

RATES

PROGRAM DOCUMENTATION

**Terminal Project for
Business 652
Contemporary Real Estate Analysis**

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A. INTRODUCTION

RATES is a computer program written in Basic for the IBM personal computer. RATES is based on BUS RATES, a Basic program used on the WITS timesharing computer network. The essential computational algorithms are taken from BUS RATES. Notable enhancements and additions include:

A summary of outlays and receipts is displayed on the screen and can be printed as well.

Input and output drivers exhibit greater user friendliness.

Multiple internal rates of return can be identified.

Net present value profiles can be plotted using an adapted version of the NWA Statpak plot program.

RATES was written as a student project for Business 652, Contemporary Real Estate Analysis, under the direction of Dr. Michael Robbins.

B. GENERAL PROGRAM DESCRIPTION

Given a schedule of outlays and receipts, RATES will calculate:

The period covered by the cash flows,

The starting and ending dates of the cash flow schedule,

The total outlays and total receipts, and

The internal rate of return (IRR).

In addition, net present value (NPV) is calculated by applying the user-specified discount rate or required rate of return to the cash outlays and receipts.

Modified internal rate of return (MIRR) is computed by (1) discounting all outlays to their present value at the opportunity cost of equity capital rate, and (2) taking all receipts and calculating their future value to the end of the schedule period at the indicated reinvestment rate. The modified internal rate of return is then calculated to be that rate which will compound the present value of all outlays to equal the future value of all receipts (i.e., the geometric mean rate of return: the nth root of the ending value divided by the beginning value minus one).

The user may then (1) print a copy of the output and a summary of outlays and receipts, (2) re-run the analysis using different discount rates, (3) search for any other internal rates of return that may exist, or (4) plot the net present value profile of the investment proposal on the display.

Cash flow schedules may be saved in diskette data files and re-used in later analyses.

C. OPERATING INSTRUCTIONS

Starting the Program

Start the program by entering RATES after the DOS A> or B> prompt. The program label will appear. Press any key to proceed.

Opening Menu

In the opening menu, you are offered three options: (E)nter data, (H)elp, and (Q)uit. The (H)elp selection offers some useful information on program operation should it be required.

Press (E)nter data to proceed.

Input from Keyboard or File?

RATES offers two input options: data input from the keyboard or data input from a diskette data file.

If this is your first time running the program, you may wish to select (K)eypad input to stipulate a series of cash flows and discount rates. You can then save this data to a disk file and call it up later. If you have already created data files, or wish to use a pre-prepared data file, then select (F)ile.

Data Entry from the Keyboard

If you choose to enter data from the keyboard, RATES prompts you for the following inputs:

1. Discount rate -- Select and enter the appropriate discount rate. The rate chosen is used as the discount rate for outlays in the calculation of modified internal rate of return (MIRR). It is also used as the discount rate in calculation of net present value (NPV). Rates may be entered as either decimals or percents.

2. Safe rate -- Select a safe rate to be used as the discount or reinvestment rate for receipts in the computation of MIRR.

3. Number of compounding periods per year -- Select the number of compounding periods, from 1 to 365. If the default value (=1) is correct for your analysis, then

merely press the return key to confirm the value. The program will then proceed to the next stage of data input.

Specification of Outlays and Receipts

The program requires you to specify the schedule of outlays and receipts offered by the subject investment proposal. Each cash flow must be associated with a calendar date. The range of permissible years is 1950 to 2050. Both total outlays and total receipts must be greater than zero. The total time span must be longer than a day. Total outlays cannot equal total receipts. Transaction amounts should be in absolute values. The total number of transactions cannot exceed 500.

Outlays must be entered first. Key in the date in response to the prompt, "Enter date:". The date should be specified in numerical month-day-year format using either dashes, slashes or spaces as separators (examples: 1-3-1984; 7/17/1955; 1 1 80).

After the date is keyed in, press Enter. The program accepts the date (if legal) and prompts for a cash flow amount. At the same time, a label appears at the bottom of the screen with the message, "F9 Cash flow groups/Annuities". If the outlay is a single nonrecurring cash flow, simply enter the absolute dollar amount and press the Enter key. The amount will be accepted and the program will prompt you for another date.

If the outlays occur in consecutive periodic installments (even or uneven) or in the form of an annuity, then press F9 ("Cash flow groups/Annuities") instead of entering an amount. The program will then prompt you for the following information: (a) the number of installments, (b) the number of months separating each installment, (c) whether or not the installments are equal, and (d) the amount of the installments. Enter the appropriate data and press the Enter key after each numeric entry.

Once you have entered the first outlay (either a single amount or a series of installments) the program will again prompt you for a date. In addition, the F9 "Cash flow groups/Annuities" label will vanish and a new message will be displayed at the bottom of the screen: "F10 No more outlays". You may enter additional dates and their associated outlays or, if there are no more outlays, press function key F10. The program will then invite you to enter the schedule of receipts, in the same format as that used for outlays.

Once all receipts have been entered, press F10 ("No more receipts"). The program begins its computations immediately.

Input from Diskette Data Files

If you select (F)ile input mode, the program displays on the screen all RATES data files available on the disk currently in the B (default) drive. All RATES data files are unmistakably identified by the extension ".IRR". In response to the prompt, "Enter filename: _____IRR", key in the name of the data file of your choice. You can omit the ".IRR" extension--the computer adds it automatically if you do. When the filename is keyed in, press Enter. The program reads the data file, executes the rates computations, and reveals the output.

Output

After the necessary computations have been executed, the program displays a summary of the transactions you have entered (see Exhibit 1). The outlays and receipts are displayed chronologically, regardless of the order in which you entered them. Press any key to proceed. (Note: if the number of transactions exceeds 54, the transactions summary is not displayed on the screen, but can instead be printed.)

The next screen is designated "Rates Output" (see Exhibit 1). Displayed at this stage is the following data:

- The starting and ending dates of the investment horizon, and the length of the period covered.
- The total dollar amount of outlays and receipts
- The discount rate (for outlays) and the safe rate (for receipts) as specified by the user.
- The Internal Rate of Return
- The Modified Internal Rate of Return
- The Net Present Value

Press any key to proceed.

User Options

After the output screen has been cleared by pressing any key, the user options menu, offering nine selections, is displayed. For all options (except (Q)uit) the program returns to this menu after the option selected has been executed. The selections are:

1. (P)rint output. This function prints a copy of the program output (Exhibit 1). A printout of (B)oth rates and the transaction summary may be selected.

EXHIBIT 1

Sample RATES Output

TRANSACTION SUMMARY

1-1-1980	-\$1,000,000		7-1-1990	\$110,000
7-1-1980	\$110,000		1-1-1991	\$110,000
1-1-1981	\$110,000		7-1-1991	\$110,000
7-1-1981	\$110,000		1-1-1992	\$110,000
1-1-1982	\$110,000		7-1-1992	\$110,000
7-1-1982	\$110,000		1-1-1993	\$110,000
1-1-1983	\$110,000		7-1-1993	\$110,000
7-1-1983	\$110,000		1-1-1994	\$110,000
1-1-1984	\$110,000		7-1-1994	\$110,000
7-1-1984	\$110,000		1-1-1995	\$110,000
1-1-1985	\$110,000		7-1-1995	\$110,000
7-1-1985	\$110,000		1-1-1996	\$110,000
1-1-1986	\$110,000		7-1-1996	\$110,000
7-1-1986	\$110,000		1-1-1997	\$110,000
1-1-1987	\$110,000		7-1-1997	\$110,000
7-1-1987	\$110,000		1-1-1998	\$110,000
1-1-1988	\$110,000		7-1-1998	\$110,000
7-1-1988	\$110,000		1-1-1999	\$110,000
1-1-1989	\$110,000		7-1-1999	\$110,000
7-1-1989	\$110,000		1-1-2000	\$110,000
1-1-1990	\$110,000		1-1-2000	\$5,000,000

RATES OUTPUT

Period of 20 years, 0 months, 1 day
From 1-1-1980 to 1-1-2000

Total outlays:	\$1,000,000
Total receipts:	\$9,400,000
Discount rate (for outlays):	20.0000 percent
Safe rate (for receipts):	12.0000 percent
Internal rate of return:	24.5122 percent
Modified internal rate of return:	16.5287 percent
Net present value at 20.00 percent:	\$252,853

Alternatively, you may print (R)ates only. The (R)ates only print option is intended for use in multiple analyses of the same set of cash flows using different discount rates.

2. (F)ile data to disk. This function writes the schedule of cash flows and designated discount rates to a data file on the diskette in the drive B (the default drive). Cash flow data for a specific investment proposal therefore need only be keyed into the computer once. Once written to a diskette data file the information may be retrieved from the file for subsequent use.

All RATES data files are identified by the extension ".IRR". This extension simply provides you with a way of identifying and handling all RATES data files as a group. When the (F)ile data to disk function is selected, the program displays all RATES data files currently on the diskette in the default drive. The user is asked to select a name for the data file. RATES adheres to all DOS file naming conventions. The maximum length of the file name itself is 8 characters. You may create or access your file names using upper or lower case characters. The operating system will convert all file name entries to upper case before reading them or writing them to the disk.

When specifying a name for a data file, there is no need to include the ".IRR" extension--the program adds the extension automatically if you omit it. Using the (F)ile function, data files originally loaded into the computer from a disk file may be re-saved on the same disk (under a different name or with different discount rates if desired) or the file may be written onto a different disk. This version of RATES does not provide for changes to an existing data file.

3. (C)hange discount rates. Once an analysis has been run using the RATES program, the user may go back and change the previously specified discount and reinvestment rates as well as number of compounding periods per year. The (C)hange function allows the stipulated rates to be changed without having to re-key the cash flows or re-read the data from a file. This function facilitates evaluation of the sensitivity of NPV or MIRR to assumptions regarding the cost of capital and the reinvestment rate.
4. (D)isplay output screen. The transactions summary and rates data are returned to the display for viewing.

