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Capital Investment Analysis and Project Assessment

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EXPERT REVIEWED

Capital investment decisions that involve the purchase of items such as land, machinery, buildings, or equipment are among the most important decisions undertaken by the business manager. These decisions typically involve the commitment of large sums of money, and they will affect the business over a number of years. Furthermore, the funds to purchase a capital item must be paid out immediately, whereas the income or benefits accrue over time.

Because the benefits are based on future events and the ability to foresee the future is imperfect, you should make a considerable effort to evaluate investment alternatives as thoroughly as possible. The most important task of investment analysis is gathering the appropriate data. The procedures discussed in this publication teach you how to evaluate the decision, but if you have inaccurate or incomplete data, then an otherwise thorough and complete analysis will be misleading.

Selecting investments that will improve the financial performance of the business involves two fundamental tasks: 1) economic profitability analysis and 2) financial feasibility analysis. Economic profitability will show if an alternative is economically profitable. However, an investment may not be financially feasible: that is, the cash flows may be insufficient to make the required principal and interest payments. So you should complete both analyses before you make a final decision to accept or reject a particular project. This publication discusses both of these tasks. (Much of the discussion is abstracted from Boehlje, M. D. and V. R. Eidman. *Farm Management,* Wiley, 1986, Chapter 8.)

Audience: Business managers facing a capital investment decision

Content: Presents two phases of project assessment: economic profitability and financial feasibility

Outcome: Readers will be familiar with the time value of money and be able to calculate the net present value of a project and determine if the investment will generate enough cash to make debt payments

Completing a thorough investment analysis may seem complicated and difficult. But the reward of a soundly based decision will be worth the effort invested to learn the process and collect the necessary information. To help, this publication follows an example through the economic profitability and financial feasibility analysis process. In addition, an appendix contains the figures used to determine the present value of money received in the future.

Economic Profitability

The purpose of an economic profitability analysis is to determine whether the investment will contribute to the long-run profits of the business. Although various techniques can be used to evaluate alternative investments, including the payback period and internal rate of return, the most

commonly accepted technique is net present value, otherwise known as "discounted cash flow."

Time Value of Money

The basic concept of a net present value procedure is that a dollar in hand today is worth more than a dollar to be received sometime in the future. A dollar is worth more today than tomorrow because today's dollar can be invested and can generate earnings. In addition, the uncertainty of receiving a dollar in the future and inflation make a future dollar less valuable than if it were received today.

The procedure for accounting for the delay in receiving funds or the income given up is to discount, or penalize, future cash flows. The longer you must wait to receive them, the more heavily you must discount them. This discounting procedure converts the cash flows that occur over a period of future years into a single current value so that alternative investments can be compared on the basis of that single value. This conversion of flows over time into a single figure via the discounting procedure takes into account the opportunity cost of having money tied up in the investment.

For example, assume that a manager can earn an 8% annual return on funds invested in his or her business. Based on this return, if the manager invests $681 today, then the investment will be worth $1,000 in five years (Table 1).

Table 1. Time Value of Money

Year	Value Beginning of Year		Interest Rate		Annual Interest	Amount at End of Year
1	$681	x	8%	=	$54	$735
2	735	x	8%	=	59	794
3	794	x	8%	=	64	858
4	858	x	8%	=	69	926
5	926	x	8%	=	74	1,000

To adjust money for its future value, you use compounding (as in the example) to obtain the future value of a current sum. Every year, you add an amount to the money you already have based on the rate of return you earn. You do the reverse to calculate the present value of money you could receive in the future.

To calculate a present value—or discount future earnings to the present—assume, for example, that a manager earning 8% on his or her capital will receive $1,000 at the end of each year for the next five years. The discount factor for money received at the end of the first year, assuming an 8% rate, is 0.9259. You can find the discount factor of 0.9259 in the appendix at the point where year one and 8% meet. Hence, the $1,000 received at the end of the first year has a present value of only $925.90 ($1,000 x 0.9259). In similar fashion, you can calculate the present value of the $1,000 received at the end of years two through five using the discount factors from the appendix for 8% and the appropriate years.

