Chapter 10
Making Capital Investment Decisions

Chapter Organization

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T10.2 Fundamental Principles of Project Evaluation

- Fundamental Principles of Project Evaluation:

Project evaluation - the application of one or more capital budgeting decision rules to estimated relevant project cash flows in order to make the investment decision.

Relevant cash flows - the incremental cash flows associated with the decision to invest in a project.

The incremental cash flows for project evaluation consist of *any and all* changes in the firm's future cash flows that are a direct consequence of taking the project.

Stand-alone principle - evaluation of a project based on the project's incremental cash flows.

T10.3 Incremental Cash Flows

- Key issue:
  - When is a cash flow incremental?

- Terminology
  - A. Sunk costs
  - B. Opportunity costs
  - C. Side effects
  - D. Net working capital
  - E. Financing costs
  - F. Inflation
  - G. Government Intervention
  - H. Other issues

T10.4 Example: Preparing Pro Forma Statements

- Suppose we want to prepare a set of pro forma financial statements for a project for Norma Desmond Enterprises. In order to do so, we must have some background information. In this case, assume:

1. Sales of 10,000 units/year @ $5/unit.
2. Variable cost per unit is $3. Fixed costs are $5,000 per year. The project has no salvage value. Project life is 3 years.
3. Project cost is $21,000. Depreciation is $7,000/year.
4. Additional net working capital is $10,000.
5. The firm's required return is 20%. The tax rate is 34%.

T10.4 Example: Preparing Pro Forma Statements (continued)

Pro Forma Financial Statements

Projected Income Statements

Sales	$______
Var. costs	______
	$20,000
Fixed costs	5,000
Depreciation	7,000
EBIT	$______
Taxes (34%)	2,720
Net income	$______

T10.4 Example: Preparing Pro Forma Statements (continued)

Pro Forma Financial Statements

Projected Income Statements

Sales	$50,000
Var. costs	30,000
	$20,000
Fixed costs	5,000
Depreciation	7,000
EBIT	$ 8,000
Taxes (34%)	2,720
Net income	$ 5,280

T10.4 Example: Preparing Pro Forma Statements (concluded)

Projected Balance Sheets

	0	1	2	3
NWC	$______	$10,000	$10,000	$10,000
NFA	21,000	______	______	0
Total	$31,000	$24,000	$17,000	$10,000

T10.4 Example: Preparing Pro Forma Statements (concluded)

Projected Balance Sheets

	0	1	2	3
NWC	$10,000	$10,000	$10,000	$10,000
NFA	21,000	14,000	7,000	0
Total	$31,000	$24,000	$17,000	$10,000

T10.5 Example: Using Pro Formas for Project Evaluation

- Now let's use the information from the previous example to do a capital budgeting analysis.

  Project operating cash flow (OCF):

EBIT	$8,000
Depreciation	+7,000
Taxes	-2,720
OCF	$12,280

T10.5 Example: Using Pro Formas for Project Evaluation (continued)

- Project Cash Flows

	0	1	2	3
OCF		$12,280	$12,280	$12,280
Chg. NWC	______			______
Cap. Sp.	-21,000	______	______	______
Total	______	$12,280	$12,280	$______

T10.5 Example: Using Pro Formas for Project Evaluation (continued)

- Project Cash Flows

	0	1	2	3
OCF		$12,280	$12,280	$12,280
Chg. NWC	-10,000			10,000
Cap. Sp.	-21,000			
Total	-31,000	$12,280	$12,280	$22,280

T10.5 Example: Using Pro Formas for Project Evaluation (concluded)

- Capital Budgeting Evaluation:

NPV = $-\$31,000 + \$12,280/1.20^1 + \$12,280/1.20^2 + \$22,280/1.20^3$

= \$655

IRR = 21%

PBP = 2.3 years

AAR = $\$5280/\{(31,000 + 24,000 + 17,000 + 10,000)/4\} = 25.76\%$

- Should the firm invest in this project? Why or why not?

