Evaluation of Managerial Techniques: NPV and IRR

Rabaya Bosri[1]

Abstract: *The main aim of this research work is to evaluate the managerial decision technique on the basis of NPV and IRR. Every small and large organization must take some decisions on the basis of forecasted future events. We know that the increasing the value of the stock in a company is the goal of financial management. Thus, what we need to know is how to tell whether a particular investment will achieve that. Frequently, financial managers use the common techniques are NPV or IRR. In this research work is to analyze which technique is most useful for the managers.*

Key Word: NPV, IRR, formula, technique, managerial decision.

1. Introduction

When running a business, making the right decisions can lead to success, while making the wrongs can result to failure. With so much riding on each decision, it's important that thoughtful consideration is put into each one that needs to be made. To help them, many business leaders go through a thoughtful decision-making process. While there are a wide variety of decision-making techniques and tools, many tend to revolve around the same key principles of figuring out the decision that needs to be made, considering and researching the options and reviewing the decision once it's been made. Capital budgeting is a long term planning for commitment of funds to fixed assets. For evaluating long term planning financial managers use the most following common tecnique Payback period (PBP), Average accounting return, Discounted payback (DPBP), Net present value (NPV), Internal rate of return (IRR), Net terminal value (NTV), Profitability Index (PI). Each of the techniques is very important for making investment decisions.

2. Literature Review

There are many reviews in favor of NPV and IRR and vice versa. Some of these views are discussed here.

"Net present value is the difference between the amount invested and the present value of future cash flows"(Alan, 2004). Charles et al (2009) reviewed that the

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[1]   Lecturer, Department of Busniess Studies, UITS, E-mail: rubacu@live.com

"NPV method calculates the expected monetary gain or loss from a project by discounting all expected future cash inflows and outflows back to the present point in time using the required appropriate rate of return". Colin (2006) added that "NPV is the most straightforward way to determine whether a project yields a return in excess of the alternative equal risk investment in trade securities". Colin (2006) has also explained that NPV is the present value of the net cash inflows less the project's initial investment outlay, if the rate of return from the project is greater than the return from an equivalent risk investment in securities traded in the financial market, the NPV will be positive, vice versa, if the rate of return is lower, the NPV will be negative. A positive NPV shows that an investment should be accepted, while a negative NPV shows that the investment should be rejected. Kashyap (2006) added that "the key inputs of the calculation of NPV are the interest rate or discount rate which used to compute the present values of future cash flows. When the discount rate is higher than the shareholders' required rate of return, and the project has a positive NPV at this rate, then shareholders will expect an additional profit that has a present value equal to the NPV."

"IRR is another of capital budgeting technique which consider time value of money but results in answer expressed in percentage form"(Pauline, 2006). IRR represents a discount rate which leads to a net present value of zero where the present value of the cash inflows equals to the cash outflows (Pauline, 2006). Charles et al (2009) added that IRR method calculates the discount rate at which an investment's present value of all expected cash inflows equals to the present value of its expected cash outflows. It also means that IRR is the discount rate that makes NPV=£0. Kashyap (2006) emphasized that "when choosing investments or projects, the investment with the highest IRR should be chosen and of course that the IRR is greater than the cost of capital at the same time." Lower of the pair of discount rate + [(NPV at lower rate/Difference between the NPVs) x difference in rates]. According to Myers' observations, the NPV analysis ignored the time series interactions among contingent investments. Todd et al (2004) reviewed that "by using NPV model, an increase in risk is accounted for increasing the discount rate". Pankaj (2009) noted that "NPV underestimates the value of a project as it ignores the value of the implicit options that managements have in project.""IRR method, one of DCF techniques, which unable to consider the flexibility to revise decisions after a project begins" (Kent et al, n.d.).

3. Objectives of Study

The main objectives of this study are given below:

> ➢ To identify the basic idea about NPV and IRR.
> ➢ To evaluate the project by using NPV and IRR.
> ➢ To make a decision which technique is better.

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4. Methodology of the Study

Primary Source:

It is assumed projects and evaluated those projects by using some numerical information.

Secondary Source:

Finally, it used finance journals, books, newspapers, articles, etc. to complete this research work.

Numerical information can be analyzed by MS Excel.

5. Findings and Analysis

5.1 Theoretical Discussion on NPV and IRR:[7][8][9]10]

Definition of NPV:

NPV is the difference between the present value of cash inflows and the present value of cash outflows. NPV compares the value of a dollar today to the value of that same dollar in the future, taking inflation and returns into account. NPV analysis is sensitive to the reliability of future cash inflows that an investment or project will yield and is used in capital budgeting to assess the profitability of a project.

