

Capital Budgeting Decisions

Chapter Questions

- 1) When making capital budgeting decisions, firms use different techniques to identify and analyze the return that can be made from such an investment. The main techniques are: the Net Present Value (NPV), the Internal Rate of Return (IRR), the Modified IRR (MIRR), the Payback Period (PB), or the Discounted Payback Period (DPB).
- 2) All the capital budgeting techniques – that consider the time value of money - are related in the sense that they will provide the same accept and reject decisions. In the acceptance case, when $NPV > 0$, when the $IRR > r$, when the $MIRR > r$, and when $DPB < \text{then an asset's useful life}$. All of these would lead to a positive contribution to the firm's value, increasing stockholder's wealth. Even so, conflicts in the results can exist between techniques when the projects are mutually exclusive – while in the independent ones, all acceptable projects should be implemented.
- 3) Broadly speaking, when trying to decide between two mutually exclusive projects, they will analyze their NPV. If the $NPV_1 > NPV_2$, then this is the chosen project. The NPV is a good measure of profitability comparison because it already places the results in dollars, and it also assumes that the current rate of reinvestment is the required rate of return. Firms can also compare the Modified IRR rate, which compares the expected rates of return while maintaining the same assumption regarding the reinvestment rates of return.
- 4) Firms use mostly the NPV, the IRR, and the Payback Period. More specifically in recent years, they have focused on NPV.

Supplemental Questions

- 1) When trying to choose between two mutually exclusive projects, an important question that comes up is if it is more useful to generate cash flows now or later. The answer to this question depends on the rate at which the cash inflows could be reinvested, and each of the two capital budgeting techniques utilizes a different assumption as to what that rate might be. The NPV assumes that the reinvestment rate is equal to the required rate of return, while the IRR implies that the said rate is equal to the expected rate of return – which is not always realistic. In summary, these assumptions are embedded into these methods because calculating the PV of their future cashflows – in order to choose between two similar projects - implies a specific rate of return.
- 2) Yes. For example, let's suppose that the $r = 10\%$, and that Project A has an $IRR = 11\%$, and Project B has an $IRR = 15\%$. In this case, Project B is preferred to Project A because, $IRR_B > IRR_A$, which would imply a greater return. If these projects are independent, and if we change the $r = 12\%$, only Project B would be acceptable – changing the ranking. If the projects are mutually exclusive, and the same change in required rate happens, conflicts between the IRR and the NPV can cause the rankings to change as well.
- 3) If a project's $NPV = 0$, as it relates to the discounted payback period, it implies that the initial investment was recovered on a present value basis at the end of its useful life – recovering the full amount but now producing cash inflows beyond that amount. Also, because the traditional payback period method only shows how quickly the initial invested amount will be recovered – but nothing beyond it, this indicates that the PB will be a pretty accurate measure of the expected cashflows originating from this investment. Lastly, if the $NPV = 0$, I would assume that the $IRR = r$.

4) This is not necessarily true. If the focus is used in either the NPV or the IRR, the decisions can be very different. In fact, although you may have an NPV = \$5,000 for both Projects, by analyzing the IRR – which is a “safety margin” measure – one can understand more about the riskiness and the margin of error within an investment. Even if the projects were mutually exclusive, my answer would still be the same because these can lead to conflicts between the results of the two techniques, which will then cause different decisions to be made with the same numbers.

5) This statement is false. A firm’s decision to reject or accept an investment depends on the relationship between the IRR and its own required rate of return. In this case, Firm A might have accepted the IRR = 19% because $IRR > r$, while the opposite might not have been true for Firm B, where $IRR < r$.

Chapter Problems

7,17,23,25

7) $CF_0 = (\$42,000)$

$CF_{1,2,3,4,5} = \$11,000$

$r = 9\%$

Using the financial calculator $\rightarrow NPV = 786.16 > 0$; $IRR = 9.7\% > r$

The project should be purchased.

17) Compute PB and DPB; should it be purchased?

$CF_0 = \$329,000$

$CF_{1,2,3,4,5} = \$94,000$

$$R = 12.5\%$$

PB

Year	Expected CF	SUM of CF
0	(329,000)	(329,000)
1	94,000	(235,000)
2	94,000	(141,000)
3	94,000	(47,000)
4	94,000	47,000
5	94,000	141,000

$$PBs = 3 + 47,000/94,000 = 3.5$$

DPB

Year	Expected CF	PV of CF	SUM of CF
0	(329,000)	(329,000)	(329,000)
1	94,000	83,556	(245,444)
2	94,000	157,827	(87,617)
3	94,000	223,846	136,229
4	94,000	282,530	418,759
5	94,000	334,693	753,452

$$DPBs = 2 + 87,617/157,827 = 2.56$$

Yes, it is acceptable because $DPB < \text{the project's useful life}$.

23) Mutually exclusive projects

Year	Project S	Project T
0	(\$16,000)	(\$15,000)
1	14,000	2,000
2	6,000	18,600

$r = 16\%$; IRR of the project the company should purchase?

$NPV_s = 527.94$ $IRR_s = 19\%$

$NPV_t = 546.97$ $IRR_t = 18.22\%$

Results: $NPV_s < NPV_t$; $IRR_s > IRR_t$

There is a conflict between the results of the two techniques. I would use the results from the NPV to decide, which would lead to accepting Project T. However, if the company wishes to research further, they can calculate the MIRR.

