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JEFFI/2

A Cash Flow Analysis Program

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Abstract

JEFFI/2 is a modification of an earlier cash flow analysis program called JEFFI (Just Enough Fine Financial Information). JEFFI/2 overcomes several shortcomings of the earlier version. First, JEFFI/2 is a stand alone program; it no longer requires LOTUS 123 loaded on your system. Second, investments of 4 to 30 years may be evaluated. The earlier version facilitated analysis of fixed 10-year investments only. Finally, JEFFI/2 allows explicit recognition of additional capital infusions during the life of the investment. The earlier version did not. JEFFI/2 retains a number of unique features of the earlier program related to treatment of the final year cash flows, depreciation, working capital, and derivation of a discount rate.

The Authors

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JEFFI/2

JEFFI/2 is an updated version of JEFFI—a cash flow analysis program written and released in 1993 (Hansen and Palmer 1993). Like it's predecessor, JEFFI/2 is designed to provide a quick, first look at investment potential. Also, like JEFFI, JEFFI/2 is simple to use but generates sophisticated measures of performance. It provides both discounted (net present value, internal rate of return) and undiscounted (payback period) measures of investment performance. It also provides separate performance measures for returns to the overall investment (similar in concept to what Ross and others (1993) refer to as the Adjusted-Present-Value approach) and for returns to equity investors only (what Ross and others (1993) refer to as the Flow-to-Equity approach). The latter gives explicit recognition to debt repayment (principal and interest) and returns to equity investors.

JEFFI/2 Improvements

The original JEFFI had several drawbacks that we have eliminated in JEFFI/2. First, JEFFI was Lotus based. Thus, to run JEFFI, Lotus had to be loaded on the computer. This is no longer necessary.

Second, in striving to keep JEFFI simple, we required a fixed 10-year period for the investment. It was assumed that at the end of 10 years the business closed. Cash flows in year 10 were assumed to include not only revenue from sales in year 10, but also the return of working capital, proceeds from the sale of land at its original cost, and proceeds from the sale of assets at their depreciated or book value. This position was supported by the proposition that it is virtually impossible to predict cash flows with any certainty beyond 10 years. This we believe is still true to a large degree. However, JEFFI/2 has been modified to permit evaluation of investments of any length between 4 and 30 years.

Third, the program was not set up to allow for explicit treatment of additional capital inflows during the life of an investment. Many times, however, businesses plan on incremental investments as the business becomes established and starts to grow. JEFFI/2 provides a menu to input these investments.

Unique Features of JEFFI/2

Like JEFFI, JEFFI/2 has several unique features:

Final Year Cash Flows

Regardless of the length of the investment, the final year cash flows assume the return of all working capital outlays, the return of the value of the land at it original purchase price, and the return of assets at either a user specified salvage value or, if none is specified, the depreciated or book value of the assets. If a salvage value is specified and it is greater than the depreciated book value of the assets, the book value of the assets will be subtracted from the salvage value and the difference will be added to the before tax revenue. In addition, an amount equal to the book value of the assets will be added to the after tax earnings. If the specified salvage value is less than or equal to the book value of the assets, the entire amount will be added to the after tax earnings.

Treatment of Depreciation

As with the earlier version, JEFFI/2 permits calculation of depreciation by any method desired; it calls only for annual totals to be entered into the program. Although depreciation is treated by accountants as an expense, depreciation is not a true annual cost. Rather the cost represented by depreciation is taken into account by the initial investment in plant and equipment. Depreciation, or capital recovery, is recognized in discounted cash flow analyses for its role in shielding a portion of the before-tax revenue from taxation. Thus, depreciation is deducted from before-tax revenues to derive taxable income. This amount is added back to the after-tax profit to arrive at a value for after-tax earnings. Net after-tax cash flows are equal to after-tax profit plus or minus any adjustments to working capital. Net after-tax cash flows are used to derive the discounted net present value and the internal rate of return.

Treatment of Working Capital

In accounting, working capital refers to a firm's short-term assets. Gross working capital is defined as the firm's total current assets while net working capital is the difference between current assets and current liabilities. Gross working capital can include cash, short-term securities, in addition to accounts receivable and inventories.

Our use of the term working capital is more narrow and reflects the need to cover the costs of raw material inventories, work-in-process, finished goods inventories, and receivables. The user is required to establish an initial amount for working capital, which becomes part of the initial investment. However, as the business grows and sales increase, so does the amount of working capital needed to support expanded inventories, work-in-process, and receivables. JEFFI/2 automatically adjusts increases (decreases) the amount of working capital needed to support a higher (lower) level of operation. These adjustments are based on the change in the level of sales from one year to the next. The exact amount of the adjustment is based on the ratio between the initial working capital allowance and gross sales in the first year of operation. Subsequent changes in the level of sales are multiplied by this ratio to arrive at the adjustment in working capital.

Repayment of Borrowed Capital (Principal and Interest)

JEFFI/2 recognizes that when money is borrowed, the cost of that money may be included in the discount rate as part of the weighted average cost capital (borrowed and equity), or it may be accounted for explicitly through periodic repayment (amortization) of interest and principal. When the latter approach is taken, the overall return measures apply exclusively to the equity portion of investment. By contrast, when the cost of capital includes interest costs, return measures apply to the overall investment (project). JEFFI/2 provides for both treatments.