5. (S)earch for multiple IRRs. A future net cash flow stream that contains both receipts and outlays raises the possibility of multiple IRRs. The (S)earch function identifies any additional IRRs that may exist, starting at the first IRR found and searching to 1000 percent. The length of time required for the search depends on the number of cash flows. The (S)earch function does not operate, however, if no real IRR exists for the investment (as would be indicated in the original output screen).

The (S)earch function begins with the first IRR which is found using an iterative secant algorithm. The program then evaluates NPV at regularly spaced, consecutively increasing discount rates, terminating the search at a discount rate of 1000 percent. If any minima or maxima are found in the NPV function, the program reverts to the secant algorithm on the assumption that the function will again traverse the x-axis (where $NPV=0$). If another IRR solution is found, the interval search is resumed and continues until another minima or maxima is found or until 1000 percent is reached.

6. (N)PV profile plot. This function displays on the screen a plot of NPV as a function of discount rate. This function is known as the NPV profile. The user is prompted for the following parameters:

- a. Start plot at what discount rate (in percent) ?
- b. End plot at what discount rate (in percent) ?
- c. Spacing of data points (in percent) ?

The user should select the appropriate parameters so as to focus on the area of greatest interest in the function. Data points should be spaced closely enough to provide for adequate visual resolution of the plot as it appears on the screen. The values of the individual data points are displayed on the screen as they are generated. The print screen key may be used to produce a hard copy of the NPV profile.

The plot itself is produced by a modified version of the NWA Statpak plot program. RATES chains to a separate program named RATEPLOT.BAS to perform the (N)PV profile plot function. When the plot function is completed, the main program is reloaded and the options menu reappears.

7. (R)e-run program. Starts the program over from the beginning. Any existing data is cleared.

8. (H)elp. Some useful reminders on program operation are displayed to the screen.
9. (Q)uit. Exit RATES. You are asked to confirm--just to be sure. Don't forget to save any important data to a diskette data file.

D. IRR, MIRR, AND NPV AS CRITERIA OF INVESTMENT DESIRABILITY

Internal Rate of Return

The internal rate of return or yield for an investment is the discount rate that equates the present value of the expected cash outflows with the present value of the expected inflows. In other words, the IRR is that rate of interest (or discount) which produces a net present value of zero for a specific investment. Like net present value (NPV), IRR falls within the category of discounted cash flow methods in that it takes account of both the magnitude and timing of expected cash flows in each period of a project's life. When the cash flow stream is an uneven series or when the initial outlay does not occur at time zero, solving for the internal rate of return involves an iterative procedure using present values. RATES is programmed to perform this procedure, thereby eliminating the need for arduous manual computations. RATES calculates the IRR of a series of unequal cash flows, groups of equal cash flows, or any combination thereof. The program can accommodate up to 500 separate cash flows.

The acceptance criterion generally employed with the internal rate of return method is to compare the internal rate of return with a required rate of return, known as the cutoff, or hurdle, rate. If the internal rate of return exceeds the required rate, the project is accepted; if not, it is rejected.

Net Present Value

Like the IRR method, the net present value method is a discounted cash flow approach to capital budgeting. The net present value method calls for discounting all cash flows to present value using the required rate of return. If the sum of these discounted cash flows is equal to, or greater than, zero, the proposal is accepted; if not, it is rejected. The acceptance criterion may be restated as follows: a project will be accepted if the present value of cash inflows exceeds the present value of cash outflows. Since different net present values will be given for different required rates of return, the relative desirability of proposed projects will change with changes in the discount rate.

The RATES program calculates NPV by discounting the stipulated cash outlays and receipts using the discount rate specified by the user.

Modified Internal Rate of Return

The traditional IRR technique has several drawbacks which hamper its usefulness in some investment applications. The technique implicitly assumes that all cash flows are either reinvested or discounted at the computed yield rate. This assumption is financially reasonable as long as the rate is within a realistic borrowing and lending range. When the IRR becomes significantly greater or smaller, the assumption becomes less valid and the resulting value less sound as an investment measure.

Another problem with the IRR is that under certain circumstances several different discount rates produce a net present value of zero. For "normal" investments, there will be only one positive real IRR -- a normal investment being one that has one or more outflows (costs) followed by a series of inflows (receipts). If, however, a project calls for a large outflow either sometime during or at the end of its life, then it is a "nonnormal" project, and the possibility of multiple real roots arises.

The modified internal rate of return is one of several IRR alternatives which attempts to avoid the shortcomings of the traditional IRR technique. MIRR eliminates the multiple IRR problem and the reinvestment (or discounting) assumption by utilizing user-stipulated reinvestment and borrowing rates. MIRR essentially reduces a sequence of positive and negative cash flows to two positive numbers separated by a string of zeros from which the geometric mean rate of return (i.e., the nth root of the ending value divided by the beginning value minus one) may be computed.

Comparison of NPV and IRR

The question of which method--NPV or IRR--is preferable for purposes of evaluating investment proposals depends upon what is the appropriate rate of reinvestment for the intermediate cash flows.

IRR implicitly assumes that investment returns can be reinvested at the same yield rate as the IRR generated by the subject investment. IRR is calculated without respect to market rates of lending, borrowing, or reinvestment. For proposals with a high IRR, a high reinvestment rate is assumed; for proposals with a low IRR, a low reinvestment rate is assumed. Only rarely will the IRR calculated represent the apropos rate for reinvestment of intermediate cash flows. With the NPV method, however, the implied reinvestment rate (i.e., the required rate of return) is the same for each proposal. This reinvestment rate represents the minimum return on other available

opportunities. To the extent that the required rate of return/discount rate can be regarded as an approximate measure of the opportunity rate of reinvestment, the NPV method is preferred over the IRR method.

The IRR method entails the possibility of more than one mathematically correct rate. The equation employed in calculating the IRR is a polynomial equation of degree n ; hence, there are n roots or solutions. Depending upon (a) the pattern of the cash flow stream, and (b) the magnitude of the cash flows, an investment proposal may have one IRR, more than one IRR, or no IRR that is a real number.

Generally, however, there is only one positive solution and, therefore, one unique IRR. This is the case in the "conventional" investment--an investment having one or more periods of cash outflows followed by one or more periods of cash inflows.

If the investment proposal being analyzed is a "nonconventional" investment, more than one positive IRR may be obtained. A "nonconventional" investment is one having one or more periods of cash outflows (inflows) interspersed with periods of cash inflows (outflows). Nonconventional investments may have more than one unique solution, all of them mathematically correct, but none of which have any financial validity.

While a multiple reversal of cash flow signs is a necessary condition for the occurrence of multiple IRRs, it is not sufficient. The occurrence of multiple IRRs also depends upon the magnitude of the cash flows of the investment proposal. A further intricacy is that certain investment proposals may have no IRR that is a real number. (Appendix A provides some interesting examples of cash flow schedules having multiple IRRs or no real IRR.)

The multiple IRR predicament may be avoided through the use of the NPV method, since NPV does not give more than one solution to any investment proposal.

The problem of multiple IRRs may also be resolved by explicitly incorporating the available reinvestment opportunities into the analysis using the MIRR method.

The IRR method is appealing due to its conceptual simplicity. However, a single IRR calculation cannot be employed with a high degree of confidence since the future performance of income producing real estate cannot often be projected with a high degree of accuracy. The IRR should therefore be studied under varying sets of assumptions. Moreover, the IRR should not be relied on as the sole criterion of investment desirability, since it does not take risk into account.

E. SAMPLE PROGRAM SESSIONS

Sample Program Session No. 1

A developer is considering a project offering the following cash flows after taxes and borrowing (4):

n	Date	After tax cash flows
0	01-01-1980	(\$230,000) (Initial investment)
1	01-01-1981	(\$500,000)
2	01-01-1982	(\$500,000)
3	01-01-1983	\$2,000,000

The approach you would use with the RATES computer program to find the internal rate of return on this investment is as follows:

1. Load and RUN the program.
2. When the program label "RATES" appears, press any key to proceed.
3. The first menu offers you three commands from which to choose: (E)nter data, (H)elp, and (Q)uit. Press (E)nter data.
4. The next menu says "Input from (K)eypad or (F)ile?". For this example, we will input the data from the keypad. Press (K)eypad.
5. The program now asks you to "Enter rates". Enter the discount rate to be used in calculating net present value. For this example, enter 7 percent (either as a decimal or percent). This rate is also used as the discount rate for outlays in the computation of the modified internal rate of return.
6. Enter the safe rate or reinvestment rate. This rate is used as the rate for compounding receipts in the calculation of modified internal rate of return. For this example, enter 7 percent.
7. Specify the number of compounding periods per year, from 1 to 365. The default value is 1. For this problem, select the default value by merely pressing the Enter key. The default value of 1 is confirmed and the program proceeds.
8. The program now asks you to "Enter Outlays". First, the date of any outlay to be entered must be specified. Use a numeric month-day-year format, with "/", "-", or spaces as separators. The outlays (and subsequently the receipts) need not be entered in chronological order. RATES will do this sorting for you. Enter the date of the first outlay: 1-1-1980 (or

1/1/80 or 1 1 80 as you prefer). Press Enter. Remember that the range of allowable years is 1950 to 2050. The total time span for all outlays and receipts must be longer than a day.

