CHAPTER 3: QUESTIONS

1. *A new investment project is to demolish an existing gas station and construct a small shopping mall. Which of the items should be treated as incremental cash flows relevant to the investment decision?*

a. The current value of the land.
b. The current value of the gasoline-retailing business.
c. The cost of wrecking the gas station, digging up the tanks, and cleaning the land.
d. The cost of new antipollution devices installed by order of the local government six months ago.
e. Lost earnings on other real estate projects owing to staff time that will be spent if the mall is built.
f. An allocated portion of the depreciation from the company's headquarters building.
g. The fee that has already been paid to an architect for designing the mall.
h. Future noncash expenses such as depreciation that will result if the mall is built. i. Allocation of corporate overhead to the project.

Answer: The incremental cash flows relevant to the decision include items a, b, c, e, and h. The current value of the land (a) is used by both the gas station and the mall. However, the land may be sold; therefore, its value is incremental (as an opportunity cost). Items (d) and (g) are sunk costs. Items (f) and (i) represent suspicious allocations of corporate overhead to the mini-mall project.

In effect, the owner must examine the following three alternatives and select the one with the maximum value:

i) Keep the gasoline business and either continue to operate it or sell it to someone else.
ii) Tear the gasoline station down and selling the land.
iii) Tear the gasoline station down and put up the shopping mall.

2. *A soft drink bottler is trying to determine the present value of its business in an area where it forecasts no growth in unit sales. Sales this year will be $10 million and expenses will be $9*

million. The present rate of return required is 20 percent, and inflation is expected to be 10 percent indefinitely.

The company president believes that the present value of the business is $5 million, that is, $1 million per year discounted at 20 percent. His assistant argues that the present value is $1 million divided by 10 percent, the expected real interest rate. This yields an NPV of $10 million. What is the correct solution to the valuation problem?

Answer: We interpret the phrase "no growth" to refer to lack of unit sales growth. The price of soft drinks and the corresponding expenses are assumed to grow at the average rate of inflation. The assistant is correct; real cash flows should be discounted at real interest rates. We expect to have $1M in earnings in the next year. In real terms, this represents $1M/(1.10) = 0.909M, since the one year inflation rate is 10%. If these earnings continue to grow at the rate of inflation, then they will be constant in real terms, so we discount the level perpetuity of 0.909M at the real interest rate of 9.09% (Note that (1 + nominal rate) = (1 + real rate)(1 + expected inflation). The NPV is $10M (=0.909M/0.0909).

3. *In late 1985, Donald Trump, the New York real estate developer, unveiled a plan to build the tallest building in the world on Manhattan's West Side as the centerpiece of a commercial and residential complex to be known as Television City. He bought the land in 1981 for only $81 million. By 1985, its estimated value was $2 billion. "I can do things that no one else can do because I got the land so cheap," said Trump. The Donald is (was?) very rich, but is he correct?*

Answer: Perhaps Donald Trump presents a different face to the public. If he uses $81M as the cost of the property, any investment will look profitable, even the simple strategy of selling the undeveloped property for $2B. Other development strategies have to compete against this simple strategy; they will not look as profitable in this light. In other words, the present value of the marginal benefits of any development project he undertakes should exceed the present value of the marginal costs of the development. The calculation of marginal benefits will not include the tremendous increase in the value of the land.

Consider the following example. Suppose the present value of the benefits of a proposed real-estate project is $100M. How should Trump determine its NPV?

A. $100M ─ $81M = $19 Million
B. $100M ─ $ 2B = ─$1.9 Billion

Method A is consistent with Trump's statement. Method B, however, is correct.

4. *In May 1992, IBM announced plans to resell the ultra-powerful PCs of Parallan Computer. However, according to one analyst, "In pushing into increasingly powerful and expensive PCs, IBM runs the risk of cannibalizing its own sales of minicomputers." How should this possibility be factored into IBM's investment decision?*

Answer: Answer. The real question that IBM should raise is not whether it will lose sales of its existing minicomputers but what will happen to sales if it doesn't sell Parallan's PCs. In other words, the relevant consequence of sales of Parallan's PCs for capital budgeting purposes is the incremental effect of any cannibalization that occurs—which equals the lost profit on lost sales that would not otherwise have been lost had the new product not been introduced. Those sales that would have been lost anyway should not be counted a casualty of cannibalization.
In general, a project's incremental cash flows can be found only by subtracting worldwide corporate cash flows without the investment—the base case—from post-investment corporate cash flows. To come up with a realistic base case, and thus a reasonable estimate of incremental cash flows, the key question that managers must ask is, "What will happen if we don't make this investment?" The critical error made by many companies is to ignore competitor behavior and assume that the base case is the status quo. But in a competitive world economy, the least likely future scenario is the status quo. A company that opts not to come out with a new product because it is afraid that the product will cannibalize its existing product line is most likely leaving a profitable niche for some other company to exploit. Sales will be lost anyway, but now they will be lost to a competitor. Similarly, a company that chooses not to invest in a new process technology because it calculates that the higher quality is not worth the added cost may discover that it is losing sales to competitors who have made the investment. In a competitive market, the rule is simple: If you must be the victim of a cannibal, make sure the cannibal is a member of your family.