Derivation of a Project Discount Rate

The discount rate used to derive the net present value for the net cash flows to the overall project is based on what is known as the weighted average cost of capital (WACC) concept. This concept recognizes that investment funds usually include debt and equity. The program uses the user-specified borrowing rate (an average of rates charged by lenders), equity rate (the average return desired by investors), and debt position (the percent of the total investment that is borrowed) to derive an after-tax WACC according to the following formula:

WACC = ((borrowing rate * (1 - tax rate)) * debt position)
+ (equity rate * (1 - debt position))

Treatment of Negative Before-tax Income

It is possible that in the early years of an investment, the investment may generate a negative before-tax income. In that eventuality, JEFFI/2 sets the tax to "zero." In reality, negative earnings could be brought forward and used to lessen the tax burden in future years or they could be used in the year they occur to offset positive income from other activities of the firm. In either situation, the impact of the negative cash flow would be lessened to some degree. However, because such treatment calls for additional information lying outside the parameters of the investment itself, we have chosen not to assume any write-off or carry forward of negative before-tax income. By taking this approach, if we err, it will be in the conservative direction.

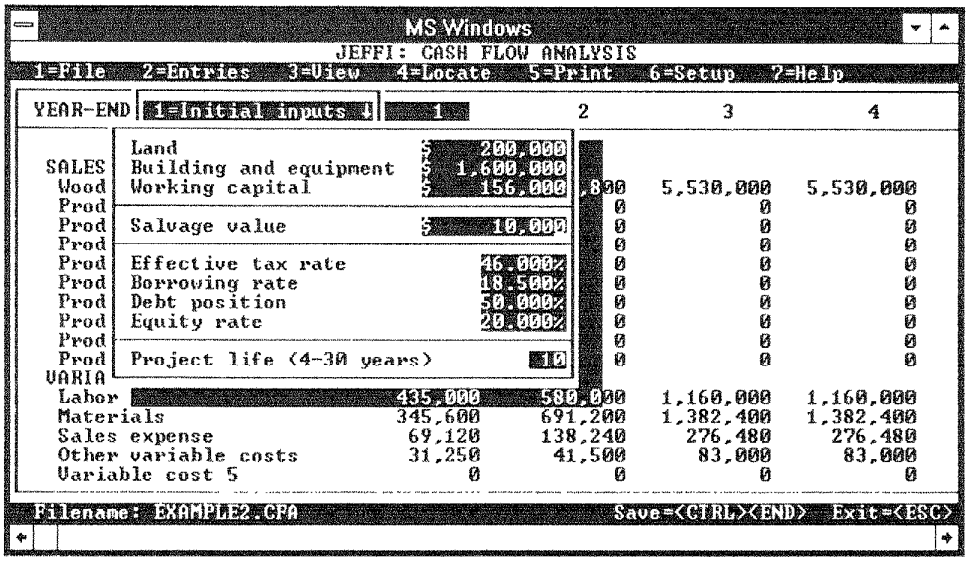
Example Files

JEFFI/2 contains two examples filed under the names "Example1" and "Example2." Example2 is used in all illustrations of inputs and outputs that follow. To access either file, click on "1=File" then on "2=Open" and type in either Example1 or Example2. Data used in the example files are from an earlier publication titled "System 6 Alternatives: An Economic Analysis" by Hansen and Reynolds (1986). This publication examined several alternative mill constructs proposed for use in the manufacture of dimension and glued panels from low-grade, small diameter hardwoods. The specific configurations used in the examples were referred to as the

"standard" and "maxi" mills. In addition to the mill examination, the publication contains an appendix that discusses many of the factors germane to capital budgeting analysis. Copies of this publication are still available by writing to the author at the address at the end of this publication.

Data Input

To create a new file and begin entering data, click on "1=File." Then click on "1=Create" in the shadow box submenu. This is followed by clicking of "2=Entries" on the main menu bar and then on "1=Initial Inputs" in the shadow box submenu. You are then asked for inputs for land, buildings and equipment, working capital, and any other miscellaneous start up expenditures. After these entries are made, you are asked to enter an effective tax rate (the current



corporate tax rates range from a minimum of 15% to a maximum of 39%). When deriving this rate, you need to account for both federal and state taxes. Also, do not use the marginal rate but the average over all income. To arrive at a tax rate, you must have some idea of your taxable income. If not, use your best "guesstimate." If you are too far off, you can always adjust the tax rate after you have made an initial run and run JEFFI/2 again.

You also are asked to provide a borrowing rate, a debt position (that is, the percent of the overall investment that is borrowed), and equity rate (this rate should at least equal what investors can expect to earn elsewhere for investments of similar risk). Finally, you are asked to indicate the life of the investment. This can either be the "true" anticipated life for up to 30 years or a shorter period. The problem with an investment of considerable length is that you will need to anticipate and estimate future costs and revenues for each year. Also, it usually assumes that you will be doing the same things, in the same way, 20 or 30 years from now. In light of how rapidly most things change today, such assumptions may be quite inappropriate. No matter what length is chosen for the investment, JEFFI/2 assumes the following:

- At the end of the last year, buildings and equipment are sold at their specified salvage value or at a price equal to their undepreciated value, and proceeds are added to the before or after-tax cash flow as appropriate.