You can then determine the present value of this flow of money as the sum of the annual present values. So the present value of an annual flow of $1,000 for each of five years (assuming an 8% discount rate) is only $3,992.60. As a manager, you would be equally well off if you were to receive a current payment of $3,992.60 or the annual payment of $1,000 per year for five years, assuming an 8% discount rate. In essence, discounting reverses the compounding process and converts a future sum of money to a current sum by discounting or penalizing it for the fact that you don't have it now, but have to wait to get it and consequently give up any earnings you could obtain if you had it today.

Table 2. Computations to Discount to Present Value

Year	Cash Flow		Discount Factor		Present Value
1	$1,000	x	0.9259	=	$925.90
2	1,000	x	0.8573	=	857.30
3	1,000	x	0.7938	=	793.80
4	1,000	x	0.7350	=	735.00
5	1,000	x	0.6806	=	680.60
				Total	$3,992.60

Net Present Value

Using these concepts of the time value of money, you can determine the net present value (NPV) for a particular investment as the sum of the annual cash flows discounted for any delay in receiving them, minus the investment outlay.

In mathematical notation this set of computations can be summarized as:

$$N = \sum_{n=1}^{K} \frac{I_n}{(1+d)^n} - O$$

Where *N* denotes net present value; ***n*** denotes the time period, with *K* indicating the last period an inflow is expected; Σ denotes a summation of all n periods; I_n denotes the net cash inflow in period ***n***; ***d*** the rate of discount; and ***O*** the cash outlay required to purchase the capital asset.

There are six steps to complete this net present value analysis procedure:

Step 1. Choose an appropriate discount rate to reflect the time value of money.

Step 2. Calculate the present value of the cash outlay required to purchase the asset.

Step 3. Calculate the benefits or annual net cash flow for each year from the investment over its useful life.

Step 4. Calculate the present value of the annual net cash flows.

Step 5. Compute the net present value.

Step 6. Accept or reject the investment.

These computation steps are explained in the next section. The section after that uses the example of a mechanic considering the purchase of a tow truck to illustrate the procedure.

Step 1. Choose an appropriate discount rate to reflect the time value of money.

You use the discount rate to adjust future flows of income back to their present value. The discount rate you choose essentially indicates the minimum acceptable rate of return for an investment; it represents the "cutoff criterion" in judging whether or not an investment returns at least the cost of the debt and equity funds that must be committed or acquired by the business to obtain the asset.

How should you determine the combination of debt and equity funds used to finance an investment? In the long run, the funds you use to acquire any capital item will come from both debt (borrowed funds) and equity (your financial contribution to the business) sources. Therefore, you should base the cost of capital on the combination of debt and equity capital used in the "long run" to finance the operation, not the specific combination of debt and equity that you may use to finance a particular purchase. Even though you may use a high proportion of debt to finance current investments, using this debt now will reduce your business's ability to use credit in the financing of future investments.

The objective is to evaluate investment alternatives based on the long-run optimal capital structure of the business—the capital structure or combination of debt and equity that you expect to maintain over a number of years. To determine the long-run cost of capital (based on this optimal capital structure) for the business, you must weight the cost of debt funds and the cost of equity funds by the long-run proportions of debt and equity that will be used to finance the business. This results in a weighted cost of capital that can be summarized as:

$$d = K_e W_e (1 - t) + K_d W_d (1 - t)$$

Where d is the discount rate, K_e is the cost of equity funds (rate of return on equity capital), W_e is the proportion of equity funds used in your business, K_d is the cost of debt funds (interest), t is the marginal tax rate, and W_d is the proportion of debt funds in your business.

The purpose of the weighted cost of capital formula is to obtain a discount rate that accurately reflects the long-run direct cost of debt funds and the opportunity cost of equity funds, along with the long-run proportions of debt and equity that will be used in the firm. Note that the cost of equity funds is best estimated as the opportunity cost (income foregone) of committing equity to this particular investment compared to other investments.

The best way to specifically measure this cost is to look at the rate of return being generated by the equity capital currently being used in your business. You calculate this rate of return as the sum of the cash return plus the gain in asset values divided by net worth or equity (market value basis) as measured on your business's balance sheet. You calculate the annual cash return as annual net income from the income statement. You determine annual capital gain by comparing the market value of assets of the business this year to the value last year; you can obtain these data from your balance sheet.