Yes -- the NPV > 0, and the IRR > required return

T10.6 Example: Estimating Changes in Net Working Capital

- In estimating cash flows we must account for the fact that some of the incremental sales associated with a project will be on credit, and that some costs won't be paid at the time of investment. How?

  Answer: Estimate changes in NWC. Assume:

  1. Fixed asset spending is zero.
  2. The change in net working capital spending is $200:

	0	1	Change	S/U
A/R	$100	$200	+100	___
INV	100	150	+50	___
-A/P	100	50	(50)	___
NWC	$100	$300	Chg. NWC = $______	

T10.6 Example: Estimating Changes in Net Working Capital

- In estimating cash flows we must account for the fact that some of the incremental sales associated with a project will be on credit, and that some costs won't be paid at the time of investment. How?

  Answer: Estimate changes in NWC. Assume:

  1. Fixed asset spending is zero.
  2. The change in net working capital spending is $200:

	0	1	Change	S/U
A/R	$100	$200	+100	U
INV	100	150	+50	U
-A/P	100	50	(50)	U
NWC	$100	$300	Chg. NWC = $200	

T10.6 Example: Estimating Changes in Net Working Capital (continued)

- Now, estimate operating and total cash flow:

Sales	$300
Costs	200
Depreciation	0
EBIT	$100
Tax	0
Net Income	$100

OCF = EBIT + Dep. – Taxes = $100

Total Cash flow = OCF– Change in NWC – Capital Spending

= $100 – ______ – ______ = ______

T10.6 Example: Estimating Changes in Net Working Capital (continued)

- Now, estimate operating and total cash flow:

Sales	$300
Costs	200
Depreciation	0
EBIT	$100
Tax	0
Net Income	$100

OCF = EBIT + Dep. – Taxes = $100

Total Cash flow = OCF– Change in NWC – Capital Spending

= $100 – 200 – 0 = – $100

T10.6 Example: Estimating Changes in Net Working Capital (concluded)

- Where did the - $100 in total cash flow come from?
- What *really* happened:

Cash sales = $300 - ____ = $200 (collections)

Cash costs = $200 + ____ + ____ = $300 (disbursements)

T10.6 Example: Estimating Changes in Net Working Capital (concluded)

- Where did the - $100 in total cash flow come from?
- What *really* happened:

Cash sales = $300 - 100 = $200 (collections)

Cash costs = $200 + 50 + 50 = $300 (disbursements)

Cash flow = $200 - 300 = - $100 (= cash in – cash out)

T10.7 CCA Property Classes (See Chapter 2)

Class	Rate	Examples
8	20%	Furniture, photocopiers
10	30%	Vans, trucks, tractors and computer equipment
13	Straight-line	Leasehold improvements
22	50%	Pollution control equipment

T10.8 Depreciation on $10,000 Furniture (CCA Class 8, 20% rate)

Year	UCC_t	CCA	UCC_{t+1}
1	$5,000	$1,000	$4,000
2	9,000	1,800	7,200
3	7,200	1,440	5,760
4	5,760	1,152	4,608
5	4,608	922	3,686
6	3,686	737	2,949

T10.9 CCA on Assets of $10,000 by year

Year	Class 8	Class 10	Class 22
1	$1,000	$1,500	$_____
2	1,800	_____	3,750
3	1,440	1,785	_____
4	1,152	_____	938
5	922	875	469
6	737	612	___

T10.9 CCA on Assets of $10,000 by year

Year	Class 8	Class 10	Class 22
1	$1,000	$1,500	$2,500
2	1,800	2,550	3,750
3	1,440	1,785	1,875
4	1,152	1,250	938
5	922	875	469
6	737	612	234

T10.10 Example: Fairways Equipment and Operating Costs

Two golfing buddies are considering opening a new driving range, the "Fairways Driving Range" (motto: "We always treat you fairly at Fairways"). Because of the growing popularity of golf, they estimate the range will generate rentals of 20,000 buckets of balls at $3 a bucket the first year, and that rentals will grow by 750 buckets a year thereafter. The price will remain $3 per bucket.