Failure to heed this rule led IBM to slight investment in and sales of small computers despite the challenge from personal computers, minicomputers, and workstations; small computers looked less profitable to sell than IBM's mainframes. Instead of trying to figure out a way to compete in a world in which the advent of the microprocessor, and the powerful personal computers and workstations it helped create, turned computer hardware into a low-margin commodity product, IBM tried to protect its profitable mainframe business by slowing down or axing products that were even vaguely competitive with its mainframes. For example, in the mid-1970s, IBM researchers pioneered reduced instruction-set computing, or RISC, a revolutionary technology for designing faster computers. But the advance wasn't rushed into products, largely because it was seen as a menace to IBM's mainframe business. Competitors like Sun Microsystems, Dell, Compaq, and Hewlett-Packard, with no mainframe business of their own to protect, took advantage of IBM's inertia by running rings around it in the personal computer and workstation markets (Sun harnessed RISC technology to now lead in RISC-based workstations), stealing sales from its mainframe business anyway. By trying so hard not to cannibalize its mainframes, IBM lost sales and profits to its competitors.

In contrast to IBM, Intel is a model cannibal. Once threatened by copycats cloning its popular 80386 chip, the semiconductor giant responded aggressively. Intel slashed prices, undercutting the cloners, then rolled out a better generation of chips that will eventually make its old lines obsolete. According to one analyst, "Intel said to competitors: 'You'd better run as fast as we are, because we're destroying the pavement behind us as we move along.' They plundered and burned the 386 market. Trashed it. Destroyed it." If IBM fails to sell Parallan's PCs because of a fear of cannibalization, it will likely just be repeating its past errors.

5. *Flexible manufacturing systems enable companies to respond quickly to emerging market trends and to easily accommodate product redesigns as technology changes. What is there in these advantages that sometimes leads companies applying the traditional discounted cash flow analysis to under-invest in such systems? That is, why do companies sometimes underestimate the value of flexible manufacturing systems in the sense of assigning negative NPVs to positive NPV projects?*

Answer: Flexible manufacturing systems are often costly, difficult to administer, and hard to defend in the short term. However, they make it easier for a company to adapt to a changing technological and business environment and a more competitive marketplace. That is, they give companies options that would otherwise might not exist. With such systems in place, the firm will find it easier to enter and capture niche markets as they emerge. The relevant base case may not be the status quo, but rather, an anticipated decline in sales following competitors' adaptations to the new technology. This ease of adaptation has a value to the firm; it may make all future investments more profitable. Firms may underestimate NPV when they fail to take the option-like characteristics of the new technology into account, and mistakenly assume that the status quo will be maintained in the absence of adaptation.

6. *Many companies are now installing marketing and sales productivity (MSP) systems that automate routine tasks and gather, update, and interpret data that were either scattered or uncollected before. These data include information about every sales lead generated, every sales task performed, and every customer prospect closed or terminated. Describe some of the direct costs and benefits that might be associated with an MSP system. What are some intangible benefits of an MSP system as well as some hidden costs of implementing such a system?*

Answer: An MSP system delivers tangible productivity gains, like reducing paper work, improving the quality of telephone campaigns by pre-qualifying sales leads, and increasing sales force productivity by reducing the time salepeople spend on non-selling tasks (such as scheduling sales calls, compiling sales reports, generating proposals and bids, and entering orders). Intangible benefits are more difficult to quantify, but may be more important in the long run. An MSP system tracks every one of a company's marketing and sales activities, from advertising that generates sales leads to direct mail and telephone qualification of the leads to closing the first sale—all the way through the life of each account. By analyzing the data the MSP system gathers—data that were previously unavailable—marketing and sales management are now able to relate marketing actions with marketplace results. As such, an MSP system can improve the timeliness and quality of marketing decision making and lead to more responsive customer service and deeper understanding of customers. MSP systems also reduce marketing inertia because they streamline the implementation of marketing programs. Moreover, by linking orders, services delivered, and prices paid with the actual costs of lead generation, preselling, closing, distribution, and post sale support, MSP systems furnish the tools for analyzing and adjusting the marketing mix (personal selling, direct mail, telemarketing, advertising, pricing, other promotional efforts) and product mix.

The direct costs of such a system include the cost of the computer and telecommunications

hardware, the software, and the cost of tying all those pieces together. Expensive as these direct costs are, the hidden costs can double or even triple the overall cost. These hidden costs include system customization, expert consulting, and end-user training. Moreover, because malfunctioning of an automated marketing system can threaten a business's revenue stream, most companies will probably have to run both systems—automated and manual—until the network has proved out .

