Capital Budgeting اعداد الموازنة الرأسمالية

Capital budgeting is both a decision-making and a control tool. Like the five-step decision process that we have emphasized throughout this book, there are five stages to the capital budgeting process:

خطوات اعداد الموازنات الرأسمالية

Stage 1: Identify Projects Identify potential capital investments that agree with the organization's strategy.

Stage 2: Obtain Information Gather information from all parts of the value chain to evaluate alternative projects.

Stage 3: Make Predictions Forecast all potential cash flows attributable to the alternative projects.

Stage 4: Make Decisions by Choosing Among Alternatives Determine which investment yields the greatest benefit and the least cost to the organization.

Stage 5: Implement the Decision, Evaluate Performance, and Learn Given the complexities of capital investment decisions and the long time horizons they span, this stage can be separated into two phases:

- **Obtain funding and make the investments selected in stage 4.**
- **Track realized cash flows, compare against estimated numbers, and revise plans if necessary.**

This chapter discusses four capital budgeting methods to analyze financial information:

1- Net present value (NPV) صافي القيمة الحالية

2- Internal rate of return (IRR) معدل العائد الداخلي

3- Payback فترة الاسترداد

4- Accrual accounting rate of return (AARR) معدل العائد المحاسبي المستحق

Both the net present value (NPV) and internal rate of return (IRR) methods use discounted cash flows, which we discuss in the following section.

Discounted Cash Flow التدفق النقدي المخصوم

Discounted cash flow (DCF) methods measure all expected future cash inflows and outflows of a project discounted back to the present point in time. The key feature of DCF methods is the time value of money, which means that a dollar (or any other monetary unit) received today is worth more than a dollar received at any future time. The reason is that $1 received today can be invested at, say, 10% per year so that it grows to $1.10 at the end of one year. The time value of money is the opportunity cost (the return of $0.10 forgone per year) from not having the money today. In this example, $1 received one year from now is worth $1/ 1.10= $0.9091 today. Similarly, $100 received one year from now will be weighted by 0.9091 to yield a discounted cash flow of $90.91, which is today's value of that $100 next year. In this way, discounted cash flow methods explicitly weigh cash flows by the time value of money. Note that DCF focuses exclusively on cash inflows and outflows rather than on operating income as determined by accrual accounting.

The two DCF methods we describe are the net present value (NPV) method and the internal rate-of-return (IRR) method. Both DCF methods use what is called the required rate of return (RRR), the minimum acceptable annual rate of return on an investment. The RRR is internally set, usually by upper management, and typically reflects the return that an organization could expect to receive elsewhere for an investment of comparable risk. The RRR is also called the discount rate, hurdle rate, cost of capital, or opportunity cost of capital. Suppose the CFO at Top-Spin has set the required rate of return for the firm's investments at 8% per year.

Net Present Value Method طريقة صافي القيمة الحالية

The net present value (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 rate of return. To use the NPV method, apply the following three steps:

Step 1: Draw a Sketch of Relevant Cash Inflows and Outflows.

Step 2: Discount the Cash Flows Using the Correct Compound Interest Table from Appendix A and Sum Them.

Step 3: Make the Project Decision on the Basis of the Calculated NPV. If NPV is zero or positive, financial considerations suggest that the project should be accepted; its expected rate of return equals or exceeds the required rate of return. If NPV is negative, the project should be rejected; its expected rate of return is below the required rate of return.

Internal Rate-of-Return Method طريقة معدل العائد الداخلي

The internal rate-of-return (IRR) method calculates the discount rate at which an investment's present value of all expected cash inflows equals the present value of its expected cash outflows. That is, the IRR is the discount rate that makes NPV= $0. Exhibit 21-3 presents the cash flows and shows the calculation of NPV using a 10% annual discount rate for Top-Spin's carbon-fiber project. At a 10% discount rate, the NPV of the project is $0. Therefore, IRR is 10% per year.

How do managers determine the discount rate that yields NPV= $0? In most cases, managers or analysts solving capital budgeting problems use a calculator or computer program to provide the internal rate of return. The following trial-and-error approach can also provide the answer.