Capital spending requirements include:

Ball dispensing machine	$ 2,000
Ball pick-up vehicle	8,000
Tractor and accessories	8,000
	$18,000

All the equipment is Class 10 CCA property, and is expected to have a salvage value of 10% of cost after 6 years.

Anticipated operating expenses are as follows:

T10.10 Example: Fairways Equipment and Operating Costs (concluded)

Operating Costs (annual)

Land lease	$ 12,000
Water	1,500
Electricity	3,000
Labor	30,000
Seed & fertilizer	2,000
Gasoline	1,500
Maintenance	1,000
Insurance	1,000
Misc. Expenses	1,000
	$53,000

Working Capital

Initial requirement = $3,000

Working capital requirements are expected to grow at 5% per year for the life of the project

T10.11 Example: Fairways Revenues, Depreciation, and Other Costs

Projected Revenues

Year	Buckets	Revenues
1	20,000	$60,000
2	20,750	62,250
3	21,500	64,500
4	22,250	66,750
5	23,000	69,000
6	23,750	71,250

T10.11 Example: Fairways Revenues, Depreciation, and Other Costs (continued)

Cost of balls and buckets

Year	Cost
1	$3,000
2	3,150
3	3,308
4	3,473
5	3,647
6	3,829

T10.11 Example: Fairways Revenues, Depreciation, and Other Costs (concluded)

Depreciation on $18,000 of Class 10 CCA equipment

Year	UCC_t	CCA	UCC_{t+1}
1	9,000	2,700	$15,300
2	15,300	4,590	10,710
3	10,710	3,213	7,497
4	7,497	2,249	5,248
5	5,248	1,574	3,674
6	3,674	1,102	2,572

T10.12 Example: Fairways Pro Forma Income Statement

	Year 1	2	3	4	5	6
Revenues	$60,000	$62,250	$64,500	$66,750	$69,000	$71,250
Variable costs	3,000	3,150	3,308	3,473	3,647	3,829
Fixed costs	53,000	53,000	53,000	53,000	53,000	53,000
Depreciation	2,700	4,590	3,213	2,249	1,574	1,102
EBIT	$1,300	$1,510	$4,979	$8,028	$10,779	$13,319
Taxes(20%)	260	302	996	1,606	2,156	2,664
Net income	$1,040	$1,208	$3,983	$6,422	$8,623	$10,655

T10.13 Example: Fairways Projected Changes in NWC

- Projected increases in net working capital

Year	Net working capital	Change in NWC
0	$ 3,000	$ 3,000
1	3,150	150
2	3,308	158
3	3,473	165
4	3,647	174
5	3,829	182
6	4,020	- 3,829

T10.14 Example: Fairways Cash Flows

- Operating cash flows:

Year	EBIT	+ Depreciation	– Taxes	= Operating cash flow
0	$ 0	$ 0	$ 0	$ 0
1	1,300	2,700	260	3,740
2	1,510	4,590	302	5,798
3	4,979	3,213	996	7,196
4	8,028	2,249	1,606	8,671
5	10,779	1,574	2,156	10,197
6	13,319	1,102	2,664	11,757

T10.14 Example: Fairways Cash Flows (concluded)

- Total cash flow from assets:

Year	OCF	–	Chg. in NWC	–	Cap. Sp.	=	Cash flow
0	$ 0		$ 3,000		$18,000		– $21,000
1	3,740		150		0		3,590
2	5,798		158		0		5,640
3	7,196		165		0		7,031
4	8,671		174		0		8,497
5	10,197		182		0		10,015
6	11,757		-3829		-1,440		17,026

T10.15 Alternative Definitions of OCF

Let:

OCF	=	operating cash flow
S	=	sales
C	=	operating costs
D	=	depreciation
T	=	corporate tax rate

