

Capital Budgeting

With this program, the user can evaluate capital budgeting problems and perform comprehensive investment analysis comparisons on up to 4 separate projects or investments.

Required Inputs

The required inputs for each item evaluated are:

- Investment information describing costs and returns
- Financing terms including down payment, length of loan and interest rate
- Depreciation details
- Investor tax rates and required return information (see program screen image on next page for more detail)

Main Menu

The Main Menu is shown on the next page. Inputs are entered in yellow shaded cells. Calculated data are shown in blue shaded cells and transparent cells. Data in white cells can not be changed by the user.





Capital Budget Analysis

Worksheet to compute NPV, compare price and terms, evaluate IRR and MIRR, for basic capital budgeting/investment analysis problem.

-Select Report to Print -Select Report to View

Select number of items (1-4) 4		1	2	3	4
Investment Information:	Item description	New Tractor A	New Tractor B	Used Tractor C	Used Tractor D
	Purchase price	\$83,000	\$89,000	\$0	\$0
	Additional cash flows: Year 1	\$11,250	\$11,250	\$0	\$0
	Cash flow growth rate per year	1.00%	1.00%	0.00%	0.00%
	Investment horizon (years)	15	15	3	3
	Terminal market value	\$6,000	\$6,000	\$0	\$0
	<i>Optional: Customize cash flows</i>	Customize cash flow s			
Financing Terms:	Down payment %	80.00%	20.00%	100.00%	100.00%
	Length of loan (years)	5	5	0	0
	Annual interest rate on loan	10.000%	6.000%	0.000%	0.000%
Depreciation Variables:	Length to depreciate (years)	7	7	3	3
	Salvage value for depreciation	\$0	\$0	\$0	\$0
	Depreciation method	MACRS: 150%, half yea	MACRS: 150%, half yea	No Depreciation	No Depreciation
Investor Information:	Discount rate	10.00%	10.00%	10.00%	10.00%
	Marginal tax rate	28.00%	28.00%	28.00%	28.00%
	Capital gains tax rate	20.00%	20.00%	20.00%	20.00%
Results:	Net present value	\$329.76	\$4,418.03	\$0.00	\$0.00
	Internal rate of return	10.081%	11.631%	Not Meaningful	Not Meaningful
	Modified internal rate of return	10.036%	10.888%	Not Meaningful	Not Meaningful
	Annuity equivalent	\$43.35	\$580.86	\$0.00	\$0.00
	Net present value	Horizons Differ	Horizons Differ	Horizons Differ	Horizons Differ
Ranking:	Internal rate of return	Horizons Differ	Horizons Differ	Horizons Differ	Horizons Differ
	Modified internal rate of return	Horizons Differ	Horizons Differ	Horizons Differ	Horizons Differ
	Annuity equivalent	2	1	3	3
	Net present value	Horizons Differ	Horizons Differ	Horizons Differ	Horizons Differ
Solve for NPV = 0:	Purchase price	Solve Price	Solve Price	Solve Price	Solve Price
	Year 1 cash flow	Solve Cash Flow s			
	Growth rate per year	Solve Grow th Rate			

Navigating the Program

The program contains 3 types of utilities that are used in the program. Drop-down menus, buttons, and graphs & tables are explained below.

Drop-Down Menus

Four drop-down menus are available on the Main Menu of the Capital Budgeting program. To choose a selection using a drop-down menu, click on the arrow located on the right side of the cell, highlight the preferred selection, and click once.

The **select report to print** menu allows the user to print a report. The following reports are available to print: SUMMARY, DISCOUNT RATE SENSITIVITY GRAPH, MARGINAL TAX SENSITIVITY GRAPH, SENSITIVITY TABLES, ITEM 1 DETAIL, ITEM 2 DETAIL, ITEM 3 DETAIL, ITEM 4 DETAIL, and ALL REPORTS.

The **select report to view** menu allows a user to select among the following reports to view: DISCOUNT RATE SENSITIVITY GRAPH, MARGINAL TAX SENSITIVITY GRAPH, SENSITIVITY TABLES, ITEM 1 DETAIL, ITEM 2 DETAIL, ITEM 3 DETAIL, and ITEM 4 DETAIL.