9. The program now ask you to enter a dollar amount. Do so, however, using no commas or dollar signs. Key in 230000 and press Return.
10. The program now asks you for the date of the next outlay. Note that two more outlays are called for, that they are of equal amounts (\$500,000), and that they are spaced 12 months apart. Key in the date of the first \$500,000 outlay, 1-1-1981, and press Return. Now, when the program asks you for an amount, press the function key F9. Before you do, however, note the label at the bottom of the display: "F9 Cash flow groups/Annuities". The label appears simultaneously with the "Enter amount:" prompt to remind you that you can enter periodic cash flows conveniently using the F9 option. After pressing F9, enter the indicated information in response to the prompts that appear on the screen:

Number of installments: ?	2
Number of months separating each installment: ?	12
Are the installments equal amounts (Y/N) ?	Y
Amount of installments: ?	500000

11. Since there are no more outlays, press F10 to so indicate. The program no asks you to "Enter receipts". Enter the first and only receipt, \$2,000,000 on 1-1-83, in the same manner as outlays were entered. Once you have done so, press F10 to indicate that there are no more receipts. The program immediately proceeds with its computations. The time required for calculation depends upon the number of cash flows (including installments) entered.
12. When the program has finished working, the transaction summary appears on the screen. This is a chronological listing of all the transactions you entered. Press any key and the program output appears on the screen. Compare your results with the values shown in Exhibit 2 -- they should be the same.
13. Press any key and the output screen is cleared and user options are displayed. If your line printer is ready, press (P)rint output and then press (B)oth transactions summary and rates. The program will then print an attractive, report-quality document replicating the output of this analysis as it appeared on the screen. The program then returns to back to the options menu.

EXHIBIT 2

RATES Output for Sample Program Session No. 1

TRANSACTION SUMMARY

1-1-1980	-\$230,000		1-1-1982	-\$500,000
1-1-1981	-\$500,000		1-1-1983	\$2,000,000

RATES OUTPUT

Period of 3 years, 0 months, 1 day
From 1-1-1980 to 1-1-1983

Total outlays:	\$1,230,000
Total receipts:	\$2,000,000
Discount rate (for outlays):	7.0000 percent
Safe rate (for receipts):	7.0000 percent
Internal rate of return:	29.9896 percent
Modified internal rate of return:	20.8197 percent
Net present value at 7.00 percent:	\$498,587

14. Since you may want review this analysis in the future without having to re-enter the dates and amounts, save this information to a file on your diskette by pressing (F)ile data to disk. The program discloses all existing RATES data files currently on the diskette in drive B (the default drive). All RATES files have the extension ".IRR" to aid in their identification. Pick a filename and key it in. The program automatically adds the ".IRR" extension for you. Press Enter and the file is written to the disk, available for future use.

15. At this point, press (Q)uit and (Y)es and inspect the printout the program has generated (Exhibit 2).

The internal rate of return is calculated to be 29.99 percent. Note, however, that this internal rate of return implies that the investor at time zero is discounting one million dollars of future outlays such that they represent a present "cost" of only \$680,000 (i.e., the two \$500,000 outlays discounted at 30 percent back to time zero, 1-1-1980, would have a present value of \$680,000). Could the developer judiciously anticipate \$680,000 today to be sufficient to satisfy firm obligations of \$500,000 in each of the next two years? The answer is yes only if he could invest the \$680,000 at an after-tax yield of 30 percent. The future payments are imperative, however, to preserve the solvency of the project. Therefore, the return the developer receives must virtually guarantee the availability of the liquid amount when needed. Since an after tax yield of 7 percent would be more realistic, the modified internal rate of return using a 7 percent discount rate is found to be 20.82 percent. This material decline in IRR results because of the dissimilar manner in which negative cash flows were discounted. Discounting the two future \$500,000 outlays to time zero at 7 percent gives a present value of \$904,000 -- a more objective indication of the developer's obligation for future outlays. The use of MIRR may therefore provide a more meaningful indicator of investment yield.

Sample Program Session No. 2

Choose between these two mutually exclusive investment alternatives based on the IRR and NPV criteria (4):

n	Date	Investment Alternatives	
		A	B
0	01-01-1980	(\$10,000)	(\$10,000)
1	01-01-1981	\$0	\$11,000
2	01-01-1982	\$15,625	\$2,600

Discount rate: 10 percent
Safe rate: 10 percent
Compounding periods per year: 1

1. Load and RUN the program.
2. Key in the cash flow schedule and discount rates for each investment (referring to the operating instructions if necessary) or load the data from a diskette data file if one is available.
3. Make a printout of the program output. Press (Q)uit and (Y), and examine the RATES output. Compare your results to the printout reproduced in Exhibit 3.

The IRR calculated for investment A is 25 percent, while the IRR for B is 30 percent. Based upon the IRR criterion, therefore, B is preferred over A. However, this assumes that the investor's goal is to maximize rate of return. Not considered are the available reinvestment opportunities. Investment A involves only one receipt, while B involves two. In an investment comparison of this type, the question that should be asked is: At what rate can the intermediate cash flows be reinvested?

If the investor could expect to achieve a yield of 10 percent on reinvested intermediate cash flows, a direct comparison would be as follows:

n	Date	Investment Alternatives		Reinvestment of Proceeds at 10%
		A	B	
0	01-01-1980	(\$10,000)	(\$10,000)	
1	01-01-1981	\$0	\$11,000--10%	
2	01-01-1982	\$15,625	\$2,600 + \$12,100	\$14,700

Assuming a reinvestment rate of 10 percent, the terminal value of Investment B exceeds that of A. While both require the same initial outlay, B has a terminal value of \$14,700 compared to \$15,625 for Investment A. Note that when the reinvestment assumption was made explicit, the indicated relative desirability of the two investments directly contradicts the IRR criterion. In contrast to the misleading IRR measure, MIRR explicitly incorporates the reinvestment assumption (MIRR A = 25 percent; MIRR B = 21.24 percent) and appropriately reflects the appropriate choice to maximize investor wealth.

EXHIBIT 3

RATES Output for Sample Program Session No. 2

TRANSACTION SUMMARY

1-1-1980	-\$10,000	1-1-1982	\$15,625
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RATES OUTPUT

Period of 2 years, 0 months, 1 day
From 1-1-1980 to 1-1-1982

Total outlays:	\$10,000
Total receipts:	\$15,625
Discount rate (for outlays):	10.0000 percent
Safe rate (for receipts):	10.0000 percent
Internal rate of return:	25.0000 percent
Modified internal rate of return:	25.0000 percent
Net present value at 10.00 percent:	\$2,917

TRANSACTION SUMMARY

1-1-1980	-\$10,000	1-1-1982	\$2,600
1-1-1981	\$11,000		

RATES OUTPUT

Period of 2 years, 0 months, 1 day
From 1-1-1980 to 1-1-1982

Total outlays:	\$10,000
Total receipts:	\$13,600
Discount rate (for outlays):	10.0000 percent
Safe rate (for receipts):	10.0000 percent
Internal rate of return:	30.0000 percent
Modified internal rate of return:	21.2436 percent
Net present value at 10.00 percent:	\$2,149

Sample Program Session No. 3

Identify any and all internal rates of return for the following set of cash flows:

n	Date	Amount
0	01-01-1980	(\$1,000)
1	01-01-1981	\$6,500
2	01-01-1982	(\$13,500)
3	01-01-1983	\$9,000

1. Key in the cash flow schedule (referring to the operating instructions if necessary). In addition, key in the discount and safe rates of your choice. Specify one compounding period per year. The resulting output should be similar to that shown in Exhibit 4. The internal rate of return is found to be 50 percent. Other IRRs may exist, however, since the subject investment is a nonconventional one--i.e., its future net cash flow contains both an outlay and receipts.
2. To determine whether multiple IRRs exist, clear the output display by pressing any key and select the function (S)earch for multiple IRRs from the menu. The program executes its search algorithm and, when finished, displays the results on the screen. Three IRRs are found for this investment, as shown in Exhibit 4.
3. Clear the multiple IRR output from the screen and return to the menu by pressing any key. Select the function, (N)PV profile plot. Enter the following responses to the prompts:

Start plot at what discount rate (in percent)? 40
End plot at what discount rate (in percent)? 210
Spacing of data points (in percent)? 2.5

The plotting routine displays the data points on the screen as they are generated; for each discount rate, from 40 percent to 210 percent at intervals of 2.5 percent, the discount rate and the calculated NPV are displayed. An arrow appears on the screen to identify any intervals in which an IRR will be found. When the data generation process is complete, the following prompt appears:

(N)ew parameters or (P)lot?