Because the cash flows that you will discount in Step 3 will be computed on an after-tax basis to reflect all costs and cash flows, you should compute the discount rate on an after-tax basis as well. So you multiply the cost of equity (K_e) times one minus the marginal tax rate ($1 - t$) to adjust it to an after-tax rate. Also note that because interest (the cost of debt funds) is

tax deductible, thus reducing the tax liability of the business, the true cost of debt is the rate of interest on debt funds minus the tax savings. Equivalently, the true after-tax cost of debt can be calculated as the interest rate (K_d) times one minus the marginal tax rate ($1 - t$).

You multiply the costs of equity and debt funds by the respective proportions of equity and debt in the business to obtain the long-run cost of capital or the discount rate. You can obtain the proportions of debt and equity from your balance sheet, where W_d is calculated as total liabilities divided by total assets, and W_e is calculated as $1 - W_d$. If your current balance sheet does not reflect the desired or expected long-run mix of equity and liabilities, you should make adjustments in W_d and W_e.

For example, the current amount of debt in the balance sheet may be higher than you desire or plan to have in the long run because of a recent investment, for instance, and you plan to pay the investment off as soon as possible. In this case, you should reduce the value of W_d calculated from the current balance sheet to reflect the proportion of debt that you expect to have in the long run. Thus, if the long-run optimal or desired amount of debt and equity is not currently reflected in your balance sheet, appropriate adjustments may be required.

By using the cost of capital as the estimate of the discount rate in the net present value computation, you are evaluating the returns for a particular investment compared to the cost of the debt and equity funds committed to that investment. Consequently, a particular investment is desirable only if it will return more income than the costs that will be incurred to finance the business.

Step 2. Calculate the present value of the cash outlay required to purchase the asset.

In most cases, the present value of the cash outlay will be equal to the purchase price of the asset because all the capital must be committed at the time the purchase is made. In some cases, however, an additional capital outlay will occur in future years in order, for example, to replace equipment that wears out before the end of the useful life of a building or facility. In this situation, you must discount these future capital outlays to the present and add them to the initial outlay.

In computing the capital outlay for a particular investment, it is important to include all additional outlays that may be required. For example, if you were evaluating the construction of a new retail building, the capital outlay would include not only the purchase price of the building, but also the cost of any additional inventories that might be required. In essence, these additional working capital commitments will be necessary to operate the larger facility, and you must consider them as part of the capital outlay for the new investment.

Step 3. Calculate the benefits or annual net cash flow for each year of the investment's useful life.

As suggested by the term "discounted cash flow," the benefits to be included are the increased net cash flows that result from a particular investment. You should calculate these cash flows on an after-tax basis. Because depreciation is not a cash flow but only an accounting entry to allocate the cost of a capital item over its useful life, it does not enter directly in the computation of annual net cash flows. Instead, depreciation enters the calculations only as it influences the tax liability or the tax savings of a particular investment. In addition, since the discount rate reflects current expectations of inflation because the data used in the calculation come from current market rates, the estimation of future cash income and cash expenses should also reflect expected price increases for inputs and outputs. You can compute the annual net cash flows for an investment using the following format:

Cash Revenue – Cash Expenses
+ Terminal Value – Income Taxes
= Annual Net Cash Flow

You would calculate cash revenue for a particular investment as product sales from that particular investment times the expected prices, whereas cash expenses would include the cash costs of the inputs used in production. Note that interest on debt used to finance the investment is not included as a cash expense because it has already been included in the computation of the cost of capital (Step 1).

You compute income taxes as:

Cash Revenue
– Cash Expenses
– Depreciation
= Net Income

Then,

Net Income x Marginal Tax Rate

= Taxes

The marginal tax rate reflects the additional taxes that will be paid on income generated by the particular investment. Note that depreciation enters in this computation of the tax liability. As shown above, the additional tax liability will reduce the net cash flow from a particular investment.

You should include the terminal value, also known as "salvage value," of a particular machine or a piece of equipment as a positive cash flow in the last year if it is to be sold or traded on a new item. The salvage value is part of the cash benefit stream that will be received if the capital item is sold. Or if it is traded for a new capital item, as is often the case with machinery, the salvage value reflects the reduced cash outlay that will be incurred to purchase the new machine.