The **number of items to analyze** menu allows the user to select from 1 to 4 items for comparison in the analysis. When the number is selected, the program

displays that number of columns for data collection, each representing an item in the analysis.

Four **depreciation methods** are available. Selections include: Straight line, MACRS 150% full year, MACRS 150% half year, and no depreciation. The methods are described later.

Buttons

Four buttons are available on the Main Menu of the Capital Budgeting program.

Customize cash flows displays the box shown below. This box allows the user to enter the cash flows for each year of the analysis. This method replaces both the *additional cash flows in year one* entry and the *cash flow growth rate per year* entry, which are designed to estimate cash flows for each year. Three options are available on the screen shown below:

1. Set the cash flows entries to zero
2. Reset the cash flows entries to the default series
3. Return to Main Menu.

The box shown below is for an analysis with a 5-year investment horizon. If the analysis were for a 10-year investment horizon, 10 entry spaces would appear. The maximum number of entry spaces is 30.

Year	Cash Flow
Year 1	11,250.00
Year 2	11,250.00
Year 3	11,250.00
Year 4	11,250.00
Year 5	11,250.00

Buttons: Set Cash Flows to Zero, Reset to Default Series, Return to Main

Solve Price adjusts the *purchase price* so that the net present value is zero.

Solve Cash Flows adjusts the amount of *additional cash flows in year one*, causing the net present value to equal zero.

Solve Growth Rate

adjusts the *cash flows growth rate* so that the net present value equals zero.

Graphs and Tables

Four graphs and tables can be generated when using the Capital Budgeting program.

The **DISCOUNT RATE SENSITIVITY GRAPH** displays the net present values for each item in the analysis with respect to different discount rates.

The **MARGINAL TAX SENSITIVITY GRAPH** displays the net present values for each item in the analysis with respect to different marginal tax rates.

The **SENSITIVITY TABLES** provide the net present values for each item with respect to different discount rates and marginal tax rates.

A **detailed cash flow** for each item analyzed is available. The information provided with the cash flow includes: additional revenue, terminal value, depreciation, down payment & loan payment, loan balance, principal, interest, tax savings, capital gains tax, net after-tax cash flows, discount factor, net present value calculation, and MIRR calculations for both future value inflows and present value outflows.

Input Sections

The inputs required for the analysis of an asset or group of assets are described below. As an example, the inputs for item 1 of the Main Menu are explained.

Investment Information

Investment Information:	Item description	New Tractor A	New Tractor B
	Purchase price	\$83,000	\$89,000
	Additional cash flows: Year 1	\$11,250	\$11,250
	Cash flow growth rate per year	1.00%	1.00%
	Investment horizon (years)	15	15
	Terminal market value	\$6,000	\$6,000
	Optional: Customize cash flows	Customize cash flows	Customize cash flows

Item description Recommended for each item. This helps identify data on graphs and tables. In the example, item 1 is called “New Tractor A”.

Purchase price The price of the capital asset, project, or a price the user wishes to evaluate. In the example, the user evaluates “New Tractor A” at a price of \$83,000.

Additional cash flows: Year 1 The net cash flows generated by the investment in the first year after being purchased. The value should include all cash inflows and outflows except for real estate taxes and loan payments. In the example, the additional cash flows in year 1 for “New Tractor A” total \$11,250.

Cash flow growth rate per year The annual anticipated change in cash flows from the *additional cash flows for year 1* entry. This rate may be positive or negative. In the example, the user estimates that cash inflows will increase 1% per year for the tractor.

Investment horizon (years) The length of time that the user chooses to analyze the purchase and/or maintain possession of the item. For example, the user chose 15 years as the investment horizon for “New Tractor A.”

Terminal market value The value of the asset if it were sold at the end of the investment horizon. For example, after 15 years, the estimated market value of Tractor A is \$6,000.

Optional: Customize cash flows This line provides the user with an option to enter the cash flows for each year instead of the computer’s calculations. The computer calculates cash flows using the *first year cash flows* entry and *cash flows growth rate*.