EXHIBIT 4

RATES Output for Sample Program Session No. 3

TRANSACTION SUMMARY

1-1-1980	-\$1,000		1-1-1982	-\$13,500
1-1-1981	\$6,500		1-1-1983	\$9,000

RATES OUTPUT

Period of 3 years, 0 months, 1 day
From 1-1-1980 to 1-1-1983

Total outlays:	\$14,500
Total receipts:	\$15,500
Discount rate (for outlays):	20.0000 percent
Safe rate (for receipts):	12.0000 percent
Internal rate of return:	50.0000 percent
Modified internal rate of return:	18.2467 percent
Net present value at 20.00 percent:	\$250

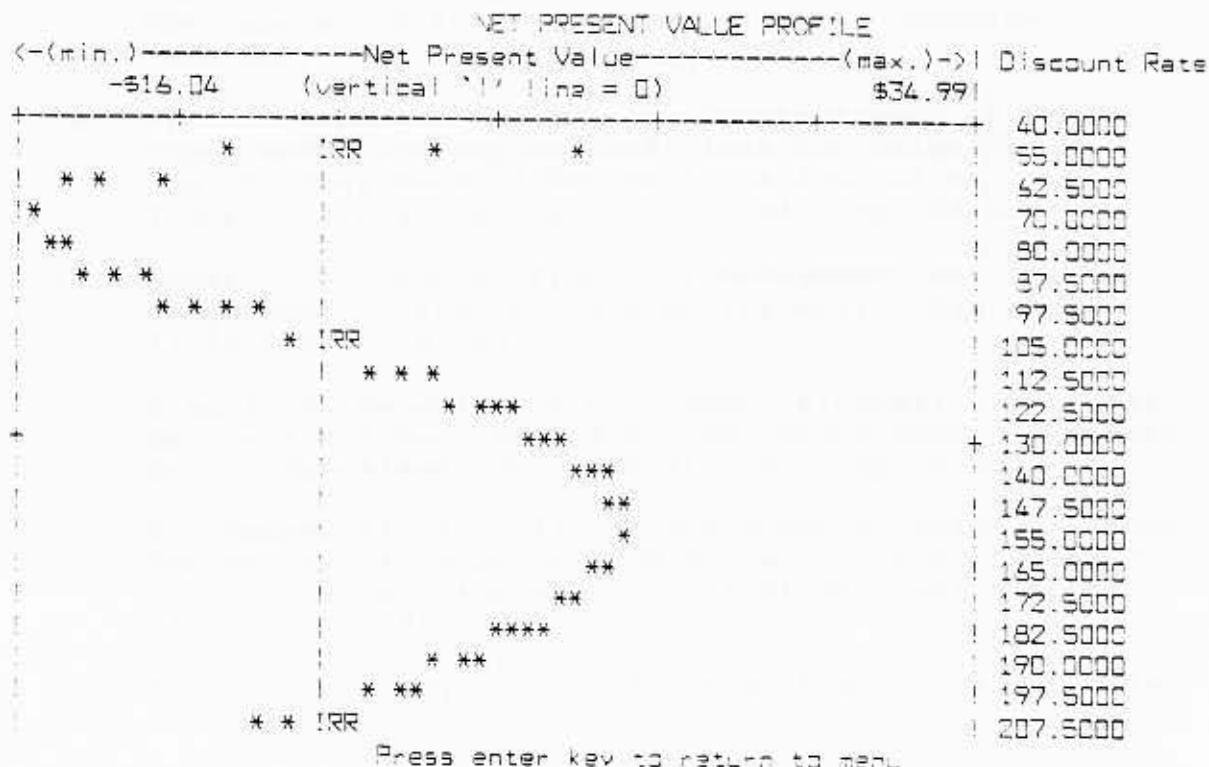
RESULTS OF SEARCH FOR
MULTIPLE INTERNAL RATES OF RETURN

Internal Rate of Return No. 1 = 50.0000 %
Internal Rate of Return No. 2 = 100.0000 %
Internal Rate of Return No. 3 = 200.0003 %

Enter (P)lot. Note that if the preceding display of data points indicated that the specified plot parameters do not adequately focus on the area of interest in the NPV function, the parameters could be re-specified at this point by pressing (N)ew parameters. The NPV function is plotted over the specified interval on the screen (Exhibit 5). Use the PrtSc (print screen) command to print a hard copy of the NPV profile.

EXHIBIT 5

Net Present Value Profile Generated by RATES



F. REFERENCES

- (1) Seymour Kaplan, "A Note on a Method for Precisely Determining the Uniqueness or Nonuniqueness of the Internal Rate of Return for a Proposed Investment," *The Journal of Industrial Engineering*, January-February 1965, pp. 70-1.
- (2) Richard H. Bernhard, "On the Inconsistency of the Soper and Sturm-Kaplan Conditions for Uniqueness of the Internal Rate of Return," *The Journal of Industrial Engineering*, August 1967, pp. 498-500.
- (3) James C. Van Horne, *Financial Management and Policy*, (Englewood Cliffs, N.J.: Prentice-Hall, 1968), pp. 17-19 and pp. 83-93.
- (4) Stephen D. Messner and M. Chapman Findlay, III, "Real Estate Investment Analysis: IRR Versus FMRR," *The Real Estate Appraiser*, July-August, 1975, pp. 5-20.
- (5) M. Chapman Findlay, III, and Stephen D. Messner, "FMRR Reexamined: A response from Hipparchus and Ptolemy," *The Real Estate Appraiser and Analyst*, July-August, 1980, pp. 19-22.
- (6) Michael S. Young, "FMRR: A Clever Hoax?" *The Appraisal Journal*, July 1979, pp. 359-369.
- (7) Donald J. Valachi, "The Internal Rate of Return: A Note on the Arithmetic of Multiple and Imaginary Rates," *The Real Estate Appraiser*, March-April, 1977, pp. 39-42.
- (8) Donald J. Valachi, "More on the Arithmetic of Multiple and Imaginary Rates of Return," *The Real Estate Appraiser and Analyst*, September-October 1980, pp. 19-22.
- (9) Donald J. Valachi, "On Interpreting the Internal Rate of Return on a Real Estate Investment," *The Real Estate Appraiser and Analyst*, First Quarter 1981, pp. 35-42.
- (10) Austin J. Jaffe and C.F. Sirmans, *Real Estate Investment Decision Making*, (Englewood Cliffs, N.J.: Prentice-Hall, 1982), pp. 55-7 and pp. 462-470.
- (11) Real Estate Finance Pac, (Seattle, Wash.: Palmer Berge Company) pp. 17-25.

G. APPENDICES

Appendix A

Interesting Cash Flow Patterns for RATES Analysis

Description	Cash Flows					Reference Number			
	Time 0	Year 1	Year 2	Year 3		IRR 1	IRR 2	IRR 3	
A unique IRR	(\$1,000)	\$4,000	(\$4,000)	--		100.00%	--	--	2
Two IRRs	(\$16)	\$100	(\$100)	--		25.00%	400.00%	--	7
Three IRRs	(\$10)	\$60	(\$110)	\$62		12.11%	79.09%	208.80%	7 and 11
Three IRRs	(\$1,000)	\$6,500	(\$13,500)	\$9,000		50.00%	100.00%	200.00%	1
No real IRR	\$1,000	(\$2,000)	\$1,500	--		None	--	--	4
No IRR in real numbers	(\$100)	\$200	(\$200)	--		None	--	--	7

Appendix B
Suggestions for Further Development

RATES could be improved if the following capabilities were added:

1. The ability to change cash flow data without re-entering the entire file.
2. The ability to calculate FMRR (Financial Management Rate of Return).
3. The ability to interface with other programs, such as word processing and dBase II.

Appendix C
Program Listing

```
10 REM ---< RATES PROGRAM >---BY JOHN KRAUS
60 REM <<<<<<<<<Business 652 Terminal Project>>>>--<<Summer 1984>>
110 REM * * LABEL SUBROUTINE
160 GOSUB 1410
210 CLS
260 LOCATE 6,1
310 GOSUB 560
360 LOCATE 25,29:PRINT "Press any key to continue";
410 V$=INKEY$:IF V$="" THEN GOTO 410
460 LOCATE 1,1 :PRINT SPC(1)
510 GOTO 1910
560 REM ** PRINT SUBROUTINE FOR LABEL
610 KEY OFF
660 X=10
710 PRINT TAB(X)A0$:PRINT TAB(X)A0$:PRINT TAB(X)A0$
760 PRINT
810 PRINT TAB(X)A1$
860 PRINT TAB(X)A2$
910 PRINT TAB(X)A3$
960 PRINT TAB(X)A4$
1010 PRINT TAB(X)A5$
1060 PRINT TAB(X)A6$
1110 PRINT TAB(X)A7$
1160 PRINT
1210 PRINT TAB(X)A0$
1260 PRINT TAB(X)A0$
1310 PRINT TAB(X)A0$
1360 RETURN
1410 A0$="$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$"
1450 A1$="oooooooooooo   ooo     ooooooooooooo   oooooo    "
1510 A2$="oooo   ooo     oooo   ooo   ooo   ooo   ooo   ooo   ooo   "
1560 A3$="oooo   ooo     ooo   ooo   ooo   ooo   ooo   ooo   ooo   "
1610 A4$="oooooooooooo   ooo   ooo   ooo   ooo   ooo   ooo   ooo   "
1660 A5$="oooo   ooo     oooooooooooo   ooo   ooo   "
1710 A6$="oooo   ooo     ooo   ooo   ooo   ooo   ooo   ooo   ooo   "
1760 A7$="oooo   ooo   ooo   ooo   ooo   ooooooooooooo   ooooooooo   "
1810 A8$="$$$$$$$$$$$$$$$$$ By John Kraus $$$$$$$$$$$$$$ Version 1.0 $$$$$$$$$$$$$$"
1860 RETURN
1910 REM ---< RATES PROGRAM >---BY JOHN KRAUS
1960 CLEAR
2010 REM *** SET DEFAULT PARAMETERS *****
2060 CC1=0:CC2=7 'SET COLOR COMMAND PARAMETERS FOR BANNERS
2110 ON ERROR GOTO 43960
2160 BEEPER$="ON" 'BEEPS DURING PROGRAM OPERATION
2210 COUNTER = 0
2260 KEY OFF
2310 KEY 9,"INSTALLMENTS"+CHR$(13) 'FOR INSTALLMENT AMOUNT INPUTS
2360 KEY 10,"ENDINPUT"+CHR$(13)
2410 K1=1 '# OF COMPOUNDING PERIODS PER YEAR
```

```

2460 DIMROWS=500
2510 DIM A(DIMROWS) ' HOLDS NUMERIC DATE AND CASH FLOW DATA AND COUNTERS.
2560 DIM B(DIMROWS,2) 'COL 1 STORES DATES; COL 2 STORES CASH FLOWS; USED FOR
IRR
CALCULATION
2610 DIM B$(DIMROWS) 'HOLDS STRING REPRESENTATION OF DATE
2660 LMARGIN=12
2710 IF RERUN$="Y" THEN GOTO 3560
2760 REM ***** OPENING MENU *****
2810 CLS
2860 MM1=33 ' MENU MARGIN 1 (LEFT MARGIN)
2910 LOCATE 10,35
2960 COLOR 0,7
3010 PRINT " SELECT: "
3060 COLOR 7,0
3110 PRINT:PRINT
3160 PRINT TAB(MM1)"(E)nter data"
3210 PRINT TAB(MM1)"(H)elp"
3260 PRINT TAB(MM1)"(Q)uit"
3310 V$=INKEY$
3360 IF V$="E" OR V$="e" THEN GOTO 3560 ' MENU 2.1
3410 IF V$="q" OR V$="Q" THEN QUIT=1:GOTO 43160
3460 IF V$="H" OR V$="h" THEN GOSUB 47010:GOTO 2760
3510 GOTO 3310
3560 REM ***** FILE OR KEYBOARD INPUT?*****
3610 CLS
3660 MM2.1=24
3710 LOCATE 10,35
3760 COLOR 0,7
3810 PRINT " SELECT: "
3860 COLOR 7,0
3910 PRINT:PRINT
3960 PRINT TAB(MM2.1)"Input from (K)eypad or (F)ile?"
4010 FILE$=""
4060 V$=INKEY$
4110 IF V$="F" OR V$="f" THEN GOTO 4260
4160 IF V$="K" OR V$="k" THEN GOTO 5260
4210 GOTO 4060
4260 REM ** INPUT DATA FROM DISK FILE *****
4310 FILE$="Y"
4360 CLS
4410 LOCATE 3,31
4460 COLOR 0,7
4510 PRINT " DATA FILE SELECTION "
4560 COLOR 7,0
4610 LOCATE 5,1
4660 FILES "*.IRR"
4710 LOCATE CSRLIN+2,27
4760 PRINT "Enter filename: _____.IRR"
4810 LOCATE CSRLIN-1,43
4860 INPUT "", GETFILENAME$  

4910 IF RIGHT$(GETFILENAME$,4)<>".IRR" THEN GETFILENAME$=GETFILENAME$+".IRR"
4960 LOCATE CSRLIN+1,24
5010 COLOR 0,7
5060 PRINT " Reading data from file: ";