After you compute the annual net cash flow for each year of the project, you have produced a series of annual net cash flows.

Step 4. Calculate the present value of the annual net cash flows.

In Step 3, you calculated the annual net cash flow stream for the entire useful life of the asset. Now you want to convert this stream into a single figure that represents the current or present value of such a stream of income over time. As has been suggested earlier, you can determine the present value of income that will be received sometime in the future by multiplying the annual income times the discount factor for the appropriate discount rate and year. By multiplying the annual net cash flow for each year times the discount factor and then summing the discounted annual net cash flows, you can obtain a single present value figure.

You obtain the discount factors to be used in this computation from the table in the appendix. Determine the factor for each year by entering the number from the table for the appropriate discount rate in Step 1 and the appropriate year. For example, if you calculated a discount rate of 12% in Step 1, the discount factor for year 1 to be used in the computation of the present value of the annual net cash flows would be 0.8929. Likewise, the discount factor for year 2 (12 %) would be 0.7972.

Step 5. Compute the net present value.

You simply compute net present value as the present value of the net cash flows obtained in Step 4 minus the present value of the cash outlay to purchase the investment of Step 2:

Present value of net cash flows – Present value of cash

= Net present value

Step 6. Accept or reject the investment.

The criterion for accepting or rejecting an investment is simple if the alternatives are mutually exclusive: accept an investment if it has a positive net present value or reject that investment if it has a negative net present value. This simple criterion is possible because when the benefit stream or the annual net cash flows for a particular investment are discounted with the cost of capital, the resulting figure represents the maximum amount that you could afford to pay for the investment and expect to just "break even," including opportunity costs on the money invested. Therefore, a net present value of zero indicates that the particular investment is generating a return exactly equivalent to the cost of capital or the cost of debt and equity funds that have been used to finance the investment.

A positive net present value indicates that the particular investment is generating a benefit stream larger than the cost of the funds used to finance the investment; hence, the investment is a profitable one. In essence, the additional return adjusted by the time value of money is larger than the additional cost of the investment. In contrast, a negative net present value indicates that the increased income received from the investment will be less than the cost of funds required to support that investment. Thus, the investment is undesirable, and you should commit the funds to some alternative investment that will generate a return at least equivalent to their cost.

In some cases, the decision may not be one of accepting or rejecting a particular investment but of choosing among a number of alternative investments. In this situation, you can rank the investment alternatives in order of preference based on their net present values, with the alternative having the highest net present value ranked first and the one with the

lowest net present value ranked last. You would then implement all those alternatives with a positive net present value if the funds were available to do so. If the funds to acquire the alternative investments were limited, you would choose that combination of projects that generates the largest total net present value with the limited funds.

A Profitability Example

To show you how to use the net present value procedure in capital budgeting, let's apply it to an example of deciding whether a mechanic should add a tow truck to his business. A good tow truck can be bought for $76,800. The mechanic has researched the costs to operate the truck and the possible revenues that could be earned. Additionally, he has estimated that the truck would be worth about $30,000 when the project would end in five years.

The tax rate is expected to be 35%, and the business will finance the project with 60% equity and 40% debt in the long run. The cost of equity capital (return on equity funds currently being used in the business) is 13.4%, and debt funds can be borrowed at 10.6%.

Step 1. Choose an appropriate discount rate to reflect the time value of money.

The mechanic would compute the discount rate as:

$$
\begin{aligned}
d &= K_e W_e (1 - t) + K_d W_d (1 - t) \\
&= 0.134 \times 0.6 \times 0.65 + 0.106 \times 0.4 \times 0.65 \\
&= 0.052 + 0.028 \\
&= 0.08
\end{aligned}
$$

Where

d	=	discount rate
K_e	=	cost of equity (rate of return on equity capital)
W_e	=	proportion of equity funds used in the business
K_d	=	cost of debt funds (interest)
W_d	=	proportion of debt funds in the business
t	=	tax rate

Step 2. Calculate the present value of the cash outlay required to purchase the asset.

The purchase price of the truck is $76,800. No additional working capital will be required, and the total outlay must be committed immediately. So the present value of the cash outlay is $76,800.