Financing Terms

Financing Terms:	Down payment %	80.00%	20.00%
	Length of loan (years)	5	5
	Annual interest rate on loan	10.000%	6.000%

Down payment (%) The amount of the purchase price that is not financed with debt. The percentage entry can range from 0 to 100%. An entry of “0” means that the entire purchase price is financed with debt, while an entry of “50” means that half of the purchase price is financed with debt. Constant loan payments are calculated using straight-line amortization. In the example, the user pays 80% of the purchase price with a down payment and finances 20% of the purchase price with debt.

Length of loan (years) The amortization period of the loan. The user will have 5 years to fully repay the money borrowed for “New Tractor A” before penalties are incurred.

Annual interest rate on loan (%) The rate at which interest is charged on the remaining balance of the loan each period. A loan with a 10% interest rate is used in the example.

Depreciation Variables

Depreciation Variables:	Length to depreciate (years)	7	7
	Salvage value for depreciation	\$0	\$0
	Depreciation method	MACRS: 150%, half year	MACRS: 150%, half year

Length to depreciate (years) The recovery period, or number of years, that depreciation can be claimed per the useful life of the asset approved by the IRS (See Table 1). Table 1 shows that depreciation for farm machinery may be written off for 7 years.

Salvage value for depreciation The resale, or scrap, value of a depreciable asset. The salvage value of the new tractor is \$0.

Under current tax law, specific **depreciation methods** are permitted for different classes of property. Options contained within the program are shown below. The user chose to depreciate the “New Tractor A” using the 150% half-life method.

No depreciation

150% full year An accelerated method of depreciation that is available for most farm property, including farm machinery. This is used if the property is put in service in the first half of the year.

150% half life An accelerated method of depreciation that is available for most farm property, including farm machinery. This is used if the property is put in service in the second half of the year.

Straight-line Available for most farm property. This method of depreciation provides the same amount of depreciation for each year of the asset’s life.

Investor Information

Investor Information:	Discount rate	10.00%	10.00%
	Marginal tax rate	28.00%	28.00%
	Capital gains tax rate	20.00%	20.00%

After-tax **discount rate (atdr)** The discount rate used to calculate the present value of future cash flows. One method for calculating the atdr is to use the before-tax discount rate (dr), or interest rate, and the marginal tax rate (mtr) with

the following equation: $\text{atdr} = \text{dr} \times (1 - \text{mtr})$. Using this approach with $\text{dr} = 8\%$ and $\text{mtr} = 28\%$ from the example, the user's atdr is: $8\% \times (1 - 28\%) = 0.57$, rounded to 6%.

Marginal tax rate (%) (mtr) The user's income tax rate on the next dollar earned. An entry of 25% means that \$0.25 of the next dollar earned goes towards income taxes. In the example, the user's marginal tax rate is 28%.

Capital gains tax rate (%) The tax rate on capital gains (i.e. the appreciation of asset values) at the end of the horizon. For example, the capital gains tax rate used in the example is 20%.

Results

The program provides a results section for ease of comparing the investments. The following results are included: net present value, internal rate of return, modified internal rate of return, and annuity equivalent.

Results:			
	Net present value	\$329.76	\$4,418.03
	Internal rate of return	10.081%	11.631%
	Modified internal rate of return	10.036%	10.888%
	Annuity equivalent	\$43.35	\$580.86

Net present value (NPV) Represents the cash flows for the length of the loan discounted to represent what the flows would be today. This value is the sum of all net present value calculations in the report. A higher NPV is preferred.

Internal rate of return (IRR) The interest rate calculated for the sum of net after tax cash flows causing the net present value to equal zero. The IRR for the example is 10.081%. This rate suggests that a positive return was made on the investment. A higher IRR is preferred.

Modified internal rate of return (MIRR) Considers both the cost of the investment and the interest received on cash reinvested and is the discount rate that equates the future value inflows and present value outflows. A higher MIRR is preferred.

Annuity equivalent A method used to compare investments with different economic lives by calculating an annuity value for each on a common time basis using each investment's economic life, sum of cash outflows, and cost of capital. The *annuity equivalent* value shown in the results section above is the estimated annual annuity for the investment with respect to its economic life. The (a) annuity payment is calculated as the (b) net present value divided by the (c) present value of a dollar over the length of the economic life of the investment

using the cost of capital. When comparing investment's annuity equivalents, a lower annuity payment is preferred.

