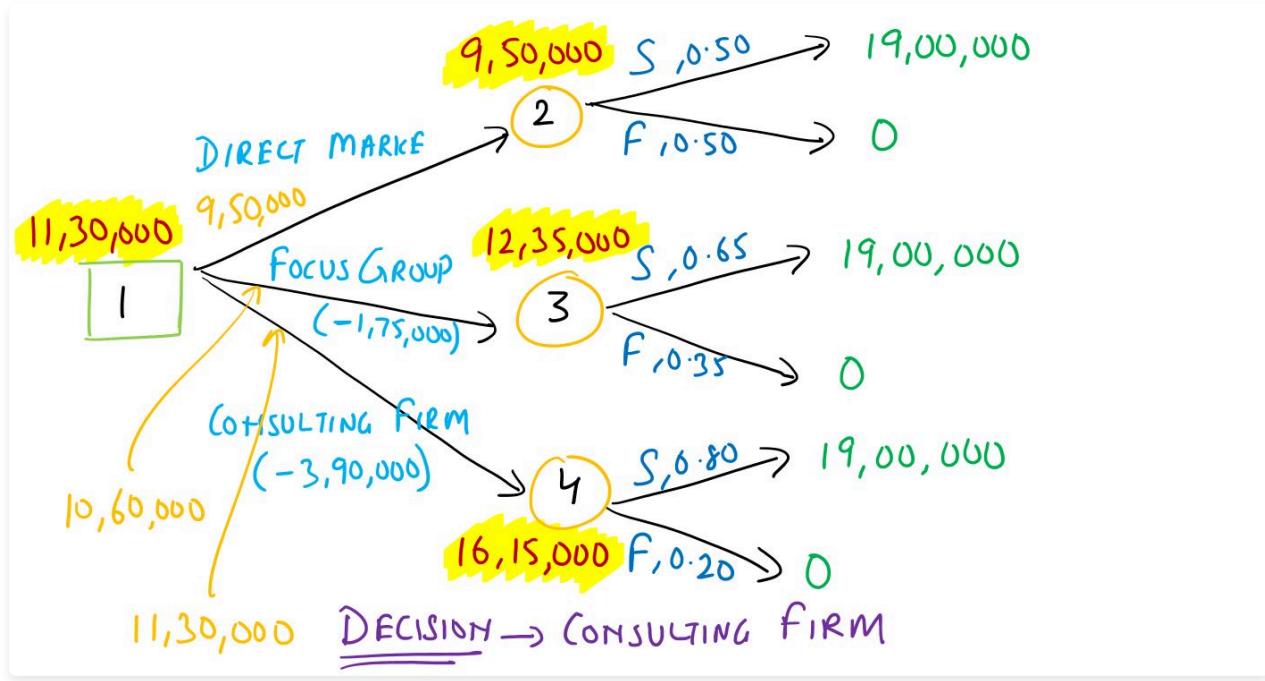


The company should test market first with the product since that option has the highest expected payoff.

9. Process of Decision Tree

The head of a burgeoning company contemplates introducing a new gadget to the market. If launched directly, there's a 50 percent chance of success. For Rs 175,000, the manager can conduct a focus group, increasing the product's chance of success to 65 percent. Alternatively, the manager can opt to engage a consulting firm for Rs 390,000 to conduct market research and refine the product. The consulting firm has a track record of successfully launching new products 80 percent of the time. A successful product launch would yield a payoff of Rs 19 lakhs, while a failure would result in an NPV of zero. Which course of action will yield the highest expected payoff for the company?

Solution:



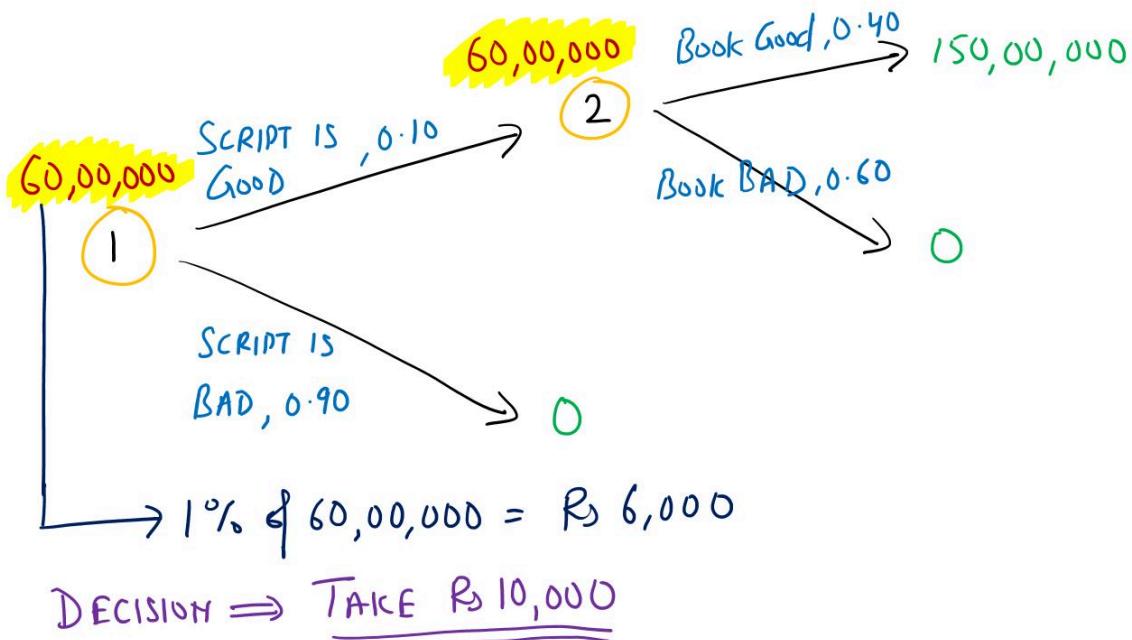
9. Process of Decision Tree

Aspiring novelist Chetna Bhagat has just completed her first manuscript, a gripping thriller packed with suspense and intrigue. Despite her optimism about its potential success, Chetna struggles to find a publishing house willing to take a chance on her work. Finally, Titan Publishing offers to purchase the manuscript for either (a) Rs 10,000 or (b) 1 percent of the book's profits.

The publishing house faces two crucial decisions: firstly, to determine the quality of the manuscript as either good or bad, and secondly, to evaluate the market response to the published book. Initially, there's a 90 percent chance the manuscript is deemed unsatisfactory, resulting in its rejection. However, if deemed good, Titan proceeds with publishing. Following publication, there's a 60 percent chance the book fails to resonate with readers, leading to minimal promotion and no profit. Conversely, if the book is well-received, Titan heavily promotes it, with an average profit of Rs 150 lakhs.

Chetna declines the Rs 10,000 offer, opting instead for 1 percent of the profits. Was this a wise decision by her?

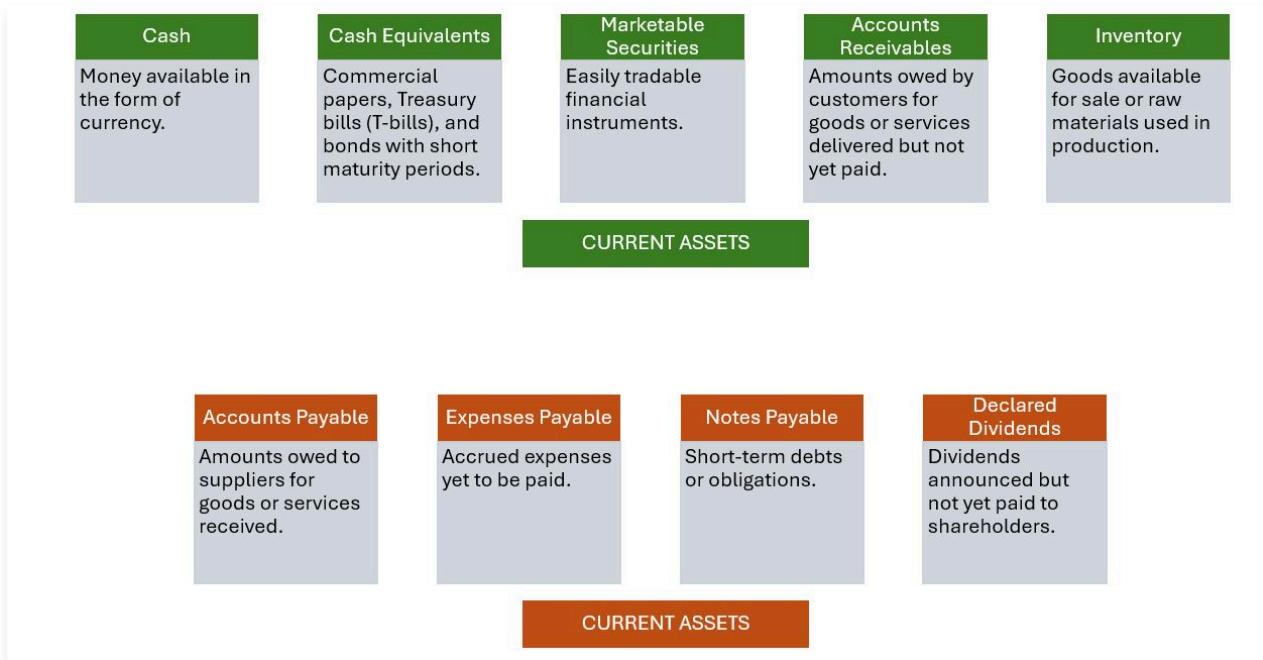
Solution:



Chetna should accept Rs 10,000 offer.

1. Introduction

Working Capital Management (WCM) refers to the management of a company's short-term assets and liabilities in order to ensure efficient operation and maximize profitability. It involves monitoring and controlling the levels of current assets and liabilities to maintain a balance between liquidity and profitability.



Current Assets are assets that are expected to be converted into cash or used up within a year. Examples include cash and cash equivalents, marketable securities, accounts receivable, and inventories and other short-term investments.

$$\text{NET WORKING CAPITAL} = \text{CURRENT ASSETS} - \text{CURRENT LIABILITIES}$$

Current Liabilities are obligations that are due within a year. Examples include accounts payable, expenses payable (including accrued wages and taxes), and notes payable.

Net Working Capital is the difference between current assets and current liabilities. A positive net working capital indicates that a company has enough short-term assets to cover its short-term liabilities. Conversely, a negative net working capital may indicate liquidity issues.

Gross Working Capital refers to the aggregate of all current assets within a business.

As a financial manager, following types of questions are analyzed, under Working Capital Management:

1. What is an appropriate amount of cash reserves to maintain in the bank to cover bill payments?
2. What is the optimal borrowing amount for the firm in the short term?
3. What is the suitable level of credit to offer customers?
4. What is the optimal level of inventory to maintain to meet demand without tying up excessive capital?
5. How can the company effectively manage its accounts receivable to minimize the risk of late payments or defaults?
6. Should the company negotiate early payment discounts with suppliers to optimize cash flow?
7. What are the most suitable short-term investment options for excess cash reserves to earn a return while maintaining liquidity?
8. How can the company streamline its cash conversion cycle to improve operational efficiency and cash flow?
9. Are there opportunities to renegotiate payment terms with vendors to better align cash outflows with revenue inflows?

2. Decisions in WCM

The short-term financial policy (Working Capital Management) of a firm comprises two primary decisions:

1. Investment in Current Assets

This element refers to the amount of current assets a firm holds relative to its total operating revenues (Sales).

A **flexible or accommodative (Conservative Policy)** short-term financial policy entails maintaining a high ratio of current assets to sales. This approach ensures that the firm has sufficient liquidity to meet short-term obligations and unexpected expenses.

Conversely, a **restrictive (Aggressive Policy)** short-term financial policy involves maintaining a low ratio of current assets to sales. This strategy aims to minimize idle cash and inventory, optimizing the allocation of resources and improving efficiency.

2. Financing of Current Assets

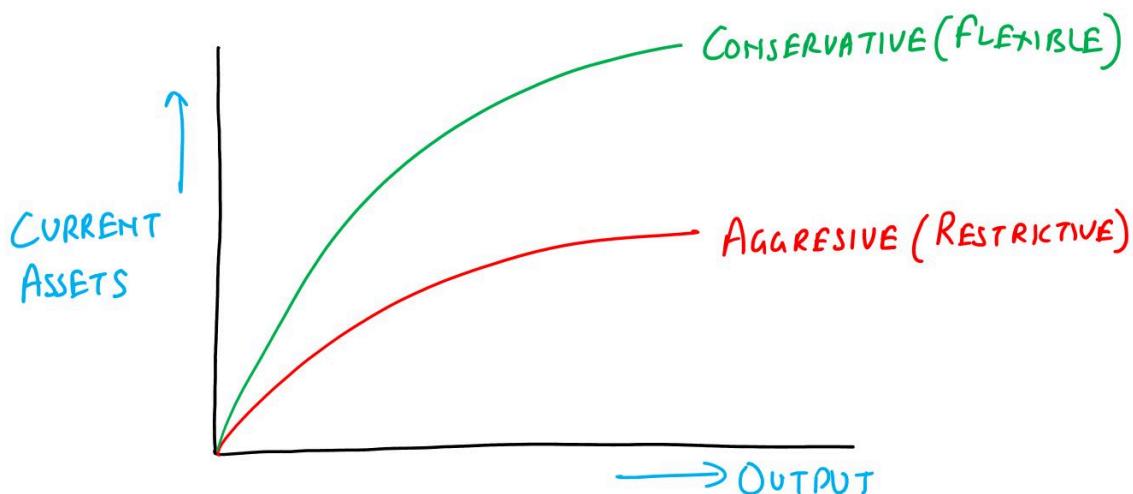
This aspect focuses on how the firm finances its current assets, specifically the proportion of short-term debt to long-term debt.

A **restrictive (Aggressive Policy)** short-term financial policy is characterized by a high proportion of short-term debt relative to long-term financing. This approach may involve utilizing lines of credit, trade credit, or short-term loans to fund working capital needs.

In contrast, a **flexible (Conservative Policy)** short-term financial policy involves relying less on short-term debt and more on long-term financing options. This may include issuing long-term bonds, obtaining term loans, or utilizing retained earnings to finance current assets.

We will discuss them one by one.

3. Investment in Current Assets



There are two contrasting approaches to investing in current assets, each with its own implications for a firm's liquidity and operational efficiency.

1. Flexible Short-Term Financial Policy (Conservative Policy)

This approach involves maintaining a high ratio of current assets to sales to ensure ample liquidity for meeting short-term obligations and unexpected expenses.

Strategies under a flexible policy include:

- Holding large balances of cash and marketable securities.
- Making substantial investments in inventory.
- Offering liberal credit terms, resulting in a high level of accounts receivable.

While flexible policies incur higher cash outflows to finance current assets, they yield the highest future cash inflows. This is because:

- Liberal credit policies stimulate sales, driving revenue growth.
- Large inventory levels enable quick delivery services, enhancing customer satisfaction and increasing sales potential.
- The firm can potentially command higher prices due to the added value of quick delivery and generous credit terms.
- Fewer production stoppages occur due to inventory shortages.

Impact on Liquidity

The greater the level of current assets, the greater the liquidity of the firm.

$$ROI = \frac{\text{NET PROFITS}}{\text{CURRENT ASSETS} + \text{FIXED ASSETS}}$$

Impact on Profitability

Expanding the current assets portfolio tends to diminish profitability. Increasing investment in current assets leads to a decrease in return on investment (ROI). Elevated levels of cash, receivables, and inventory elevate the denominator in the ROI equation, resulting in decreased net profits, the numerator. Consequently, adopting a conservative policy typically yields lower profitability.

