12-1

We will take the 2016 tax rates listed in Table 12-1:

Taxable income = $62,000

Non-refundable tax credit = $12,000

Taxable income = $50,000

1. Income up to $45,282 is taxed at 15%: $45,282 (0.15) = $6,792

Income from $45,282 to $85,414 is taxed at 22%: ($50,000 – $45,282)(0.22) = $1,038

Total federal income tax = $6,792+ $1,038= **$7,830**

1. Additional income = $16,000

Total net income = $50,000 + $16,000 = $66,000

Tax on first $45,282 = $6,792

Income from $45,282 to $85,414 is taxed at 22%: ($66,000 – $45,282)(0.22) = $4,558

Total federal income tax = $6,792+ $4,558= $11,350

Tax for additional income of $16,000 = $11,350– 7,830= **$3,520**

12-12

Total taxable income = $150,000

Total provincial (corporate) tax at 16% = $24,000

Total federal tax at 15% = $22,500

The combined incremental tax rate = Provincial tax + Federal tax = 31%

12-16

SOYD Depreciation

*N* = 8; SUM = (*N*/2)(*N* + 1)=36

1st Year Depreciation = (8/36) ($120,000 − $12,000) = $24,000

Annual Decline = (1/36) ($120,000 − $12,000) = $3,000

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **SOYD Depreciation** | **Taxable Income** | **Income Taxes at 48%** | **After-Tax Cash Flow** |
| 0 | −$120,000 |  |  |  | −$120,000 |
| 1 | +$29,000 | $24,000 | $5,000 | −$2,300 | +$26,700 |
| 2 | +$26,000 | $21,000 | $5,000 | −$2,300 | +$23,700 |
| 3 | +$23,000 | $18,000 | $5,000 | −$2,300 | +$20,700 |
| 4 | +$20,000 | $15,000 | $5,000 | −$2,300 | +$17,700 |
| 5 | +$17,000 | $12,000 | $5,000 | −$2,300 | +$14,700 |
| 6 | +$14,000 | $9,000 | $5,000 | −$2,300 | +$11,700 |
| 7 | +$11,000 | $6,000 | $5,000 | −$2,300 | +$8,700 |
| 8 | +$8,000 | $3,000 | $5,000 | −$2,300 | +$5,700 |
|  | +$12,000 |  | $0 | $0 | +$12,000 |
| Sum |  | $108,000 |  |  |  |

Will the firm obtain a 6% after tax rate of return?

PW of Cost = PW of Benefits

$120,000 =$26,700(*P*/*A*, *i*%, 8)−$3,000(P/G, *i*%, 8)+$12,000(*P*/*F*, *i*%, 8)

At *i* = 6%

PW of Benefits = $26,700(6.210)−$3,000(19.842)+$12,000(0.6274)

= $113,810

So *i* is too high

Therefore, the firm will not obtain a 6% after-tax rate of return.

Further calculations show actual rate of return to be approximately 4.5%.

12-19

The cashflows associated with the project are shown in the following table. Note that in the final year, the equipment is sold for $35,000 while its book value is $10,150, so a CCA recapture of $24,850 occurs, on which tax must be paid.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **BTCF** | **UCC** | **CAA** | **Taxable Income** | **Incomes Taxes** | **ATCF** | **PW (ATCF)** |
| 0 | –$100,000 | $100,000 |  |  |  | –$100,000 | –$100,000 |
| 1 | $30,000 | $85,000 | $15,000 | $15,000 | $5,100 | $24,900 | $21,722 |
| 2 | $30,000 | $70,000 | $25,500 | $4,500 | $1,530 | $28,470 | $21,667 |
| 3 | $30,000 | $44,500 | $21,000 | $9,000 | $3,060 | $26,940 | $17,886 |
| 4 | $30,000 | $23,500 | $13,350 | $16,650 | $5,661 | $24,339 | $14,096 |
| 5 | $30,000 | $10,150 | $7,050 | $22,950 | $7,803 | $22,197 | $11,215 |
| Salvage | $35,000 |  |  | $24,850 | $8,449 | $26,551 | $13,415 |

The right-hand column shows the present worth of the after-tax cashflows assuming an interest rate of 14.63%. We have established by trial and error that this interest rate gives the sum of the present worths of the ATCF’s a value of zero, so we can conclude that **the after-tax rate of return is 14.63%.**

12-23

Initial cost = $108,000

Time = 8 years

Salvage = 0

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **SOYD Depreciation** | **Taxable Income** | **Income Taxes at 34%** | **After-Tax Cash Flow** | **PW at 15% = ATCF (*P*/*F*, 15%, Year)** |
| 0 | −$108,000  −$25,000 |  |  |  | 0 | 0 |
| 1 | $24,000 | $24,000 | 0 | 0 | $24,000 | $20,870 |
| 2 | $24,000 | $21,000 | $3,000 | −$1,020 | $22,980 | $17,375 |
| 3 | $24,000 | $18,000 | $6,000 | −$2,040 | $21,960 | $14,439 |
| 4 | $24,000 | $15,000 | $9,000 | −$3,060 | $20,940 | $11,973 |
| 5 | $24,000 | $12,000 | $12,000 | −$4,080 | $19,920 | $9,904 |
| 6 | $24,000 | $9,000 | $15,000 | −$5,100 | $18,900 | $8,170 |
| 7 | $24,000 | $6,000 | $18,000 | −$6,120 | $17,880 | $6,721 |
| 8 | $24,000 | $3,000 | $21,000 | −$7,140 | $43,860 | $13,684 |
| $25,000 | 0 | 0 |  |
| Total |  | $108,000 |  |  |  | −$29,864 |