Example of Investment A's annuity equivalent calculations:

(c) *Present value of \$1 using cost of capital*

$$V_0 = A \left[\frac{1 - (1 + i/m)^{-m \times N}}{i/m} \right]$$

A = periodic payment (\$1)
 i = cost of capital, or discount rate, (%)
 m = compounding frequency (annually)
 N = economic life (years)

For example, $\left(\$1 \frac{1 - (1 + 10\%/1)^{-1 \times 15}}{10\%/1} = 7.6 \right)$

(b) *Net Present Value (NPV) = \$329.76*

(a) *Annuity payment is the NPV divided by (c) or 329.76 / 7.6 = \$43.35*

Ranking

The program has a *ranking* section that provides recommendations for the preferred purchase. The ranking system refers to the results in the category and ranks them according to preferred financial benchmarks. For example, a higher net present value is preferred. The following categories are included in the *ranking* section: net present value, internal rate of return, modified internal rate of return, and annuity equivalent.

In the example below, the second column is preferred over the first column. No comparisons were made for net present value, internal rate of return, or modified internal rate of return because the investment horizons differed.

Ranking:	Net present value	Horizons Differ	Horizons Differ
	Internal rate of return	Horizons Differ	Horizons Differ
	Modified internal rate of return	Horizons Differ	Horizons Differ
	Annuity equivalent	2	1

If the rankings differ across the four investments, the user should rely more heavily on the net present value (NPV) and the modified internal rate of return calculations. The NPV allows the user to choose the investment that returns the most money in today's dollars. The modified internal rate of return is the return on an investment assuming that the returns are reinvested at the discount rate. In addition, if a "replacement investment" is being considered – one that may not actually increase cash inflow but does offset cash outflow – the user should take

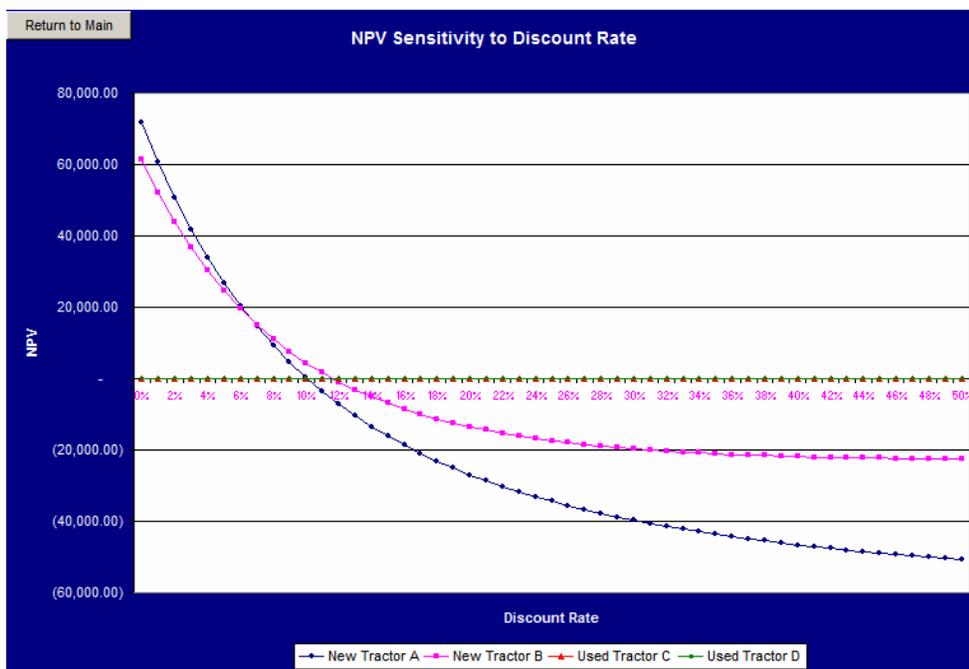
into consideration the amount of the annual cash outflow and decide if it is affordable.

Graphs and Tables

Four graphs and tables can be generated when using the Capital Budgeting program. They are described next.