Impact on Risk

Boosting cash reserves strengthens the firm's capacity to fulfill financial obligations promptly. Increasing receivables through lenient credit terms and relaxed enforcement can potentially drive additional sales. Similarly, expanding inventory can prevent lost sales due to product shortages. Consequently, embracing conservative working capital policies tends to mitigate risk exposure.

2. Restrictive Short-Term Financial Policy (Aggressive Policy)

In contrast, a restrictive policy involves maintaining a low ratio of current assets to sales to minimize idle cash and inventory, thereby improving resource allocation and operational efficiency.

Strategies under a restrictive policy include:

- Keeping low cash balances
- Avoiding investments in marketable securities.
- Making minimal investments in inventory.
- Offering no credit sales and thus maintaining no accounts receivable.

While restrictive policies reduce the need for financing current assets and lower cash outflows, they may limit sales growth potential and customer satisfaction due to:

- Restricted credit policies may deter potential customers who require financing options.
- Limited inventory levels may result in longer delivery times and potential lost sales opportunities.
- The firm may miss out on opportunities to charge premium prices for quick delivery services or liberal credit terms.

Impact on Liquidity

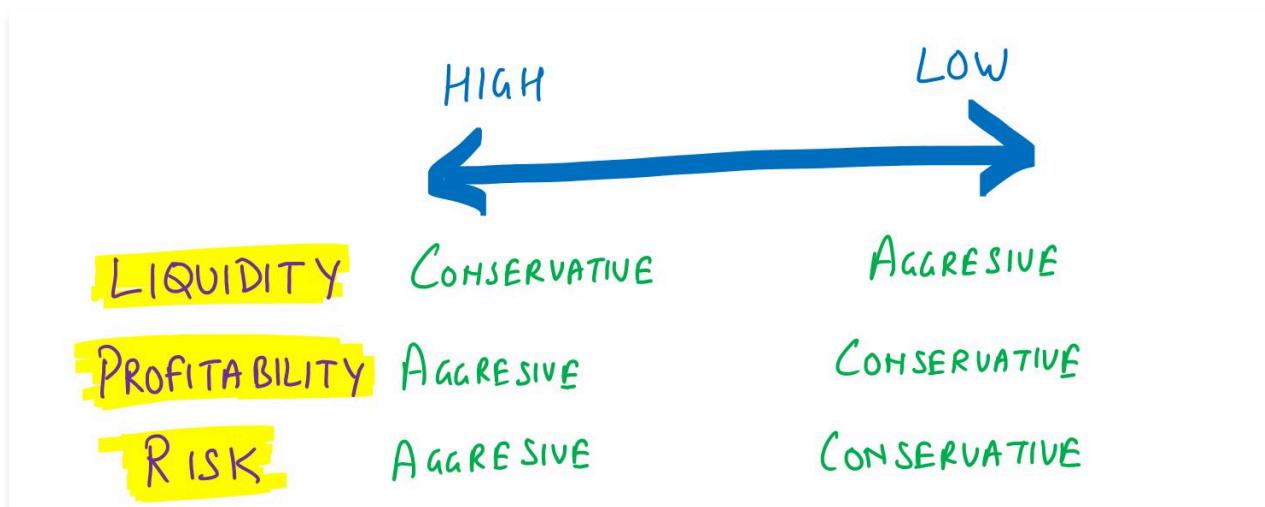
The lower the level of current assets, the lower the liquidity of the firm.

Impact on Profitability

Decreasing the amounts of current assets held will increase our the profitability. If we can reduce the firm's investment in current assets while still being able to properly support output and sales, ROI will increase. Lower levels of cash, receivables, and inventory would reduce the denominator in the equation; and net profits, our numerator, would remain roughly the same or perhaps even increase. The Aggressive policy, thus, provides the highest profitability.

Impact on Risk

Decreasing cash reduces the firm's ability to meet financial obligations as they come due. Decreasing receivables, by adopting stricter credit terms and a tougher enforcement policy, may result in some lost customers and sales. Decreasing inventory may also result in lost sales due to products being out of stock. Therefore more aggressive working capital policies lead to increased risk.



Summary

Our examination of working capital policies has highlighted two fundamental principles in finance:

- (i) Profitability decreases as liquidity increases.
- (ii) Profitability and risk are positively correlated, indicating a trade-off between risk and return.

3. Investment in Current Assets

Determining the optimal level of investment in short-term assets involves weighing the costs associated with different financing policies to strike a balance between flexibility and constraint.

Carrying Costs

These are costs that increase with the level of investment in current assets.

There are typically two types of carrying costs.

First, there's an opportunity cost as the rate of return on current assets is lower compared to other investments (The lower risk profile of current assets translates to lower potential returns. Investors are often willing to accept lower returns on assets with lower risk). Second, there are costs related to maintaining the economic value of assets, such as warehousing inventory expenses.

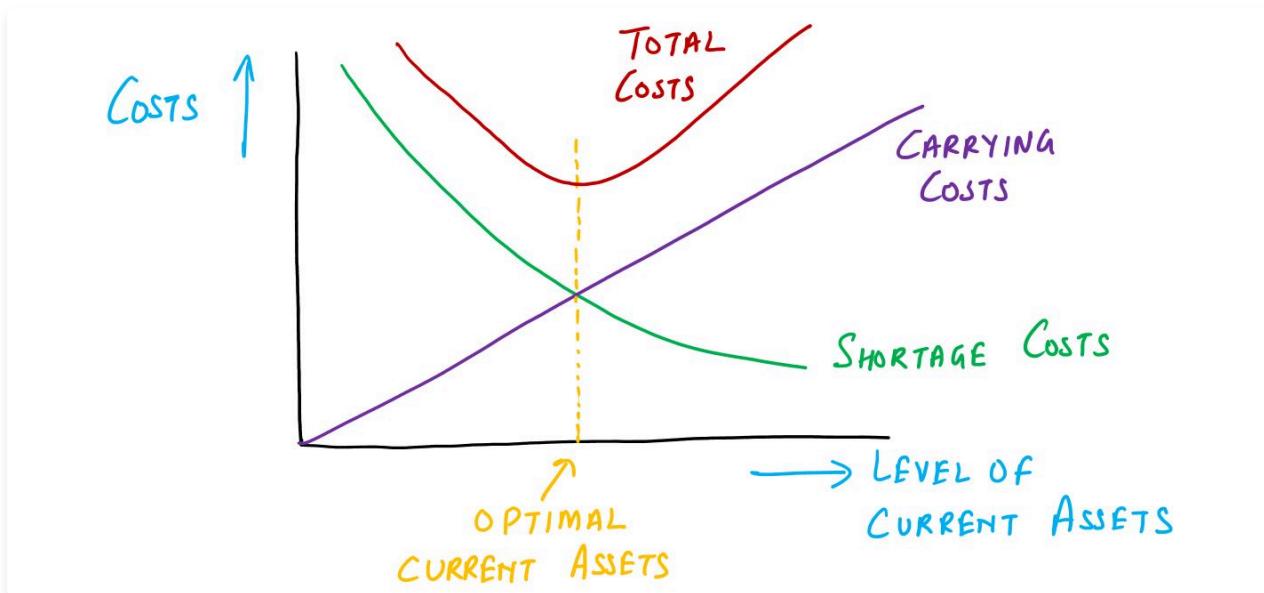
Shortage Costs

Conversely, shortage costs decrease with higher investment in current assets.

These costs are incurred when investment in current assets is low. For instance, if a firm faces a cash shortage, it may need to sell marketable securities or borrow funds, incurring additional expenses. Additionally, shortages in inventory or the inability to extend credit to customers can result in lost sales and operational disruptions.

Thus there are two kinds of shortage costs:

1. Trading costs, or Order costs : Order costs are the costs of placing an order for more cash (brokerage costs) or more inventory (production setup costs).
2. Costs related to safety reserves : These are the costs of lost sales, lost customer goodwill, and disruption of production schedules.

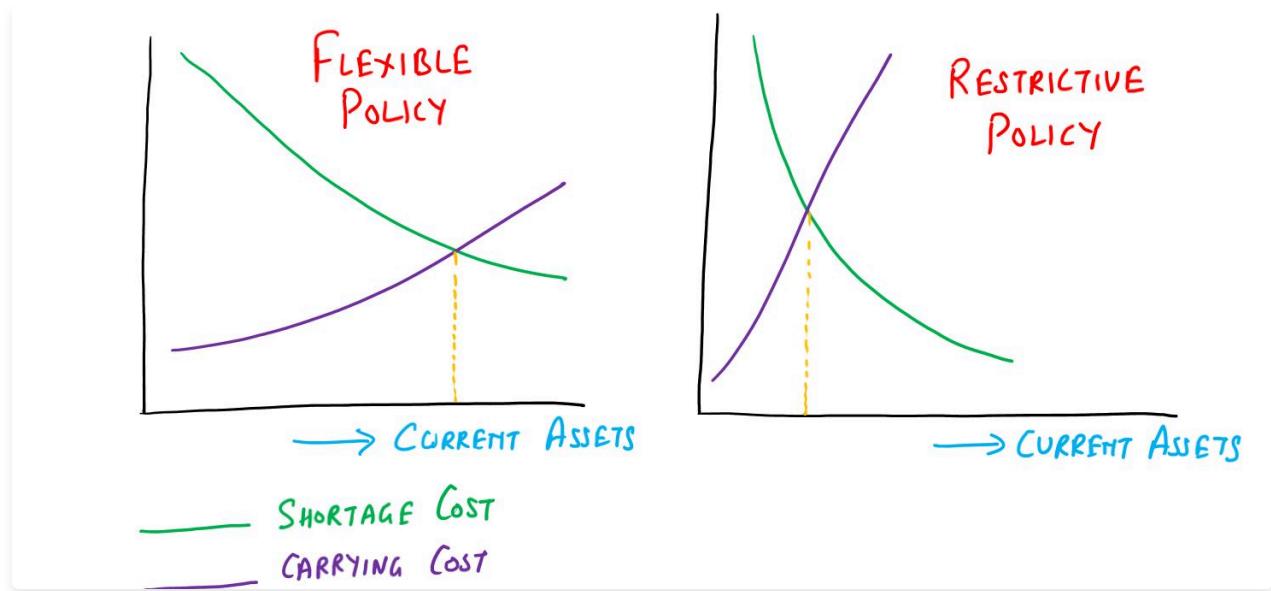


Total Costs

The total costs of investing in current assets encompass both carrying costs and shortage costs. The optimal investment level, depicted by the minimum point on the total cost curve, represents the balance between these costs.

Flexible Vs Restrictive Policy

If carrying costs are low or shortage costs are high, the optimal policy favors maintaining substantial current assets. This suggests a flexible policy that prioritizes liquidity and operational flexibility.



Conversely, if carrying costs are high or shortage costs are low, the optimal policy leans towards a restrictive approach. This entails keeping current assets at a modest level to minimize expenses.

In summary, the optimal short-term financing strategy depends on the trade-off between carrying costs and shortage costs. By striking the right balance, firms can effectively manage their liquidity needs while minimizing unnecessary expenses.

4. Financing of Current Assets

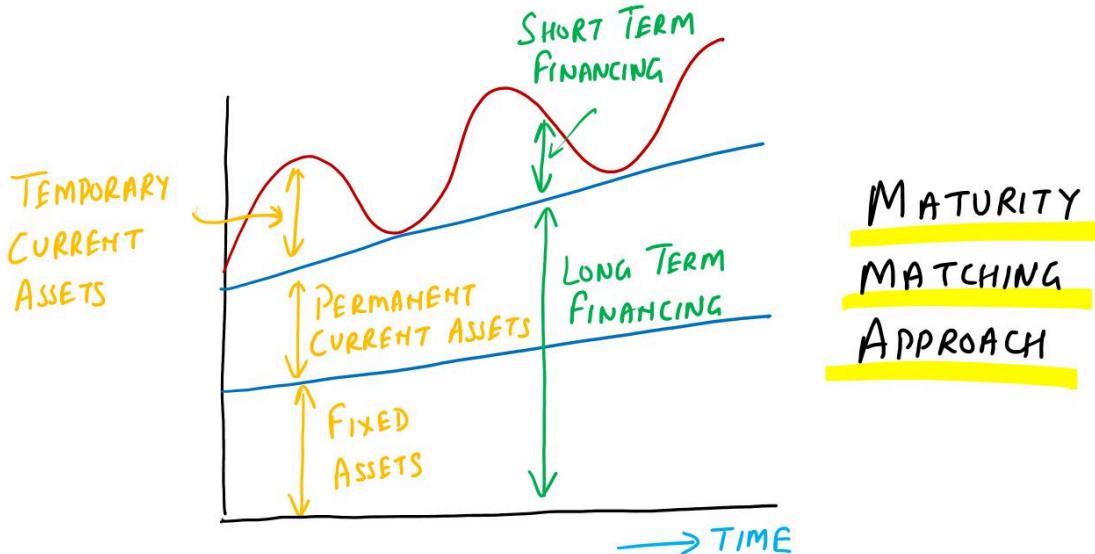
So far, we have analyzed the investment level in current assets.

Now, let us delve into how the company funds its current assets, particularly the ratio of short-term debt to long-term debt. This leads us to evaluate the magnitude of current liabilities, assuming the current asset investment is optimal.

Working capital can be categorized based on time. **Permanent working capital** represents the minimum current asset requirement for long-term needs, often referred to as "bare bones" working capital. In contrast, **temporary working capital** denotes the investment in current assets that fluctuates with seasonal demands.

4. Financing of Current Assets

This is also called Maturity Matching approach.



In an ideal economy, short-term assets (such as inventory and accounts receivable) can be easily financed with short-term debt (such as short-term loans or lines of credit). Similarly, long-term assets (such as property, plant, and equipment) can be financed with long-term debt (such as bonds or mortgages, as well as equity, such as common stock or retained earnings).

Thus, if the firm adopts a hedging (maturity matching) approach to financing, each asset would be offset with a financing instrument of the same approximate maturity:

- (i) Short-term or seasonal variations in current assets would be financed with short-term debt
- (ii) Permanent component of current assets would be financed with long-term debt or with equity.
- (iii) Fixed assets would be financed with long-term debt or with equity.

The rationale for this is that if long-term debt is used to finance short-term needs, the firm will be paying interest for the use of funds during times when these funds are not needed.

In other words, we can say that short-term assets typically have shorter operating cycles and generate cash flows more quickly, making them suitable for financing with short-term debt that can be repaid relatively soon. Conversely, long-term assets have longer operating cycles and generate cash flows over an extended period, making them better suited for financing with long-term debt or equity, which have longer repayment horizons.

Thus the financing structure is well-matched to the nature of the assets being financed, minimizing mismatches between asset maturities and debt repayment schedules. As a result, the net working capital, which is the difference between current assets and current liabilities, is always zero.

This is also called self-liquidating approach.

Example

To illustrate the hedging (maturity matching) approach to financing, consider a retail company gearing up for the Christmas season.

As the holiday approaches, the company anticipates a surge in inventory and receivables to meet increased customer demand. Rather than relying solely on long-term debt, the company opts for a short-term loan to finance this seasonal expansion in assets.