T10.15 Alternative Definitions of OCF (concluded)

- The Tax-Shield Approach

$$
\begin{aligned}
OCF &= (S - C - D) + D - (S - C - D) \times T \\
&= (S - C) \times (1 - T) + (D \times T) \\
&= (S - C) \times (1 - T) + \text{Depreciation} \times T
\end{aligned}
$$

- The Bottom-Up Approach

$$
\begin{aligned}
OCF &= (S - C - D) + D - (S - C - D) \times T \\
&= (S - C - D) \times (1 - T) + D \\
&= \text{Net income} + \text{Depreciation}
\end{aligned}
$$

- The Top-Down Approach

$$
\begin{aligned}
OCF &= (S - C - D) + D - (S - C - D) \times T \\
&= (S - C) - (S - C - D) \times T \\
&= \text{Sales} - \text{Costs} - \text{Taxes}
\end{aligned}
$$

T10.16 Chapter 10 Quick Quiz -- Part 1 of 3

- Now let’s put our new-found knowledge to work. Assume we have the following background information for a project being considered by Gillis, Inc.
- See if we can calculate the project’s NPV and payback period. Assume:

  Required NWC investment = $40; project cost = $60; 3 year life

  Annual sales = $100; annual costs = $50; straight line depreciation to $0

  Tax rate = 34%, required return = 12%

  - Step 1: Calculate the project’s OCF
  - OCF = (S - C)(1 - T) + Dep × T
  - OCF = (___ - __)(1 - .34) + (____)(.34) = $_____

T10.16 Chapter 10 Quick Quiz -- Part 1 of 3

- Now let’s put our new-found knowledge to work. Assume we have the following background information for a project being considered by Gillis, Inc.
- See if we can calculate the project’s NPV and payback period. Assume:

  Required NWC investment = $40; project cost = $60; 3 year life

  Annual sales = $100; annual costs = $50; straight line depreciation to $0

  Tax rate = 34%, required return = 12%

  - Step 1: Calculate the project’s OCF
  - OCF = (S - C)(1 - T) + Dep × T
  - OCF = (100 - 50)(1 - .34) + (60/3)(.34) = $39.80

T10.16 Chapter 10 Quick Quiz -- Part 1 of 3 (concluded)

- Project cash flows are thus:

	0	1	2	3
OCF		$39.8	$39.8	$39.8
Chg. in NWC	-40			40
Cap. Sp.	-60			
	-$100	$39.8	$39.8	$79.8

Payback period = ____________

NPV = ____________

T10.16 Chapter 10 Quick Quiz -- Part 1 of 3 (concluded)

- Project cash flows are thus:

	0	1	2	3
OCF		$39.8	$39.8	$39.8
Chg. in NWC	– 40			40
Cap. Sp.	– 60			
	– 100	$39.8	$39.8	$79.8

Payback period = 1 + 1 + (100 – 79.6)/79.8 = 2.26 years

NPV = $\$39.8/(1.12) + \$39.8/(1.12)^2 + 79.8/(1.12)^3 - 100 = \$24.06$

T10.17 Example: A Cost-Cutting Proposal

Consider a $10,000 machine that will reduce pretax operating costs by $3,000 per year over a 5-year period. Assume no changes in net working capital and a scrap (i.e., market) value of $1,000 after five years. For simplicity, assume straight-line depreciation. The marginal tax rate is 34% and the appropriate discount rate is 10%.