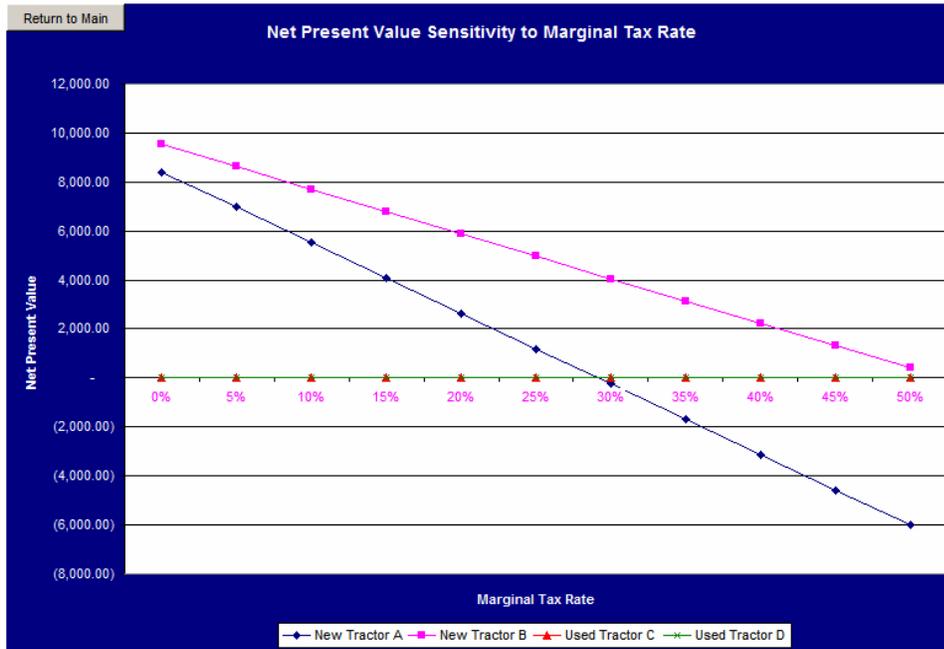
DISCOUNT RATE SENSIVITY GRAPH

This graph displays the net present values for each item in the analysis with respect to different discount rates. For example, at 6%, the NPV for “New Tractor A” is positive and at 12% it is negative. Thus, as the discount rate increases, the net present value decreases.



MARGINAL TAX SENSITIVITY GRAPH

This graph displays the net present values for each item in the analysis with respect to different marginal tax rates. For example, at a 20% marginal tax rate, the net present value for “New Tractor A” is approximately \$2,500. At 25%, however, the net present value is approximately \$1,700. Thus, as the marginal tax rate increases, the net present value decreases.



SENSITIVITY TABLES

The table below shows the net present value’s sensitivity to changes in marginal tax rates. In this example, as marginal tax rates increase, the net present values decrease.

Net Present Value Sensitivity to Marginal Tax Rate

Marginal Tax Rate	New Tractor A	New Tractor B	Used Tractor C	Used Tractor D
0%	8,408	9,534	-	-
5%	6,966	8,620	-	-
10%	5,523	7,707	-	-
15%	4,080	6,793	-	-
20%	2,638	5,880	-	-
25%	1,195	4,966	-	-
30%	(247)	4,053	-	-
35%	(1,690)	3,139	-	-
40%	(3,132)	2,225	-	-
45%	(4,575)	1,312	-	-
50%	(6,018)	398	-	-

The table below shows the net present value's sensitivity to changes in the discount rate. In this example, as discount rates increase, the net present values decrease.