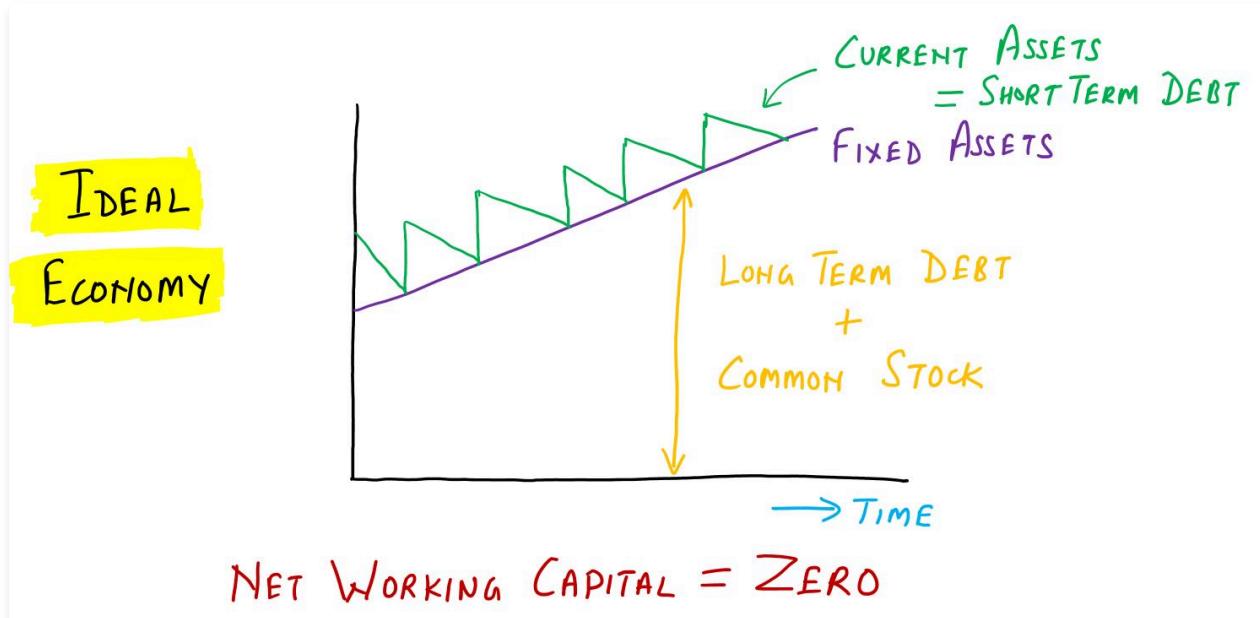
As sales roll in and inventory is depleted, receivables accumulate, generating cash flow. This cash is then used to repay the short-term loan, effectively self-liquidating the debt. This process unfolds over a few months, demonstrating the strategy of borrowing only when needed and ensuring that the loan is supported by the funds generated from the seasonal operations.

Meanwhile, the company's permanent asset requirements, such as infrastructure or ongoing operational needs, are financed with long-term debt and equity. These assets are expected to contribute to long-term profitability, covering the costs of long-

term financing.

4. Financing of Current Assets

In the real world, because a firm experiences long-term growth in sales, there will be a permanent need for both current and long-term assets.

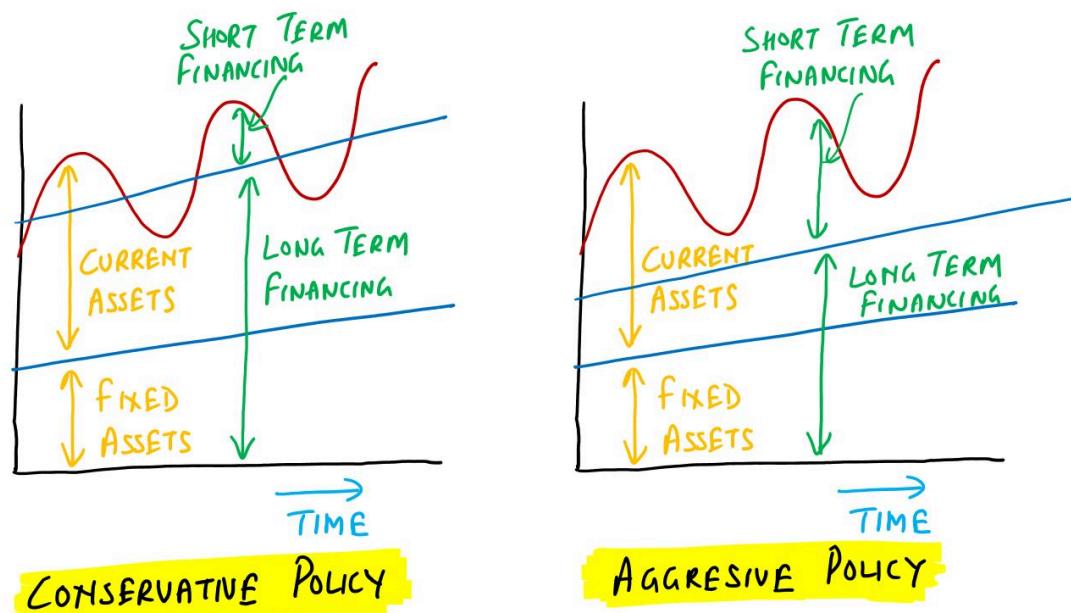


A growing firm requires a consistent investment in both types of assets. This total asset requirement fluctuates over time due to three main factors:

- (i) a secular growth trend,
- (ii) seasonal variations around the trend, and
- (iii) unpredictable day-to-day and month-to-month fluctuations.

Short-term debt entails higher risk due to the potential inability to meet principal and interest payments if cash flows don't align. For instance, if a company borrows short-term to fund a long-term project like building a plant, it faces the risk that lenders may not renew the loan at maturity. This could lead to financial strain or even bankruptcy if the company can't repay.

Additionally, uncertainty surrounds interest costs with short-term debt as rates fluctuate more than long-term rates. Refinancing short-term debt during periods of rising interest rates may result in higher overall interest costs compared to long-term debt, adding to the borrower's risk.



In case of aggressive policy, the firm finances a part of its permanent current assets with short-term debt. As a result, it must refinance this debt at maturity, and this involves an element of risk. The greater the portion of the permanent asset needs financed with short-term debt, the more aggressive the financing is said to be.

There is a negative margin of safety.

This strategy is considered restrictive because it may lead to tighter cash flows and increased reliance on short-term debt to meet immediate funding needs.

Conservative Policy (Flexible Strategy)

Here the firm finances a portion of its expected seasonal funds requirement (temporary current assets), with a long-term debt. It will pay interest on excess debt during seasonal troughs when these particular funds are not needed.

The higher the long-term financing line, the more conservative the financing policy of the firm, and the higher the cost.

Since this strategy results in chronic short-term cash surpluses and a significant investment in net working capital, it is considered a flexible strategy.

4. Financing of Current Assets

Determining the ideal amount of short-term borrowing is not a straightforward task. Several factors need to be considered in a comprehensive analysis:

1. Cash Reserves: Under the flexible financing strategy, surplus cash is available, resulting in minimal short-term borrowing. This approach reduces the likelihood of financial distress as firms can easily meet recurring short-term obligations.

However, investments in cash and marketable securities typically offer minimal net present value.

2. Maturity Hedging: Typically, firms finance inventories using short-term bank loans and fixed assets using long-term financing. This practice avoids the risk associated with maturity mismatching, where long-lived assets are financed with short-term borrowing. Such mismatches would require frequent refinancing and pose inherent risks, especially considering the volatility of short-term interest rates compared to longer rates.

3. Term Structure: Short-term interest rates are usually lower than long-term rates. Consequently, relying on short-term borrowing tends to be more cost-effective on average than long-term borrowing. This implies that firms may find it advantageous to utilize short-term borrowing for their financing needs.

5. Two Decisions in WCM- interrelationship

In the preceding sections, we examined two broad aspects of working capital management: what level of current assets to maintain and how to finance current assets.

These two facets are interdependent.

All other things equal, a firm that follows a conservative policy of maintaining high levels of current assets should be in a better position to successfully utilize short-term borrowing than a firm that maintains aggressively low levels of current assets.

On the other hand, a firm that finances its current assets entirely with equity will be in a better risk position to take a more aggressive stance when it comes to maintaining low ("lean and mean") levels of current assets.

Because of their interdependence, these two aspects of working capital management must be considered jointly.

Uncertainty and the Margin of Safety

If the firm knows with certainty its future sales demand, resulting receivable collections, and production schedule, it will be able to arrange its debt maturity schedule to correspond exactly to the schedule of future net cash flows. As a result, profits will be maximized, for there will be no need to hold excessive (and relatively low-yielding) levels of current assets nor to have more long-term financing than is absolutely necessary.

When sales and resulting cash flows are subject to uncertainty, however, the situation is changed. The greater the dispersion of the probability distribution of possible net cash flows, the greater the margin of safety that management will wish to provide.

Assume initially that the firm cannot borrow on short notice to meet unexpected cash drains. As a result, it can provide a margin of safety only by (1) increasing the level of current assets (especially cash and marketable securities), or (2) lengthening the maturity schedule of financing. Both of these actions affect profitability. In the first choice, funds are committed to relatively low-yielding assets. In the second, the firm may pay interest on borrowings over periods of time when the funds are not needed. In addition, long-term debt has a higher expected interest cost than does short-term debt.

Risk and Profitability

A decision on the appropriate margin of safety will be governed by considerations of risk and profitability and by management's attitude toward bearing risk. Each solution (increasing liquidity, lengthening the maturity schedule, or a combination of the two) will cost the firm something in profit-making ability.

For a given risk tolerance, management may determine which solution is least costly and then implement that solution. On the other hand, management might determine the least costly solution for various levels of risk. Then management could formulate risk tolerances on the basis of the cost involved in providing a margin of safety.

The greater the ability of the firm to borrow on short notice, the less it needs to provide for a margin of safety.

6. Computing Working Capital Requirements

The computation of working capital requirements is a critical financial process that helps businesses determine the liquidity needed to meet short-term obligations. This method provides a structured approach to assess and plan for the financial resources required for day-to-day operations.

Working Capital Requirements Computation			
CURRENT ASSETS			
Stock of Raw Materials			X X X X
Work in Progress:			
Raw Material			X X X X
Direct Labour			X X X X
Finished Goods			<u>X X X X</u>
Total Work in Progress			X X X X
Stock of Finished Goods			X X X X
Debtors			X X X X
Cash Balance			<u>X X X X</u>
<i>Gross Working Capital (A)</i>			<u>X X X X</u>
CURRENT LIABILITIES			
Creditors			X X X X
Outstanding Wages			X X X X
Outstanding Overheads			<u>X X X X</u>
<i>Total Current Liabilities (B)</i>			<u>X X X X</u>
Net Working Capital (A-B)			X X X X

1. Current Assets

The first step in computing working capital is to identify and quantify current assets. This includes:

(i) *Stock of Raw Materials*: The inventory of raw materials that will be used in production. Accurate estimation is vital as it impacts production efficiency and costs.

(ii) *Work in Progress (WIP)*: This includes all costs associated with products that are in the production process but not yet completed. WIP is typically broken down into:

- *Raw Material*: The portion of raw materials that has been issued to production but not yet converted into finished goods.
- *Direct Labour*: The costs of labor directly involved in the production process.
- *Finished Goods*: The value of products that are completed and ready for sale but are still held in inventory.

(iii) *Stock of Finished Goods*: This represents the inventory of completed products available for sale.

(iv) *Debtors*: The amounts owed by customers who have purchased goods on credit. This reflects future cash inflows.

(v) *Cash Balance*: The liquid cash available for immediate expenses and operational costs.

The sum of all these components forms the Gross Working Capital (A), representing the total funds tied up in current assets.

2. Current Liabilities

Next, current liabilities must be assessed, which include:

(i) *Creditors*: The amounts payable to suppliers for goods purchased on credit.

(ii) *Outstanding Wages*: Wages owed to employees that have not yet been paid.

(iii) *Outstanding Overheads*: Costs incurred for services or utilities that are yet to be settled.

The total of these liabilities gives the Total Current Liabilities (B).

3. Net Working Capital

Finally, to compute the Net Working Capital (A - B), subtract the total current liabilities from gross working capital. This figure indicates the liquidity available to the business to cover its short-term obligations. A positive net working capital suggests that the company can easily meet its current liabilities, while a negative value indicates potential liquidity issues.

NOTES:

1. Profits should be ignored while calculating working capital requirements because the Profits may or may not be used as working capital.
 2. Even if profits are to be used for working capital, they have to be reduced by the amount of income tax, drawings, and dividends paid, etc.
 3. Calculation of Work-in-Process depends upon its degree of completion with regard to material, labor, and overheads. However, if nothing is specified in a question about the degree of completion, we may assume to take 100% cost of material, labor as well as overheads. Some authors also suggest 100% consumption of raw material and 50% (half on average) in the case of labor and overheads.
 4. Calculation for stocks of finished goods and debtors should be made at cost unless otherwise specified in the question.
-

6. Computing Working Capital Requirements

A proforma cost sheet of a company provides the following data:

Particulars Cost per Unit (₹)

Raw Material: 20

Direct Labour: 8

Overheads: 15

Total Cost: 43

Add: Profit: 7

Selling Price: 50

The following additional information is available:

Average raw material in stock – one month.

Average work in process – half a month.

Finished goods in stock – on average one month.

Credit allowed to debtors – 2 months.

Credit allowed by suppliers – one month.

Time lag in payment of wages – one month.

Time lag in payment of overheads – one month.

Cash balance is expected to be ₹90,000.

You are required to prepare a statement showing the working capital needed to finance a level of activity of 52,000 units of output as per the Total Approach method of Working Capital Estimation. You may assume that production is carried on evenly throughout the year and wages and overheads accrue.

SOLUTION:

For WIP calculation, we have assumed 100% of raw material, direct labour and overheads.

Working Capital Requirements Computation		
CURRENT ASSETS		
Stock of Raw Materials	$52,000 \times 20 \times (1/12)$	86,667
Work in Progress:		
Raw Material	$52,000 \times 20 \times (0.5/12)$	43,333
Direct Labour	$52,000 \times 8 \times (0.5/12)$	17,333
Finished Goods	$52,000 \times 15 \times (0.5/12)$	32,500
Total Work in Progress		93,166
Stock of Finished Goods	$52,000 \times 43 \times (1/12)$	1,86,333
Debtors		4,33,333
Cash Balance		90,000
<i>Gross Working Capital (A)</i>		<u>8,89,499</u>
CURRENT LIABILITIES		
Creditors	$52,000 \times 20 \times (1/12)$	86,667
Outstanding Wages	$52,000 \times 8 \times (1/12)$	34,667
Outstanding Overheads	$52,000 \times 15 \times (1/12)$	65,000
<i>Total Current Liabilities (B)</i>		<u>1,86,334</u>
Net Working Capital (A-B)		7,03,165

6. Computing Working Capital Requirements

The cost structure of a company's product is as follows (in Cost in Rs per unit):

Raw Material: 20

Direct Labour: 5

Overheads: 15

Total Cost of Production: 40

Add: Profit: 10

Selling Price: 50

The annual production is 2,40,000 units.

It is the policy of the company to maintain the stock of raw materials equivalent to one month's production.

Half a month's production will remain in process throughout the year (Stage of completion 50%).

The finished goods remain in the warehouse on average for a month.

The company sells its goods on credit and allows two months' credit to its customers.

The suppliers of raw materials provide 3 months' credit to the company.