7. *Accrued pension benefits represent an obligation of a company for the past service of its employees. No current or future action can affect this obligation. The amortization of accrued pension benefits must be recognized, however, as a current expense in the company's financial statements. Many companies turn around and allocate these costs to divisions. One company allocated these costs in proportion to pension benefits accrued by its workers. A plant with an older work force received almost all of its division's accrued pension costs, adding $4 per hour to the plant's labor cost relative to the cost of several newer plants with much younger workers.*

a. *How is this allocation of accrued pension benefits likely to affect future investment decisions? The competitiveness of products manufactured by the plant?*

Answer: Some positive NPV future investment decisions may be foregone if the divisions assign accrued pension benefits to the projects considered. Pension obligations committed in the past represent sunk costs. Also, the division in a competitive environment will be expected to show strong profits net of accrued pension benefits. In a competitive market, the firm may not be able to cut price enough to retain market share if it is required to price high enough to cover its accrued pension liabilities.

b. *Suppose that because of its high labor costs, the company decided to shut down the older plant and shift work to the newer ones. How will this decision affect the company's competitiveness?*

Answer: The company must still meet its accrued pension obligation. It is possible that the shut-down will improve the company's competitiveness, but the merits of this decision should be evaluated in the absence of lower apparent accrued pension costs. It is more likely that the company would become less competitive; older workers may be more skilled and/or more productive than their younger counterparts.

c. *How should the company treat accrued pension benefits for investment, product sourcing, and pricing purposes?*

Answer: The company should treat existing pension benefits as (sunk) overhead. For pricing purposes, it should examine only the marginal addition to pension liability that a project will cause, and allocate only this cost to the project.

8. *Starshine Products is considering the launch of a new line of dolls that would use an assembly line that currently has some spare capacity. Some Starshine executives argued that*

because the assembly line was already paid for, its cost was sunk and should not be included in the project evaluation. Others argued that the assembly line was a scarce resource and should be priced accordingly. What cost should Starshine assign to use of the excess assembly line capacity?

Answer: The cost associated with the additional use of the line due to the new project should be allocated to the new project. This includes, but is not limited to, the additional costs of power, labor, maintenance and repair, changes in expected replacement costs incurred earlier by additional use, and any opportunity costs of the line usage. For example, are there other potential future uses of the spare capacity, e.g. sales growth of the current product line? The answer depends upon the alternative uses of the assembly line.

9. *In order to produce its new line of canned foods, Hammond Foods must purchase a specialized piece of equipment that has the capacity to fill a million cans annually. Suppose Hammond plans to initially produce 150,000 cans annually. Some executives argued that the new product line should be charged for only 15 percent of the cost of the new equipment. Others argued that it should bear the full cost of the special-purpose machinery. Who is right? Explain.*

Answer: It would be appropriate to charge the full cost of equipment against the project's benefits provided there is no other user. Clearly, the machine (the remaining 85%) would not be purchased in the absence of this production decision; it represents a truly incremental cash flow. Also, to the extent that the extra capacity gives the company an option to cheaply expand production, the option value should also be included in the purchase/production decision.

10. *Happy Tub makes traditional cast-iron bathtubs. However, the company was thinking of adopting a novel proprietary casting process to make lighter bathtubs that could compete better against plastic ones which were eating into sales, while also reducing raw materials costs. The $25 million investment seemed wise from a marketing perspective, but its NPV came to -$3 million. What other factors should you consider in light of the following assumptions that entered into this figure?*

a. The base case implicitly assumed that sales would stay the same without the new investment.

b. Happy Tub has two plants, both running below capacity. Since just one plant would be upgraded, however, only products made at that plant would benefit from the new efficiencies. Thus, the finance director used a high discount rate to reflect the highly uncertain volumes and costs savings from using the new process.

c. Happy Tub used a standard ten-year life to evaluate the new project. Since ten years was also the standard life over which plant and machinery were depreciated, the finance director inserted a zero terminal value for the upgraded plant.

d. Happy Tub ignored the other opportunities that the introduction of the proprietary casting

process might create since these opportunities were purely speculative.

e. Although the proprietary casting process promised quality improvements, the investment analysis assumed that any sales of the new bathtub would just replace sales of Happy Tub's cast iron tubs. The analysis considered the cost savings from reduced raw materials usage to be the only source of project gains.

Answer:

CHAPTER 3: PROBLEMS

1. *TelCo must decide whether to replace a computer system with a new model. TelCo forecasts net before-tax cost savings from the new computer over five years as given below (in $000). It has a 12 percent cost of capital, a 35 percent tax rate, and uses straight-line depreciation.*

Year	1	2	3	4	5
($)	350	350	300	300	300

a. *The new computer costs $1 million but TelCo is eligible for a 15 percent investment tax credit (ITC) in the first year. The ITC reduces Telco's taxes by an amount equal to 15 percent of the equipment's purchase price. In addition, the old computer can be sold for $450,000. If the old computer originally cost $1.25 million and is three years old (depreciable, not economic, life is five years), what is the net investment required in the new system? Assume that there was no ITC on the old computer and that both computers are being depreciated to a zero salvage value.*

Answer: All figures are in thousands. The net investment in the machine can be found by the following equation:

Net Inv = Cost - Salv(Old) + Tax from sale of Old = 1000 - 450 - 0.35(50) = $532.50.