Step 3. Calculate the benefits or annual net cash flow for each year from the investment over its useful life.

The revenue from operating the truck is calculated to be $42,032 for the first year. Similarly, there are expenses associated with its operation. These are estimated to be $20,301 for year one and increase each year because of inflation.

To calculate taxes, the mechanic would subtract expenses and depreciation from the revenue to find the taxable income. These taxes will then be removed from the revenue along with the cash expenses to give annual net cash flow, which, in the first year, will be $5,590.

He would thus compute the annual net cash flows as follows for year one:

	$42,032	(cash revenue)
–	20,301	(cash expenses)
+	0	(salvage value)
–	5,590	(taxes)
=	$16,141	(annual net cash flow)

He computed income taxes for year one as:

	$42,032	(cash revenue)
–	20,301	(cash expenses)
–	5,760	(taxes)
=	$15,971	(net income)

Then,

$15,971 (net income) x 35% (marginal tax rate)

= $5,590 (taxes)

Annual computations, based on the mechanic's estimations of revenue and expenses, would be as shown in Table 3.

Table 3. Annual Cash Flows for an Investment Project

Year	Cash Revenue	Cash Expense	Salvage Value	Taxes	Net Cash Flow
1	$42,032	$20,301		$5,590	$16,141
2	42,360	20,910		3,777	17,673
3	42,122	21,242		4,139	16,741
4	41,887	21,583		4,413	15,891
5	41,654	21,931	30,000	15,054	34,669

Step 4. Calculate the present value of the annual net cash flows.

The mechanic would compute the present value of the net cash flows as the sum of the discounted annual net cash flows (net cash flow times the discount factor) (Table 4).

Table 4. Computations to Reach Net Cash Flow for Each Year of an Investment

Year	Annual Net Cash Flow	Discount Factor	Present Value of Annual Net Cash Flow
1	$16,141	0.9259	$14,945
2	$17,673	0.8573	$15,151
3	$16,741	0.7938	$13,289
4	$15,891	0.7350	$11,680
5	$34,669	0.6806	$23,596
Present value of the net cash flows			$78,661

Step 5. Compute the net present value.

Net present value is computed as the present value of the net cash flows minus the present value of the cash outlay:

$78,661 – $76,800 = $1,861

Step 6. Accept or reject the investment.

Based on the positive net present value of Step 5, the mechanic's decision would be to buy the tow truck and add that service to his business. The tow truck will generate a return that exceeds the cost of funding the venture—it generates a positive net present value.

Financial Feasibility

Once you have analyzed the profitability of various investments and chosen an alternative, you need to evaluate its financial feasibility. Financial feasibility analysis determines whether or not the investment will generate sufficient cash income to make the principal and interest payments on borrowed funds used to purchase the asset. If you will be making the purchase with equity funds and a loan is not required, then financial feasibility analysis is unnecessary.

Feasibility Calculation

The first step in financial feasibility analysis is to determine the annual net cash flows for your project. Fortunately, you have already calculated these annual flows as part of your economic profitability analysis. Next, you must determine the annual principal and interest payments based on the loan repayment schedule. Because the annual net cash flows are after-tax and the payment schedule is before-tax, you must adjust this payment schedule to an after-tax basis by calculating the tax savings from the deductibility of interest and subtracting this savings from the payment schedule. Then, you compare the annual net cash flow to the after-tax annual principal and interest payments to determine if a cash surplus or deficit will occur.

If a cash surplus results, the investment project will generate sufficient cash flow to make the loan payments, and the project is financially feasible as well as economically profitable. If a cash deficit results, the project is not financially feasible—it will not generate sufficient cash income to make the loan payments. Cash deficits do not mean that the investment is unprofitable or should not be made; they simply mean that you will likely encounter loan servicing problems.

You can reduce or eliminate cash deficits in a number of ways. Extending the loan terms (i.e., more years to repay the principal) will result in lower annual debt servicing requirements, thus reducing the deficit. Increasing the amount of the

down payment will reduce the size of the loan and the annual principal and interest payments. Possibly, you could increase the net cash flow from the project by controlling expenses more carefully or increasing utilization. If you cannot reduce or eliminate the deficit, then you must subsidize with cash from some other source to make the capital purchase financially feasible. By completing a financial feasibility analysis, you can estimate the size of the needed subsidy.