```

```

5110 COLOR 24,7
5160 PRINT GETFILENAME$;" "
5210 COLOR 7,0
5260 REM---
5310 IF FILE$="Y" OR FILE$="y" THEN GOTO 58760 ' FOR FILE SELECTION, INPUT
5360 REM ***** RATE INPUTS *****
5410 RATEFLAG=RATEFLAG+1 ' INDICATES IF THIS SCREEN HAS BEEN EXECUTED FOR THE
    FIRST TIME YET
5460 FORMATR$="##,####"
5510 CLS
5560 LOCATE 4,34
5610 COLOR 0,7
5660 PRINT " ENTER RATES "
5710 COLOR 7,0
5760 TOPLINE=10
5810 LMARGINR=18
5860 COLR=55
5910 LOCATE TOPLINE,LMARGINR
5960 PRINT "Discount rate ="
6010 LOCATE TOPLINE+2,LMARGINR
6060 PRINT "Safe rate ="
6110 LOCATE TOPLINE+4,LMARGINR
6160 PRINT "Number of compounding periods"
6210 PRINT TAB(LMARGINR)" per year (1-365) ="
6260 FORMATC$="###"
6310 LOCATE TOPLINE+5,COLR+4
6360 PRINT USING FORMATC$;K1
6410 IF RATEFLAG>1 THEN GOTO 8310
6460 LOCATE TOPLINE,COLR+3
6510 INPUT;DRATE
6560 FIRSTDRATE=DRATE
6610 IF DRATE<0 THEN LOCATE TOPLINE,COLR+3:PRINT SPC(12):GOTO 6460
6660 GOSUB 11660
6710 LOCATE TOPLINE,COLR
6760 PRINT SPC(24)
6810 LOCATE TOPLINE,COLR-8
6860 PRINT USING FORMATR$;DRATE;
6910 PRINT " percent"
6960 LOCATE TOPLINE+2,COLR-7
7010 INPUT;SRATE
7060 FIRSTSRATE=SRATE
7110 IF SRATE<0 THEN LOCATE TOPLINE+2,COLR-7:PRINT SPC(24):GOTO 6960
7160 GOSUB 11660
7210 LOCATE TOPLINE+2,COLR
7260 PRINT SPC(24)
7310 LOCATE TOPLINE+2,COLR-8
7360 PRINT USING FORMATR$;SRATE;
7410 PRINT " percent"
7460 LOCATE TOPLINE+9,LMARGINR+2
7510 COLOR 0,7
7560 PRINT " If no change, press return without input "
7610 COLOR 7,0
7660 LOCATE TOPLINE+5,COLR-5
7710 INPUT;NEWK1

```

```
7760 IF NEWK1=0 THEN NEWK1=K1:GOTO 7860
7810 IF NEWK1<1 OR NEWK1>366 THEN LOCATE TOPLINE+5,COLR-5:PRINT SPC(16):GOTO
7660
7860 REM ** LANDING
7910 LOCATE TOPLINE+5,COLR-6
7960 PRINT SPC(14)
8010 LOCATE TOPLINE+8,LMARGINR+4
8060 PRINT STRING$(45,32)
8110 IF NEWK1<>0 THEN K1=NEWK1
8160 LOCATE TOPLINE+5,COLR+4
8210 PRINT USING FORMATC$;K1
8260 GOTO 11910 'SKIP CHANGES; INPUT TRANSACTIONS
8310 REM** CHANGE RATE INPUTS? ****
8360 COLR=55
8410 FORMATC$="###"
8460 FORMATR$="##.####"
8510 TOPLINE=8
8560 LMARGINR=18
8610 CLS
8660 LOCATE 4,31
8710 COLOR 0,7
8760 PRINT " ENTER ANY CHANGES "
8810 COLOR 7,0
8860 LOCATE TOPLINE,LMARGINR
8910 PRINT "(D)iscount rate =";TAB(COLR-6);
8960 PRINT USING FORMATR$;DRATE;
9010 PRINT " percent"
9060 LOCATE TOPLINE+2,LMARGINR
9110 PRINT "(S)afe rate =";TAB(COLR-6);
9160 PRINT USING FORMATR$;SRATE;
9210 PRINT " percent"
9260 LOCATE TOPLINE+4,LMARGINR
9310 PRINT "(N)umber of compounding periods"
9360 PRINT TAB(LMARGINR)" per year (1-365) ="
9410 LOCATE TOPLINE+5,COLR+6
9460 PRINT USING FORMATC$;K1
9510 LOCATE TOPLINE+10,36
9560 COLOR 24,7
9610 PRINT " SELECT: "
9660 COLOR 7,0
9710 LOCATE 21,15
9760 PRINT " (D)iscount rate, (S)afe rate, (N)umber of "
9810 LOCATE 22,15
9860 PRINT " compounding periods, or (C)onfirm ... (D,S,N,C) ?"
9910 COLOR 7,0
9960 V$=INKEY$
10010 IF V$="C" OR V$="c" THEN GOTO 11910
10060 IF V$="D" OR V$="d" THEN GOTO 10260
10110 IF V$="S" OR V$="s" THEN GOTO 10710
10160 IF V$="N" OR V$="n" THEN GOTO 11160
10210 GOTO 9960
10260 REM ** CHANGE DISCOUNT RATE
10310 LOCATE TOPLINE,COLR-10
10360 PRINT SPC(24)
```

```

10410 LOCATE TOPLINE, COLR-5
10460 INPUT;DRATE
10510 FIRSTDRATE=DRATE
10560 GOSUB 11660
10610 PRINT USING FORMATR$;DRATE
10660 GOTO 8310
10710 REM ** CHANGE SAFE RATE
10760 LOCATE TOPLINE+2, COLR-10
10810 PRINT SPC(25)
10860 LOCATE TOPLINE+2, COLR-5
10910 INPUT;SRATE
10960 FIRSTSRATE=SRATE
11010 GOSUB 11660
11060 PRINT USING FORMATR$;SRATE
11110 GOTO 8310
11160 REM ** CHANGE NO. OF COMP. PDS.
11210 LOCATE TOPLINE+5, COLR-3
11260 PRINT SPC(16)
11310 LOCATE TOPLINE+5, COLR
11360 INPUT;NEWK1
11410 IF NEWK1=0 THEN NEWK1=K1:GOTO 8310
11460 IF NEWK1<1 OR NEWK1>366 THEN LOCATE TOPLINE+5, COLR-5:PRINT SPC(16):GOTO
11160
11510 K1=NEWK1
11560 PRINT USING FORMATC$;K1
11610 GOTO 8310
11660 REM ** SUBROUTINE TO CONVERT DECIMAL RATES TO PERCENTAGES*****
11710 DRATE=ABS(DRATE):SRATE=ABS(SRATE)
11760 IF DRATE<1 THEN DRATE=DRATE*100
11810 IF SRATE<1 THEN SRATE=SRATE*100
11860 RETURN
11910 REM **KEYBOARD DATE AND AMOUNT INPUT ****
11960 IF SKIPFLOWS$="Y" THEN GOTO 25510 'COMMENCE CALCULATION WITH NEWLY
     INPUTTED RATES
12010 CLS
12060 MODE$=" ENTER OUTLAYS "
12110 F9=-1 ' F9 CHANGES ABSOLUTE INPUT OF OUTLAYS AND RECEIPTS TO NEGATIVE OR
12160 REM ** RECEIPTS LOOP CONNECTS HERE*****
12210 LMARGIN=12
12260 LOCATE 2,34
12310 COLOR 0,7
12360 PRINT MODE$
12410 COLOR 7,0
12460 IF LASTERROR=1 THEN GOTO 12660 'SKIP DATE HELP MESSAGE IF AN ERRORCODE
     =1 MESSAGE IS BEING DISPLAYED
12510 ENTERCOUNTER=ENTERCOUNTER+1 'DATE HELP INDICATOR; ONLY PRINT DATE HELP
     THE FIRST TIME THEY TRY TO ENTER A DATE
12560 IF ENTERCOUNTER=1 THEN GOSUB 40610 'DATE HELP SUBROUTINE PRINT ON FIRST
     DATE ENTRY
12610 IF LASTERROR=2 THEN LOCATE 5,LMARGIN:PRINT SPC(24)
12660 REM***LANDING
12710 LOCATE 5,12
12760 REM ***** INPUT DRIVER LOOPS BACK TO HERE FOR ADDITIONAL CASH FLOWS ***
12810 IF CSRLIN>17 THEN GOSUB 20910 'CLEAR FULL SCREEN