Net Present Value Sensitivity to Discount Rate

Discount Rate	New Tractor A	New Tractor B	Used Tractor C	Used Tractor D
0%	71,612.32	61,519.41	-	-
1%	60,536.20	52,159.72	-	-
2%	50,656.37	43,919.72	-	-
3%	41,822.28	36,653.20	-	-
4%	33,904.41	30,234.66	-	-
5%	26,791.07	24,556.19	-	-
6%	20,385.75	19,524.81	-	-
7%	14,604.89	15,060.24	-	-
8%	9,375.96	11,093.06	-	-
9%	4,635.90	7,563.07	-	-
10%	329.76	4,418.03	-	-
11%	(3,590.46)	1,612.51	-	-
12%	(7,166.71)	(893.09)	-	-
13%	(10,435.81)	(3,133.35)	-	-
14%	(13,430.06)	(5,138.46)	-	-
15%	(16,177.92)	(6,934.91)	-	-
16%	(18,704.45)	(8,545.92)	-	-
17%	(21,031.81)	(9,991.87)	-	-
18%	(23,179.59)	(11,290.73)	-	-
19%	(25,165.18)	(12,458.33)	-	-
20%	(27,003.99)	(13,508.62)	-	-
21%	(28,709.78)	(14,453.98)	-	-
22%	(30,294.76)	(15,305.32)	-	-
23%	(31,769.88)	(16,072.35)	-	-
24%	(33,144.89)	(16,763.68)	-	-
25%	(34,428.55)	(17,386.95)	-	-
26%	(35,628.72)	(17,948.99)	-	-
27%	(36,752.44)	(18,455.87)	-	-
28%	(37,806.08)	(18,913.01)	-	-
29%	(38,795.36)	(19,325.26)	-	-
30%	(39,725.45)	(19,696.96)	-	-
31%	(40,601.03)	(20,031.98)	-	-
32%	(41,426.33)	(20,333.81)	-	-
33%	(42,205.20)	(20,605.58)	-	-
34%	(42,941.11)	(20,850.11)	-	-
35%	(43,637.26)	(21,069.93)	-	-

Detailed Cash Flow for Each Item

A detailed cash flow report is generated for each asset included in the analysis. The report includes: additional revenue, terminal value, depreciation, down payment & loan payment, loan balance, principal, interest, tax savings, capital gains tax, net after-tax cash flows, discount factor, net present value calculations, and MIRR future value inflows and present value outflows.

An explanation of the calculations is provided for the “New Tractor A’s” cash flow.

New Tractor A													
Time	Additional Revenue	Terminal Value	Depreciation	Downpayment & Loan Payment	Loan Balance	Principal	Interest	Tax Savings	Capital Gains Tax	Net After Tax Cash Flows	Discount Factor	Net Present Value Calc.	MIRR Calculations FV Inflows PV Outflows
0				66,400						(66,400)	1.0000	(66,400)	(66,400)
1	11,250		8,893	4,379	16,600	2,719	1,660	2,955		6,676	0.9091	6,069	25,351
2	11,363		15,880	4,379	13,881	2,391	1,388	4,835		8,637	0.8264	7,138	29,817
3	11,476		12,477	4,379	10,890	3,290	1,089	3,799		7,682	0.7513	5,772	24,110
4	11,591		10,167	4,379	7,600	3,619	760	3,059		7,026	0.6830	4,799	20,046
5	11,707		10,167	4,379	3,981	3,981	398	2,958		7,008	0.6209	4,351	18,177
6	11,824		10,167					2,847		11,360	0.5645	6,412	26,786
7	11,942		10,167					2,847		11,445	0.5132	5,873	24,533
8	12,062		5,083					1,423		10,108	0.4665	4,715	19,637
9	12,182									8,771	0.4241	3,720	15,539
10	12,304									8,859	0.3855	3,415	14,267
11	12,427									8,947	0.3505	3,136	13,100
12	12,551									9,037	0.3186	2,879	12,028
13	12,677									9,127	0.2897	2,644	11,044
14	12,804									9,219	0.2633	2,428	10,140
15	12,932	6,000							1,200.00	14,111	0.2394	3,378	14,111
16											0.2176		-
17											0.1978		-
18											0.1799		-
19											0.1635		-
20											0.1486		-
21											0.1351		-
22											0.1228		-
23											0.1117		-
24											0.1015		-
25											0.0923		-
26											0.0839		-
27											0.0763		-
28											0.0693		-
29											0.0630		-
30											0.0573		-
											Total NPV	329.76	
											IRR	10.081%	
											MIRR	10.036%	

Additional revenue Represents the additional cash flows received by the investment. In year 1, this value is the additional cash flows in year 1 as entered in the Main Menu. For other years, this value equals the previous year’s additional revenue multiplied by one plus the growth rate. If the year comes after the investment horizon, no additional revenue is calculated. For example, year 1’s additional revenue is \$11,250. In year 2, the additional revenue is \$11,250 multiplied by one plus the growth rate (1%), which equals \$11,363.