- At the end of the last year, land is sold at its purchase price, and proceeds are added to the after-tax net cash flow in the last year.

- Working capital outlays made during the life of the investment are returned to the after- tax net cash flow as inventories are sold off and accounts receivables are collected.

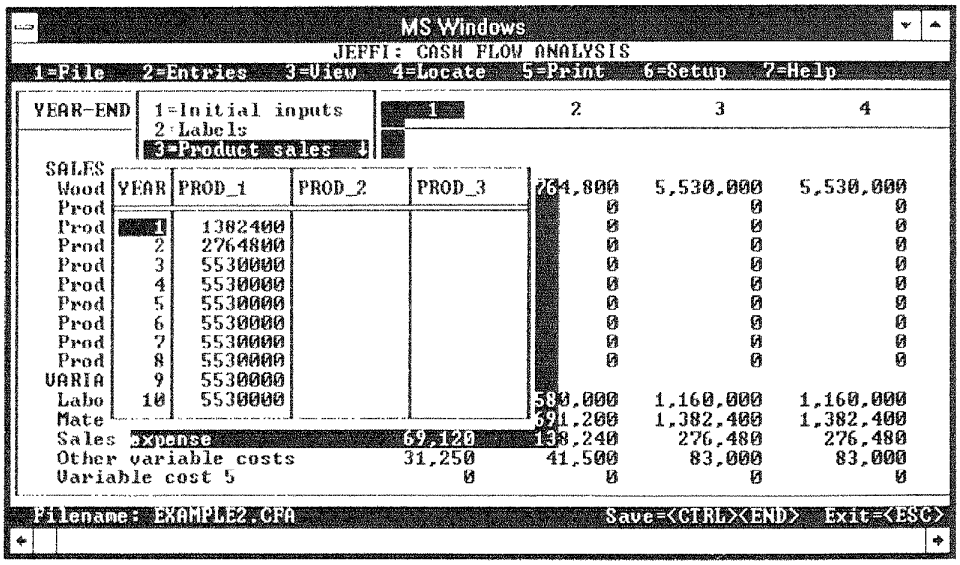
These three assumptions, to varying degrees, compensate for lost revenues that might otherwise have been realized in the future.

As to the borrowing rate, use the before-tax rate charged by the lender or a weighted average if funds are borrowed from more than one source. For debt position, indicate what percentage of the total investment is to come from creditors. For instance, if one of every five dollars is to be borrowed, use 20 percent (entered as 20.00). If one of every three dollars is to be borrowed, use 33 percent (entered as 33.33), and so on. It is highly unlikely that creditors will permit a debt position much above 40 to 50 percent. Although you are asked to give a before-tax cost for borrowed capital, JEFFI/2 automatically calculates an after-tax cost of capital that is used in developing a weighted average cost or discount rate for net present value calculations.

After entering all initial inputs, you are ready to start entering annual sales and cost data. However, if you wish to label revenue and cost items, you must first click on "2=Labels" under "2=Entries." After doing this, specify either products, fixed costs, or variable costs. If you chose to list products, you may list up to 10 individually. If this is not sufficient, you may either categorize and combine like items, or after listing nine items individually, label the last remaining items "all others" and enter their combined sum. Labels are limited to 27 characters including spaces.

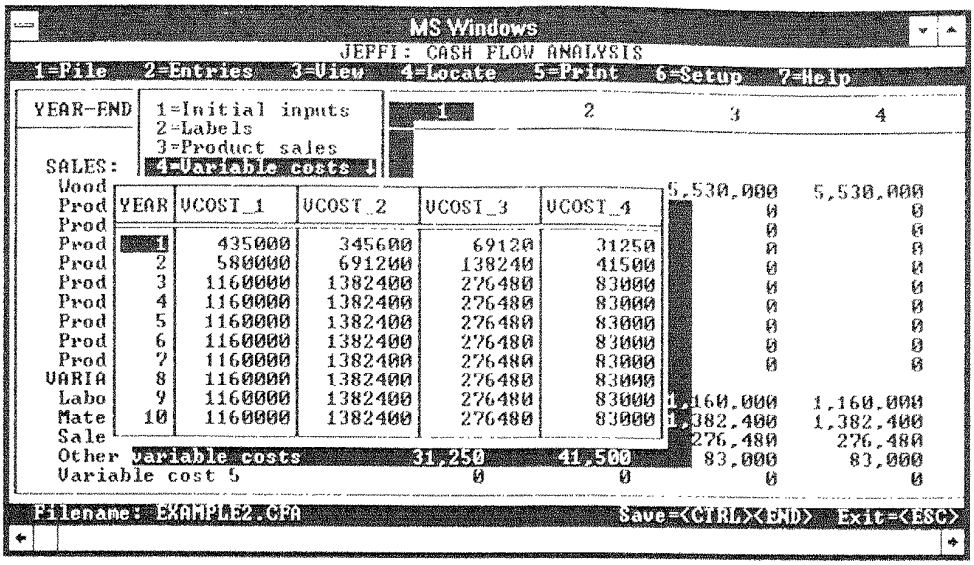
You may label up to 10 individual fixed-cost and 10 individual variable-cost items. If there are more than 10 in either cost category, they may be treated the same way as that described for products. Also, the same limitation on the number of characters applies.