25) Independent Projects

Intern's Name	Project's Life	NPV	IRR	Discounted Payback	Decision
Albert	7 years	\$5,300	12.0%	6.8 years	Accept
Josie	6	(1,800)	8.0	5.8	Reject
Kenny	10	4,500	10.0	9.6	Accept

(a) Which intern's report has the error?

Josie's report has an error. She indicates that the DPB is 5.8 years, which would imply the moment in which the initial investment amount is paid back. Even so, she indicated that by the end of the 6 years – after the investment's is over –, the NPV is still a negative \$1,800. This means that the DPB should be greater than the project's life, and not less.

(b) Yes, it provides an indication of the firm's required rate of return. The firm's decision was partially based on the negative NPV; even so, a negative NPV usually implies an $IRR < r$, as they usually proceed in the same directions when they are independent projects. The same is true for mutually exclusive projects for the techniques which consider time value of money. In sum, the intern's results indicate that the firm's required rate of return is $r > 8\%$, but probably less or equal to 10%.

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- 4) Firms use mostly the NPV, the IRR, and the Payback Period. More specifically in recent years, they have focused on NPV. ✓

Supplemental Questions

↪ No, it doesn't. IRR is the rate on investment (YTM). but it doesn't influence IRR.
 ↳ it is used to make a decision Chapter 9

1) When trying to choose between two mutually exclusive projects, an important question that comes up is if it is more useful to generate cash flows now or later. The answer to this question depends on the rate at which the cash inflows could be reinvested, and each of the two capital budgeting techniques utilizes a different assumption as to what that rate might be. The NPV assumes that the reinvestment rate is equal to the required rate of return, while the IRR implies that the said rate is equal to the expected rate of return – which is not always realistic. In summary, these assumptions are embedded into these methods because calculating the PV of their future cashflows – in order to choose between two similar projects – implies a specific rate of return.

↪ Value of the firm won't change. → Point of indifference.
 Flip a coin.

2) Yes. For example, let's suppose that the $r = 10\%$, and that Project A has an $IRR = 11\%$, and Project B has an $IRR = 15\%$. In this case, Project B is preferred to Project A because, $IRR_B > IRR_A$, which would imply a greater return. If these projects are independent, and if we change the $r = 12\%$, only Project B would be acceptable – changing the ranking. If the projects are mutually exclusive, and the same change in required rate happens, conflicts between the IRR and the NPV can cause the rankings to change as well.

↪
 $IRR = r$
 if
 $NPV = 0$
 $NPB = present$
 life

3) If a project's $NPV = 0$, as it relates to the discounted payback period, it implies that the initial investment was recovered on a present value basis at the end of its useful life – recovering the full amount but now producing cash inflows beyond that amount. Also, because the traditional payback period method only shows how quickly the initial invested amount will be recovered – but nothing beyond it, this indicates that the PB will be a pretty accurate measure of the expected cashflows originating from this investment. Lastly, if the $NPV = 0$, I would assume that the $IRR = r$.

↪ tradition → $PB = ?$

Answers lead to same decision if independent. Yes.

4) This is not necessarily true. If the focus is used in either the NPV or the IRR, the decisions can be very different. In fact, although you may have an NPV = \$5,000 for both Projects, by analyzing the IRR – which is a “safety margin” measure – one can understand more about the riskiness and the margin of error within an investment. Even if the projects were mutually exclusive, my answer would still be the same because these can lead to conflicts between the results of the two techniques, which will then cause different decisions to be made with the same numbers.

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$r = 9\%$

$N=5$ $I/Y=9$ $PMT=11,000$ $FV=0$
 $PV=?$

Using the financial calculator $\rightarrow NPV = 786.16 > 0$; $IRR = 9.7\% > r$

The project should be purchased.

(good! remembered to subtract).

17) Compute PB and DPB; should it be purchased?

$CF_0 = \$329,000$

$CF_{1,2,3,4,5} = \$94,000$

* Can't make assumptions about PB, if I know the answer with other techniques.

no firm value or money
* Can choose each one of the techniques to answer.

↳ if M. Exclusive, have to be deeper and analyze NPV.

↳ independent $\rightarrow$ doesn't matter which technique

↳ mutually exclusive $\rightarrow$ use NPV.

$$R = 12.5\%$$

PB

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$$DPBs = 2 + 87,617/157,827 = 2.56 \quad 4 + \frac{46,469}{52,163} = 4.89 \text{ years}$$

Yes, it is acceptable because $DPB < \text{the project's useful life}$.

23) Mutually exclusive projects

annuity (not for transition)

$$PB = \frac{329,000}{94,000} = 3.5 \text{ years}$$

$$94,000 / 1.125$$

$$5,694$$

Year	Project S	Project T
0	(\$16,000)	(\$15,000)
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$r = 16\%$; IRR of the project the company should purchase?

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(a) Which intern's report has the error?

Josie's report has an error. She indicates that the DPB is 5.8 years, which would imply the moment in which the initial investment amount is paid back. Even so, she indicated that by the end of the 6 years – after the investment's is over –, the NPV is still a negative \$1,800. This means that the DPB should be greater than the project's life, and not less.

X $5.8 < 6$

↳ she should have said yes, if 5.8 were true.

(b) Yes, it provides an indication of the firm's required rate of return. The firm's decision was partially based on the negative NPV; even so, a negative NPV usually implies an $IRR < r$, as they usually proceed in the same directions when they are independent projects. The same is true for mutually exclusive projects for the techniques which consider time value of money. In sum, the intern's results indicate that the firm's required rate of return is $r > 8\%$, but probably less or equal to 10% .