The period of lag for wages and overheads is one month.

A minimum cash balance of ₹25,000 is expected to be maintained.

You are required to prepare a statement showing the working capital requirement as per the cash cost approach method of working capital estimation.

SOLUTION:

Working Capital Requirements Computation		
CURRENT ASSETS		
Stock of Raw Materials	$2,40,000 \times 20 \times (1/12)$	4,00,000
Work in Progress:		
100% → Raw Material	$2,40,000 \times 20 \times (0.5/12) \times 100\% = 2,00,000$	2,00,000
50% → Direct Labour	$2,40,000 \times 5 \times (0.5/12) \times 50\% = 25,000$	25,000
50% → Finished Goods	$2,40,000 \times 5 \times (0.5/12) \times 50\% = 75,000$	75,000
Total Work in Progress		3,00,000
Stock of Finished Goods	$2,40,000 \times 40 \times (1/12)$	8,00,000
Debtors	$2,40,000 \times 40 \times (2/12)$	16,00,000
Cash Balance		25,000
<i>Gross Working Capital (A)</i>		<u>31,25,000</u>
CURRENT LIABILITIES		
Creditors	$2,40,000 \times 20 \times (3/12)$	12,00,000
Outstanding Wages	$2,40,000 \times 5 \times (1/12)$	1,00,000
Outstanding Overheads	$2,40,000 \times 15 \times (1/12)$	3,00,000
<i>Total Current Liabilities (B)</i>		<u>16,00,000</u>
Net Working Capital (A-B)		15,25,000

6. Computing Working Capital Requirements

Prepare a statement showing working capital requirement to finance a level of activity of 10,400 units per year. The cost structure is provided below (Cost/Unit (₹)):

Raw Materials: 10

Direct Labour: 5

Overheads: 7

Profit: 5

Additional Information:

Average raw material in stock – one month.

Average material in process – 2 weeks (assume 50% of completion stage with full material consumption).

Average finished goods in stock – one and a half months.

Credit allowed by suppliers – one month.

Credit allowed to debtors – one month.

Time lag in payment of wages – 2 weeks.

Time lag in payment of overheads – one month.

Cash basis sales – 25%.

Cash balance is expected to be ₹15,000.

The production is carried out evenly throughout the year.

SOLUTION:

PARTICULAR	COST PER UNIT
RAW MATERIAL	10
DIRECT LABOUR	5
OVERHEADS	7
TOTAL COST	22
PROFIT	5
SELLING PRICE	27

Working Capital Requirements Computation

CURRENT ASSETS

Stock of Raw Materials $10,400 \times 10 \times (1/12)$ 8667

Work in Progress:

Raw Material	$10,400 \times 10 \times (2/52) \times 100\%$	4000
Direct Labour	$10,400 \times 5 \times (2/52) \times 50\%$	1000
Finished Goods	$10,400 \times 7 \times (2/52) \times 50\%$	1400

Total Work in Progress

Stock of Finished Goods $10,400 \times 22 \times (1.5/52)$ 28600

Debtors $10,400 \times 27 \times (1/12) \times 75\%$ 17550

Cash Balance

Gross Working Capital (A) $\underline{76217}$

CURRENT LIABILITIES

Creditors $10,400 \times 10 \times (1/12)$ 8667

Outstanding Wages $10,400 \times 5 \times (2/52)$ 2000

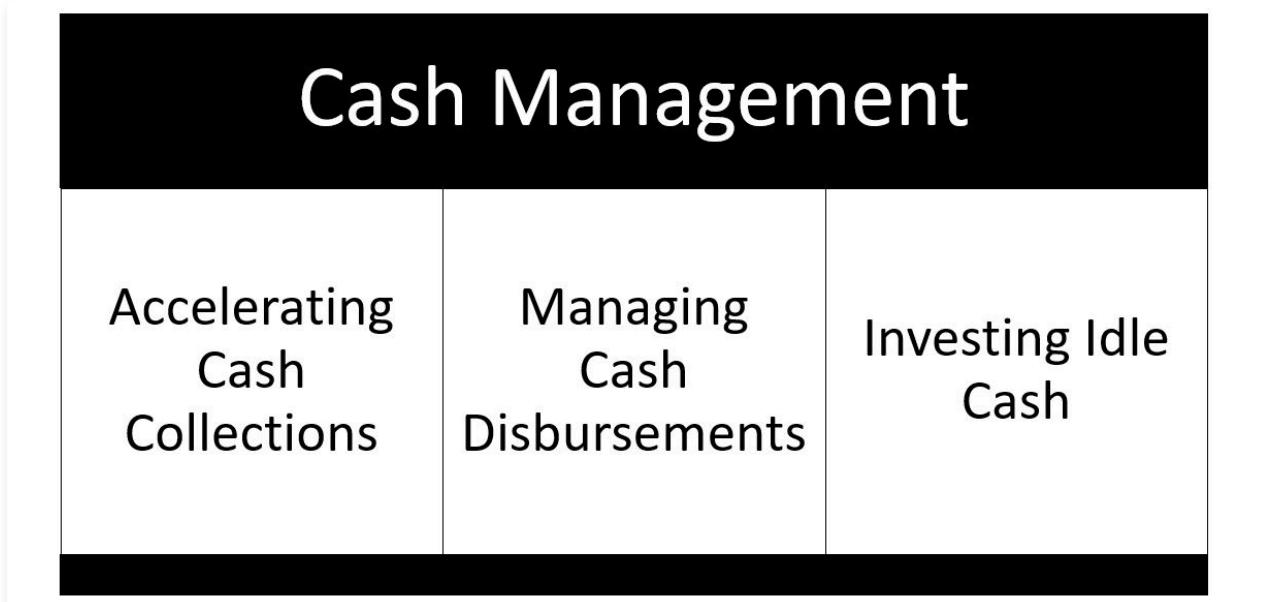
Outstanding Overheads $10,400 \times 7 \times (1/12)$ 6067

Total Current Liabilities (B) $\underline{16734}$

Net Working Capital (A-B) $\underline{\underline{59483}}$

1. Cash Management

Cash Management refers to the process of efficiently managing a company's cash flows to optimize liquidity while minimizing idle cash holdings. The primary objective is to strike a balance between ensuring that sufficient cash is available to meet short-term obligations and investment opportunities, while also avoiding excessive cash reserves that could otherwise be invested for higher returns.



The fundamental principle of cash management revolves around the mantra of "collect early and pay late." This means that companies aim to accelerate the collection of receivables from customers while delaying payments to suppliers and creditors wherever possible. By doing so, companies can maximize the amount of time their cash remains available for use, thereby reducing the need for external financing and improving overall financial health.

Key components of cash management include:

1. **Accelerating Collections:** Companies employ various strategies to expedite the collection of accounts receivable, such as offering discounts for early payments, implementing efficient billing and invoicing processes, and utilizing electronic payment methods to streamline transactions.
2. **Managing Disbursements:** On the disbursement side, companies seek to optimize payment processes by negotiating favorable payment terms with suppliers, prioritizing payments based on due dates and cash availability, and leveraging technologies like automated payment systems to improve efficiency and control.
3. **Investing Idle Cash:** Companies invest surplus cash in short-term marketable securities or other low-risk, highly liquid instruments to earn a return on idle funds while ensuring liquidity. These investments provide an opportunity to generate additional income without sacrificing accessibility to cash when needed for operational requirements.

1. Cash Management

John Maynard Keynes, in his classic work *The General Theory of Employment, Interest, and Money*, identified 3 motives for holding cash: The speculative motive, the precautionary motive, and the transaction motive.

1. Speculative Motive

The speculative motive involves holding cash to capitalize on investment opportunities or favorable market conditions. For instance, a company may hold cash to take advantage of bargain purchases, attractive interest rates, or advantageous exchange rate fluctuations in international operations. However, for most firms, the speculative motive can be satisfied through reserve borrowing ability or investments in marketable securities rather than holding cash directly. For example, consider a retail company holding cash to seize opportunities for acquiring distressed inventory at discounted prices during economic downturns.

2. Precautionary Motive

The precautionary motive pertains to maintaining a financial reserve for unforeseen emergencies or contingencies. While there may be a need for precautionary liquidity, the availability of highly liquid and relatively secure money market instruments, such as Treasury bills, diminishes the necessity of holding substantial cash reserves. For instance, a manufacturing firm may retain cash reserves to cover unexpected equipment repairs or temporary disruptions in supply chains.

3. Transactional Motive

The transactional motive involves holding cash to facilitate routine operational transactions, such as paying bills, wages, taxes, and dividends. Cash inflows from sales and financing activities are utilized to meet cash outflows from expenses and liabilities. While electronic funds transfers and digital payment mechanisms may reduce the need for physical cash in transactions, there remains a necessity for liquidity management to ensure smooth cash flow operations.

Compensating balances maintained at commercial banks to offset banking services further influence the level of cash holdings, as these balances serve as a lower limit dictated by banking requirements.

1. Cash Management

Liquidity management involves determining the ideal level of liquid assets a firm should maintain to meet its short-term obligations efficiently. This includes not only cash but also marketable securities, often referred to as cash equivalents. On the other hand, cash management focuses specifically on optimizing the processes for collecting and disbursing cash, ensuring smooth cash flow operations.

While liquidity management addresses the overall liquidity position of the firm, cash management is more concerned with the day-to-day management of cash resources. A prudent cash management strategy involves striking a balance between holding enough cash to cover operational needs while maximizing returns on excess cash through investments in marketable securities or reinvestment in the business.

1. Cash Management

Managing cash effectively is crucial for maintaining financial stability and maximizing shareholder value. Depending on the firm's cash position, various strategies can be employed:

Excess Cash

When a firm has surplus cash on hand, it can consider several options:

Dividends: One option is to distribute excess cash to shareholders in the form of dividends. This rewards investors and enhances shareholder value.

Stock Buybacks: By repurchasing its own shares, the firm can reduce the number of outstanding shares, thereby increasing earnings per share and potentially boosting stock prices.

Debt Reduction: Another approach is to use excess cash to pay down debt. This reduces interest expenses and strengthens the firm's financial position. If the firm has an optimal capital structure, paying off debt moves it to an under-leveraged position. However, a combination of debt reduction and stock buybacks could be structured to leave capital structure unchanged.

Insufficient Cash

When a firm faces a cash shortfall, it must take action to address the deficit:

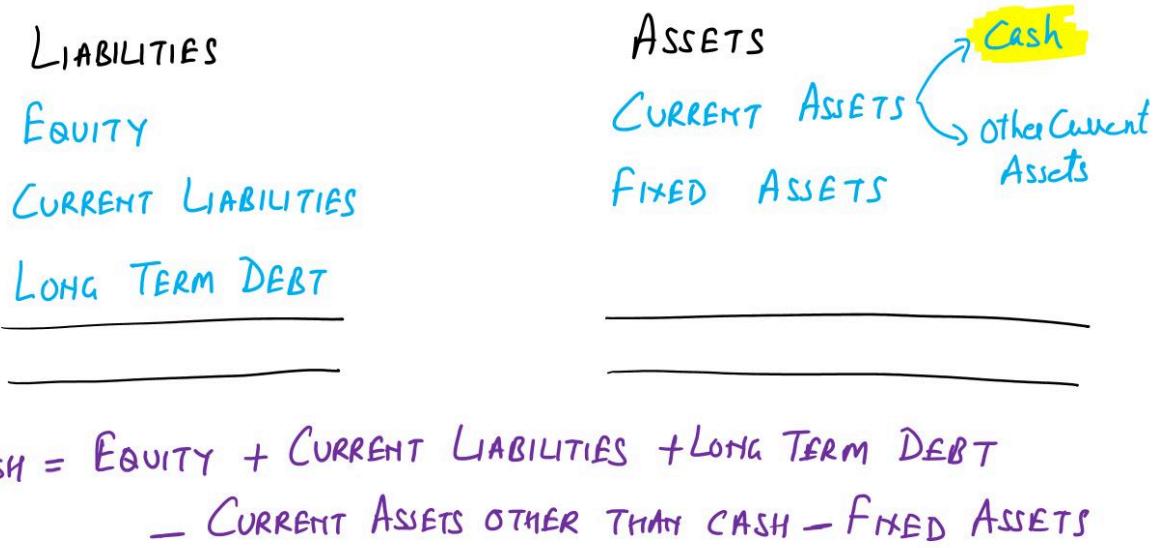
Borrowing: One option is to borrow funds through loans or credit lines to cover immediate cash needs. This provides short-term liquidity but increases interest expenses.

Equity Issuance: Selling additional shares of stock is another way to raise cash. However, this dilutes existing shareholders' ownership and may depress stock prices.

Improving Profitability: Increasing profitability through cost-cutting measures, revenue growth initiatives, or efficiency improvements can generate internal cash flow to address cash shortages.

2. Changes in Cash

For understanding changes in cash, we observe that certain activities lead to an increase in cash, while others result in a decrease. To analyze these changes effectively, we initially define cash in relation to other components of the balance sheet. This approach allows us to isolate the cash account and assess how the firm's operational and financial decisions affect cash flow.



Activities that **Increase Cash** (Sources of Cash):

- Increasing long-term debt (borrowing over the long term)
- Increasing equity (selling some stock)
- Increasing current liabilities (getting a 90-day loan)
- Decreasing current assets other than cash (selling some inventory for cash)
- Decreasing fixed assets (selling some property)

Activities that **Decrease Cash** (Uses of Cash):

- Decreasing long-term debt (paying off a long-term debt)
- Decreasing equity (repurchasing some stock)
- Decreasing current liabilities (paying off a 90-day loan)
- Increasing current assets other than cash (buying some inventory for cash)
- Increasing fixed assets (buying some property)

Activities that boost cash are termed "sources of cash," while those that reduce cash are labeled "uses of cash." Notably, sources of cash typically involve augmenting liability or equity accounts or diminishing asset accounts. This logic aligns with the fact that increasing a liability implies raising funds through borrowing or equity issuance, while decreasing an asset suggests liquidating an asset, both resulting in cash inflow.

Conversely, uses of cash entail the opposite actions, necessitating the expenditure of cash, such as repaying liabilities or acquiring assets.

2. Changes in Cash

A company has a book value of equity of Rs 13,205. Long-term debt is Rs 8,200. Net working capital, other than cash, is Rs 2,205. Fixed assets are Rs 18,380. If current liabilities are Rs 1,630, what are current assets?

Solution:

EQUITY 13205	CURRENT ASSETS	<i>cash x</i>
CURRENT LIABILITY 1630		<i>Other CA</i>
LONG TERM DEBT 8200	FIXED ASSETS 18380	2205
XXX	XXX	

$$\text{Cash, } x = 13205 + 1630 + 8200 - 2205 - 18380 = 2450$$

$$\text{CURRENT ASSETS} = 2450 + 2205 = 4655$$

3. Operating Cycle and Cash Cycle

Let us consider a straightforward scenario involving a business selling shirts. On day 0, we buy shirts worth Rs 1,000 on credit. Thirty days later, we settle the bill with the manufacturer. After an additional 30 days, a customer purchases shirts from us for Rs 1,400. However, the customer does not make the payment until another 45 days have passed.

Here's a breakdown of the timeline:

Day 0: We acquire inventory.