```

```

12860 IF ARRAYIN$="N" GOTO 21360
12910 ARRAYIN$="N"
12960 SAVECSR=CSRLIN
13010 CSRRELOCATE=CSRLIN
13060 IF ERRORCODE=1 THEN GOSUB 41710 ' IF OUTLAYS <1
13110 IF NUMOUT=0 THEN GOTO 13660'SKIP END OF OUTLAYS MESSAGE AT BOTTOM IF NO
    OUTLAYS HAVE BEEN ENTERED
13160 IF F9=1 AND NUMREC=0 THEN GOTO 13660 'DONT PRINT END OF RECEIPTS MESSAGE
    IF NO RECEIPTS HAVE BEEN ENTERED
13210 LOCATE 25,10:PRINT SPC(34);
13260 LOCATE 20,1:PRINT
13310 LOCATE 25,45
13360 PRINT "F10";
13410 COLOR 0,7
13460 IF F9=-1 THEN PRINT " No more outlays ";
13510 IF F9=1 THEN PRINT " No more receipts ";
13560 COLOR 7,0
13610 LOCATE CSRRELOCATE-1,1:PRINT 'AVOID SCREEN JUMP
13660 REM ** LANDING
13710 PRINT TAB(LMARGIN);
13760 LINE INPUT "Enter date: ";DATEINPUT$
13810 IF DATEINPUT$="" THEN GOTO 13610
13860 IF DATEINPUT$="ENDINPUT" AND ((F9=-1 AND NUMOUT=0) OR (F9=1 AND
    NUMREC=0)) THEN BEEP:LOCATE CSRRELOCATE,LMARGIN: PRINT SPC(20):GOTO 13610
13910 IF DATEINPUT$="INSTALLMENTS" AND ((F9=-1 AND NUMOUT=0) OR (F9=1 AND
    NUMREC=0)) THEN BEEP:LOCATE CSRRELOCATE,LMARGIN: PRINT SPC(26):GOTO 13610
13960 IF HELP$="Y" THEN GOSUB 41260 'TO ERASE HELP MESSAGE
14010 IF DATEINPUT$="ENDINPUT" THEN GOTO 17310 'SUPERCEDES OTHER TESTS
14060 IF LEN(DATEINPUT$)<6 THEN DATEERROR$="GENERAL":GOTO 17910
14110 IF LEN(DATEINPUT$)>10 THEN DATEERROR$="GENERAL":GOTO 17910
14160 REM *** DETERMINE IF DATE SEPARATOR IS -,/,OR SPACE ***
14210 DASH$="-"
14260 GOTO 14510
14310 IF DASH$="/" THEN GOTO 14460
14360 DASH$="/"
14410 GOTO 14510
14460 DASH$=" "
14510 V1=INSTR(DATEINPUT$,DASH$)
14560 IF V1=0 AND DASH$=" " THEN GOTO 17910
14610 IF V1=0 THEN GOTO 14310 ' IF DASHES ARE NOT USED AS DATE SEPARATORS
14660 IF V1=3 THEN MONTH$=MID$(DATEINPUT$,V1-2,2) 'GIVES FIRST TWO DIGITS OF
    DATE      INPUT$
14710 IF V1=2 THEN MONTH$=MID$(DATEINPUT$,V1-1,1) ' GIVES FIRST DIGIT OF
    DATEINPUT      $
14760 V2=INSTR(V1+1,DATEINPUT$,DASH$) ' LOOKS FOR DASH AFTER DAY IN DATEINPUT$
14810 IF V2=V1+2 THEN DAY$=MID$(DATEINPUT$,V2-1,1) ' GETS A ONE-DIGIT DAY
14860 IF V2=V1+3 THEN DAY$=MID$(DATEINPUT$,V2-2,2) ' GETS A TWO-DIGIT DAY
14910 DATELENGTH=LEN(DATEINPUT$)
14960 IF LEN(DATEINPUT$)-V2=4 THEN YEAR$=MID$(DATEINPUT$,V2+1,4)'GETS A 4 DIGIT
    DA      TE
15010 IF LEN(DATEINPUT$)-V2=2 THEN YEAR$=MID$(DATEINPUT$,V2+1,2)'GETS A 2 DIGIT
    DA      TE
15060 MONTH=VAL(MONTH$)
15110 DAY=VAL(DAY$)

```

```

15160 YEAR=VAL(YEAR$)
15210 IF LEN(YEAR$)<4 AND VAL(YEAR$)>50 THEN YEAR=YEAR+1900
15260 IF LEN(YEAR$)<4 AND VAL(YEAR$)<50 THEN YEAR=YEAR+2000
15310 YEAR$=STR$(YEAR)
15360 MID$(YEAR$,1,1)="-"
15410 IF LEN(MONTH$)=1 THEN MONTH$="0"+MONTH$
15460 IF LEN(DAY$)=1 THEN DAY$="0"+DAY$
15510 IF DASH$="-" AND (INSTR(DATEINPUT$,"/")>0 OR INSTR(DATEINPUT$," ")>0)
THEN DATEERROR$="GENERAL":GOTO 17910
15560 IF DASH$="/" AND (INSTR(DATEINPUT$,"-")>0 OR INSTR(DATEINPUT$," ")>0)
THEN DATEERROR$="GENERAL":GOTO 17910
15610 IF DASH$="-" AND (INSTR(DATEINPUT$,"/")>0 OR INSTR(DATEINPUT$," ")>0)
THEN DATEERROR$="GENERAL":GOTO 17910
15660 IF MONTH<1 OR MONTH>12 THEN DATEERROR$="MONTH":GOTO 17910 '(TO DATE INPUT
ERROR SUBROUTINE)
15710 IF DAY<1 OR DAY>31 THEN DATEERROR$="DAY":GOTO 17910'(TO DATE INPUT ERROR
SUBROUTINE)
15760 IF YEAR<1950 OR YEAR>2050 THEN DATEERROR$="YEAR":GOTO 17910
15810 LOCATE CSRRELOCATE,LMARGIN+12
15860 TRANSDATE$=MONTH$+"-"+DAY$+YEAR$
15910 PRINT TRANSDATE$
15960 LOCATE 25,45
16010 PRINT SPC(23);
16060 LOCATE 22,1:PRINT
16110 INSTALLMENTS$="Y"
16160 LOCATE 25,13
16210 PRINT "F9";
16260 COLOR 0,7
16310 PRINT " Cash flow groups/Annuities ";
16360 COLOR 7,0
16410 LOCATE 2,1
16460 PRINT
16510 INSTALLMENTS$="N"
16560 LOCATE CSRRELOCATE,LMARGIN+29
16610 LINE INPUT " Enter amount: ",AMOUNT$
16660 COMMA=INSTR(AMOUNT$,",")
16710 IF COMMA>0 THEN BEEP:LOCATE CSRRELOCATE,LMARGIN+29:PRINT SPC(33): GOTO
16560
16760 IF AMOUNT$="INSTALLMENTS" THEN GOTO 18660
16810 IF AMOUNT$="" OR VAL(AMOUNT$)<=0 THEN BEEP:LOCATE
CSRRELOCATE,LMARGIN+29:PRINT SPC(36):GOTO 16560
16860 IF INSTR(AMOUNT$,"S")>0 OR INSTR(AMOUNT$,"T")>0 THEN BEEP:LOCATE
CSRRELOCATE,LMARGIN+29:PRINT SPC(36):GOTO 16560
16910 AMOUNT = VAL(AMOUNT$)
16960 LOCATE CSRLIN-1,LMARGIN+45
17010 FORMAT1$="####,#####"
17060 PRINT USING FORMAT1$:AMOUNT
17110 A(6) = AMOUNT*F9
17160 PRINT ' SKIPS TO NEXT LINE OF INPUT SCREEN
17210 A(0)=6
17260 GOTO 12760
17310 REM ****END INPUT OF OUTLAYS OR RECEIPTS ****
17360 DATEINPUT$="" 'CLEAR STRING
17410 IF F9=1 THEN LOCATE CSRLIN-1,LMARGIN:GOTO 25510 ' TRUE IF PROGRAM IS

```

ACCEPTING RECEIPTS INPUT DATA; THEREFORE, IF TRUE, BEGIN CALC. OF TRANS. PD.