SOYD Depreciation

= *N* (*N* + 1)/2

= (8 × 9)/2

= 36

*d*1 = ($108,000 – 0) 8/36 = $24,000

Gap in depreciation in consecutive years = ($108,000 – 0)/ 36 = $3,000

**The project should not be undertaken** because the NPW at 15% is negative.

12-31

Geraldine paid $9,700 for the land and $90,000 for the house. The land does not depreciate, whereas the house depreciates at 10%. The first-year rule applies:

CCA depreciation at 10%:

In 1st year = 10% ($45,000) = $4,500

In 2nd year = 10% ($85,500) = $8,550

In 3rd year = 10% ($76,950) = $7,695

In 4th year = 10% ($69,255) = $6,925

Total depreciation in 4 years = $27,670

Book value of house and lot after 4 years = $99,700 – $27,670 = $62,330

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **CCA Depreciation** | **Taxable Income** | **Income Taxes at 36%** | **After-Tax Cash Flow** |
| 0 | −$99,700 |  |  |  | −$99,700 |
| 1 | $6,000 | $4,500 | $1,500 | –$540 | $5,460 |
| 2 | $6,000 | $8,550 | −$2,550 | $918 | $6,918 |
| 3 | $6,000 | $7,695 | −$1,695 | $610 | $6,610 |
| 4 | $6,000 | $6,925 | −$561 | $224 | $95,863 |
| $105,000 |  | $42,670\* | −$15,361 |

\*Depreciation recaptured + Capital gain.

This yields the equation

–$99,700 + 5,460(*P*/*F*, *i*,1) + 6,918(*P*/*F*, *i*,2) + 6,610(*P*/*F*, *i*,3) + 95,863(*P*/*F*, *i*,4) = 0

which corresponds to an **after-tax rate of return of 3.93%**

12-38

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **CCA** | **Taxable Income** | **Income Taxes** | **After-Tax Cash Flow** | **PW (ATCF)** |
| 0 | –$300,000 |  |  |  | –$300,000 | –$300,000 |
| 1 | $150,000 | $45,000 | $105,000 | $40,950 | $109,050 | $97,366 |
| 2 | $150,000 | $76,500 | $73,500 | $28,665 | $121,335 | $96,728 |
| 3 | $150,000 | $63,000 | $87,000 | $33,930 | $116,070 | $82,616 |
| 4 | $150,000 | $40,050 | $109,950 | $42,881 | $107,120 | $68,076 |
| 5 | $150,000 | $21,150 | $128,850 | $50,252 | $99,749 | $56,600 |
|  | | | | | | **$101,386** |

1. If we sum the after-tax cashflows, they total –$23,290 at the end of Year 3 and $44,786 at the end of Year 4. So the after-tax payback period is

3 + 23290/(44,786+23,290) = **3.342 years**

1. **Yes, this is a desirable investment**, as present worth at 12% is **$101,386**.

12-41

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **CCA** | **Taxable Income** | **Income Taxes** | **After-Tax Cash Flow** | **PW (12%)** |
| 0 | –$20,000 |  |  |  | –$20,000 | –$20,000 |
| 1 | $8,000 | $5,500 | $2,500 | $1,125 | $6,875 | $6,138 |
| 2 | $8,000 | $7,975 | $25 | $11 | $7,989 | $6,369 |
| 3 | $8,000 | $3,589 | $4,411 | $1,985 | $6,015 | $4,281 |
|  | $10,000 |  | $7,064 | $3,179 | $6,821 | $4,855 |
|  | | | | | NPW | $1,643 |

Book value = $20,000 − $5,500 − $7,975 − $3,589 = $2,936

Recaptured depreciation = Market value of salvage – Book value of salvage

= $10,000 − $2,936= $7,064.

**Net PW = $1,643**

12-48

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Before-Tax Cash Flow** | **Depreciation** | **Δ Taxable Income** | **Income Taxes at 40%** | **After-Tax Cash Flow** |
| 0 | − *x* − $5,500 |  | −$3,000 | +$1,200 | − *x* − $4,300 |
| 1 | +$7,000 |  | $7,000 | −$2,800 | +$4,200 |
| 2 | +$7,000 |  | $7,000 | −$2,800 | +$4,200 |
| … | … |  | … | … | … |
| … | … |  | … | … | … |
| 9 | +$7,000 |  | $7,000 | −$2,800 | +$4,200 |
| 10 | +$7,000 |  | $7,000 | −$2,800 | +$4,200 |
|  | +*x* + $2,500 | $0 | $0 |  | +*x* + $2,500 |

Where *x* = maximum purchase price for old building and lot.

PW of benefits – PW of cost = 0

$4,200 (*P*/*A*, *i*%, 10) + (*x* + $2,500) (*P*/*F*, *i*%, 10) − *x* − $4,300 = 0

At the desired *i* = 15%:

$4,200 (5.019) + (*x* + $2,500) (0.2472) − *x* − $4,300 = 0

$21,080 + 0.2472*x* + $618 − *x* − $4,300 = 0

*x* = ($21,080 + $618 − $4,300)/0.7528 = $23,100