Using the *tax-shield approach* to find OCF:

OCF = (S - C)(1 - T) + (Dep × T)

= [$0 - (-3,000)](.66) + (2,000 × .34)

= $1,980 + $680 = $2,660

The after-tax salvage value is:

market value - (increased tax liability) = market value - (market value - book) × T

= $1,000 - ($1,000 - 0)(.34) = $660

T10.17 Example: A Cost-Cutting Proposal (concluded)

The cash flows are

Year	OCF	Capital spending	Total
0	$ 0	-$10,000	-$10,000
1	2,660	0	2,660
2	2,660	0	2,660
3	2,660	0	2,660
4	2,660	0	2,660
5	2,660	+660	3,320

T10.18 Chapter 10 Quick Quiz -- Part 2 of 3

Evaluating Cost Cutting Proposals

Cost	=	$900,000
Depreciation	=	$180,000 per year
Life	=	5 years
Salvage	=	$330,000
Cost savings	=	$500,000 per year, before taxes
Tax rate	=	34 percent
Add. to NWC	=	–$220,000 *(note the minus sign)*

- **1. *After-tax* cost saving: $500K × (______) = $______ per year.**
- **2. Depreciation *tax shield*: $180K × ______ = $______ per year.**
- **3. *After-tax* salvage value: $330K - ($330K - 0)(.34) = $______**

Evaluating Cost Cutting Proposals

Cost	=	$900,000
Depreciation	=	$180,000 per year
Life	=	5 years
Salvage	=	$330,000
Cost savings	=	$500,000 per year, before taxes
Tax rate	=	34 percent
Chg. in NWC	=	$220,000

- **1. *After-tax* cost saving: $500K × (1 - .34) = $330K per year.**
- **2. Depreciation *tax shield*: $180K × .34 = $61.2K per year.**
- **3. *After-tax* salvage value: $330K - ($330K - 0)(.34) = $217.8K**
- **4. Now let's compute the project cash flows and then calculate the IRR:**

T10.18 Chapter 10 Quick Quiz -- Part 2 of 3 (concluded)

	0	1	2	3	4	5
AT saving		$330.0K	$330.0K	$330.0K	$330.0K	$330.0K
Tax shield		61.2K	61.2K	61.2K	61.2K	61.2K
OCF		_____	_____	$391.2K	$391.2K	$391.2K
Chg. in NWC	____					_____
Cap. Sp.	-900K					217.8K
	- ____	$391.2K	$391.2K	$391.2K	$391.2K	_____

	0	1	2	3	4	5
AT saving		$330.0K	$330.0K	$330.0K	$330.0K	$330.0K
Tax shield		61.2K	61.2K	61.2K	61.2K	61.2K
OCF		$391.2K	$391.2K	$391.2K	$391.2K	$391.2K
Chg. in NWC	-$220K					220K
Cap. Sp.	-900K					217.8K
	-$1,120K	$391.2K	$391.2K	$391.2K	$391.2K	$829K

The IRR is about 28%, so unless it costs the firm more than 28% to raise money, the project looks good!

T10.19 Example: Setting the Bid Price

The Canadian Forces are seeking bids on Multiple Use Digitizing Devices (MUDDs). The contract calls for units per year for 3 years. Labor and material costs are estimated at $10,000 per MUDD. Production space can be leased for $12,000 per year. The project will require $50,000 in new equipment which is expected to have a salvage value of $10,000 after 3 years. Making MUDDs will require a $10,000 increase in net working capital. Assume a 34% tax rate and a required return of 15%. Use straight-line depreciation to zero.

Year	Operating cash flow	Increases in NWC	Capital spending	Total = cash flow
0	$ 0	– $10,000	– $50,000	– $60,000
1	OCF	0	0	OCF
2	OCF	0	0	OCF
3	OCF	10,000	+ 6,600	OCF + 16,600

T10.19 Example: Setting the Bid Price (continued)

- Taking the present value of $16,600 in year 3 (= $10,915 at 15%) and netting against the initial outlay of – $60,000 gives

Year	Total cash flow
0	– $49,085
1	OCF
2	OCF
3	OCF

The result is a three-year annuity with an unknown cash flow equal to "OCF."