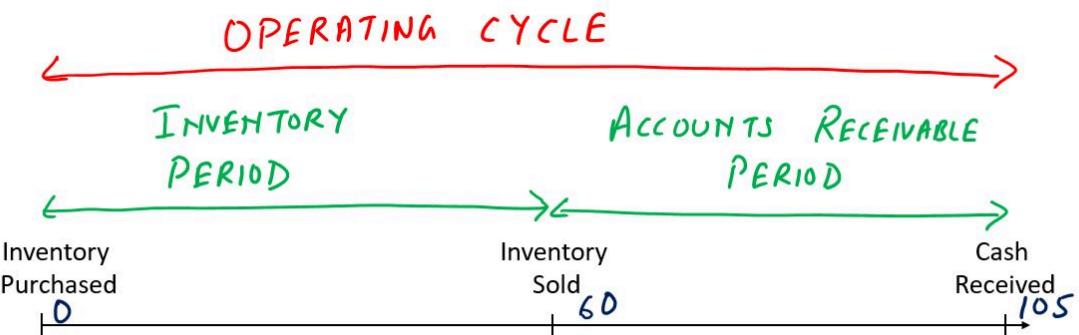
Day 30: We pay for the inventory.

Day 60: We sell the inventory but on credit.

Day 105: We collect payment for our sale.

Operating Cycle

The **operating cycle** represents the duration required to complete the entire process of acquiring inventory, selling it, and subsequently collecting payment for it. In our case, this comprehensive cycle spans 105 days, encompassing all the steps involved in the business operation of selling shirts.



The operating cycle comprises 2 distinct components:

- Inventory Period:** This segment denotes the duration involved in acquiring and selling the inventory. In our illustration, this period extends over 60 days. This is also called *Inventory conversion period* or *Days Inventory Outstanding (DIO)*.
- Accounts Receivable Period:** This phase represents the time taken to collect payment for the sale made to the customer. In our scenario, this period spans 45 days. This is also called *Average collection period* or *Days Sales Outstanding (DSO)*.

The operating cycle, therefore, is the sum total of the inventory period and the accounts receivable period.

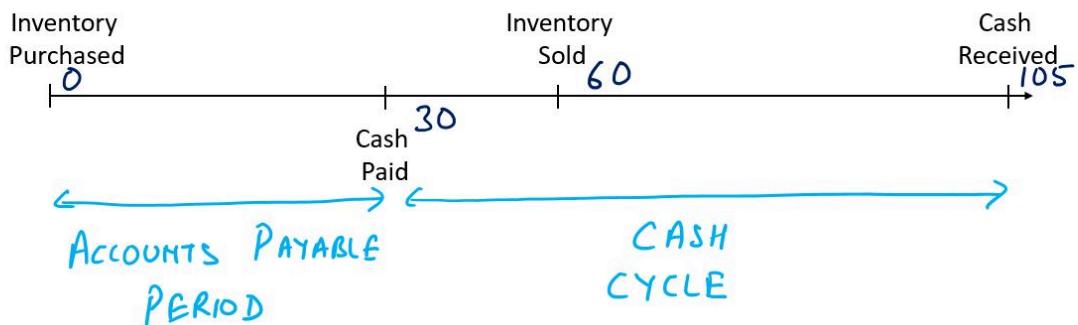
$$\text{OPERATING CYCLE} = \text{INVENTORY PERIOD} + \text{ACCOUNTS RECEIVABLE PERIOD}$$

The essence of the operating cycle lies in delineating how a product navigates through the current asset accounts. Initially, the product resides as inventory, transitioning into a receivable upon sale, and culminating in its ultimate transformation into cash upon successful collection of payment. Notably, at each juncture of this journey, the asset progressively moves closer to the cash state.

Cash Cycle

An important observation is that cash flows do not occur simultaneously. For instance, payment for the inventory is made only 30 days after acquisition, leaving an intervening period known as the **accounts payable period**. This is also called *Average Payable period* or *Days Payable Outstanding (DPO)*.

OPERATING CYCLE



Further, although we expend cash on day 30, we do not receive payment until day 105. Consequently, we must arrange financing to cover the Rs 1,000 for the period spanning $105 - 30 = 75$ days. This duration is termed the **cash cycle**. It is also called *Cash Conversion Cycle*.

The cash cycle represents the number of days that elapse before cash is collected from a sale, measured from the time when payment is made for the inventory.

$$\text{CASH CYCLE} = \text{OPERATING CYCLE} - \text{ACCOUNTS PAYABLE PERIOD}$$

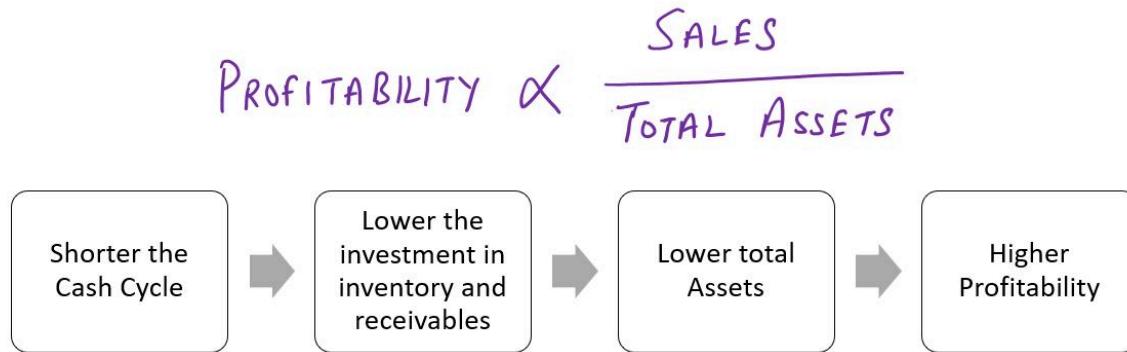
Mathematically, the cash cycle is calculated as the difference between the operating cycle and the accounts payable period.

The gap between cash inflows (Day 105) and outflows (Day 30) highlights the importance of short-term financial management (Working Capital Management). This difference is affected by the lengths of both the operating cycle and the accounts payable period.

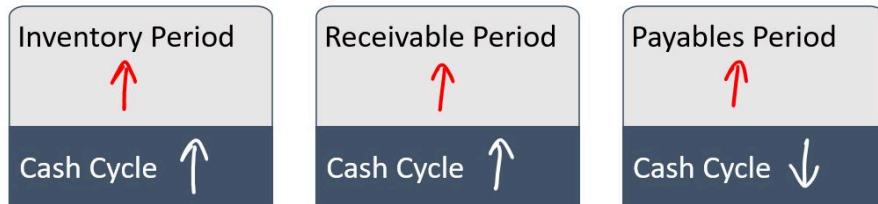
To bridge this gap, the company has the option to borrow funds or maintain a liquidity reserve in the form of cash or marketable securities.

Alternatively, managerial strategies such as modifying inventory, receivable, and payable periods can be employed to reduce the gap. These strategies are discussed in following sections.

3. Operating Cycle and Cash Cycle



One of the basic determinants of profitability for a firm is its total asset turnover, which is defined as Sales/Total assets. Higher this ratio is, the greater are the firm's accounting Return on Assets (RoA) and Return on Equity (RoE). Thus, all other things being the same, the shorter the cash cycle is, the lower is the firm's investment in inventories and receivables. As a result, the firm's total assets are lower, and total turnover is higher.



The cash cycle depends on the inventory, receivables, and payables periods. The cash cycle increases as the inventory and receivables periods get longer. It decreases if the company is able to defer payment of payables and thereby lengthen the payables period.

Most firms have a positive cash cycle, and they thus require financing for inventories and receivables. The longer the cash cycle, the more financing is required. A lengthening cycle can indicate that the firm is having trouble moving inventory or collecting on its receivables.

3. Operating Cycle and Cash Cycle

Indicate the effect that the following will have on the operating cycle.

- a. Receivables average goes up.
- b. Credit repayment times for customers are increased.
- c. Inventory turnover goes from 3 times to 6 times.
- d. Payables turnover goes from 6 times to 11 times.
- e. Receivables turnover goes from 7 times to 9 times.
- f. Payments to suppliers are accelerated.

Solution:

- a. Receivables average goes up.**

Increase. If receivables go up, the time to collect the receivables would increase, which increases the operating cycle.

- b. Credit repayment times for customers are increased.**

Increase. If credit repayment times are increased, customers will take longer to pay their bills, which will lead to an increase in the operating cycle.

- c. Inventory turnover goes from 3 times to 6 times.**

Decrease. If the inventory turnover increases, the inventory period decreases.

- d. Payables turnover goes from 6 times to 11 times.**

No change. The accounts payable period is part of the cash cycle, not the operating cycle.

- e. Receivables turnover goes from 7 times to 9 times.**

Decrease. If the receivables turnover increases, the receivables period decreases.

- f. Payments to suppliers are accelerated.**

No change. Payments to suppliers affects the accounts payable period, which is part of the cash cycle, not the operating cycle.

3. Operating Cycle and Cash Cycle

Indicate the effect that the following will have on the operating cycle and cash cycle.

- a. The terms of cash discounts offered to customers are made less favorable.
- b. The cash discounts offered by suppliers are increased; thus, payments are made earlier.
- c. An increased number of customers begin to pay in cash instead of with credit.
- d. Fewer raw materials than usual are purchased.
- e. A greater percentage of raw material purchases are paid for with credit.
- f. More finished goods are produced for inventory instead of for order.

Solution:

- a. The terms of cash discounts offered to customers are made less favorable.**

Impact on cash cycle: Increase

Impact on operating cycle: Increase

If the terms of the cash discount are made less favorable to customers, the accounts receivable period will lengthen. This will increase both the cash cycle and the operating cycle.

- b. The cash discounts offered by suppliers are increased; thus, payments are made earlier.**

Impact on cash cycle: Increase

Impact on operating cycle: No Change

This will shorten the accounts payable period, which will increase the cash cycle. It will have no effect on the operating cycle since the accounts payable period is not part of the operating cycle.

- c. An increased number of customers begin to pay in cash instead of with credit.**

Impact on cash cycle: Decrease

Impact on operating cycle: Decrease

If more customers pay in cash, the accounts receivable period will decrease. This will decrease both the cash cycle and the operating cycle.

- d. Fewer raw materials than usual are purchased.**

Impact on cash cycle: Decrease

Impact on operating cycle: Decrease

Assume the accounts payable period and inventory period do not change. Fewer raw materials purchased will reduce the inventory period, which will decrease both the cash cycle and the operating cycle.

- e. A greater percentage of raw material purchases are paid for with credit.**

Impact on cash cycle: Decrease

Impact on operating cycle: No Change

If more raw materials are purchased on credit, the accounts payable period will tend to increase, which would decrease the cash cycle. We should say that this may not be the case. The accounts payable period is a decision made by the company's management. The company could increase the accounts payable account and still make the payments in the same number of days. This would leave the accounts payable period unchanged, which would leave the cash cycle unchanged. The change in purchases made on credit will not affect the inventory period or the accounts payable period, so the operating cycle will not change.

- f. More finished goods are produced for inventory instead of for order.**

Impact on cash cycle: Increase

Impact on operating cycle: Increase

If more goods are produced for inventory, the inventory period will increase. This will increase both the cash cycle and operating cycle.

3. Operating Cycle and Cash Cycle

We have following information about XYZ Ltd. Credit sales for the year just ended were Rs 50,000, and cost of goods sold was Rs 30,000. How long does it take XYZ to collect on its receivables? How long does merchandise stay around before it is sold? How long does XYZ take to pay its bills?

	Beginning	Ending
Item	5000	7000
Accounts Receivable	1600	2400
Accounts Payable	2700	4800

Solution:

	Beginning	Ending	AVERAGE
Item	5000	7000	6000
Accounts Receivable	1600	2400	2000
Accounts Payable	2700	4800	3750

$$\text{INVENTORY TURNOVER} = \frac{30,000}{6,000} = 5 \quad \text{INVENTORY PERIOD} = \frac{365}{5} = 73$$

$$\text{RECEIVABLE TURNOVER} = \frac{50,000}{2,000} = 25 \quad \text{RECEIVABLE PERIOD} = \frac{365}{25} = 14.6$$

$$\text{PAYABLE TURNOVER} = \frac{30,000}{3,750} = 8 \quad \text{PAYABLE PERIOD} = \frac{365}{8} = 45.6$$

$$\text{OPERATING CYCLE} = 73 + 14.6 = 87.6 \text{ Days}$$

$$\text{CASH CYCLE} = 87.6 - 45.6 = 42 \text{ Days}$$

3. Operating Cycle and Cash Cycle

Consider the following financial statement information for the ABC Corporation:

	Beginning	Ending
Inventory	17385	19108
Accounts Receivable	13182	13973
Accounts Payable	15385	16676

Net sales is 1,78,312 and the Cost of goods sold is 1,40,382. Calculate the operating and cash cycles. How do you interpret your answer?

Solution:

INVENTORY

$$\text{INVENTORY TURNOVER} = \frac{\text{COGS}}{\text{AVERAGE INVENTORY}} = \frac{140382}{\frac{17385 + 19108}{2}} = 7.693$$

$$\text{INVENTORY PERIOD} = \frac{365}{7.693} = 47.44 \text{ Days}$$

RECEIVABLE

$$\text{RECEIVABLE TURNOVER} = \frac{\text{CREDIT SALES}}{\text{AVERAGE RECEIVABLE}} = \frac{178312}{\frac{13182 + 13973}{2}} = 13.133$$

$$\text{RECEIVABLE PERIOD} = \frac{365}{13.133} = 27.79 \text{ Days}$$

$$\text{OPERATING CYCLE} = 47.44 + 27.79 = 75.23 \text{ Days}$$

PAYABLES

$$\text{PAYABLES TURNOVER} = \frac{\text{COGS}}{\text{AVERAGE PAYABLES}} = \frac{140382}{\frac{15385 + 16676}{2}} = 8.757$$

$$\text{PAYABLES PERIOD} = \frac{365}{8.757} = 41.68 \text{ Days}$$

$$\text{CASH CYCLE} = 75.23 - 41.68 = 33.55 \text{ Days}$$

The firm is receiving cash on average 33.55 days after it pays its bills.

4. Cash Budgeting

Cash Budgeting is a tool in short-term financial planning, enabling financial managers to assess immediate financial requirements and opportunities. By outlining cash inflows and outflows over a specified period, it aids in determining the need for short-term borrowing and identifies cash flow gaps along the timeline.

The cash budget operates on a straightforward premise: it estimates cash receipts and disbursements to forecast cash flows accurately.

Cash outflows typically fall into 4 main categories:

(i) **Payments of Accounts Payable:** These disbursements cover expenses related to goods or services, such as raw materials, acquired on credit. The timing of these payments is often contingent upon the sales forecast, as purchases correlate with anticipated sales.

(ii) **Wages, Taxes, and Other Expenses:** This category encompasses various operational costs essential for business operations, including wages, taxes, utilities, and other day-to-day expenditures.

Notably, expenses like depreciation, although considered normal business costs, do not entail cash outflows.

(iii) **Capital Expenditures:** Cash outlays for capital expenditures involve investments in long-term assets essential for business operations. These expenditures include purchases of property, plant, equipment, and other significant assets necessary for sustained growth and productivity.

(iv) **Long-Term Financing:** This category encompasses payments associated with long-term debt obligations and shareholder distributions, such as interest payments, principal repayments, and dividends.

Net Cash Balance

Finally, the net cash balance is computed by subtracting total cash outflows from cash inflows, providing a clear indication of the organization's liquidity position.

By analyzing this net cash balance, financial managers can make informed decisions regarding short-term borrowing, investment opportunities, and overall financial management strategies.