To enter revenue data, click on "3=Product sales." A shadow box will appear. Data are

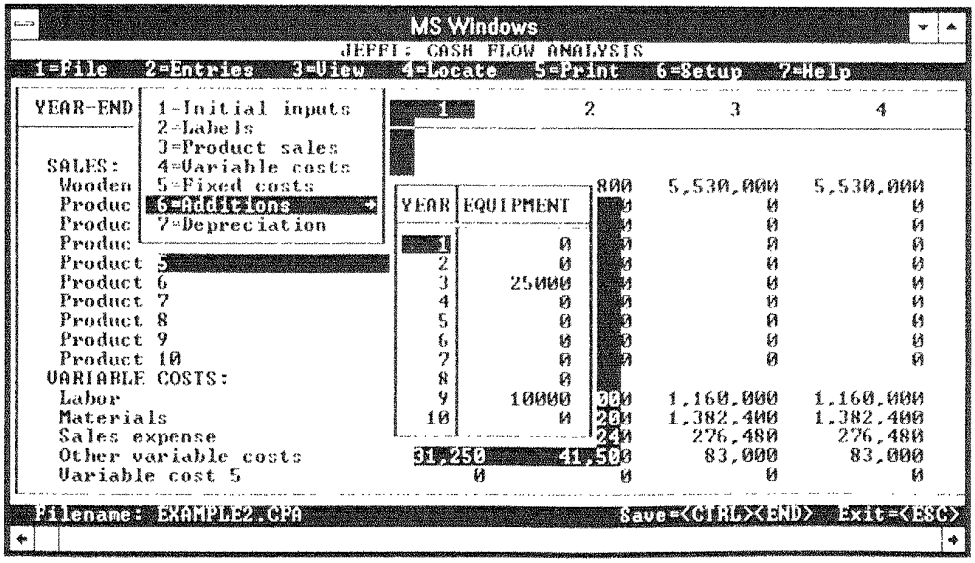


entered by moving down the column if there is only one product listed, or across a row if more than one product is listed, whichever is most convenient. After entering all revenue data, hit return. You are now ready to enter cost data. Click on "2=Entries" on the main menu bar and then "4=Variable costs." Another shadow box will appear asking for variable costs. Data again may be entered either down a column or across a row depending on the number of cost items listed.

After all variable cost data are entered, repeat the procedure once again to enter data on fixed costs by clicking on "5=Fixed costs."



You also may make equipment and building additions anytime during the life of the investment. Simply click on "6=Additions." Here you see only one column. Only list values in the year they occur. Leave all others blank.



The total value of all additions in any one year must be aggregated. For example, if you put in a new headrig and resaw, you may not list them separately as you did for revenue and costs, rather you must enter their combined value.

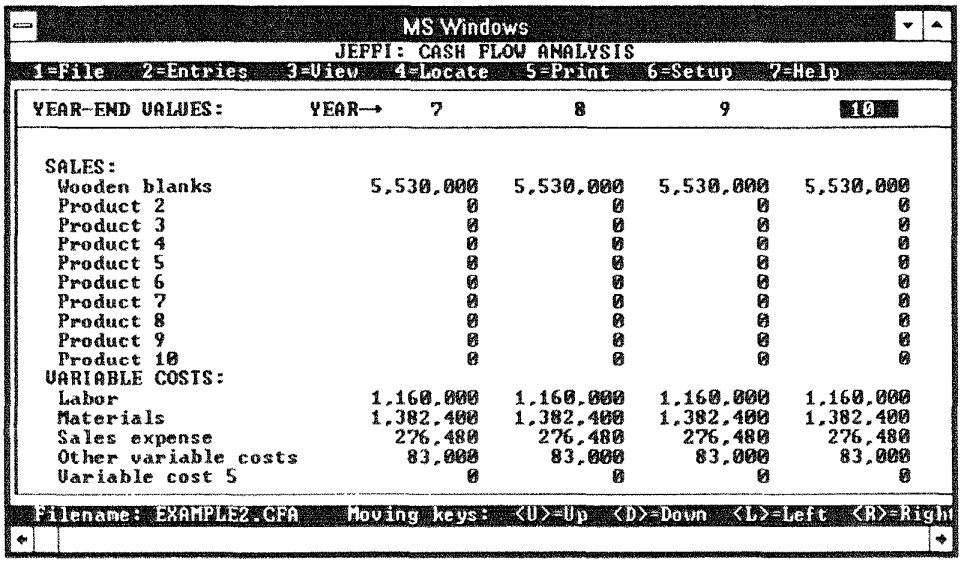
Finally, you are asked to input information on depreciation. Unlike in business accounting, depreciation is not a true cost. Rather, it is used to shelter a portion of operating revenue from taxation. There are several methods used to calculate depreciation. Most common among these are straight line, double-declining-balance, and sum-of-the-years-digits or fixed percentage method. The latter two represent accelerated methods and thus shield more income earlier than the straight line method. Also, different assets have different schedules. Under the modified accelerated cost recovery system, eligible property placed in service after December 31, 1986, may be recovered in 3, 5, 7, 10, 15, 20, 27.5, 31.5, or 39 years depending on its classification (for more information on depreciation schedules and their calculation, see the *U.S. Master Tax Guide* published by the Commerce Clearing House, New York).