Formula:

NPV is calculated using the following formula:

$$NPV = CF/(1+r) \wedge t - CO$$

Where, CF = Annul Cash inflows

r=discount rate

t=project life

CO=initial investment.

Decision Criteria:

> ➢ If the NPV of a prospective project is positive, the project should be accepted.
> ➢ If NPV is negative, the project should probably be rejected because cash flows will also be negative.
> ➢ If NPV is zero (0), the project may be accepted or rejected, it depends on managers.

Significance for NPV:

NPV is significant to the financial managers for the following reasons:

- Time Value of Money is given more importance, i.e. value of money today is more than the value of money received a year from now.
- Projects profitability & risk factors are given high priority.
- It takes into consideration both before & after cash flow over the life span of a project.

Drawbacks for NPV:

NPV is disadvantageous because:

- It might not give you accurate decision when the two or more projects are of unequal life.
- Will not give the clarity how long a project or investment will generate positive NPV due to simple calculation.
- NPV method suggests accepting that investment plan which provides positive NPV but it doesn't provide accurate answer at what period of time you will achieve positive NPV.
- Calculating appropriate discount rate for cash flows is difficult.

Definition of IRR:

Internal Rate of Return (IRR) is the discount rate that equates the NPV of an investment opportunity with $0. It is the compound annual rate of return that the firm will earn if it invests in the projects and receives the given cash inflows.

The IRR is always expressed as a percentage. For a project to be acceptable under the IRR method, the discount rate must exceed the project's cost of capital, otherwise known as the hurdle rate. An IRR less than the hurdle rate represents a cost to shareholders, while an IRR greater than the hurdle rate represents a return on investment, increasing shareholder wealth.

Formula:

$$\$0 = \sum_{i=1}^{n} \frac{CFt}{(1 + IRR) \wedge t} - CO$$

Where, CF = Annul Cash inflows

IRR=Internal Rate of Return

t=project life

CO=initial investment.

Decision Criteria:

> If the IRR is greater than cost of capital, accept the project.
> If the IRR is less than cost of capital, reject the project.

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Significance for IRR:

- This approach is mostly used by financial managers as it is expressed in percentage form so it is easy for them to compare to the required cost of capital.
- It will provide you an excellent guidance on a project's value and associated risk.

- IRR method gives you the advantage of knowing the actual returns of the money which you invested today.

Drawbacks for IRR:

- IRR tells you to accept the project or investment plan where the IRR is greater than weighted average cost of capital but in case if discount rate changes every year than it is difficult to make such comparison.
- If there are two or more mutually exclusive projects (they are the projects where acceptance of one project rejects the other projects from concern) than in that case too IRR is not effective.

5.2 Project Evaluation by NPV and IRR:

Example,

	Project X	Project Y
Initial Investment	$130000	$85000
1	25000	40000
2	35000	35000
3	45000	30000
4	50000	10000
5	55000	5000
Cost of capital	12%	12%

Now I calculate NPV & IRR for each of the project.

NPV calculation by PVIF table:

NPV for Project X

Year	Annual Cash Inflow	PV factor @12%	PV of Inflow
1	$25000	.893	$22325
2	35000	.797	27895
3	45000	.712	32040

4	50000	.636	31800
5	55000	.567	31185
		Total PV of inflow	$114060
		Initial investment	(130000)
		NPV	($15940)

NPV for Project Y

Year	Annual Cash Inflow	PV factor @12%	PV of Inflow $
1	$40000	.893	$35720
2	35000	.797	27895
3	30000	.712	21360
4	10000	.636	6360
5	5000	.567	2835
		Total PV of inflow	$94170
		Initial investment	85000
		NPV	$9170

Analysis: The NPV of Project X is ($15940) and the NPV of Project Y is $9170.

Decision: So, the project Y is accepted because its NPV is positive and higher than project X.

Now, the second evaluation technique is IRR.

IRR for Project X

Step 1: Factor calculation:

$$\frac{\text{Initial investment}}{\text{Average cash flow}}$$
$$\frac{\$130000}{\$42000}$$
$$=3.095$$

Now, I go to PVIFA table at 5 years time line factor 3.095 lies under 18% and 12%.