Step 1: Use a discount rate and calculate the project's NPV.

Step 2: If the calculated NPV is less than zero, use a lower discount rate. (A *lower* discount rate will *increase* NPV. Remember that we are trying to find a discount rate for which NPV= $0.) If NPV is greater than zero, use a higher discount rate to lower NPV. Keep adjusting the discount rate until NPV= $0

Payback Method طريقة فترة الاسترداد

We now consider the third method for analyzing the financial aspects of projects. The payback method measures the time it will take to recoup, in the form of expected future cash flows, the net initial investment in a project. As in NPV and IRR, payback does not distinguish among the sources of cash flows, such as from operations, purchase or sale of equipment, or investment or recovery of working capital. Payback is simpler to calculate when a project has uniform cash flows, as opposed to non uniform cash flows. We consider the former case first.

Uniform Cash Flows تدفقات نقدية منتظمة

In the Top-Spin example, the carbon-fiber machine costs $379,100, has a five-year expected useful life, and generates $100,000 *uniform* cash flow each year. Calculation of the payback period is as follows:

$$\text{Payback period} = \frac{\text{Net initial investment}}{\text{Uniform increase in annual future cash flows}}$$

$$= \frac{\$379{,}100}{\$100{,}000} = 3.8 \text{ years}^{4}$$

Non uniform Cash Flows التدفقات النقدية غير المنتظمة

When cash flows are not uniform, the payback computation takes a cumulative form:

The cash flows over successive years are accumulated until the amount of net initial investment is recovered. Assume that Venture Law Group is considering the purchase of videoconferencing equipment for $150,000. The equipment is expected to provide a total cash savings of $340,000 over the next five years, due to reduced travel costs and more effective use of associates time. The cash savings occur uniformly throughout each year, but are not uniform across years.

Year	Cash Savings	Cumulative Cash Savings	Net Initial Investment Unrecovered at End of Year
0	—	—	$150,000
1	$50,000	$ 50,000	100,000
2	55,000	105,000	45,000
3	60,000	165,000	—
4	85,000	250,000	—
5	90,000	340,000	—

It is clear from the chart that payback occurs during the third year. Straight-line interpolation within the third year reveals that the final $45,000 needed to recover the $150,000 investment (that is, $150,000 $105,000 recovered by the end

of year 2) will be achieved three quarters of the way through year 3 (in which $60,000 of cash savings occur):

$$\text{Payback period} = 2 \text{ years} + \left(\frac{\$45{,}000}{\$60{,}000} \times 1 \text{ year}\right) = 2.75 \text{ years}$$

Accrual Accounting Rate-of-Return Method طريقة معدل العائد المحاسبي

We now consider a fourth method for analyzing the financial aspects of capital budgeting projects. The accrual accounting rate of return (AARR) method divides the average annual (accrual accounting) income of a project by a measure of the investment in it. We illustrate AARR for the Top-Spin example using the project's net initial investment as the amount in the denominator:

$$\text{Accrual accounting rate of return} = \frac{\text{Increase in expected average annual after-tax operating income}}{\text{Net initial investment}}$$

If Top-Spin purchases the new carbon-fiber machine, its net initial investment is $379,100. The increase in expected average annual after-tax operating cash inflows is $98,200. This amount is the expected after-tax total operating cash inflows of $491,000 ($100,000 for four years and $91,000 in year 5), divided by the time horizon of five years. Suppose that the new machine results in additional depreciation deductions of $70,000 per year ($78,000 in annual depreciation for the new machine, relative to $8,000 per year on the existing machine).5 The increase in expected average annual after-tax income is therefore $28,200 (the difference between the cash flow increase of $98,200 and the depreciation increase of $70,000). The AARR on net initial investment is computed as follows:

$$AARR = \frac{\$98{,}200 - \$70{,}000}{\$379{,}100} = \frac{\$28{,}200 \text{ per year}}{\$379{,}100} = 0.074, \text{ or } 7.4\% \text{ per year}$$