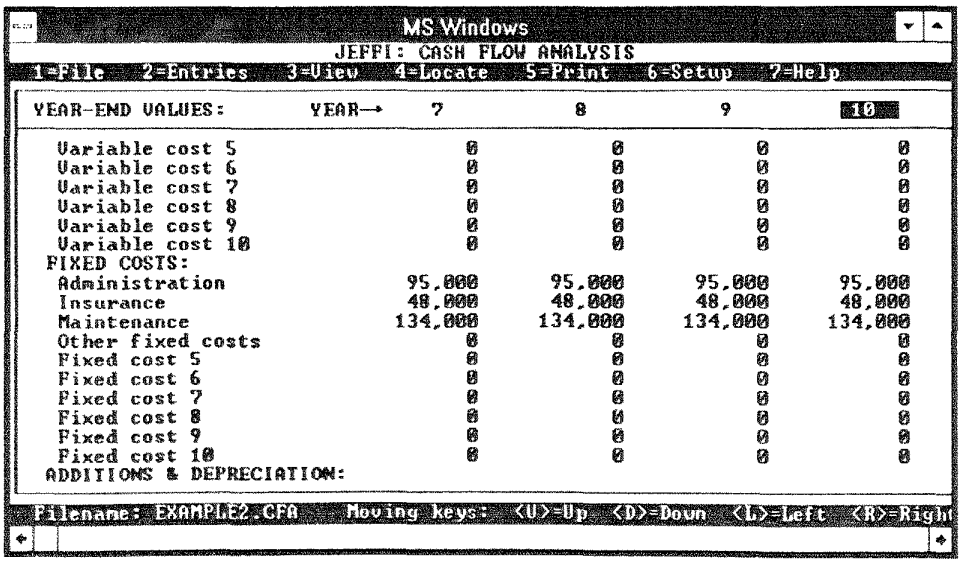
JEFFI/2 is not designed to calculate depreciation, rather only depreciation totals calculated elsewhere are entered into JEFFI/2. Note: if additional building or equipment comes on board at some time during the life of the investment, depreciation on that building or piece of equipment will need to be included in the depreciation calculations for that and subsequent years.

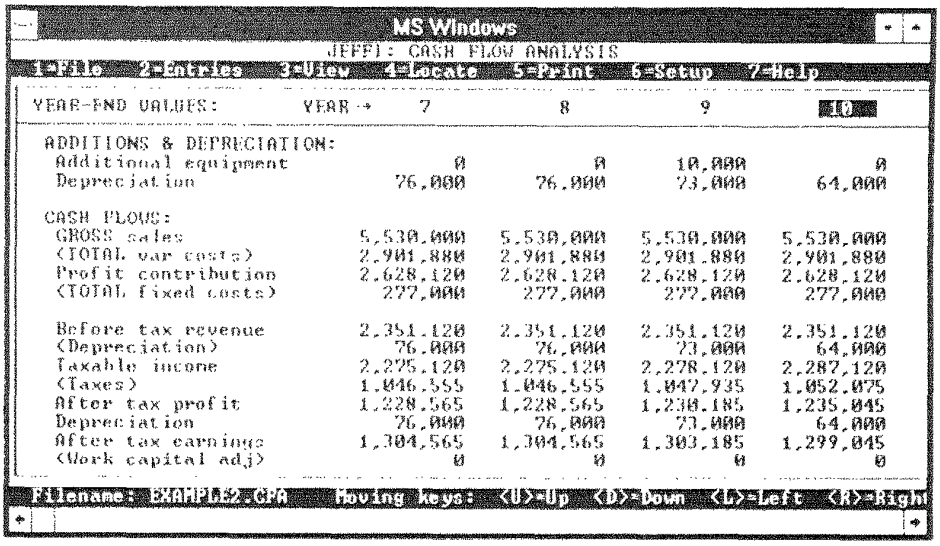
JEFFI/2 Outputs

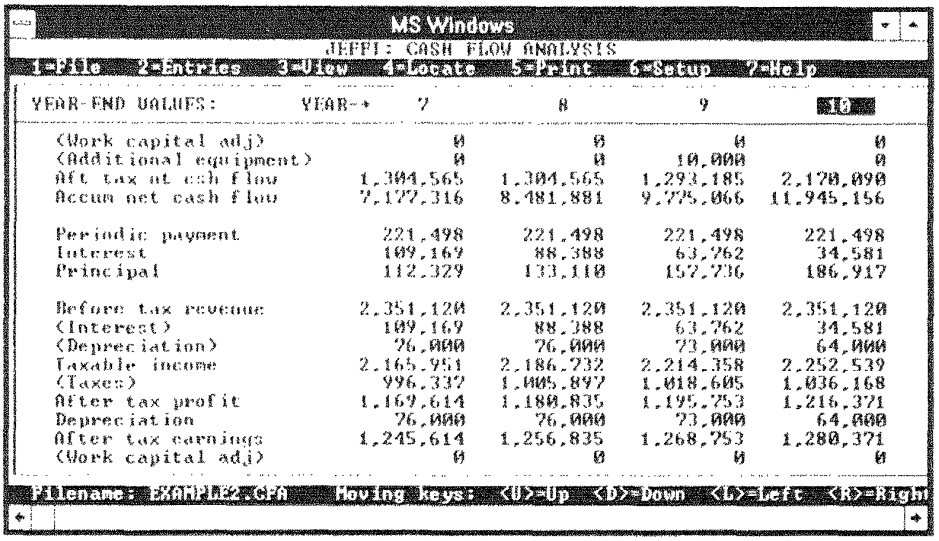
After entering all data, you are now ready to view resulting cash flows. To do so, you must click on "3=View" in the main menu bar. Three options will be presented. The first option is "1=Cash flow table". Because this output is so large, only information for the last 4 years of the maxi-mill investment (Example2) is depicted below. To capture the entire work sheet from top to bottom, five screens were necessary.