4. Cash Budgeting

The ABC Corporation's purchases from suppliers in a quarter are equal to 75% of the next quarter's forecast sales. The payables period is 60 days. Wages, taxes, and other expenses are 20% of sales, and interest and dividends are Rs 73 per quarter. No capital expenditures are planned.

The projected quarterly sales for Q1, Q2, Q3 and Q4 are Rs 1320, Rs 1490, Rs 1380 and Rs 1190 respectively. Sales for the first quarter of the following year are projected at 1450. Calculate the company's cash outlays.

Solution:

Since the **payables period is 60 days**, the payables in each period will be calculated as:

$$\text{Payables each period} = \frac{2}{3} \times \text{last quarter's orders} + \frac{1}{3} \times \text{this quarter's orders}$$

$$\text{Payables each period} = \frac{2}{3} \times 75\% \times \text{current sales} + \frac{1}{3} \times 75\% \times \text{next period's sales}$$

Now, using this formula and the projected sales, we can calculate the payables and total cash outlays for each quarter:

Quarter	Payment of Accounts (in Rs)	Wages, Taxes, and Other Expenses (in Rs)	Long-term Financing Expenses (Interest and Dividends)	Total Cash Outlays (in Rs)
Q1	Rs 1,032.50	Rs 264	Rs 73	Rs 1,369.50
Q2	Rs 1,090.00	Rs 298	Rs 73	Rs 1,461.00
Q3	Rs 987.50	Rs 276	Rs 73	Rs 1,336.50
Q4	Rs 957.50	Rs 238	Rs 73	Rs 1,268.50

4. Cash Budgeting

The following is the sales budget for LMN Ltd, for the first quarter of 2025:

	January	February	March
Sales Budget	2,34,800	2,49,300	2,71,000

Credit sales are collected as follows:

- (i) 65 percent in the month of the sale.
- (ii) 20 percent in the month after the sale.
- (iii) 15 percent in the second month after the sale.

The accounts receivable balance at the end of the previous quarter was Rs 1,06,800 (Rs 76,300 of which were uncollected December sales).

- a. Compute the sales for November.
- b. Compute the sales for December.
- c. Compute the cash collections from sales for each month from January through March.

Solution:

- a. Compute the sales for November.

$$\text{NOVEMBER SALES} = \frac{106800 - 76300}{0.15} = 203333.33$$

- b. Compute the sales for December.

$$\text{DECEMBER SALES} = \frac{76300}{0.35} = 218000.00$$

- c. Compute the cash collections from sales for each month from January through March.

COLLECTION IN ANY MONTH

$$= 15\% \text{ of Sale 2 months ago} + 20\% \text{ of last month sale} + 65\% \text{ of current sales}$$

JANUARY COLLECTION

$$\begin{aligned} &= 0.15 \times 203333.33 + 0.20 \times 218000 + 0.65 \times 234800 \\ &= 226720 \end{aligned}$$

FEBRUARY COLLECTION

$$= 0.15 \times 218000 + 0.20 \times 234800 + 0.65 \times 249300 \\ = 241705$$

MARCH COLLECTION

$$= 0.15 \times 234800 + 0.20 \times 249300 + 0.65 \times 271060 \\ = 261230$$

4. Cash Budgeting

Here are some important figures from the budget of PQR Inc., for the second quarter of 2023.

	April	May	June
Credit sales	547,200	570,240	630,720
Credit purchases	211,680	252,720	288,450
Wage, taxes and expenses	57,240	69,422	72,432
Interest	16,416	16,416	16,416
Equipment purchases	119,520	131,040	0

The company predicts that 5 percent of its credit sales will never be collected, 35 percent of its sales will be collected in the month of the sale, and the remaining 60 percent will be collected in the following month. Credit purchases will be paid in the month following the purchase. In March 2013, credit sales were \$3,02,400, and credit purchases were \$2,24,640. Beginning cash balance in April was \$4,03,200. Using this information, prepare the cash budget for April, May and June.

Solution:

The sales collections each month will be:

$$\text{Sales collections} = .35(\text{current month sales}) + .60(\text{previous month sales})$$

Given this collection, the cash budget will be:

	April	May	June
Beginning cash balance	\$403,200	\$358,344	\$457,690
Cash receipts			
Cash collections from credit sales	372,960	527,904	562,896
Total cash available	776,160	886,248	1,020,586
Cash disbursements			
Purchases	224,640	211,680	252,720
Wages, taxes, and expenses	57,240	69,422	72,432
Interest	16,416	16,416	16,416
Equipment purchases	119,520	131,040	-
Total cash disbursements	417,816	428,558	341,568
Ending cash balance	\$358,344	\$457,690	\$679,018

5. Float Management

Float refers to the difference between the balance shown in a company's accounting records (book balance or ledger balance) and the balance shown in its bank account (available balance). This difference arises due to the timing discrepancies between when transactions are recorded in the company's books and when they are processed by the bank.

$$\text{FLOAT} = \text{AVAILABLE BALANCE} - \text{BOOK BALANCE}$$

For example, when a firm writes a Rs 8,000 check to a supplier, it records the transaction immediately in its accounting records, reducing its book balance. However, it takes 3 days for the check to clear the bank. During these 3 days, the firm experiences float, as the funds are still available for other purposes despite the reduction in its book balance.

5. Float Management

Float can be categorized into two main types: disbursement float and collection float.

Disbursement Float

Disbursement float occurs when a company writes checks that have not yet been presented to the bank for payment. This situation leads to a decrease in the company's book balance but does not immediately affect its available balance. The company effectively has access to the funds represented by these checks until they are presented to the bank for payment. During this period, the company can use these funds for other purposes, such as investing in marketable securities to earn interest.

Imagine ABC Manufacturing, which pays its suppliers using checks. On January 15th, ABC Manufacturing writes a check to one of its suppliers for Rs 10,000 for raw materials. The supplier receives the check on January 20th but deposit it with the bank on January 23th.

In this scenario, on January 15th, ABC Manufacturing records the Rs 10,000 payment in its accounting records, reducing its book balance by Rs 10,000. However, the check has not yet been presented to the bank for payment, so its available balance remains unaffected. ABC Manufacturing effectively has a disbursement float of Rs 10,000 between January 15th and January 23th. During this period, ABC Manufacturing can use this Rs 10,000 for other purposes, such as investing in marketable securities to earn interest.

Collection Float

Collection float arises when a company receives checks from customers or counterparties, but these checks have not yet been processed by the bank and added to the available balance. As a result, the company's book balance increases, but its available balance remains unchanged until the checks clear.

Suppose XYZ Inc. receives a payment from one of its customers on April 1st in the form of a Rs 7,000 check. It takes five business days for the check to be deposited into its bank account. Although the Rs 7,000 payment is recorded in XYZ Inc.'s books on April 1st, it doesn't increase the available balance until April 6th when the check clears the bank. During this period, from April 1st to April 6th, XYZ Inc. experiences collection float. Its book balance reflects the receipt of Rs 7,000, but the funds are not immediately available for use until April 6th (when the check is processed by the bank).

Net Float

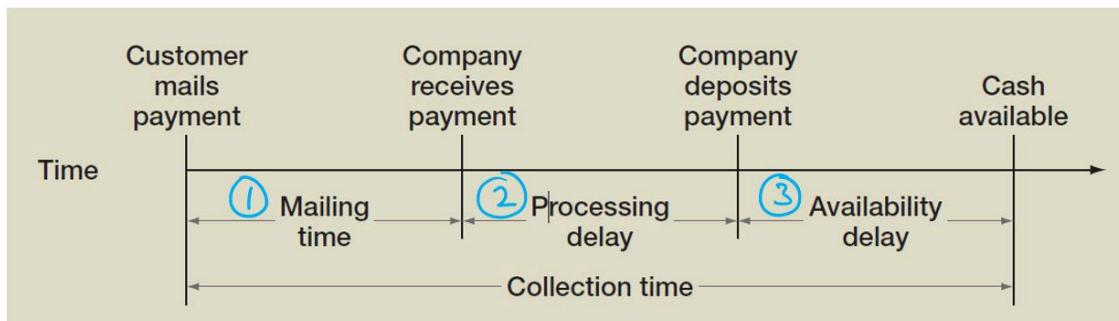
The net float is the sum of the total collection float and disbursement float. It represents the overall difference between a company's available balance and its book balance at a particular point in time.

$$\text{NET FLOAT} = \text{DISBURSEMENT FLOAT} - \text{COLLECTION FLOAT}$$

If the net float is positive, it indicates that the company's disbursement float exceeds its collection float, and its available balance exceeds its book balance. Conversely, if the available balance is less than the book balance, the company has a net collection float.

5. Float Management

$$\text{COLLECTION TIME} = \textcircled{1} + \textcircled{2} + \textcircled{3}$$



Measuring float involves understanding the time it takes for transactions to move through various stages, typically consisting of mailing time, processing delay, and availability delay:

(i) **Mailing Time:** This refers to the duration during which checks are in transit via postal services.

In case of a disbursement, the firm's book balance goes down when the check is mailed, so the mailing time is an important component in disbursement float.

However, with a collection, the firm's book balance isn't increased until the check is received, so mailing time is not a component of collection float.

(ii) **Processing Delay:** It is the time taken by the recipient to process the payment and deposit the check into a bank.

(iii) **Availability Delay:** This denotes the time required for a check to clear through the banking system.

To calculate the average daily disbursement float in a given scenario, you consider both the dollar amount and the time delay involved.

For instance, if you mail a Rs 500 check monthly, which takes 5 days in transit (mailing time), 1 day for processing, and 3 days for the recipient's bank to clear it (availability delay), the total delay is 9 (5+1+3) days.

$$\text{TOTAL FLOAT} = \text{TOTAL DAYS OF DELAY} \times \text{AMOUNT}$$

$$\text{AVERAGE DAILY FLOAT} = \frac{\text{TOTAL FLOAT}}{\text{DAYS IN MONTH}}$$

In this example, the total float is Rs 4500 (9 days \(\times\) Rs 500), and assuming 30 days in the month, the average daily float would be Rs 150 (Rs \(\frac{4500}{30}\)). This means that on average, you have Rs 150 tied up in disbursement float each day.

5. Float Management

The cost of float refers to the expense incurred by a company due to the time it takes for checks or other forms of payment to clear through the banking system. It is essentially the opportunity cost associated with the funds that are tied up in the float.

To find the cost of float, you typically need to consider two main factors:

- (i) **Interest Rate or Opportunity Cost:** Determine the interest rate or the rate of return that could be earned by investing the funds that are tied up in the float. This could be the interest rate on short-term investments or the company's cost of capital.
- (ii) **Average Daily Float:** Calculate the average amount of funds tied up in float on a daily basis. This can be computed by dividing the total float amount over a period of time (such as a month) by the number of days in that period.

Once you have these two pieces of information, you can use the following formula to calculate the cost of float:

$$\text{Cost of float} = \text{Amount} \times \text{Opportunity Cost Rate}$$

For example, if a company has an average daily float of Rs 10,000 and the prevailing interest rate for short-term investments is 3%, the cost of float would be Rs 300 per day.

5. Float Management

While electronic payments have significantly reduced the time it takes for funds to move between accounts compared to traditional paper-based methods, float still exists, albeit in a different form.

Here is why float management is still important:

- (i) *Settlement Delays:* Even in electronic payment systems, there can be settlement delays between when a payment is initiated and when it is processed and settled. Understanding these delays and optimizing cash flow accordingly can help businesses manage their liquidity more effectively.
 - (ii) *Processing Times:* Electronic payments may still require processing time, especially for large transactions or cross-border payments. Businesses need to account for these processing times when planning their cash management strategies.
 - (iii) *Opportunity Cost:* Float management is about maximizing the use of funds while they are in transit. Even in electronic payment systems, there may be a brief period between when funds are deducted from one account and credited to another. During this time, businesses can potentially invest these funds or earn interest, making effective float management important for maximizing returns.
-

5. Float Management

Your neighbor goes to the post office once a month and picks up two checks, one for Rs 11,000 and one for Rs 3,400. The larger check takes four days to clear after it is deposited; the smaller one takes five days.

- (a) What is the total float for the month?
- (b) What is the average daily float?

Solution:

$$\text{TOTAL FLOAT} = 4 \times 11000 + 5 \times 3400 = 61000$$

$$\text{AVERAGE DAILY FLOAT} = \frac{61000}{30} = 2033.33$$

5. Float Management

A small company writes checks totaling Rs 17,000 to pay its suppliers, everyday. The usual clearing time for the checks is 4 days. Meanwhile, the company is receiving payments from its customers each day, in the form of checks, totaling Rs 28,500. The cash from the payments is available to the firm after two days. Calculate the company's disbursement float, collection float, and net float.

Solution:

$$\text{DISBURSEMENT FLOAT} = 4 \times 17000 = 68000$$

$$\text{COLLECTION FLOAT} = 2 \times 28500 = 57000 \text{ (-ve)}$$

$$\text{NET FLOAT} = 68000 - 57000 = 11000$$

5. Float Management

A firm receives an average of Rs 16,000 in checks per day. The delay in clearing is typically three days. The current interest rate is 1.8% percent per day.

- (a) What is the firm's float?
- (b) What is the most the firm should be willing to pay today to eliminate its float entirely?
- (c) What is the highest daily fee the firm should be willing to pay to eliminate its float entirely?

Solution:

- (a) What is the firm's float?

$$\text{COLLECTION FLOAT} = 3 \times 16000 = 48000$$

- (b) What is the most the firm should be willing to pay today to eliminate its float entirely?

The firm should pay no more than the amount of the float (Rs 48,000) to eliminate the float.

- (c) What is the highest daily fee the firm should be willing to pay to eliminate its float entirely?

$$\text{MAXIMUM DAILY CHARGE} = 48000 \times 0.00018 = 8.64$$

6. Cash Collection Management

The cash collection process involves 3 fundamental stages, each contributing to the overall time required for funds to be received and available for use by the business. These stages encompass mailing time, check-processing delay, and the bank's availability delay.

The duration of each phase is influenced by various factors, including the geographical proximity of the firm's customers and banks, as well as the efficiency of the firm's cash collection practices.

1. Mailing Time

Mailing time refers to the period it takes for payments, such as checks or remittance documents, to physically travel from the customer to the business. The duration of this phase depends on factors such as the distance between the customer and the business, postal service efficiency, and any potential delays in transit.

2. Check Processing Delay

Check-processing delay encompasses the time taken by the business to process received payments once they are physically received. This involves tasks such as depositing checks, recording payments in the accounting system, and reconciling accounts. Efficient processing procedures, including automated scanning and deposit methods, can help minimize delays in this phase.

3. Bank's Availability Delay

The bank's availability delay represents the time required for deposited funds to become available for withdrawal or use by the business. Banks typically have processing timelines for verifying and clearing deposited checks, which can vary based on factors such as the type of check, the bank's policies, and any potential hold periods.

To effectively manage cash collection and minimize the time funds spend in each phase, businesses can employ various techniques. Let us discuss them one by one.

6. Cash Collection Management

Lockboxes are specialized post office boxes used by businesses to expedite the cash collection process.

When a firm receives payments by mail, it can designate lockboxes as collection points where customers mail their checks instead of sending them directly to the firm's headquarters. These lockboxes are typically maintained by local banks, and larger corporations may have multiple lockboxes across different geographic locations.