T10.19 Example: Setting the Bid Price (continued)

- The PV annuity factor for 3 years at 15% is 2.283. Setting NPV = $0,

  NPV = $0 = – $49,085 + (OCF × 2.283), thus

  OCF = $49,085/2.283 = $21,500

- **Using the *bottom-up* approach to calculate OCF,**

  OCF = Net income + Depreciation

  $21,500 = Net income + $50,000/3 = Net income + $16,667

  Net income = $4,833

- **Next, since annual costs are $40,000 + $12,000 = $52,000**

  Net income = (S - C - D) × (1 - T)

  $4,833 = (S × .66) - (52,000 × .66) - (16,667 × .66)

  S = $50,153/.66 = $75,989.73

Hence, sales need to be at least $76,000 per year (or $19,000 per MUDD)!

T10.19 Example: Setting the Bid Price (continued)

Background: Suppose we also have the following information.

- 1. The bid calls for 20 MUDDs per year for 3 years.
- 2. Our costs are $35,000 per unit.
- 3. Capital spending required is $250,000; and depreciation = $250,000/5 = $50,000 per year
- 4. We can sell the equipment in 3 years for half its original cost: $125,000.
- 5. The after-tax salvage value equals the cash in from the sale of the equipment, less the cash out due to the increase in our tax liability associated with the sale of the equipment for more than its book value:

  Book value at end of 3 years = $250,000 - 50,000(3) = $100,000

  Book gain from sale = $125,000 - 100,000 = $25,000

  Net cash flow = $125,000 - 25,000(.39) = $115,250
- 6. The project requires investment in net working capital of $60,000.
- 7. Required return = 16%; tax rate = 39%

T10.19 Example: Setting the Bid Price (continued)

- The cash flows ($000) are:

	0	1	2	3
OCF		$OCF	$OCF	$OCF
Chg. in NWC	- $ 60			+ 60
Capital Spending	- 250			+115.25
	- $310	$OCF	$OCF	$OCF + 175.25

Find the OCF such that the NPV is zero at 16%:

+$310,000 - 175,250/1.16³	**=**	**OCF × (1 - 1/1.16³)/.16**
$197,724.74	**=**	**OCF × 2.2459**
OCF	**=**	**$88,038.50/year**

T10.19 Example: Setting the Bid Price (concluded)

If the required OCF is $88,038.50, what price must we bid?

Sales	$__________
Costs	700,000.00
Depreciation	50,000.00
EBIT	$__________
Tax	24,319.70
Net income	$ 38,038.50

Sales = $62,358.20 + 50,000 + 700,000 = $812,358.20 per year, and

the bid price should be $812,358.20/___ = _________ per unit.

T10.19 Example: Setting the Bid Price (concluded)

If the required OCF is $88,038.50, what price must we bid?

Sales	$812,358.20
Costs	700,000.00
Depreciation	50,000.00
EBIT	$ 62,358.20
Tax	24,319.70
Net income	$ 38,038.50

Sales = $62,358.20 + 50,000 + 700,000 = $812,358.20 per year, and

the bid price should be $812,358.20/20 = $40,618 per unit.

T10.20 Example: Equivalent Annual Cost Analysis

- Two types of batteries are being considered for use in electric golf carts at City Country Club. Burnout brand batteries cost $36, have a useful life of 3 years, will cost $100 per year to keep charged, and have a salvage value of $5.

  Longlasting brand batteries cost $60 each, have a life of 5 years, will cost $88 per year to keep charged, and have a salvage value of $5.

T10.20 Example: Equivalent Annual Cost Analysis (continued)

- Using the *tax shield* approach, cash flows for Burnout are:

OCF = (Sales - Costs)(1 - T) + Depreciation(T)

= (0 - 100)(.66) + 12(.34)

= -$66 + 4 = -$62

Year	Operating cash flow	Capital - spending	Total = cash flow
0	$ 0	-$ 36	-$36
1	-62	0	- 62
2	-62	0	- 62
3	-62	+ 3.3	- 58.7

T10.20 Example: Equivalent Annual Cost Analysis (continued)

- Again using the *tax shield* approach, OCFs for Longlasting are:

OCF = (Sales - Costs)(1 - T) + Depreciation(T)

= (0 - 88)(.66) + 12(.34) = -$58 + 4 = -$54

Year	Operating OCF	Capital - spending	Total = cash flow
0	$ 0	-$ 60	- $60
1	- 54	0	- 54
2	- 54	0	- 54
3	- 54	0	- 54
4	- 54	0	- 54
5	- 54	+ 3.3	- 50.7

T10.20 Example: Equivalent Annual Cost Analysis (continued)

- Using a 15% required return, calculate the cost per year for the two batteries.