A Feasibility Example

To illustrate the use of financial feasibility analysis, let's apply it to the earlier example of the decision to invest in a tow truck. Assume that the lender has agreed to a five-year loan for the full purchase price with five equal annual principal payments and 8.3% interest on the outstanding balance.

The data used in the financial feasibility analysis are summarized in Table 5. You calculated the annual net cash flow (not the *discounted* net cash flow) earlier in the economic profitability analysis (see Step 3). The loan payment schedule calls for an annual payment of $19,387.

You calculate the tax savings from interest deductibility as the interest payments times the marginal tax bracket (35% in this example), resulting in an after-tax payment schedule as noted. As indicated in the last column of the table, cash deficits occur in several years of the project. Thus, even though the project is profitable, it will not produce sufficient cash to make the loan payments.

This does not necessarily mean that the mechanic should not make the investment. It does mean that it will not generate enough cash to make the loan payment. Consequently, the mechanic should consider changes such as a longer term loan or a down payment and smaller loan. Other possibilities to make the project financially feasible would be to subsidize it with cash from elsewhere or reduce expenses so as to increase the cash flow from the investment.

Final Comment

The net present value method (NPV) of evaluating an investment allows you to consider the time value of money. Essentially, it helps you find the present value in "today's dollars" of the future net cash flow of a project. Then, you can compare that amount with the amount of money needed to implement the project. If the present value is greater than the cost, the project will provide a return on investment in excess of capital costs. If you are considering more than one project, you can compute the NPV of both and choose the one with the greatest NPV. The six steps in this publication show you how to calculate the NPV.

Calculating the net present value of a project will tell you whether you will make a profit on the project overall. But in some years you may not have positive cash flows. An NPV does not tell you how much money may need to be borrowed to make up for a loss in a particular year. To estimate the cash needs in each year, you should calculate the financial feasibility of the project.

Table 5. Information Used in Feasibility Calculations

Year	Annual Net Cash Flow	*Payment Schedule*			Tax Savings from Investment Deductibility	After-Tax Payment Schedule	Surplus or Deficit
		Principal	Interest	Total			
1	$16,141	$13,013	$6,374	$19,387	$2,231	$17,156	$-1,015
2	17,673	14,093	5294	19,387	1,853	17,534	139
3	16,741	15,262	4125	19,387	1,444	17,944	-1,203
4	15,891	16,529	2858	19,387	1,000	18,387	-2,496
5	34,669	17,901	1486	19,387	520	18,867	15,802