17460 GOTO 17510 'SET UP INPUT DRIVER FOR RECEIPTS

17510 REM ***** INITIALIZE INPUT DRIVER FOR RECEIPTS *****

17560 MODE\$=" ENTER RECEIPTS "

17610 ARRAYINS\$="Y"

17660 COUNTER=0

17710 INSTALLMENTS\$="NULL"

17760 CLS

17810 F9=1 ' F9 CHANGES ABSOLUTE INPUT OF OUTLAYS AND RECEIPTS TO NEGATIVE OR
POSITIVE RESPECTIVELY

17860 GOTO 12160

17910 REM ***** DATE INPUT ERROR SUBROUTINE *****

17960 HELP\$="Y"

18010 ARRAYINS\$="Y"

18060 IF DATEERROR\$="MONTH" THEN LOCATE 22,19:COLOR 0,7:PRINT " ERROR -- Month
must be from 1 to 12 only. ":"GOTO 18310

18110 IF DATEERROR\$="DAY" THEN LOCATE 22,20:COLOR 0,7:PRINT " ERROR -- Day must
be from 1 to 31 only. ":"GOTO 18310

18160 IF DATEERROR\$="YEAR" THEN LOCATE 22,19:COLOR 0,7:PRINT " ERROR -- Year
must be from 1950 to 2050. ":"GOTO 18310

18210 IF DATEERROR\$="GENERAL" THEN LOCATE 22,15:COLOR 0,7:PRINT TAB(15)" ERROR
-- Date input unacceptable. Re-enter date. ":"GOTO 18310 'CATCH ALL ERROR
MESSAGE

18260 LOCATE 22,15:COLOR 0,7:PRINT TAB(15)" ERROR -- Date input unacceptable.
Re-enter date. ":"GOTO 18310

18310 REM** LANDING

18360 COLOR 7,0

18410 LOCATE CSRRELOCATE,5

18460 PRINT SPC(43)

18510 LOCATE CSRRELOCATE,5

18560 BEEP

18610 GOTO 12760

18660 REM *** INSTALLMENT INPUT SUBROUTINE *****

18710 INSTALLMENTS\$="Y"

18760 LOCATE 25,10

18810 PRINT SPC(36);

18860 LOCATE 2,1:PRINT

18910 LOCATE CSRRELOCATE,LMARGIN+29

18960 PRINT " Multiple Installments "

19010 PRINT

19060 PRINT TAB(LMARGIN+5);

19110 INPUT "Number of installments: ";NUM

19160 IF (NUM<0) OR (NUM>DIMROWS-5) THEN BEEP:GOTO 19060

19210 IF NUM<>0 THEN GOTO 19510 'OTHERWISE, GO BACK AND INPUT A SINGLE AMT

19260 LOCATE CSRRELOCATE,42

19310 PRINT SPC(26)

19360 LOCATE CSRRELOCATE+2,5

19410 PRINT SPC(48)

19460 GOTO 16010

19510 REM ** LANDING

19560 PRINT TAB(LMARGIN+5) "Number of months separating each installment: ";

19610 INPUT MINTV

19660 IF MINTV<=0 OR MINTV>60 THEN BEEP:GOTO 19560

19710 PRINT TAB(LMARGIN+5) "Are the installments equal amounts (Y/N) ?"

```

19760 EQUAL$=INKEY$
19810 IF EQUAL$=="Y" OR EQUAL$=="y" THEN 20510
19860 IF EQUAL$=="N" OR EQUAL$=="n" THEN 19960
19910 GOTO 19760
19960 REM ** CALCULATION OF UNEQUAL INSTALLMENTS PER INPUT SPECIFICATION**
20010 FOR ZZZ=1 TO NUM
20060 PRINT TAB(LMARGIN+7);
20110 PRINT "Amount of installment number ";ZZZ;" ";
20160 INPUT;AMOUNT
20210 IF AMOUNT<0 THEN BEEP:GOTO 20060
20260 A(ZZZ+5)=AMOUNT*F9
20310 NEXT ZZZ
20360 PRINT
20410 PRINT
20460 GOTO 12760
20510 REM ***** CALCULATION OF EQUAL INSTALLMENTS PER INPUT SPECIFICATION*****
20560 PRINT TAB(LMARGIN+5);
20610 CSRINSTALL=CSRIN1
20660 INPUT "Amount of installments: ";AMOUNT
20710 IF AMOUNT<0 THEN BEEP:GOTO 20660
20760 A(6)=AMOUNT*F9
20810 PRINT
20860 GOTO 12760
20910 REM *** CLEARS SCREEN WHEN FULL ****
20960 CSRRELOCATE=5
21010 CLS
21060 LOCATE 2,33
21110 COLOR 0,7
21160 PRINT MODE$ 
21210 COLOR 7,0
21260 LOCATE 5,LMARGIN
21310 RETURN
21360 REM **** TRANSFER DATA TO A() ARRAY ****
21410 A(1)=MONTH
21460 A(2)=DAY
21510 A(3)=YEAR
21560 A(4)=NUM
21610 A(5)=MINTV ' MINTV=PERIODICITY:THE NO. OF MONTHS SEPARATING EACH
     INSTALLMENT
21660 FORMAT0JR3$="#####"
21710 IF A(6)=0 THEN A(6)=AMOUNT*F9
21760 IF INSTALLMENTS$=="N" OR INSTALLMENTS$=="n" THEN A(0)=6 'NUMBER OF ELEMENTS
     IN A()
21810 IF INSTALLMENTS$=="Y" OR INSTALLMENTS$=="y" THEN A(0)=NUM+5 'NUMBER OF
     ELEMENTS IN A()
21860 IF INSTALLMENTS$=="N" THEN GOTO 22110
21910 IF EQUAL$=="N" THEN GOTO 22110
21960 FOR I = 1 TO NUM
22010 A(I+6)=AMOUNT*F9
22060 NEXT I
22110 REM ** LANDING
22160 IF F9=-1 THEN NUMOUT=NUMOUT+1 ' COUNTS THE NUMBER OF OUTLAYS
22210 IF F9=1 THEN NUMREC=NUMREC+1 'COUNTS THE NUMBER OF RECEIPTS
22260 ARRAYINS$="Y"