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Step 2: NPV calculation @18% and 12%

Year	Annual Cash Inflow	PV factor @18%	PV @18%	PV factor @12%	PV @12%
1	$25000	.847	$21,175	.8929	$22,322.50
2	35000	.718	25,130	.7972	27902
3	45000	.609	27,405	.7118	32031
4	50000	.516	25,800	.6355	31775
5	55000	.437	24,035	.5674	31207
		Total PV of inflow	$123,545		$145,237.50
		Initial investment	(130000)		(130000)
		NPV	($6455)		$15,237.50

Step 3:

$$IRRx = LR + NPVLR/NPVLR - NPVHR(HR - LR)$$

=12%+$15,237.50 /$15,237.50 - ($6455) *(18%-12%)
=.12 + $0.70 *.06
= 16%

IRR for Project Y

Step 1: Factor calculation:

Initial investment
Average cash flow
$85000
$24000
=$3.54

Now, I go to PVIFA table at 5 years time line factor 3.54 lies under 12% and 20%.

Step 2: NPV calculation @12% and20%

Year	Annual Cash Inflow	PV factor @12%	PV @12%	PV factor @20%	PV @20%
1	$40000	.8929	$35,716	.833	$33,320
2	35000	.7972	27902	.694	24290
3	30000	.7118	21354	.579	17370

4	10000	.6355	6355	.482	4820
5	5000	.5674	2837	.402	2010
		Total PV of inflow	$94,164		$81,810
		Initial investment	(85000)		(85000)
		NPV	$9,164		($3190)

Step 3:

IRRy=LR+ NPVLR/NPVLR-NPVHR(HR-LR)

$= 12\% + \$9,164/\$9,164-(\$3190) *(20\%-12\%)$

$= .12 + 0.741784 *0.08$

$= 0.179343$

$\approx 17.93\%$

Analysis: The IRR of project X is 16% and the IRR of project Y is 17.93%.

Decision: So, the project Y is accepted because its IRR is higher than project X and also cost of capital.

5.3 Comparison between NPV and IRR Techniques:[1]

It must first analyze the reinvestment rate assumptions for each evaluation method. The NPV method assumes that cash flows will be reinvested near or at the project's current cost of capital, while the IRR method assumes that the firm can reinvest cash flows at the project's IRR. The assumption that the firm will reinvest its cash flows at the current cost of capital is more realistic than the assumption that cash flows can be reinvested at the projects IRR. This is because the IRR may not reflect the true rate at which cash flows can be reinvested. To correct this problem, a modified IRR (MIRR) is used that incorporates the cost of capital as the reinvestment rate; however, the NPV method still has the advantage when compared to the MIRR method.

The NPV and IRR methods will return conflicting results when mutually exclusive projects differ in size, or differences exist in the timing of cash flows. When mutually exclusive projects exhibit these attributes, their NPV profiles will cross when plotted on a graph. This point at which they cross is defined as the crossover rate, which happens because one project's NPV is more sensitive to the discount rate caused by the differences in the timing of cash flows. In most cases, utilizing either the NPV or IRR method will lead to the same accept-or-reject

decision. An exception exists when evaluating mutually exclusive projects with crossing NPV profiles and the cost of capital is less than the crossover rate. When these conditions are present, the NPV and IRR results will conflict in which project to accept or reject. Because the NPV method uses a reinvestment rate close to its current cost of capital, the reinvestment assumptions of the NPV method are more realistic than those associated with the IRR method.

NPV also has an advantage over IRR when a project has non-normal cash flows. Non-normal cash flows exist if there is a large cash outflow during or at the end of the project. The presence of non-normal cash flows will lead to multiple IRRs. Hence, the IRR method cannot be employed in the evaluation process. Mathematically, this problem will not occur if the NPV method is employed. The NPV method will always lead to a singular correct accept-or-reject decision.

Theoretical View

NPV is a better method for evaluating mutually exclusive projects than the IRR method. The NPV method employs more realistic reinvestment rate assumptions, is a better indicator of profitability and shareholder wealth, and mathematically will return the correct accept-or-reject decision regardless of whether the project experiences non-normal cash flows or if differences in project size or timing of cash flows exist.

Practical View: [2][3][4][5]

Evidence suggests that in spite of the theoretical superiority of NPV, financial managers prefer to use IRR. The preferences for IRR are due to the general disposition of business people toward rates of return rather than actual dollar returns. Because interest rates, profitability and so on are most often expressed as annual rates of return, the use of IRR makes sense to financial decision makers. They tend to find NPV less intuitive because it does not measure benefits relative to the amount invested. Clearly, corporate financial analysts are responsible for identifying and resolving problems with the IRR before decision makers use it as a decision technique.

6. Conclusion

Net present value and internal rate of return are the capital budgeting techniques mostly used to evaluate the projects or investments. For individual projects IRR is used mostly to evaluate the project and NPV is preferable when the projects are mutually exclusive. But sometimes investors prefer to use NPV because it is easy to calculate and reinvest the cash flows at the cost of capital. And sometimes IRR is preferable because it gives answer in percentage and it is easy to understand. But IRR reinvest at calculated IRR.

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