  Calculate the PV of the cash flows:

  The present value of total cash flows for Burnout is -$175.40

  The present value of total cash flows for Longlasting is -$239.40

T10.20 Example: Equivalent Annual Cost Analysis (concluded)

What 3 year annuity has the same PV as Burnout?

The PV annuity factor for 3 years at 15% is 2.283:

-\$175.40 = EAC $\times$ 2.283

EAC = -\$175.40/2.283 = -\$76.83

What 5 year annuity has the same PV as Longlasting?

The PV annuity factor for 5 years at 15% is 3.352:

-\$239.40 = EAC $\times$ 3.352

EAC = -\$239.40/3.352 = -\$71.42

- Here’s one more problem to test your skills. Von Stroheim Manufacturing is considering investing in a lathe that is expected to reduce costs by $70,000 annually. The equipment costs $200,000, will be depreciated as CCA Class 43, requires no additional investment in net working capital, and has a salvage value of $50,000. The firm’s tax rate is 39% and the required return on investments in this risk class is 10%.
- What is the NPV of the project?
- What is its IRR?

T10.21 Chapter 10 Quick Quiz -- Part 3 of 3 (continued)

Depreciation on $200,000 of CCA Class 43 equipment

Year	UCC_t	CCA	UCC_{t+1}
1	$100,000	$30,000	$70,000
2	170,000	______	______
3	______	35,700	83,300
4	83,300	24,990	58,310

The after-tax salvage is $50,000 - ($50,000 - 58,310) × ____ = $53,241

Depreciation on $200,000 of CCA Class 43 equipment

Year	UCC_t	CCA	UCC_{t+1}
1	$100,000	$30,000	$70,000
2	170,000	51,000	119,000
3	119,000	35,700	83,300
4	83,300	24,990	58,310

The after-tax salvage is $50,000 - ($50,000 - 58,310) × 0.39 = $53,241

T10.21 Chapter 10 Quick Quiz -- Part 3 of 3 (concluded)

The cash flows are thus:

	0	1	2	3	4
AT saving		$42,700.0	$42,700.0	$42,700.0	$42,700.0
Tax shield		25,997.4	34,663.2	11,559.6	5,779.8
OCF		$68,697.4	$77,363.2	$54,259.6	$48,479.8
Cap. Sp.	-200,000				_______
	-$200,000	$68,697.4	$77,363.2	$54,259.6	$_______

NPV = $_______ IRR = __.__%

T10.21 Chapter 10 Quick Quiz -- Part 3 of 3 (concluded)

The cash flows are thus:

	0	1	2	3	4
AT saving		$42,700.0	$42,700.0	$42,700.0	$42,700.0
Tax shield		25,997.4	34,663.2	11,559.6	5,779.8
OCF		$68,697.4	$77,363.2	$54,259.6	$48,479.8
Cap. Sp.	-200,000				53,240.9
	-$200,000	$68,697.4	$77,363.2	$54,259.6	$101,720.7

NPV = $36,631 IRR = 17.82%

T10.22 Solution to Problem 10.5

- A proposed new project has projected sales of $75,000, costs of $40,000, and CCA of $2,500. The tax rate is 34 percent. Calculate OCF using the four different approaches described in the chapter and verify that the answer is the same in each case.