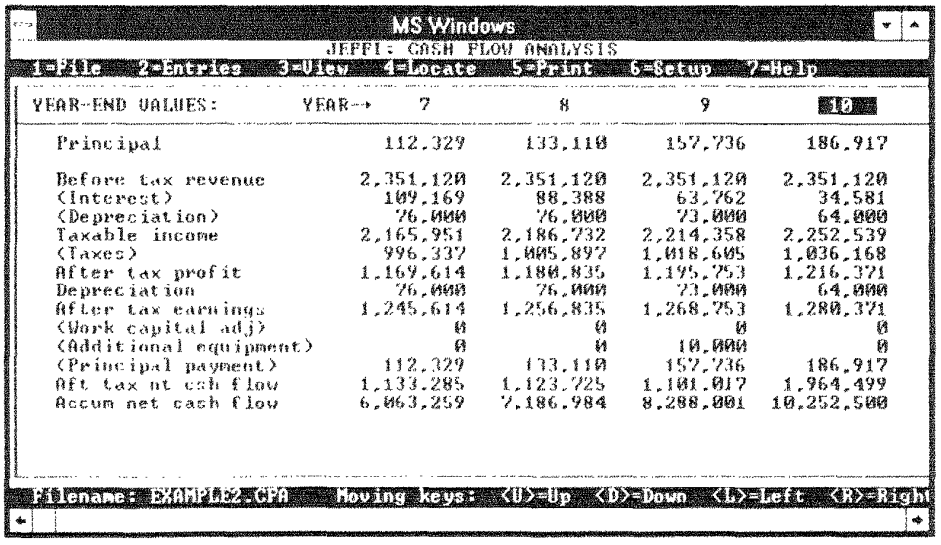
This option provides a complete, detailed look at annual cash flow data beginning with revenue, cost, capital additions, and depreciation inputs. This is followed by summaries for gross sales and for fixed and variable costs. This is followed by resulting cash flows beginning





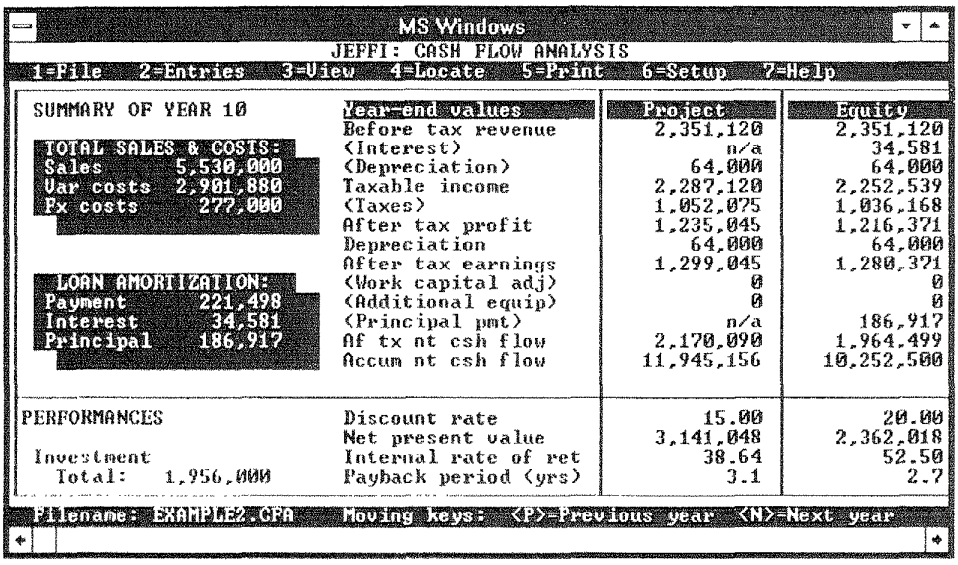

MS Windows
JEFFI: CASH FLOW ANALYSIS
1=File 2=Entries 3=View 4=Locate 5=Print 6=Setup 7=Help
YEAR-END VALUES: YEAR→ 7 8 9 10
ADDITIONS & DEPRECIATION:
Additional equipment 0 0 10,000 0
Depreciation 76,000 76,000 73,000 64,000
CASH FLOWS:
GROSS sales 5,530,000 5,530,000 5,530,000 5,530,000
(TOTAL var costs) 2,901,880 2,901,880 2,901,880 2,901,880
Profit contribution 2,628,120 2,628,120 2,628,120 2,628,120
(TOTAL fixed costs) 277,000 277,000 277,000 277,000
Before tax revenue 2,351,120 2,351,120 2,351,120 2,351,120
(Depreciation) 76,000 76,000 73,000 64,000
Taxable income 2,275,120 2,275,120 2,278,120 2,287,120
(Taxes) 1,046,555 1,046,555 1,047,935 1,052,075
After tax profit 1,228,565 1,228,565 1,230,185 1,235,045
Depreciation 76,000 76,000 73,000 64,000
After tax earnings 1,304,565 1,304,565 1,303,185 1,299,045
(Work capital adj) 0 0 0 0
Filename: EXAMPLE2.CFA Moving keys: (U)=Up (D)=Down (L)=Left (R)=Right