Appendix: Present Value of $1. Formula: $1 / (1 + i)n

Period	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%	6.5%	7.0%	7.5%	8.0%
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	.9709	.9662	.9615	.9569	.9524	.9479	.9434	.9390	.9346	.9302	.9259
2	.9426	.9335	.9246	.9157	.9070	.8985	.8900	.8817	.8734	.8653	.8573
3	.9151	.9019	.8890	.8763	.8638	.8516	.8396	.8278	.8163	.8050	.7938
4	.8885	.8714	.8548	.8386	.8227	.8072	.7921	.7773	.7629	.7488	.7350
5	.8626	.8420	.8219	.8025	.7835	.7651	.7473	.7299	.7130	.6966	.6806
6	.8375	.8135	.7903	.7679	.7462	.7252	.7050	.6853	.6663	.6480	.6302
7	.8131	.7860	.7599	.7348	.7107	.6874	.6651	.6435	.6227	.6028	.5835
8	.7894	.7594	.7307	.7032	.6768	.6516	.6274	.6042	.5820	.5607	.5403
9	.7664	.7337	.7026	.6729	.6446	.6176	.5919	.5674	.5439	.5216	.5002
10	.7441	.7089	.6756	.6439	.6139	.5854	.5584	.5327	.5083	.4852	.4632
11	.7224	.6849	.6496	.6162	.5847	.5549	.5268	.5002	.4751	.4513	.4289
12	.7014	.6618	.6246	.5897	.5568	.5260	.4970	.4697	.4440	.4199	.3971
13	.6810	.6394	.6006	.5643	.5303	.4986	.4688	.4410	.4150	.3906	.3677
14	.6611	.6178	.5775	.5400	.5051	.4726	.4423	.4141	.3878	.3633	.3405
15	.6419	.5969	.5553	.5167	.4810	.4479	.4173	.3888	.3624	.3380	.3152
16	.6232	.5767	.5339	.4945	.4581	.4246	.3936	.3651	.3387	.3144	.2919
17	.6050	.5572	.5134	.4732	.4363	.4024	.3714	.3428	.3166	.2925	.2703
18	.5874	.5384	.4936	.4528	.4155	.3815	.3503	.3219	.2959	.2720	.2502
19	.5703	.5202	.4746	.4333	.3957	.3616	.3305	.3022	.2765	.2531	.2317
20	.5537	.5026	.4564	.4146	.3769	.3427	.3118	.2838	.2584	.2354	.2145
21	.5375	.4856	.4388	.3968	.3589	.3249	.2942	.2665	.2415	.2190	.1987
22	.5219	.4692	.4220	.3797	.3418	.3079	.2775	.2502	.2257	.2037	.1839
23	.5067	.4533	.4057	.3634	.3256	.2919	.2618	.2349	.2109	.1895	.1703
24	.4919	.4380	.3901	.3477	.3101	.2767	.2470	.2206	.1971	.1763	.1577
25	.4776	.4231	.3751	.3327	.2953	.2622	.2330	.2071	.1842	.1640	.1460
30	.4120	.3563	.3083	.2670	.2314	.2006	.1741	.1512	.1314	.1142	.0994
40	.3066	.2526	.2083	.1719	.1420	.1175	.0972	.0805	.0668	.0554	.0460
60	.1697	.1269	.0951	.0713	.0535	.0403	.0303	.0229	.0173	.0130	.0099

Appendix: Present Value of $1. Formula: $1 / (1 + i)n continued

Period	8.5%	9.0%	9.5%	10.0%	10.5%	11.0%	11.5%	12.0%	12.5%	13.0%	13.5%
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	.9217	.9174	.9132	.9091	.9050	.9009	.8969	.8929	.8889	.8850	.8811
2	.8495	.8417	.8340	.8264	.8190	.8116	.8044	.7972	.7901	.7831	.7763
3	.7829	.7722	.7617	.7513	.7412	.7312	.7214	.7118	.7023	.6931	.6839
4	.7216	.7084	.6956	.6830	.6707	.6587	.6470	.6355	.6243	.6133	.6026
5	.6650	.6499	.6352	.6209	.6070	.5935	.5803	.5674	.5549	.5428	.5309
6	.6129	.5963	.5801	.5645	.5493	.5346	.5204	.5066	.4933	.4803	.4678
7	.5649	.5470	.5298	.5132	.4971	.4817	.4667	.4523	.4385	.4251	.4121
8	.5207	.5019	.4838	.4665	.4499	.4339	.4186	.4039	.3897	.3762	.3631
9	.4799	.4604	.4418	.4241	.4071	.3909	.3754	.3606	.3464	.3329	.3199
10	.4423	.4224	.4035	.3855	.3684	.3522	.3367	.3220	.3079	.2946	.2819
11	.4076	.3875	.3685	.3505	.3334	.3173	.3020	.2875	.2737	.2607	.2483
12	.3757	.3555	.3365	.3186	.3018	.2858	.2708	.2567	.2433	.2307	.2188
13	.3463	.3262	.3073	.2897	.2731	.2575	.2429	.2292	.2163	.2042	.1928
14	.3191	.2992	.2807	.2633	.2471	.2320	.2178	.2046	.1922	.1807	.1698
15	.2941	.2745	.2563	.2394	.2236	.2090	.1954	.1827	.1709	.1599	.1496
16	.2711	.2519	.2341	.2176	.2024	.1883	.1752	.1631	.1519	.1415	.1318
17	.2499	.2311	.2138	.1978	.1832	.1696	.1572	.1456	.1350	.1252	.1162
18	.2303	.2120	.1952	.1799	.1658	.1528	.1409	.1300	.1200	.1108	.1023
19	.2122	.1945	.1783	.1635	.1500	.1377	.1264	.1161	.1067	.0981	.0902
20	.1956	.1784	.1628	.1486	.1358	.1240	.1134	.1037	.0948	.0868	.0794
21	.1803	.1637	.1487	.1351	.1229	.1117	.1017	.0926	.0843	.0768	.0700
22	.1662	.1502	.1358	.1228	.1112	.1007	.0912	.0826	.0749	.0680	.0617
23	.1531	.1378	.1240	.1117	.1006	.0907	.0818	.0738	.0666	.0601	.0543
24	.1412	.1264	.1133	.1015	.0911	.0817	.0734	.0659	.0592	.0532	.0479
25	.1301	.1160	.1034	.0923	.0824	.0736	.0658	.0588	.0526	.0471	.0422
30	.0865	.0754	.0657	.0573	.0500	.0437	.0382	.0334	.0292	.0256	.0224
40	.0383	.0318	.0265	.0221	.0184	.0154	.0129	.0107	.0090	.0075	.0063
60	.0075	.0057	.0043	.0033	.0025	.0019	.0015	.0011	.0009	.0007	.0005