The book value of the old machine was $500, but it can be sold for $450, at a $50 loss. The writeoff is worth 0.35(50) = $17.50 to the company. This reduces the effective investment in the new machine.

b. *Estimate the incremental operating cash flows associated with the new system.*

Answer: The incremental cash flows can be found by calculating:

Incr Cash Flow = After Tax Savings + t * (Net Depreciation)

c. *If the new computer's salvage value at the end of five years is projected to be $100,000, should TelCo purchase it?*

Answer: If the computer has a salvage value after 5 years, and is sold at that time, the book value will be zero, and the company will have to pay a tax of 0.35 * 100 = $35 at that time. This changes the marginal cash flow to 265 + 100 - 35 = $330 in year 5.

The present value of the marginal cash flows (at 12%) is $899.19. The net present value is 899.19 - 532.50 = $366.70. The new computer should be purchased.

2. *New diesel locomotives will cost a railroad $600,000 each and can be depreciated straight-line over their five-year life. Using a diesel instead of a coal-fired steam locomotive will save $12,000 annually in operating expenses. Railroads have a required rate of return of 10 percent and a tax rate of 40 percent.*

a. What is the maximum price a railroad would be willing to pay for a coal-fired steam locomotive? (Hint: Set up the cash flows for a coal-fired locomotive at a price of P, including depreciation, and then compare them to the incremental cash flows associated with a diesel costing $600,000.)

Answer: PVIFAr=10%,n=5 = 3.790787.
Consider the decision to switch from coal-fired steam locomotives to diesel locomotives. We will find the indifference point by assuming that the net present value of the switching decision is zero.

All figures are reported in thousands. The incremental cost is (600 ─ P). Annual incremental cash flows = (1─t)(Savings) + t(Incr Depr). = 0.6(12) + 0.4(120 ─ 0.2P) = 55.2 ─ 0.08P. The present value of the incremental cash flows is PVIFA´(55.2 ─ 0.08P) or 209.251442 ─ 0.303263P. Setting this expression equal to 600 ─ P, we solve for P = $560.826. This makes NPV = 0.

b. *Will your answer to (a) change if the railroad has enormous tax-loss carryforwards that put it in a zero taxpaying position for the foreseeable future?*

Answer: Enormous tax loss carryforwards make the effective tax rate equal to zero. Therefore, the annual incremental cash flow is $12, and its present value is 12 ´ 3.790787 = 45.4894. Setting this equal to the marginal cost of (600 ─ P), we get P = $554,511. The value of the cost savings obtained by the purchase of diesel locomotives is higher, since the savings are not taxed. This makes the diesel relatively more valuable in this instance.

3. *Varico produces HO-scale trains, including a diesel locomotive that sells 100,000 units annually. Each unit requires an electric motor. Presently these are purchased once a week from a local manufacturer for $10 apiece. However, a foreign firm has offered to sell Varico a container of 100,000 motors of like quality for only $9.50 apiece. Given an interest rate of 15 percent, what should Varico do?*

Answer: By buying 100,000 motors today, the firm will have average inventory on hand of 50,000 during the year. The opportunity cost of maintaining this inventory equals

	Average Number of Units on Hand	x	Price Per Unit	x	Interest Rate		
=	50,000	x	$9.50	x	0.15	=	$1,250

By buying weekly, the firm incurs no interest expense. Thus, the real cost of buying 100,000 motors today is $950,000 + $71,250 = $1,021,250. This exceeds the $1M that it costs to buy motors at $10 apiece on a weekly basis.

4. *To capitalize on consumers' concerns about healthful food, Specific Foods, Inc., is considering a new cereal, Veggie Crisp, which contains small bits of cooked vegetables with bran flakes. As part of its cash flow analysis, the finance department has made the following forecasts of demand and cost:*

a. Sales revenue for the first year will be $200,000 and increase to $1,000,000 the next year. Revenue will then grow by 15 percent a year for the next four years, remain the same in the seventh year, and then decline by 15 percent a year for the next three years, when the product will be terminated.

b. Cost of goods sold will be 60 percent of sales.

c. Advertising and general expenses will be $10,000 a year.

d. Equipment will be purchased today for $1,250,000 and will be depreciated over the ten-year project using the straight-line method. Installation cost today is $25,000, and this is depreciated over five years, also on a straight-line basis. The equipment has no salvage value. Other initial costs (which are expensed, not depreciated) total $875,000. There is no investment tax credit.

(i). Calculate net income and operating cash flow using a 35 percent tax rate.