In a lockbox system, the local bank collects checks from the lockboxes several times a day and deposits them directly into the firm's bank account. The bank also records transaction details in a computer-readable format and sends them to the firm, facilitating efficient record-keeping and reconciliation.

Lockbox systems offer several benefits. Firstly, they reduce mailing time because checks are received at nearby post offices rather than being sent to the corporate headquarters. Additionally, they decrease processing time as the firm doesn't need to open envelopes or manually deposit checks for collection.

Overall, utilizing a bank lockbox system enables a firm to expedite the processing, depositing, and clearing of receipts compared to receiving and handling checks at its headquarters before delivering them to the bank for deposit.

6. Cash Collection Management

A firm has an average receipt size of Rs 117. A bank has approached you concerning a lockbox service that will decrease your total collection time by two days. You typically receive 6,500 checks per day. The daily interest rate is 1.5% percent. If the bank charges a fee of Rs 160 per day, should the lockbox project be accepted?

Solution:

$$\text{AVERAGE DAILY COLLECTION} = 117 \times 6500 = 760500$$

$$PV \text{ OF LockBox} = 2 \times 760500 = 1521000 \quad \text{--- (1)}$$

$$PV \text{ OF Cost of LockBox} = \frac{160}{0.0015} = 1066667 \quad \text{--- (2)}$$

SINCE (1) > (2) \Rightarrow TAKE LockBox SERVICE

6. Cash Collection Management

A manufacturing company is investigating a lockbox system to reduce its collection time. It has determined the following:

Average number of payments per day	435
Average value of payment	Rs 975
Variable lockbox fee (per transaction)	Rs 0.50
Daily interest rate on money market securities	0.02%

The total collection time will be reduced by three days if the lockbox system is adopted.

- (i) What is the PV of adopting the system?
- (ii) What is the NPV of adopting the system?

Solution:

- (i) What is the PV of adopting the system?

$$\text{AVERAGE DAILY COLLECTION} = 435 \times 975$$

$$PV \text{ of Lock Box} = 3 \times 435 \times 975 = 1272375$$

- (ii) What is the NPV of adopting the system?

$$\text{COST OF Lock Box} = \frac{0.50 \times 435}{0.0002} = 1087500$$

$$NPV \text{ of Lock Box} = 1272375 - 1087500 = 184875$$

6. Cash Collection Management

Cash concentration refers to the process by which a firm consolidates funds from various cash collection points and channels them into its main bank accounts. Since a firm typically receives payments from multiple sources, these funds may end up in different banks and accounts. Cash concentration streamlines cash management by reducing the number of accounts that need to be monitored and managed.

By routinely pooling cash, a firm simplifies its cash management practices and may also be able to negotiate better rates on short-term investments due to the larger pool of funds available. In a cash concentration system, the firm typically designates one or more concentration banks to pool funds obtained from local banks within a specific geographic region.

Concentration systems are often used alongside lockbox systems, where funds are collected more efficiently from various locations. In an integrated cash collection and concentration system, funds collected through lockboxes are transferred to **concentration banks**.

This cash concentration process yields several benefits:

(i) *Enhanced control over corporate cash flows*: By consolidating all cash into a single account, companies can better monitor their financial inflows and outflows. This strategy essentially centralizes financial oversight, akin to watching a single basket to safeguard all assets.

(ii) *Reduction of idle balances*: The practice ensures that cash held in regional bank accounts remains at minimal levels necessary for daily transactions or to meet minimum **compensating balance** requirements. Any surplus funds are swiftly transferred to the concentration bank, minimizing idle cash and maximizing its utility.

(iii) *Facilitation of more effective investments*: Pooling excess cash balances enables companies to access larger sums required for engaging in higher-yielding, short-term investment opportunities that often demand substantial initial investments. For instance, certain marketable securities may necessitate purchases exceeding Rs 10,00,000, a threshold easily met through pooled resources.

6. Cash Collection Management

Let us understand two methods for expediting the collection of receivables:

Earlier Billing

This method involves sending invoices to customers sooner than usual. By doing this, companies can accelerate the payment process, as some customers tend to pay immediately upon receipt of an invoice. Moreover, sending invoices earlier means customers have more time to pay before the due date or any applicable discount date. This strategy can be facilitated through computerized billing systems, which streamline the process of generating and sending invoices. Additionally, companies may explore alternative methods such as enclosing invoices with shipped merchandise, sending invoices via fax, or even requesting advance payment to further expedite the payment process.

Prauthorized Debit

This method eliminates the need for billing altogether by establishing a preauthorized debit agreement between the customer and the firm. Under this arrangement, customers authorize the firm to automatically withdraw funds from their bank accounts on specified dates. This is commonly used for recurring payments of fixed amounts, such as insurance premiums or mortgage payments. By removing the invoicing step and directly debiting the customer's bank account, this method ensures timely and efficient collection of payments.

7. Cash Disbursement Management

Cash disbursement management involves strategies and practices aimed at effectively managing the outflow of cash from a firm.

From the firm's perspective, disbursement float, or the delay in the processing of payments, is desirable as it provides an opportunity to retain funds for a longer duration. Therefore, the primary goal in managing disbursement float is to slow down disbursements, thereby maximizing the benefit of float.

To achieve this, firms may employ various tactics to increase disbursement float:

(i) **Geographically Distant Banks:** Writing checks on banks located far away geographically can increase the time required for checks to clear through the banking system. For example, a firm in Chennai may choose to pay a supplier with checks drawn on a bank in Kanpur, thus prolonging the processing time.

(ii) **Mailing from Remote Locations:** Sending checks from remote post offices or locations can also delay the processing of payments, thereby extending disbursement float.

However, it's important to note that maximizing disbursement float through such tactics may raise ethical and economic concerns:

- *Discounts for Early Payment:* Payment terms often include discounts for early payment, which may outweigh any potential savings from delaying payments. In such cases, increasing mailing time may not yield any benefits if payment terms are based on the date received rather than the postmark date.
- *Supplier Relations:* Deliberately delaying payments may strain relationships with suppliers, potentially leading to negative consequences and additional costs. Suppliers are unlikely to be fooled by attempts to slow down disbursements, and poor relations can impact the firm's ability to procure goods and services in the future.
- *Ethical Considerations:* Intentionally delaying payments to take advantage of mailing times or unsophisticated suppliers may be perceived as unethical business practices, akin to avoiding paying bills when they are due.

Thus maximizing disbursement float is probably a poor business practice. However, a firm will still wish to tie up as little cash as possible in disbursements.

Firms have therefore developed systems for efficiently managing the disbursement process. The general idea in such systems is to have no more than the minimum amount necessary to pay bills on deposit in the bank. With a **zero-balance account system**, the firm, in cooperation with its bank, maintains a master account and a set of subaccounts. When a check written on one of the subaccounts must be paid, the necessary funds are transferred in from the master account.

8. Investing Idle Cash

Firms often experience temporary cash surpluses for various reasons, such as financing seasonal or cyclical activities, or preparing for planned or potential expenditures.

While maintaining a target cash level to cover transactional needs and compensating balance requirements, firms frequently invest excess cash in short-term marketable securities, treating them as near-cash investments. These securities are typically categorized on the balance sheet as "short-term investments."

The firm's portfolio of short-term marketable securities typically comprises 3 components:

(i) **Ready cash segment:** This segment consists of marketable securities held to address potential shortfalls in the firm's cash account. These securities act as a reserve, ensuring the company can quickly augment its cash reserves if needed. Since cash inflows may not consistently match outflows, these securities provide instant liquidity and act as a first line of defense against unforeseen operating needs.

(ii) **Controllable cash segment:** Securities in this segment are earmarked to cover controllable or knowable outflows, such as quarterly dividend payments, tax obligations, loan repayments, and interest payments. The firm can anticipate these expenses and gradually accumulate funds to meet them. Investing these funds in marketable securities provides an opportunity to earn interest while ensuring liquidity when needed.

(iii) **Free cash segment:** This segment comprises marketable securities that are not designated for immediate cash needs or controllable outflows. Essentially, it represents surplus cash that the firm has invested short-term. Since there are no immediate plans for these funds, it's more advantageous for the firm to keep them invested rather than leaving them idle in the cash account.

8. Investing Idle Cash

When a firm's portfolio manager considers purchasing marketable securities to invest idle cash, they must thoroughly evaluate several key variables to make informed decisions. Let's delve into each of these variables:

1. Safety (Default Risk)

Safety pertains to the security of the principal investment. The primary concern is the likelihood of receiving back the initial investment amount. Government Treasury securities serve as a benchmark for safety, as they are considered highly secure if held until maturity. However, for securities other than Treasury issues, safety levels vary depending on the issuer and the type of security. A high degree of safety is crucial for a security to be seriously considered for inclusion in the firm's short-term marketable securities portfolio. Essentially, the portfolio manager assesses the probability of capital preservation when evaluating the safety of potential securities.

Default risk refers to the probability that interest and principal payments will not be made as promised, either partially or entirely. Securities such as Government Treasury bills typically have negligible default risk. Given the conservative nature of investing idle corporate cash, firms generally avoid investing in marketable securities with significant default risk. The portfolio manager analyzes the creditworthiness of issuers and the probability of default when assessing potential investments.

2. Marketability

Marketability, also known as liquidity, refers to the ease with which a security can be converted into cash on short notice. Even if a security is deemed safe when held to maturity, it may not always be possible to sell it before maturity without incurring a loss. A robust secondary market, where securities can be traded after issuance, is essential for high marketability. The portfolio manager considers factors such as trading volume and market depth to gauge a security's marketability.

3. Yield

Yield represents the return provided by a security through interest payments or appreciation of principal. Some securities, like Treasury bills, do not pay periodic interest but are instead sold at a discount and redeemed at face value. The price of a debt security varies inversely with the interest rate or yield. Therefore, the portfolio manager must be vigilant of interest-rate (or yield) risk, as changes in interest rates can impact the security's value. Understanding the relationship between yield and price fluctuations is crucial for assessing potential returns and risks.

4. Maturity

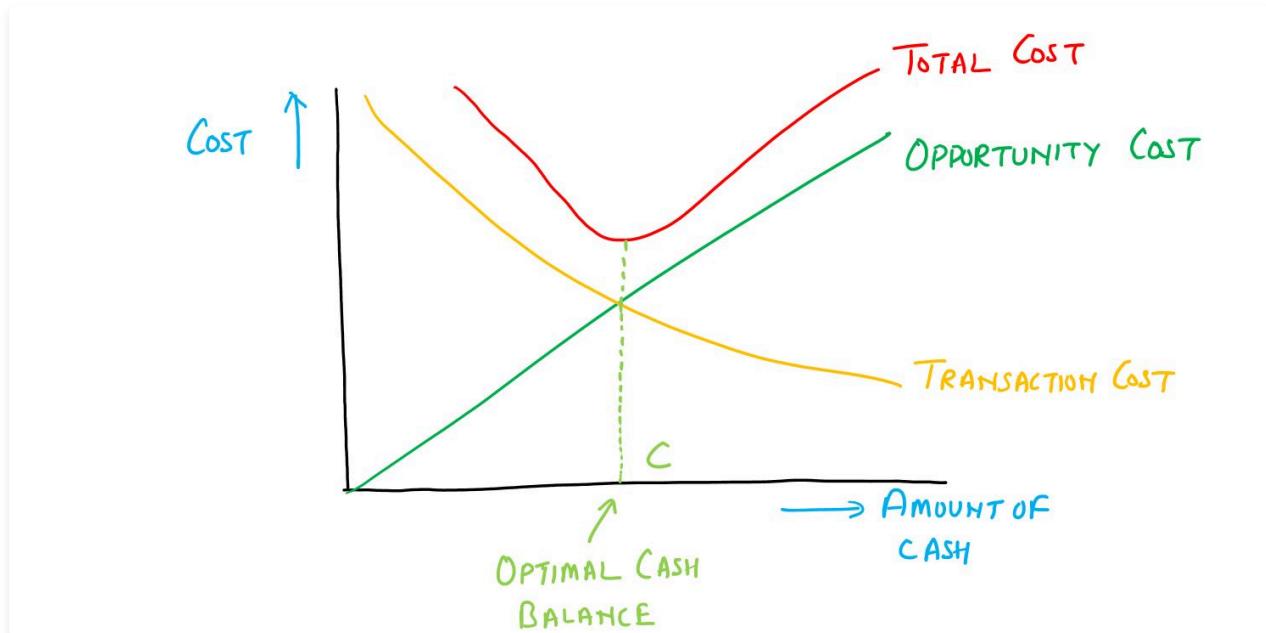
Maturity refers to the time until the security's principal is repaid. For a given change in interest rates, the prices of longer-maturity securities will change more than those of shorter-maturity securities. This phenomenon is known as interest rate risk. Firms investing in long-term securities accept greater risk than those investing in securities with short-term maturities. Generally, securities with longer maturities offer higher expected returns but also entail greater risk. The portfolio manager considers the trade-offs between maturity, risk, and potential returns when constructing the firm's investment portfolio.

9. Models of Cash Management

Let us discuss some of the models of the Cash Management.

10. Baumol model

The Baumol model, proposed by economist William Baumol, provides a framework for companies to determine their optimal cash balance under certainty. It addresses the trade-off between the opportunity cost of holding cash and the transaction cost of converting marketable securities into cash.



The primary objective of the Baumol model is to minimize the total cost associated with cash management. This includes the opportunity cost of holding cash, which refers to the foregone interest or return that could be earned by investing excess cash, and the transaction cost of converting marketable securities into cash.

According to the Baumol model, the optimal cash balance is determined by finding the trade-off between the opportunity cost and the transaction cost. The model identifies the level of cash balance at which the total cost is minimized.

Baumol drew parallels between cash management and inventory management, particularly the Economic Order Quantity (EOQ) model used in inventory management. Just as EOQ balances the carrying costs and ordering costs of inventory, the optimal cash balance in the Baumol model balances the opportunity cost of holding cash and the transaction cost of converting securities into cash.

Similar to the EOQ model, the Baumol model involves a trade-off analysis. The opportunity cost of holding cash increases with higher cash balances, as more funds remain idle and uninvested. On the other hand, the transaction cost of converting securities into cash decreases with higher cash balances, as fewer transactions are required.

$$\text{OPPORTUNITY COST} = \frac{C}{2} \times O$$

$$\text{TRANSACTION COST} = \frac{A}{C} \times F$$

$$\text{TOTAL COST} = \frac{C}{2} \times O + \frac{A}{C} \times F$$

$$\text{OPTIMUM CASH BALANCE}, C = \sqrt{\frac{2AF}{O}}$$

A = ANNUAL CASH REQUIREMENT F = COST PER TRANSACTION

O = OPPORTUNITY COST OF HOLDING C = OPTIMUM CASH BALANCE

The optimal cash balance is reached when the total cost, which is the sum of the opportunity cost and the transaction cost, is minimized. At this point, the benefits of holding additional cash to reduce transaction costs are balanced against the costs of holding excess cash in terms of forgone returns.

Assumptions of Baumol Model

The assumptions of the model are:

- The model assumes that cash outflows occur at a constant rate over time. This means that the firm's expenditure or disbursement of cash remains consistent throughout the period under consideration.
- Baumol's model assumes that there is a fixed opportunity cost associated with holding cash. This cost is represented by the interest rate that could be earned by investing excess cash in interest-bearing securities or by borrowing at the same rate if cash falls short.
- Baumol's model assumes that cash inflows occur at predetermined intervals and in fixed amounts. This means that the timing and amount of cash receipts are known with certainty.
- The model assumes that there are no costs associated with converting marketable securities into cash or vice versa. In other words, there are no transaction costs involved in buying or selling securities to meet cash needs.
- The cost per transaction is constant regardless of the size of transaction.