Sales	$75,000.00
Costs	$40,000.00
Depreciation	2,500.00
EBIT (=EBT)	$32,500.00
Taxes (@ 34%)	11,050.00
Net Income	$21,450.00

T10.22 Solution to Problem 10.5 (concluded)

OCF = EBIT + D - T = \$32,500 + 2,500 - 11,050

= \$23,950

OCF = S - C - T = \$75,000 - 40,000 - 11,050

= \$23,950

OCF = (S - C)(1 - T) + D(T)

= (\$75,000 - 40,000)(1 - .34) + .34(2,500)

= \$23,950

OCF = NI + D = \$21,450 + 2,500 = \$23,950

T10.23 Solution to Problem 10.22

- Bendog's Franks is looking at a new sausage system with an installed cost of $305,000. This cost will be depreciated straight-line to zero over the project's 5-year life, at the end of which it will be scrapped for $60,000. The sausage system will save the firm $90,000 per year in pretax operating costs, and requires an initial investment in net working capital of $27,000. If the tax rate is 40 percent and the discount rate is 10 percent, what is the NPV of this project?

T10.23 Solution to Problem 10.22 (concluded)

Annual depreciation expense = $305,000/5 = $61,000

After-tax salvage value = ($______)(1 - 0.4) = $______

OCF = ($0 - (-90,000))(1 - .4) + (.4)(61,000) = $______

So,

NPV = $______ ($PVIFA_{10\%,5}$) + ($______ + $______)/$1.10^5$

- ($305,000 + $27,000)

= $______ + ______ - ______ = ______

T10.23 Solution to Problem 10.22 (concluded)

Annual depreciation expense = $305,000/5 = $61,000

After-tax salvage value = ($60,000)(1 - .4) = $36,000

OCF = ($0 - (-90,000))(1 - .4) + (.4)(61,000) = $78,400

So,

NPV = $78,400 ($PVIFA_{10\%,5}$) + ($36,000 + $27,000)/$1.10^5$

- ($305,000 + $27,000)

= $297,198 + 39,118 - 332,000 = $4,316

T10.24 Solution to Problem 10.48

- A proposed cost-saving device has an installed cost of $480,000. The device will be used in a 5-year project, but is classified manufacturing and processing equipment for tax purposes. The required initial net working capital investment is $35,000, the marginal tax rate is 35%, and the project discount rate is 12%. The device has an estimated Year 5 salvage value of $80,000. What level of pretax cost savings do we require for this project to be profitable?

- First, calculate the annual depreciation expense:

Year	UCC_t	CCA	UCC_{t+1}
1	$240,000	$72,000	$168,000
2	408,000	122,400	285,600
3	285,600	85,680	199,920
4	199,920	59,976	139,944
5	139,944	41,983	97,961

T10.24 Solution to Problem 10.48 (continued)

- Next, calculate cash flows in years 1 through 5:
- After-tax salvage value = 80,000-($80,000-97,961)*.35= $86,286
- $OCF_1 = (S - C)(1 - .35) + .35(\$72,000)$

  $OCF_2 = (S - C)(1 - .35) + .35(\$122,400)$

  $OCF_3 = (S - C)(1 - .35) + .35(\$85,680)$

  $OCF_4 = (S - C)(1 - .35) + .35(\$59,976)$

  $OCF_5 = (S - C)(1 - .35) + .35(\$41,983)$

T10.24 Solution to Problem 10.48 (concluded)

- Finally, set NPV equal to 0 and solve for the unknown term, C:

$0 = -\$480{,}000 - \$35{,}000 + (S - C)(1 - .35)(PVIFA_{12\%,5})$

$+ .35[72{,}000/1.12 + 122{,}400/1.12^2 + 85{,}680/1.12^3 + 59{,}976/1.12^4 + 41{,}983/1.12^5]$

$+ (\$86{,}286 + \$35{,}000)/1.12^5$

Solving for C, we obtain $147,882.38.

Interpretation: If the project reduces annual pretax costs less than $147,882.38, the value of the firm will be reduced (why?); if the project reduces annual pretax costs by more than $ 147,882.38, the value of the firm will be increased.