MS Windows
JEFFI: CASH FLOW ANALYSIS
1=File 2=Entries 3=View 4=Locate 5=Print 6=Setup 7=Help
YEAR-END VALUES: YEAR→ 7 8 9 10
(Work capital adj) 0 0 0 0
(Additional equipment) 0 0 10,000 0
Aft tax nt csh flow 1,304,565 1,304,565 1,293,185 2,170,090
Accum net cash flow 7,177,316 8,481,881 9,775,066 11,945,156
Periodic payment 221,498 221,498 221,498 221,498
Interest 109,169 88,388 63,762 34,581
Principal 112,329 133,110 157,736 186,917
Before tax revenue 2,351,120 2,351,120 2,351,120 2,351,120
(Interest) 109,169 88,388 63,762 34,581
(Depreciation) 76,000 76,000 73,000 64,000
Taxable income 2,165,951 2,186,732 2,214,358 2,252,539
(Taxes) 996,337 1,005,897 1,018,605 1,036,168
After tax profit 1,169,614 1,180,835 1,195,753 1,216,371
Depreciation 76,000 76,000 73,000 64,000
After tax earnings 1,245,614 1,256,835 1,268,753 1,280,371
(Work capital adj) 0 0 0 0
Filename: EXAMPLE2.CFA Moving keys: (U)=Up (D)=Down (L)=Left (R)=Right


MS Windows
JEFFI: CASH FLOW ANALYSIS
1=File 2=Entries 3=View 4=Locate 5=Print 6=Setup 7=Help
YEAR-END VALUES: YEAR→ 7 8 9 10
Principal 112,329 133,110 157,736 186,917
Before tax revenue 2,351,120 2,351,120 2,351,120 2,351,120
(Interest) 109,169 88,388 63,762 34,581
(Depreciation) 76,000 76,000 73,000 64,000
Taxable income 2,165,951 2,186,732 2,214,358 2,252,539
(Taxes) 996,337 1,005,897 1,018,605 1,036,168
After tax profit 1,169,614 1,180,835 1,195,753 1,216,371
Depreciation 76,000 76,000 73,000 64,000
After tax earnings 1,245,614 1,256,835 1,268,753 1,280,371
(Work capital adj) 0 0 0 0
(Additional equipment) 0 0 10,000 0
(Principal payment) 112,329 133,110 157,736 186,917
Aft tax nt csh flow 1,133,285 1,123,725 1,101,017 1,964,499
Accum net cash flow 6,063,259 7,186,984 8,288,001 10,252,500
Filename: EXAMPLE2.CFA Moving keys: (U)=Up (D)=Down (L)=Left (R)=Right

with before-tax revenue and ending with the accumulated net cash flow. Following this is information on the periodic payment needed to account for repayment of debt, including both interest and principal components. This is followed by a second set of cash flow information again beginning with before-tax revenue. The only difference between this and the previous summary is that it includes explicit treatment of loan interest and principal repayment. The interest portion is deducted from before-tax income, whereas the repayment of principal is deducted from the after-tax cash flow. This second set of cash flow information is used to account for returns to equity only and for the derivations of associated cash flow measures.

The second option, "2=Cash flow summaries," provides a side by side summary comparison of cash flow data for the entire project, and for equity holders only, for any year in the investment. This information is contained in the top portion of the screen. In addition, the lower portion of the screen (below the horizontal line) provides measures of overall investment performance for the full length of the investment. Although information above the horizontal line changes with the year chosen, measures below the horizontal line remain constant.



The third option, "3=Graphs," provides a visual display of gross sales along with after tax returns to the project and to equity. To exit the graph, hit any key. This will return you to the previous data display.

How to Save a Newly Created File

To save a file that you have just created, click on "1=File" in the main menu bar. Then click on "4=Name." You are allowed up to eight characters. If you wish to exit after you have named a file, click on "3=Close."

How to Delete a File

If you wish to delete a file, click on "1=File" and then on "7=DOS shell." This will put you in DOS where you can execute the delete command. Before deleting, type "Dir" at the prompt. This will give you a complete listing of files. After you have identified the file you wish to delete, type "Del" followed by the name of the file and hit return. To return to the JEFFI/2 worksheet after deleting a file(s), type "Exit."