Answer: The income and cash flow statement ($000's) appears below (rounded mercilessly: Total PV is accurate to decimal places shown)

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sales	200	1000	1150	1323	1521	1749	1749	1487	1264	1074
CGS	120	600	690	794	913	1049	1049	892	758	644
Adv/Gen	10	10	10	10	10	10	10	10	10	10
Depr (Equip)	125	125	125	125	125	125	125	125	125	125
Depr(Inst)	5	5	5	5	5	0	0	0	0	0
OCF	91	299	338	383	434	492	492	424	366	317
PV(r=10%)	83	247	254	261	270	278	252	198	155	122

Tax rate = 35% Total PV = $2120.065

b. *Find the net present value of the project using a 10 percent cost of capital.*

Answer: Cost today = 1250 + 25 + 875(1 ─ 0.35) = $1843.750.
NPV($000's) = 2120.065 ─ 1843.750 = $276.315.
The project should be accepted.

c. *In an effort to adjust for inflation, the finance department has produced an alternative estimate of cash flows. The product price will remain the same, but advertising and general expenses will grow by 5 percent a year from its initial level of $10,000. In addition, the cost of goods sold will grow by 20 percent a year from its initial level of $600,000 until year 6, remain the same in year 7, and then decline by 15 percent a year through year 10. What is the project's net present value under these assumptions?*

Answer: Under the new cash flow estimates, the project should be rejected:

Year	1	2	3	4	5	6	7	8	9	10
Sales	200	1000	1150	1323	1521	1749	1749	1487	1264	1074
CGS	120	600	720	864	1037	1244	1244	1058	899	764
Depr(Equip)	10	11	11	12	12	13	13	14	15	16
Depr(Inst)										
OCF										
PV(r=10%)										

Year	1	2	3	4	5	6	7	8	9	10
Sales	200	1000	1150	1323	1521	1749	1749	1487	1264	1074
CGS	120	600	720	864	1037	1244	1244	1058	899	764
Adv/Gen	10	11	11	12	12	13	13	14	15	16
Depr(Equip)	125	125	125	125	125	125	125	125	125	125
Depr(Inst)	5	5	5	5	5	0	0	0	0	0
OCF	91	299	318	336	352	364	363	314	271	235
PV(r=10%)	83	247	239	229	219	205	186	146	115	91

Tax rate = 35% Total PV = $1760.160
NPV($000's) = 1760.160 ─ 1843.750 = ─$83.590.

5. In building a new facility for producing trucks, International Truck (IT) must estimate the total investment required. In the current year, IT estimates it will acquire land for the plant at $1,000,000 and modify existing plant equipment for $123,000. Next year, construction will begin and require $866,000, and further plant modifications will require $344,000. In addition, new equipment worth $140,000 will be purchased (with a 10 percent investment tax credit). The new equipment will require $250,000 of installation expense. Finally, in the next year, construction will be completed at a cost of $750,000; installation charges will total $229,000; and building modifications will require $350,000. Lastly, more new equipment will be purchased for $230,000

(with a 10 percent ITC). With a cost of capital of 10 percent, what is the present value of the initial investment required for the plant?

Answer:

Year	0	1	2
Land	1,000,000		
Modification	123,000		
Construction		866,000	750,000
Modification		344,000	350,000
New Equipment		126,000*	207,000*
Installation		250,000	229,000
Totals	1,123,000	1,586,000	1,536,000
PV (10%)	1,123,000	1,441,818	1,269,421
Total PV	$3,834,239		

*Net of investment tax credit

6. Yankee Atomic Electric Co. announced in 1992 that it would decommission its Yankee Rowe nuclear plant at an estimated cost of $247 million. The cost includes:

i. $32 million to maintain the plant until 2000, when dismantling will begin. These expenses will accrue at the rate of $4 million a year.
ii. $56.5 million for the cost of building a facility to store its spent fuel until it is shipped in 2000 to a permanent repository. This storage facility will be depreciated straight-line over its eight-year estimated life.
iii. $158.5 million for the cost of dismantling the plant in 2000 and disposing of its nuclear wastes.

At the same time, Yankee Atomic estimated that decommissioning the plant in 1992, eight years earlier than its planned retirement in 2000, will save it $116 million ($14.5 million a year) before tax by enabling the utility to purchase cheaper electricity than Yankee Rowe could provide. In addition, Yankee Atomic said it had accumulated $72 million in a decommissioning fund required by the Nuclear Regulatory Commission.

a. What is the present value of Yankee's $247 million decommissioning cost. Assume a cost of capital equal to 12 percent and a 34 percent tax rate.

Answer: . In order to answer this question we must make some assumptions regarding the timing of the various cash flows. Assume that the maintenance and storage facility costs begin immediately in 1992. The costs associated with the storage facility include an initial outlay of $56.5 million and subsequent depreciation tax shields worth $2,471,875 annually (0.35 ? $56,500,000/8) beginning in 1993 and continuing through 2000. All cash flows are assumed to occur at the beginning of the year, that is, the 1992 cash flows are expected to occur immediately and so on. As shown in the bottom row of this table, the present value of these net costs discounted at 12% is $160 million.

Year	Maintenance	Storage Facility	Dismantling/Disposal Costs	Total Cash Flows
1992		56,500,000		56,500,000
1993	4,000,000	(2,471,875)		1,528,125
1994	4,000,000	(2,471,875)		1,528,125
1995	4,000,000	(2,471,875)		1,528,125

1996	4,000,000	(2,471,875)		1,528,125
1997	4,000,000	(2,471,875)		1,528,125
1998	4,000,000	(2,471,875)		1,528,125
1999	4,000,000	(2,471,875)		1,528,125
2000	4,000,000	(2,471,875)	158,500,000	160,028,125
		Present value @ 12%		$128,106,666

b. Taking into account the savings on the purchase of cheaper electricity, and the $72 million already set aside, how much additional money does Yankee Atomic have to set aside in 1992 to have enough money to pay for the decommissioning expense?