Terminal value The terminal value from the Main Menu is entered on the cash flow report if the investment horizon (also entered on the Main Menu) equals the current year. If the current year is the final year, then the terminal market value for that item is entered on the cash flow report. For example, for Item 1 the investment horizon is 15 years. On the detailed cash flow for Item 1, the terminal value of \$6,000 is entered on the 15th period.

Depreciation Entered if the current year is less than the final year of the investment horizon. Depreciation is calculated according to the terms entered in the Main Menu. For *straight-line depreciation*, the amount of depreciation allowed each year is calculated as the purchase price divided by the number of years allowed for depreciation. For example, a tractor with a purchase price of \$83,000, which is a 7-year depreciable asset, has a depreciation deduction of \$11,857 each year for 7 years. For *MACRS depreciation*, the amount of depreciation is calculated by multiplying the purchase price by the MACRS factor for the current

year. MACRS factors are provided in the computer program and allow for an accelerated write-off.

Down payment The purchase price multiplied by the down payment (%) entry on the Main Menu. For example, the purchase price for item 1 is \$83,000 and the down payment is 80%. In year 0, the down payment is \$66,400. It is calculated as follows:

$$\text{Purchase price } (\$83,000) \times \text{down payment } (80\%) = \$66,400$$

Loan payments are calculated if the loan balance in the current year is greater than 0. The loan payments are based on a fixed payment, straight amortization loan.

Principal The amount of each loan payment that decreases the loan balance. It is calculated as the loan payment in the current year minus the interest paid in the current year.

In year 1, the principal is \$2,719. It was calculated as follows:

$$\text{Loan payment } (\$4,379) - \text{interest } (\$1,660) = \$2,719$$

Interest The portion of each loan payment that represents the cost of borrowing money. It is calculated by multiplying the interest rate by the loan balance in the current year.

In year 1, interest was \$1,660. It was calculated as follows:

$$\text{Interest rate } (10\%) \times \text{loan balance in current year } (\$16,600) = \$1,660$$

Tax savings The reduced amount of tax owed due to depreciation and interest. It is calculated by adding the depreciation and interest and then multiplying that value by the marginal tax rate.

In year 1, the tax savings is \$2,955.

$$\begin{aligned} \text{Depreciation } (\$8,893) + \text{interest } (\$1,660) &= \$10,553 \\ \$10,553 \times \text{marginal tax rate } (28\%) &= \$2,955 \end{aligned}$$

Tax on capital sale The amount of tax due at the end of the investment horizon if the asset were sold. If it is the last year of the analysis, the tax on capital sale is displayed. It is calculated in a three-step process. First, determine which is larger: the salvage value or the purchase price minus total depreciation claimed. Then subtract the larger value from the terminal value. Finally, multiply by the tax rate on capital sales.

In year 15, the tax on capital sales is \$1,200. It was calculated as follows:

$$\text{Purchase price } (\$83,000) - \text{total depreciation } (\$83,000) = \$0$$

Which is larger: salvage value (\$0) or purchase price minus depreciation (\$0)?

$$\text{Terminal value } (\$6,000) - \$0 = \$6,000$$

$$\$6,000 \times \text{tax rate on capital sales } (20\%) = \$1,200$$

Net after-tax cash flows Represent the actual cash outflow after accounting for taxes. The calculation is the negative value of the loan payment cash outflows plus tax savings added to the amount of additional revenue not taxed by income taxes. From this value, the capital gains tax is subtracted and the terminal value is added.

In year 1, the net after-tax cash flows equals \$6,676. It was calculated as follows:

$$- \text{loan payment } (-\$4,379) + \text{tax savings } (\$2,955) = -\$1,424$$

$$-\$1,424 + [\text{additional revenue } (\$11,250) \times 1 - \text{marginal tax rate } (28\%)] = \$6,676$$

$$\$6,676 - \text{capital gains tax } (0) + \text{terminal value } (\$0) = \$6,676$$

Discount factor The discounting tool used to calculate the net present value and other measures in present terms. It is calculated as one plus the discount rate raised to the power of number of periods since purchase.

In year 2, the discount factor is 0.8264. It is calculated as follows:

$$1 + \text{discount rate } (10\%) = 1.10$$

$$1.10^2 = 1.21$$

$$1 / 1.21 = 0.8264$$

Net present value calculation The value of net after-tax cash flows discounted to its present value. The calculation is the net after-tax cash flows multiplied by the discount factor.