Appendix: Present Value of $1. Formula: $1 / (1 + i)n continued

Period	14.0%	14.5%	15.0%	15.5%	16.0%	16.5%	17.0%	17.5%	18.0%	18.5%
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1	.8772	.8734	.8696	.8658	.8621	.8584	.8547	.8511	.8475	.8439
2	.7695	.7628	.7561	.7496	.7432	.7368	.7305	.7243	.7182	.7121
3	.6750	.6662	.6575	.6490	.6407	.6324	.6244	.6164	.6086	.6010
4	.5921	.5818	.5718	.5619	.5523	.5429	.5337	.5246	.5158	.5071
5	.5194	.5081	.4972	.4865	.4761	.4660	.4561	.4465	.4371	.4280
6	.4556	.4438	.4323	.4212	.4104	.4000	.3898	.3800	.3704	.3612
7	.3996	.3876	.3759	.3647	.3538	.3433	.3332	.3234	.3139	.3048
8	.3506	.3385	.3269	.3158	.3050	.2947	.2848	.2752	.2660	.2572
9	.3075	.2956	.2843	.2734	.2630	.2530	.2434	.2342	.2255	.2170
10	.2697	.2582	.2472	.2367	.2267	.2171	.2080	.1994	.1911	.1832
11	.2366	.2255	.2149	.2049	.1954	.1864	.1778	.1697	.1619	.1546
12	.2076	.1969	.1869	.1774	.1685	.1600	.1520	.1444	.1372	.1304
13	.1821	.1720	.1625	.1536	.1452	.1373	.1299	.1229	.1163	.1101
14	.1597	.1502	.1413	.1330	.1252	.1179	.1110	.1046	.0985	.0929
15	.1401	.1312	.1229	.1152	.1079	.1012	.0949	.0890	.0835	.0784
16	.1229	.1146	.1069	.0997	.0930	.0869	.0811	.0758	.0708	.0661
17	.1078	.1001	.0929	.0863	.0802	.0746	.0693	.0645	.0600	.0558
18	.0946	.0874	.0808	.0747	.0691	.0640	.0592	.0549	.0508	.0471
19	.0829	.0763	.0703	.0647	.0596	.0549	.0506	.0467	.0431	.0398
20	.0728	.0667	.0611	.0560	.0514	.0471	.0433	.0397	.0365	.0335
21	.0638	.0582	.0531	.0485	.0443	.0405	.0370	.0338	.0309	.0283
22	.0560	.0508	.0462	.0420	.0382	.0347	.0316	.0288	.0262	.0239
23	.0491	.0444	.0402	.0364	.0329	.0298	.0270	.0245	.0222	.0202
24	.0431	.0388	.0349	.0315	.0284	.0256	.0231	.0208	.0188	.0170
25	.0378	.0339	.0304	.0273	.0245	.0220	.0197	.0177	.0160	.0144
30	.0196	.0172	.0151	.0133	.0116	.0102	.0090	.0079	.0070	.0061
40	.0053	.0044	.0037	.0031	.0026	.0022	.0019	.0016	.0013	.0011
60	.0004	.0003	.0002	.0002	.0001	.0001	.0001	.0001	.0000	.0000