Answer: The following table takes into account the savings on the purchase of cheaper electricity. Not that the annual after-tax fuel savings of $9,245,000 ($14.5 million net of tax at 35%, or $14,500,000 ? 0.65) show up with a negative sign because it is a cost reduction. The net present value of these costs as shown on the bottom line is $81.3 million. Yankee Atomic has to set aside an additional $9.3 million in 1992 to make up the shortfall ($81.3 million - $72 million).

Year	Maintenance	Storage Facility	Dismantling/Disposal Costs	After-tax Fuel Savings	Total Cash Flows
1992		56,500,000			56,500,000
1993	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1994	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1995	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1996	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1997	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1998	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
1999	4,000,000	(2,471,875)		(9,425,000)	(7,896,875)
2000	4,000,000	(2,471,875)	158,500,000	(9,425,000)	150,603,125
		Present value @ 12%		$81,286,661	

c. What other factors might you consider in calculating the cost of decommissioniong?

Answer: Given the ever-stiffening environmental laws, it would make sense to take into account the likelihood that cleanup standards–and hence costs–will rise over time. At the same time, it would make sense to try to lock politicians into the decommissioning program so that it would be grandfathered in the event of tougher laws.

7. Oldham Industries is considering replacing a 5-year old machine with an original life of 10 years, a cost of $100,000, and a zero salvage value, with a new and more efficient machine. The new machine will cost $200,000 installed and will have a 10-year life. The new machine will increase sales by $25,000 and decrease scrap cost by $10,000 per year. The old machine can be sold currently at $50,000, and Oldham's marginal tax rate is 50 percent. Assume straight-line depreciation and a 10 percent investment tax credit for both the old and the new machines. A prorated portion of any investment tax credit must be returned to the IRS for equipment sold before the end of its depreciable life; that is, if half the equipment's life remains, then half the ITC is reclaimed by the IRS. Assume depreciation is taken on 100 percent of the cost of equipment.

a. What is the initial cash outflow generated by the machine replacement?

Answer:

b. What are the annual operating cash flows generated by this project?

Answer:

c. What is the net present value of this replacement project, given a 12 percent cost of capital?

Answer:

8. Molecugen has developed a new kind of cardiac diagnostic unit. Owing to the highly competitive nature of the market, the sales department forecasts demand of 5,000 units in the first year and a decrease in demand of 10 percent a year after that. After five years, the project will be discontinued with no salvage value. The marketing department forecasts a sales price of $15 a unit. Production estimates operating cost of $5 a unit, and the finance department estimates general and administrative expenses of $15,000 a year. The initial investment in land is $10,000, and other nondepreciable setup costs are $10,000.

a. Is the new project acceptable at a cost of capital of 10 percent? (Note: Use straight-line depreciation over the life of the project and a tax rate of 35 percent.)

Answer: Demand Growth —10% Price Growth 0%

Year	1	2	3	4	5
Demand	5000	4500	4050	3645	3281
Sales Price	15.00	15.00	15.00	15.00	15.00
Revenue	75,000	67,500	60,750	54,675	49,208
Costs	25,000	22,500	20,250	18,225	16,403
Expenses	15,000	15,000	15,000	15,000	15,000
NOI	22,750	19,500	16,575	13,943	11,573

Total PV = 65,960 NPV = 45,960 (Acceptable)

b. If the marketing department had forecast a decline of 15 percent a year in demand, would the project be acceptable?

Answer: Demand Growth —15%

Year	1	2	3	4	5
Demand	5000	4250	3613	3071	2610
Revenue	75,000	63,750	54,188	46,059	39,150
Costs	25,000	21,250	18,063	15,353	13,050
NOI	22,750	17,875	13,731	10,209	7,215

Total PV = 57,224 NPV = 37,224 (Acceptable)

c. If the marketing department had forecast a decline in sales price of 10 percent a year, along with the 15 percent annual decline in demand predicted in (b), would the project be acceptable?

Answer: . Demand Growth —15% Price Growth —10%

Year	1	2	3	4	5
Demand	5000	4250	3613	3071	2610
Sales Price	15.00	13.50	12.15	10.94	9.84
Revenue	75,000	57,375	43,892	33,577	25,687
Costs	25,000	21,250	18,063	15,353	13,050
Expenses	15,000	15,000	15,000	15,000	15,000
NOI	22,750	13,731	7,039	2,096	—1,536

Total PV = 37,796 NPV = 17,796 (Acceptable)

d. If prices decline by 10 percent a year, the marketing department estimates that demand will be a constant 5,000 units a year. Is the project acceptable?