In year 1, the net present value calculation is \$6,069. It is calculated as follows:

$$\text{Net after-tax cash flows } (\$6,676) \times \text{discount factor } (0.9091) = \$6,069$$

MIRR Calculation: Future Value Inflows The value of inflows in the future calculated using the cost of capital. It is calculated if the net after-tax cash flows are greater than zero. The example calculation is shown below:

a. $1 + \text{discount rate } (10\%) = 1.1$

- b. $1.1^{14} = 3.7975$
- c. $3.7975 \times \text{net after-tax cash flows } (\$9,166) = \$34,807$

MIRR Calculation: Present Value Outflows The value of outflows in present terms. It is only calculated if the “net after-tax cash flows” in the current year are less than zero (negative). If the net after-tax cash flows are positive, then this value is zero. The example calculation is shown below:

- a. $1 + \text{discount rate } (10\%) = 1.1$
- b. $1.1^0 = 1$
- c. $-\$66,400 / 1 = -\$66,400$

Calculations for information below the cash flows report.

Total net present value (NPV) Represents the cash flows for the length of the loan discounted to represent what the flows would be today. This value is the sum of all net present value calculations in the report. The total NPV for item 1 is \$329.76. When comparing NPVs, it is preferred to have the highest NPV, especially when viewing negative NPVs.

Internal rate of return (IRR) The interest rate calculated for the sum of net after-tax cash flows causing the net present value to equal zero. The IRR for the example is 10.081%. This rate suggests that a positive return was made on the investment. The **modified internal rate of return (MIRR)** considers both the cost of the investment and the interest received on reinvestment of cash and is the discount rate that equates the future value inflows and present value outflows.

Modified internal rate of return (MIRR) Calculated by (a) summing the MIRR future value inflows (b) dividing \underline{a} by a negative sum of the present value outflows (c) multiplying \underline{b} by itself “X” times (X = one divided by the number of years in the investment horizon) and (d) \underline{c} minus one.

$$\begin{aligned} &\text{Sum of MIRR future value inflows } (\$281,854) / - \text{sum of MIRR present value} \\ &\quad \text{outflows } (-\$66,400) = 4.245 \\ &4.245(1/15) 0.067 \text{” times} = 1.10 \\ &1.10 - 1 = 0.10 = 10\% \end{aligned}$$

Table 1: Farm Property Recovery Periods

Source: Internal Revenue Service, Tax Publications, MACRS Table 8-1

ASSETS	Recovery Period in Years	
	GDS	ADS
Agricultural structures (single purpose)	10	15
Airplanes (including helicopters) ¹	5	6
Automobiles	5	5
Calculator and copiers	5	6
Cattle (dairy or breeding)	5	7
Communication equipment ²	7	10
Computers and peripheral equipment.....	5	5
Cotton ginning assets.....	7	12
Drainage facilities	15	20
Farm buildings ³	20	25
Farm machinery and equipment	7	10
Fences (agricultural)	7	10
Goats and sheep (breeding)	5	5
Grain bin.....	7	10
Hogs (breeding)	3	3
Horses (age when placed in service)		
Breeding and working (12 years or less).....	7	10
Breeding and working (more than 12 years)	3	10
Racing horses (more than 2 years)	3	12
Horticultural structures (single purpose)	10	15
Logging machinery and equipment ⁴	5	6
Nonresidential real property	39 ⁵	40
Office equipment (not calculators, copiers or typewriters).....	7	10
Office furniture or fixtures.....	7	10
Residential rental property	27.5	40
Tractor units (over-the-road)	3	4
Trees or vines bearing fruit or nuts	10	20
Truck (heavy duty, unloaded weight 13,000 lbs. or more).....	5	6
Truck (weight less than 13,000 lbs.)	5	5
Typewriter.....	5	6
Water wells.....	15	20

¹Not including airplanes used in commercial or contract carrying of passengers.

²Not including communication equipment listed in other classes.

³Not including single-purpose agricultural or horticultural structures.

⁴Used by logging and sawmill operators for cutting of timber.

⁵For property placed in service after May 12, 1993; for property placed in service before May 13, 1993, the recovery period is 31.5 years.