10. Baumol model

ABC Ltd. has estimated that use of Rs. 24 lakhs of cash during the next budgeted year. It intends to hold cash in a commercial bank which pay interest @ 10% p.a. For each withdrawal, the company incurs expenditure of Rs. 150. What is the optimal size for each cash withdrawal?

Solution:

$$A = 24,00,000 \quad F = 150 \quad O = 0.10$$
$$C = \sqrt{\frac{2AF}{O}} = \sqrt{\frac{2 \times 24,00,000 \times 150}{0.10}} = \text{Rs } 84,853$$

10. Baumol model

P&R Corporation uses about Rs 10,00,000 in cash each month. The sale of marketable securities to meet any cash deficiencies costs the firm Rs 100 per transaction. P&R invests its short-term funds in securities which earn an average of 7%.

- (i) If each time the firm needs cash it sells Rs 4,00,000 of securities, what is the holding cost associated with the cash investment?
(ii) If each time the firm needs cash it sells Rs 4,00,000 of securities, what is the transaction cost associated with the cash investment?
(iii) Using the Baumol model, what level of cash infusion minimizes costs associated with cash?

Solution:

$$\text{HOLDING COST} = \frac{4,00,000}{2} \times 0.07 = 14,000$$

↑ AVERAGE CASH BALANCE

Rs 10,00,000 per month \Rightarrow Rs 120,00,000 per Year

$$\text{NUMBER OF TRANSACTIONS} = \frac{120,00,000}{4,00,000} = 30$$

$$\text{TRANSACTION COST} = 30 \times 100 = \text{Rs } 3000$$

$$C = \sqrt{\frac{2AF}{O}} = \sqrt{\frac{2 \times 120,00,000 \times 100}{0.07}} = \text{Rs } 187,164.02$$

10. Baumol model

A corporation requires Rs. 5 lakh in cash for meeting its transaction needs over the next five months. This amount is available with the corporation in the form of marketable securities. It can earn 18 percent annual yield on its marketable securities. The conversion of marketable securities into cash entails a fixed cost of Rs 500 per transaction. What is Optimum Cash management strategy?

Solution:

$$O = \frac{18}{12} \times 5 = 0.075 \leftarrow \text{For 5 months}$$

$$A = 5,00,000$$

$$F = 500$$

$$C = \sqrt{\frac{2AF}{O}} = \sqrt{\frac{2 \times 5,00,000 \times 500}{0.075}}$$
$$= 81650$$

$$\text{NUMBER OF TRANSACTIONS} = \frac{5,00,000}{81650} = 6.12 \text{ (Approx)}$$

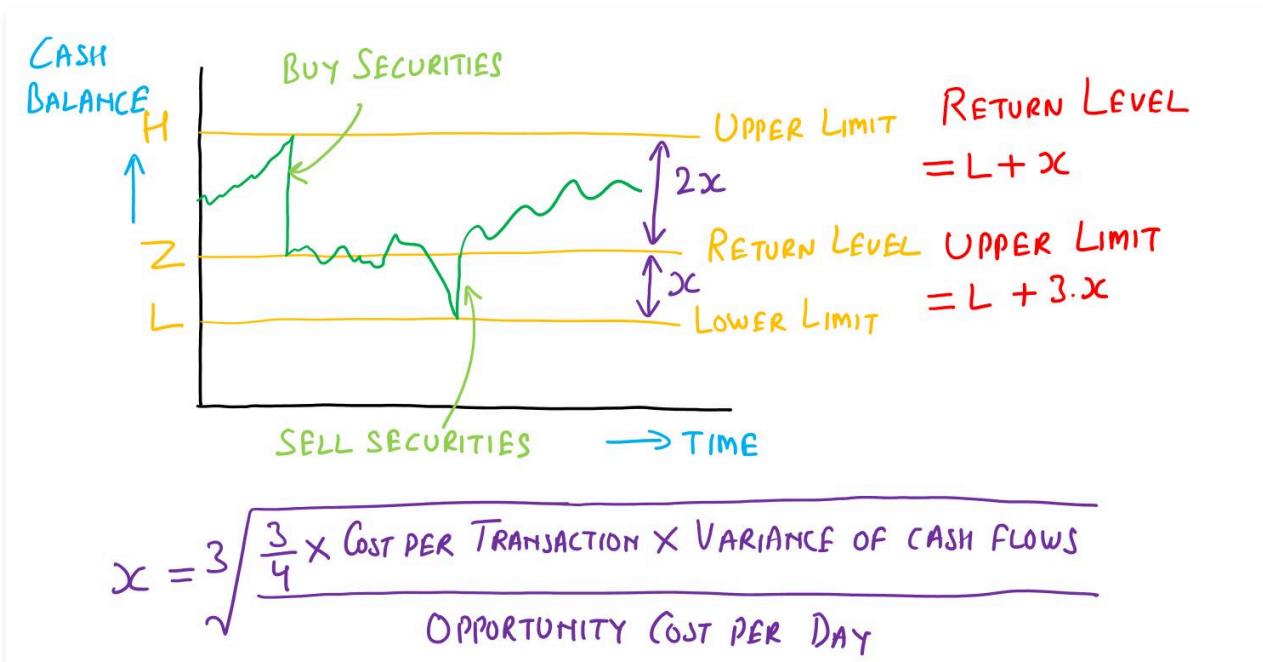
$$\text{AVERAGE DAYS BETWEEN TRANSACTIONS} = \frac{150}{6} = 25 \text{ DAYS}$$

$$\text{PER DAY CASH USAGE} = \frac{81650}{25} = 3266$$

11. Miller-Orr model

Miller and Orr model (1966) assumes that the cash flow of the firm is assumed to be stochastic, i.e. different amounts of cash payments are made on different points of time. It is assumed that the movements in cash balance occur randomly.

Miller and Orr suggested a model with control limits, which sets control points for time and size of transfers between an Investment Account and Cash Account. The model asserts that transfer money into or out of the account to return the balance to a predetermined normal point whenever the actual balance went outside a lower or upper limit.



The model specifies the following two control limits:

H = Upper control limit, beyond the cash balance should not be carried.

L = Lower control limit, sets the lower limit of cash balance, i.e. the firm should maintain cash resources at least to the extent of lower limit.

Z = Return point for cash balance

The Miller-Orr model, will work as follows:

- When cash balance touched the upper control limit (H), securities are bought to the extent of Rs. (H-Z). Then the new cash balance is Z.
- When cash balance touches lower control limit (L), marketable securities to the extent of Rs. (Z-L) will be sold. Then the new cash balance again return to point Z.

Assumptions of the model are:

- The major assumption with this model is that there is no underlying trend in cash balance over time.
- The optimal values of 'h' and 'z' depend not only on opportunity costs, but also on the degree of likely fluctuations in cash balances.

The model can be used in times of uncertainty and random cash flows. It is based on the principle that control limits can be set which when reached trigger off a transaction. The control limits are based on the day-to-day variability in cash flows and the fixed costs of buying and selling government securities.

Spread Between the Control Limits

The higher the variability in cash flows and transaction cost, the wider and higher the control limits will be. Conversely, the higher the interest rate, the lower and closer they will become. Within the control limits, the cash balance fluctuates unpredictably.

11. Miller-Orr model

Assume that the cash flows vary throughout the year. Because of uncertainty surrounding the cash flows, P&R has decided to carry a minimum balance of Rs 5,00,000 in cash. The variance of the daily cash flows is 75,000. They operate on a 365-day year. The company invests its short-term funds in securities which earn an average of 7%.

- (i) At what point will a new cash infusion be needed?
- (ii) At what point should excess cash be invested in marketable securities?

Solution:

- (i) At what point will a new cash infusion be needed?

$$\text{OPPORTUNITY COST PER DAY} = \frac{0.07}{365} = 0.00019$$
$$\text{RETURN POINT} = 5,00,000 + 3 \sqrt{\frac{\frac{3}{4} \times 100 \times 75,000}{0.00019}}$$
$$= 5,03,093.54$$

- (ii) At what point should excess cash be invested in marketable securities?

$$\text{UPPER LIMIT} = 5,00,000 + 3 \times 3 \sqrt{\frac{\frac{3}{4} \times 100 \times 75,000}{0.00019}} = 5,09,280.63$$

12. Orgler's Model

According to this model, the optimal cash management strategy can be determined through the use of a multiple linear programming model. It is a model that provides for integration of cash management with production and other aspects of the firm.

The construction of this model comprises 3 sections namely:

- (i) Selection of the appropriate planning horizon
- (ii) Selection of the appropriate decision variables and
- (iii) Formulation of the cash management strategy

1. Credit Management

Credit Management is the study of the choices a firm makes regarding payment terms when selling goods or services.

The firm can opt for immediate cash payment upon delivery or extend credit to customers, allowing them to pay at a later date. Granting credit essentially involves investing in customers, tying this investment to the sale of products or services.

The decision to grant credit is common among firms, primarily because it serves as a tool to drive sales. However, it comes with associated costs and risks. There is the possibility that customers may default on payments, leading to bad debts. Secondly, the firm must also bear the costs of carrying receivables. Therefore, the credit policy decision involves balancing the benefits of increased sales against the costs and risks of offering credit.

From an accounting standpoint, granting credit results in the creation of accounts receivable. These receivables encompass credit extended to other firms, known as **trade credit**, as well as credit granted to consumers, termed **consumer credit**.

Understanding and managing these receivables are essential aspects of credit management within a firm.

1. Credit Management

The components of a credit policy are crucial for a firm's decision-making process regarding the extension of credit to customers. Here are the 3 key components:

1. Terms of Sale

The terms of sale outline how the firm intends to sell its goods or services. This includes deciding whether to demand immediate cash payment or extend credit to customers. If credit is granted, the terms of sale specify important details such as the credit period, cash discount (if applicable), discount period, and the type of credit instrument accepted.

2. Credit Analysis

Credit analysis involves assessing the creditworthiness of potential customers to determine the likelihood of them honoring their payment obligations. Firms employ various methods and procedures to evaluate customers' creditworthiness, collectively referred to as credit analysis. This process helps distinguish between customers who are likely to pay on time and those who may default on payments.

3. Collection Policy

Once credit has been extended and goods or services have been delivered, the firm faces the task of collecting payment from customers. Establishing a collection policy is essential to address this aspect of credit management effectively. The collection policy outlines procedures and strategies for managing overdue accounts, pursuing payment from delinquent customers, and maintaining positive customer relations throughout the collection process.

2. Terms of Sale

The *terms of a sale* refer to the specific conditions under which goods or services are sold to customers on credit. These terms outline the agreement between the seller and the buyer regarding payment terms and any associated discounts.

The key components of terms of sale in credit management typically include:

1. The duration of credit granted, known as the *credit period*.
2. The cash discount available and its corresponding *discount period*.
3. The specific type of *credit instrument* accepted.

Commonly used terms like **2/10, net 60** indicate that customers have 60 days from the invoice date to settle the full amount. However, if payment is made within 10 days, a 2% cash discount can be availed.

Alternatively, if the terms are stated simply as **net 30**, it means the customer must settle the entire invoice amount within 30 days from the invoice date, without any discount offered for early payment.

Similarly, **5/10, net 45** implies that a 5% discount is available if payment is made within 10 days, while the full amount must be paid within 45 days if the discount is not utilized.

2. Terms of Sale

The credit period represents the duration for which credit is extended to buyers, allowing them time to settle their accounts. Typically, the credit period falls within a range of 30 to 120 days, although it can vary significantly across industries.

Net Credit Period is the period within which the buyer can pay the full invoice amount without any discount. It starts from the invoice date, which is the date when the invoice is issued to the buyer. The invoice date is usually aligned with the shipping or billing date, rather than the date of receipt of goods by the buyer.

If a cash discount is available, **Cash Discount Period** specifies the timeframe within which the buyer can avail of the discount by making early payment. The cash discount period typically precedes the net credit period and provides an incentive for prompt payment.

With **2/10, net 30**, for example, the net credit period is 30 days and the cash discount period is 10 days.

Various arrangements exist for determining the start of the credit period:

ROG (Receipt of Goods): In this case, the credit period starts when the customer receives the order. This might be used when the customer is in a remote location.

EOM (End of Month) Dating: With EOM dating, all sales made during a particular month are assumed to be made at the end of that month. This is useful when a buyer makes purchases throughout the month, but the seller bills only once a month. For example, terms of **2/10th, EOM** tell the buyer to take a 2% discount if payment is made by the 10th of the month; otherwise the full amount is due. **MOM**, for middle of month, is another variation.

Seasonal dating: Seasonal dating is sometimes used to encourage sales of seasonal products during the off-season. A product sold primarily in the summer (e.g., air conditioners) can be shipped in January with credit terms of **2/10, net 30**. However, the invoice might be dated June 1 so that the credit period actually begins at that time. This practice encourages buyers to order early.

2. Terms of Sale

The duration of the credit period is influenced by two significant factors: the buyer's inventory period and operating cycle. Generally, a shorter buyer inventory period and operating cycle correspond to a shorter credit period, assuming all else remains constant.

The operating cycle consists of two main components: the inventory period and the receivables period. The buyer's inventory period represents the time taken to acquire, process, and sell inventory, while the receivables period indicates the time needed to collect payment from customers after a sale.

Thus we see that, the credit period offered by the seller effectively becomes the buyer's payables period.

By extending credit to buyers, sellers effectively finance a portion of the buyer's operating cycle, thereby shortening their cash cycle. If the credit period exceeds the buyer's inventory period, the seller finances not only inventory purchases but also part of the buyer's receivables.

Moreover, if the credit period surpasses the buyer's entire operating cycle, the seller effectively provides financing for aspects of the buyer's business beyond the immediate purchase and sale of merchandise. In this scenario, the buyer effectively obtains a loan from the seller, which can be utilized for other purposes.

Hence, the **length of the buyer's operating cycle is often considered an appropriate upper limit to the credit period**, ensuring that the credit extended by the seller remains aligned with the buyer's business needs and financial capabilities.

Several other factors influence the duration of credit period, many of which also impact our customer's operating cycles. These factors include:

- **Perishability and Collateral Value:** Perishable items with rapid turnover and low collateral value typically have shorter credit periods. For instance, a food wholesaler might offer net seven days for fresh produce, while jewelry might be sold with 5/30, net four months terms.
- **Consumer Demand:** Established products often have faster turnover rates, resulting in shorter credit periods. Conversely, newer or slower-moving products may have longer credit periods to attract buyers, especially during off-season sales when demand is low.
- **Cost, Profitability, and Standardization:** Relatively inexpensive or standardized goods, as well as raw materials, tend to have shorter credit periods due to lower markups and higher turnover rates. However, there are exceptions, such as auto dealers who typically pay for cars upon receipt.
- **Credit Risk:** Higher credit risk associated with the buyer usually leads to shorter credit periods or no credit offered at all.
- **Size of the Account:** Smaller accounts may have shorter credit periods due to higher management costs and lower significance of the customers.
- **Competition:** In highly competitive markets, sellers may offer longer credit periods to attract customers.
- **Customer Type:** Sellers may offer different credit terms to various buyers. For example, a food wholesaler might provide different terms to groceries, bakeries, and restaurants, depending on their creditworthiness and relationship with the seller. Similarly, sellers may offer different terms to wholesale and retail customers.