Answer:

Demand Growth 0% Price Growth —10%

Year	1	2	3	4	5
Demand	5000	5000	5000	5000	5000
Sales Price	15.00	13.50	12.15	10.94	9.84
Revenue	75,000	67,500	60,750	54,675	49,208
Costs	25,000	25,000	25,000	25,000	25,000
Expenses	15,000	15,000	15,000	15,000	15,000
NOI	22,750	17,875	13,488	9,539	5,985

Total PV = 55,819 NPV = 35,819 (Acceptable)

9. Salterell Textiles is considering replacing the looming equipment in its North Carolina mill. The original purchase price was $79,300 two years ago. The machine has a useful life of ten years and is being depreciated using the straight-line method. The old equipment can be sold today for $10,800. The new equipment costs $80,500 and has an eight-year life. Its salvage value is expected to be $8,000. The new equipment is expected to increase output and sales revenue by $9,000 a year (after tax) and reduce costs by $7,500 (after tax).

a. With a tax rate of 25 percent and a 14 percent cost of capital, what should Salterell's decision be?

Answer: NPV = PV(Revenue & Savings) + NPV(New Machine) + NPV(Old)

NPV(Revenue & Savings) = (9000 + 7500) ´ PVIFr=14%,n=8

= 16,500 ´ 4.6389 = $76,541.25. (after tax)

NPV(New Machine) = —Cost + PV(Depr) + PV(After tax salvage)

= —80,500 + 0.25 ´ 10,062.50 ´ 4.6389 + 8000(0.75)(0.3506 = PVIF)

= —$66,726.67.

NPV(Old Machine) = [After Tax Sales Proceeds] — PV(Depr)

= [10,800 — 0.25(10,800 — 63,440*)] — 7930 ´ 0.25 ´ 4.6389

= $14,763.45.

Overall NPV = $76,541.25 — 62,830.27 + 14,763.45 = $24,578.

b. Would a 10 percent ITC change the analysis?

Answer: A 10% Investment Tax Credit would reduce current taxes by 0.10(80,500) = $8050. The effective NPV of the New Machine is increased to —58,676.67, and the overall NPV is increased to $32,628.

c. If an inflation rate of 7 percent a year must be incorporated into the decision, is the project acceptable?

Answer: An inflation rate of 7% will increase nominal revenues, costs and salvage values, but will not affect depreciation or after-tax value of the sale of an existing asset (assuming the 7% inflation rate was already included in the nominal discount rate). As such, the inclusion of inflation will only make the net present value picture rosier.

10. Ross Designs is thinking of replacing its seven-year-old knitting machine with a new one

that can also emboss designs on cloth. This will allow Ross to sell its textiles, which currently wholesale for $1.20 a yard, for $0.07 a yard more. The embossing should also raise sales 15 percent, to 2.07 million yards annually. The new machine costs $320,000, has annual operating costs of $27,000, and is expected to last for eight years. Labor, materials, and other expenses are estimated to rise by $0.02, to $1.10 per yard. Working capital requirements should remain at 30 percent of sales. All working capital investments will be recaptured in eight years. The current machine was purchased for $190,000 and is being depreciated on a straight-line basis assuming a 10-year life. Its economic life as of today, however, is estimated to be eight years, the same as that of the new machine. It can be sold for $70,000 today, or for an estimated salvage value of $5,000 in eight years. The new machine will be depreciated straight line over a five-year period, and has an estimated salvage value of $20,000 in eight years. The appropriate discount rate is estimated at 12 percent.

a. What is the change in operating cash flows for each year? What is their present value?

Answer: Here are the incremental cash flows associated with the new machine. The present value of these cash flows, discounted at 12%, is $416,409. Although it is not mentioned in the problem, the tax rate is assumed to be 35%. Note that the incremental depreciation varies from year to year, depending on the old and new depreciation schedules.

Year	1	2	3	4	5	6	7	8		
2,628,900	2,628,900		2,628,900		2,628,900		2,628,900	2,628,900	2	
Old sales revenue	2,160,000		2,160,000		2,160,000		2,160,000	2,160,000	2	
Incremental sales revenue	468,900		468,900		468,900		468,900	468,900		
Annual machine operating costs	27,000		27,000		27,000		27,000	27,000		
Other costs (new)	2,277,000		2,277,000		2,277,000					
2,277,000	2,277,000		2,277,000		2,277,000	2,277,000				
Other costs (old)	1,944,000		1,944,000		1,944,000					
1,944,000	1,944,000		1,944,000		1,944,000	1,944,000				
Incremental other costs	333,000		333,000		333,000					
333,000	333,000		333,000		333,000	333,000				
Depreciation (new)	64,000		64,000		64,000		64,000			
64,000										
Depreciation (old)	19,000		19,000		19,000					
Incremental depreciation	45,000		45,000		45,000		64,000			
64,000										
Incremental before-tax profit		63,900		63,900		63,900				
44,900	44,900	108,900		108,900	108,900					
Incremental tax @ 35%		22,365		22,365		22,365		15,715		
15,715	38,115		38,115		38,115					
Incremental after-tax profit		41,535		41,535		41,535		29,185		
29,185	70,785		70,785		70,785					
Incremental depreciation		45,000		45,000		45,000		64,000		
64,000										
Incremental operating cash flow		86,535		86,535		86,535		93,185		
70,785	70,785		70,785							
Present value @12%		77,263		68,985		61,594		59,221		
52,876	35,862		32,020		28,589					
Cumulative present value		$77,263		$146,249		$207,842		$267,063		
$319,939	$355,801		$387,820		$416,409					

b. What are the net cash flows associated with the purchase of the new knitting machine and

sale of the old one?