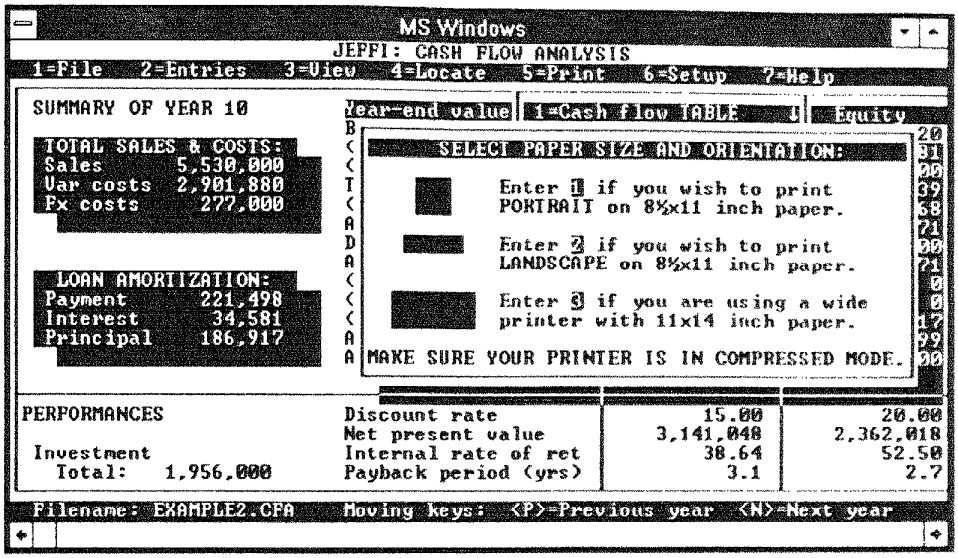
How to Exit JEFFI/2

You can exit JEFFI/2 at any time by clicking on "1=File" on the main menu bar and then clicking on "8=Exit."

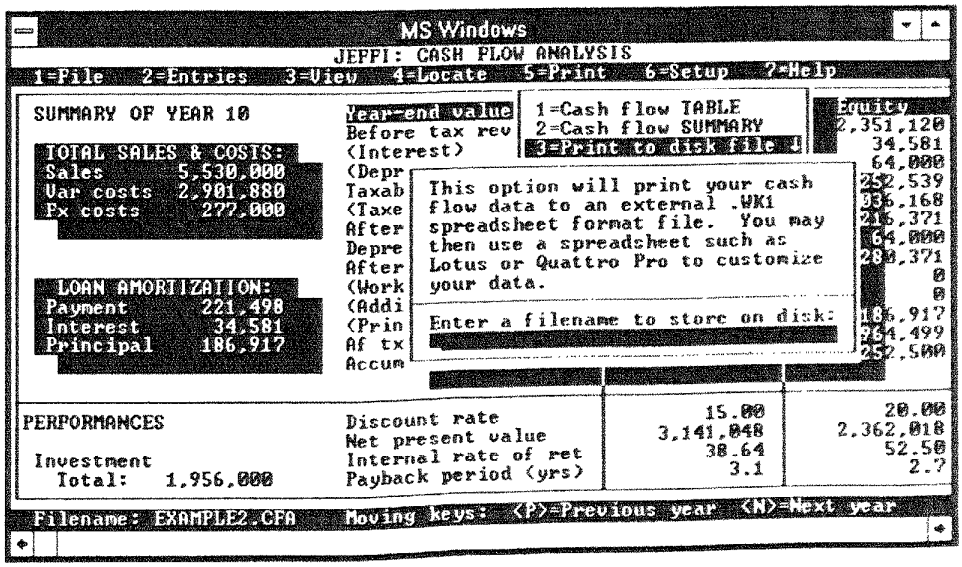
Main Menu Bar

In addition to previously mentioned options, "1=File," "2=Entries," and "3=View," there are four other options on the main menu bar that help facilitate use of JEFFI/2. The first of these is "4=Locate." This option facilitates more efficient movement within the data being displayed and is self explanatory. The next option, "5=Print," lets the user print either the entire cash flow table or the cash flow summary. The graph cannot be printed.

Because the cash flow table can be quite large, print format choices are provided. The user may select portrait or landscape on 8.5- by 11-inch paper or can select 11- by 14- inch paper. If



"2=Cash flow summary" is chosen, the program will automatically print a summary without any further instructions from the user. The user is also given an option to print the cash flow table to an external WK1 spreadsheet format file. In so doing, Lotus, Quatro Pro, or similar spreadsheet packages may be used to display JEFFI/2 inputs and outputs to whatever format desired.



Option "6=Setup" allows a user to store his or her name and the name of the organization that will appear on subsequent printouts. Option 6 also allows adjustment of the status and pitch of the error beeper. Finally, it allows the user to define a search path for JEFFI/2 so that it may be accessed from other directories.

The last option, "7=Help," allows the user to access information pertaining to each of the other six options. To exit Help click on "8=End."

Hardware and Software Requirements

For optimal performance of JEFFI/2, we recommend the following:
IBM or IBM-compatible PC with at least 2 megabytes of memory
MS DOS version 5 or higher
386 processor or above (486 or higher is preferred for quick recalculation of inputs)
Hard disk drive with at least 2 megabytes of free space
Floppy disk drive (3.5 or 5.25 inch)
Color monitor

How to Obtain Copies of JEFFI/2

The computer program described in this publication is available on request with the understanding that the U.S. Department of Agriculture cannot assure its accuracy, completeness, reliability, or suitability for any other purpose than that reported. The recipient may not assert any proprietary rights thereto nor represent it to anyone as other than a Government-produced computer program.

You may obtain copies of JEFFI/2 or inquire about its operation by writing or calling either Bruce G. Hansen or A. Jeff Palmer at the USDA Forest Service, Northeastern Forest Experiment Station, Forestry Sciences Laboratory, 241 Mercer Springs Road, Princeton, WV 24740 (Telephone: 304-431-2700).

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