Answer: If Ross purchases the new machine, it will have an initial outlay of$320,000 and cash receipts of $70,000 from the sale of the old machine. After seven years of straight-line depreciation, the old machine will have a book value of $57,000. Hence, Ross will have to pay tax of $4,550 on the recapture of $13,000 in excess depreciation ($13,000 x 0.35). Thus, Ross's net cash outlay will be $254,550 ($320,000 - 70,000 + 4,550). At the end of eight years, Ross will sell its new machine for an estimated $20,000. However, since the book value will be 0, Ross will have to pay tax of $7,000 ($20,000 x 0.35) on the recaptured depreciation. This leaves Ross with a net cash inflow of $13,000 in eight years. There is one more impact of the purchase of the new machine: Ross loses the estimated $5,000 salvage value of the old machine at the end of year 8. At the same time, Ross avoids paying tax of $1,750 on the recaptured depreciation, leaving it with a net loss of $3,250. Hence, the net effect of the purchase of the new machine and sale of the old one on year 8 cash flows is a net increase in cash flow for that year of $9,750 ($13,000 - $3,250). The purchase of the new machine also affects intermediate-term cash flows through its effects on depreciation. However, these effects have already been incorporated into the operating cash flow analysis. The present value of Ross's investment in the new machine is $250,612 ($254,550 - $9,750/1.128)

c. What is the NPV of the investment in working capital?

Answer: The incremental working capital requirement is 30% of incremental sales, or $140,670 ($468,900 x 0.30). Ross will recapture this investment at the end of year 8. Hence, the net present value of its incremental working capital investment is $83,856 ($140,670 - $140,670/1.128).

d. What is the NPV of the acquisition of the new knitting machine? Should Ross buy it?

Answer: Combining the answers to parts (a)-(c) yields an NPV for the new knitting machine of $81,941 ($416,409 - $250,612 - $83,856).

e. Suppose that all prices and costs are in nominal terms and will increase at the rate of inflation, which is projected at 4 percent. How does the analysis in parts (a) through (d) change? The 12 percent discount rate is expressed in nominal terms as well.

Answer: Assuming growth in costs and sales of 4% annually yields a new present value of operating profits equal to $460,514, as shown below, an increase of $44,105 compared its value before.

Year	1	2	3	4	5	6	7	8
New sales revenue	2,628,900	2,734,056	2,843,418	2,957,155	3,075,441	3,198,459	3,326,397	3,459,453
Old sales revenue	2,160,000	2,246,400	2,336,256	2,429,706	2,526,894	2,627,970		
Incremental sales revenue	468,900	487,656	507,162	527,449	548,547	570,489	5	
Annual machine operating costs	27,000	28,080	29,203	30,371	31,586	32,850	34,164	35,530
Other costs (new)	2,277,000	2,368,080	2,462,803	2,561,315	2,663,768	2,770,319	2,881,131	2,996,377
Other costs (old)	1,944,000	2,021,760	2,102,630	2,186,736	2,274,205	2,365,173	2,459,780	2,558,171
Incremental other costs	333,000	346,320	360,173	374,580	389,563	405,145	421,351	438,205
Depreciation (new)	64,000	64,000	64,000	64,000	64,000			
Depreciation (old)	19,000	19,000	19,000					

Incremental depreciation	45,000	45,000	45,000	64,000	64,000				
Incremental before-tax profit	63,900	68,256	72,786	58,498	63,398	132,494	137,793	143,305	
Incremental tax @ 35%	22,365	23,890	25,475	20,474	22,189	46,373	48,228	50,157	
Incremental after-tax profit	41,535	44,366	47,311	38,023	41,208	86,121	89,566	93,148	
Incremental depreciation	45,000	45,000	45,000	64,000	64,000				
Incremental operating cash flow	86,535	89,366	92,311	102,023	105,208	86,121	89,566	93,148	
Present value @12%	77,263	71,242	65,705	64,838	59,698	43,631	40,515	37,621	
Cumulative present value	$77,263	$148,506	$214,211	$279,049	$338,747				

At the same time, working capital requirements rise year by year at the rate of 4% annually. The present value of these increases net of their return at the end of year 8 is $94,374, as shown below. This figure is $10,518 more than its value of $83,856 under the no-inflation scenario.

Year	0	1	2	3	4	5	6	7	8
Incremental working capital req	140,670	5,627	5,852	6,086	6,329	6,583	6,846	7,120	(185,112)
Present value @12%	$140,670	$5,024	$4,665	$4,332	$4,022	$3,735	$3,468	$3,221	-$74,764
Cumulative present value	$140,670	$145,694	$150,359	$154,691	$158,713	$162,448	$165,917	$169,137	$94,374

The net effect of these changes is to increase the project NPV by $33,587 ($44,105 - $10,518).