```

```

22310 REM ***** TRANSFER ELEMENTS TO B(L,2) *****
22360 IF A(0)<0 THEN GOTO 22960 'SKIP RATES CARD
22410 FOR L=6 TO A(0)
22460 J1 = L-5+J2 'J2 IS LARGEST SUBSCRIPT YET USED IN B(); J1 IS THE NUMBER
    THE ELEMENT WE ARE NOW PUTTING IN THE B() MATRIX
22510 F1 = 12*A(3) + A(1)-1 + (A(2)-1)/30 ' F1 = NO. OF MONTHS OF 1ST
    TRANSACTION
22560 B1 = F1 + (L-6)*A(5)-600' B1=# OF MONTHS PAST 1950; SEE LINE 2780
    OF WITS PROGRAM
22610 B2 = A(L)
22660 B(J1,1) = B1
22710 B(J1,2) = B2
22760 F=B1:GOSUB 32110
22810 B$(J1)=STR$(G1)+STR$(G2*-1)+STR$(G3*-1)
22860 NEXT
22910 J2 = J1
22960 REM ** LANDING
23010 GOTO 12760
23060 END
23110 REM **** CALCULATE INTERNAL RATE OF RETURN *****
23160 '
23210 N2=K1*100 ' K1=# OF COMP. POS./YEAR
23260 S = 10/N2
23310 P2 = 0
23360 X1 = 1
23410 X2 = 1
23460 FOR I = 1 TO 10
23510 P1 = 0
23560 FOR J = 1 TO J1
23610 P1=P1+B(J,2)/X1^((B(J,1)-F1)*K1/12) ' SEE LINE 1790, WITS VERSION
23660 NEXT J
23710 X0 = X1 - P1 * (X2-X1)/(P2-P1)+S
23760 IF X0 < .5 THEN X0 = .5
23810 IF ABS(X0-X1) < .0000005 AND MULTIRR$="Y" THEN
NIRRS=1:FIRSTIRR=((X1-1)*N2):TRIALNUM=0: GOTO 52210
23860 IF ABS(X0-X1) < .0000005 THEN GOTO 24160
23910 X2=X1
23960 X1=X0
24010 S = 0
24060 P2 = P1
24110 NEXT I
24160 IF MULTIRR$<>"Y" THEN IRR=((X1-1)*N2):FIRSTIRR=IRR
24210 IF MULTIRR$="Y" THEN NIRRS=1:FIRSTIRR=((X1-1)*N2):TRIALNUM=0: GOTO
52210'MULTIPLE IRR FINDER
24260 GOSUB 56210
24310 REM** CALCULATE NET PRESENT VALUE, MIRR *****
24360 DEF FNR(Y)=(Y/100)/K1+1 ' Y CHANGES FROM PERCENT TO DECIMAL FORM
24410 R1=FNR(DRATE) 'OUTLAYS CAP RATE IN DECIMAL FORM
24460 R2=FNR(SRATE) 'RECEIPTS DISC. RATE IN DECIMAL FORM
24510 GOTO 24610'WITS GOTO 1480
24560 R2=R1 'WITS LINE 1470
24610 PP1=0 :PP2=0 : PP3=0
24660 FOR J=1 TO J1
24710 FORMATF1$="#####,#####":FORMATF2$="##,##"

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```

24760 B1=B(J,1)
24810 B2=B(J,2)
24860 PP8=B2/R1^((B1-F1)*K1/12)
24910 PP1=PP1+PP8
24960 IF B2>0 GOTO 25110 'WITS LINE 1570
25010 PP2=PP2-PP8
25060 GOTO 25160 'WITS LINE 1580
25110 PP3=PP3+B2*R2^((F2-B1)*K1/12)
25160 NEXT J
25210 R4=EXP(LOG(PP3/PP2)/((F2-F1)*K1/12))
25260 NPV=PP1 :F1=RSTNPV=NPV'N2=K1*100
25310 MIRR=(R4-1)*N2
25360 GOSUB 50810 'SORT FLOWS CHRONOLOGICALLY
25410 GOTO 26760 ' PRINT OUTPUT TO SCREEN
25460 END
25510 REM ***** CALCULATE TRANSACTION PERIOD ***** 
25560 SKIPFLOWS$="N"
25610 GOSUB 42760 ' FLASHING PLEASE STAND BY MESSAGE
25660 F1 = B(1,1)
25710 F2=F1
25760 F3=0
25810 F4=0
25860 FOR J=1 TO J1
25910 F = B(J,1)
25960 IF F<F1 GOTO 26260
26010 IF F>F2 GOTO 26360
26060 F=B(J,2)
26110 IF F<0 GOTO 26460
26160 F4=F4+F
26210 GOTO 26510
26260 F1=F
26310 GOTO 26060
26360 F2=F
26410 GOTO 26060
26460 F3=F3-F
26510 NEXT J
26560 F=F2-F1
26610 GOSUB 32110
26660 IF F3=F4 THEN GOSUB 41960 'IF OUTLAYS=RECEIPTS
26710 GOTO 23110 ' TO CALCULATE IRR
26760 REM ***** PRINT OUTPUT TO SCREEN *****
26810 REM ***** TRANSACTION SUMMARY *****
26860 IF BEEPER$="ON" THEN BEEP
26910 REM ** LANDING
26960 IF J1>54 THEN GOTO 28460 'SK1P TRANSACTION SUMMARY IF TOO MANY CASH FLOWS
TO DISPLAY ON SCREEN
27010 CLS
27060 LOCATE 3,30:COLOR 0,7:PRINT " TRANSACTION SUMMARY ":COLOR 7,0:PRINT
27110 LMARGIN=4
27160 SKIP=12 'SPACE BETWEEN DATE AND TRANSACTION AMOUNT
27210 FMARGIN2=29:FMARGIN3=57
27260 FORMATF1$="#####,#####":FORMATF2$="#####,#####"
27310 RIGHTROWLINE=4 'RIGHT HAND COLUMN ON SCREEN START ON RIGHTROWLINE+1
27360 FOR Z=1 TO J1

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27410 IF Z=37 THEN RIGHTROWLINE=4
27460 IF Z>36 GOTO 28010
27510 IF Z>18 THEN GOTO 27760
27560 PRINT TAB(FMARGIN);B$(Z);TAB(FMARGIN+SKIP);
27610 IF Z=1 THEN PRINT USING FORMATF1$;B(Z,2)
27660 IF Z<>1 THEN PRINT USING FORMATF2$;B(Z,2)
27710 GOTO 28210
27760 RIGHTROWLINE=RIGHTROWLINE+1:LOCATE RIGHTROWLINE,FMARGIN2
27810 PRINT TAB(FMARGIN2);B$(Z);TAB(FMARGIN2+SKIP)
27860 IF Z=19 THEN PRINT USING FORMATF1$;B(Z,2)
27910 IF Z<>19 THEN PRINT USING FORMATF2$;B(Z,2)
27960 GOTO 28210 'NEXT Z
28010 RIGHTROWLINE=RIGHTROWLINE+1:LOCATE RIGHTROWLINE,FMARGIN3
28060 PRINT TAB(FMARGIN3);B$(Z);TAB(FMARGIN3+SKIP);
28110 IF Z=37 THEN PRINT USING FORMATF1$;B(Z,2)
28160 IF Z<>37 THEN PRINT USING FORMATF2$;B(Z,2)
28210 NEXT Z
28260 LOCATE 24,28:PRINT "Press any key to continue";
28310 LOCATE 21,1:PRINT
28360 V$=INKEY$:IF V$="" THEN GOTO 28360
28410 PRINT
28460 REM ** OUTPUT SUMMARY SCREEN ****
28510 LMARGIN2=13 ' OUTPUT SCREEN FORMAT
28560 START=7' OUTPUT SCREEN FORMAT
28610 COL2=55
28660 LMARGIN2A=23
28710 FORMATO$="$###,#####"
28760 FORMATOJR$="$###,##"
28810 FORMATOJR2$="$#,##"
28860 FORMATOJR3$="$###"
28910 FORMATRATE$="#####.####"
28960 CLS
29010 LOCATE 3,33
29060 COLOR 0,7
29110 PRINT " RATES OUTPUT "
29160 COLOR 7,0
29210 PRINT
29260 PRINT TAB(LMARGIN2)STRING$(53,"-")
29310 YEARSPAN=G3-50
29360 MONTHSPAN=G1-1
29410 DAYSPAN=G2
29460 LOCATE START,LMARGIN2A
29510 PRINT "Period of":G3-50;
29560 IF G3-50=1 THEN PRINT "year,": ELSE PRINT "years,";
29610 PRINT G1-1;
29660 IF G1-1=1 THEN PRINT "month,": ELSE PRINT "months,";
29710 PRINT G2;
29760 IF G2=1 THEN PRINT "day" ELSE PRINT "days"
29810 GOSUB 32110
29860 F=F1
29910 GOSUB 32110
29960 LOCATE CSRLIN,LMARGIN2A+3
30010 PRINT "From":STR$(G1)+STR$(G2*-1)+STR$(G3*-1);
30060 F=F2

```

```

30110 GOSUB 32110
30160 PRINT " to";STR$(G1)+STR$(G2*-1)+STR$(G3*-1)
30210 LOCATE CSRLIN+1,LMARGIN2
30260 PRINT "Total outlays:      ";
30310 PRINT TAB(COL2);
30360 PRINT USING FORMATO$;F3
30410 TOTOUTLAYS=F3
30460 LOCATE CSRLIN,LMARGIN2
30510 PRINT "Total receipts:      ";
30560 PRINT TAB(COL2);
30610 PRINT USING FORMATO$;F4
30660 LOCATE CSRLIN+1,LMARGIN2
30710 PRINT "Discount rate (for outlays):";TAB(COL2-7);
30760 PRINT USING FORMATRATE$;DRATE;
30810 PRINT " percent"
30860 PRINT TAB(LMARGIN2) "Safe rate (for receipts):";TAB(COL2-7);
30910 PRINT USING FORMATRATE$;SRATE;
30960 PRINT " percent"
31010 LOCATE CSRLIN+1,LMARGIN2
31060 FORMATRATE2$="##,##"
31110 PRINT "Internal rate of return:";
31160 IF IRR1$="NONE" THEN PRINT TAB(LMARGIN2+49); "NONE":GOTO 31360
31210 PRINT TAB(COL2-7);
31260 PRINT USING FORMATRATE$;FIRSTIRR;
31310 PRINT " percent"
31360 PRINT TAB(LMARGIN2)"Modified internal rate of return:";TAB(COL2-7);
31410 PRINT USING FORMATRATE$;MIRR;
31460 PRINT " percent"
31510 PRINT
31560 PRINT TAB(LMARGIN2)"Net present value at ";
31610 PRINT USING FORMATRATE2$;FIRSTD RATE;
31660 PRINT " percent:";TAB(COL2);
31710 PRINT USING FORMATO$;FIRSTNPV
31760 PRINT:PRINT
31810 PRINT TAB(LMARGIN2)STRING$(53,"-")
31860 LOCATE 24,28
31910 PRINT "Press any key to continue";
31960 V$=INKEY$: IF V$="" THEN GOTO 31960
32010 PRINT
32060 GOTO 34160 ' OPTIONS MENU--PRINT TO DISK, FILE OR QUIT?
32110 REM ** DATE MANIPULATION SUBROUTINE ****
32160 G3=INT(F/12)
32210 G1=INT(F-G3*12)
32260 G2=INT(30*(F-G1-12*G3)+.05)+1 'G2=DAY IN SPAN OF TRANSACTIONS
32310 G1=G1+1 'G1=MONTH IN SPAN OF TRANSACTIONS
32360 G3=G3+50 'G3=YEAR IN SPAN OF TRANSACTIONS
32410 RETURN
32460 REM ***** FILE INPUT *****
32510 REM ***** WRITE TO FILE FROM STRING ARRAY F$ *****
32560 WRITEFILE$="Y" 'ERROR INDICATOR;SEE ERROR TRAPS
32610 CLS
32660 LOCATE 3,30
32710 COLOR 0,7
32760 PRINT " DATA FILE CREATION "

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```

32810 COLOR 7,0
32860 CSRRELOCATE=CSRLIN-1
32910 LOCATE 5,1
32960 FILES "*.IRR"
33010 RATE$="-1"+STR$(DRATE)+STR$(SRATE)+STR$(K1)
33060 LOCATE CSRLIN+2,23
33110 PRINT "Select data file name: _____.IRR"
33160 LOCATE CSRLIN-1,46
33210 INPUT "",FILENAME$
33260 IF RIGHT$(FILENAME$,4)<>".IRR" THEN FILENAME$=FILENAME$+".IRR"
33310 NAME FILENAME$ AS FILENAME$
33360 REM ** LANDING
33410 WRITEFILE$="DONE"
33460 LOCATE CSRLIN+1,22
33510 COLOR 0,7
33560 PRINT " Writing data to file: ";
33610 COLOR 24,7:PRINT FILENAME$;" "
33660 COLOR 7,0
33710 GOTO 57160 'PASS OVER STRING FILE MAKER TO RANDOM
33760 OPEN FILENAME$ FOR OUTPUT AS #2
33810 WRITE #2,RATE$
33860 FOR H=1 TO CARD COUNTER
33910 WRITE #2, F$(H)
33960 NEXT H
34010 CLOSE
34060 GOTO 34160
34110 END
34160 REM ***** OPTIONS MENU *****
34210 ON ERROR GOTO 43960
34260 CLS
34310 LOCATE 8,35
34360 COLOR CC1,CC2
34410 PRINT " SELECT: "
34460 COLOR 7,0
34510 LOCATE 11,1
34560 OPTTAB=31
34610 PRINT TAB(OPTTAB);"(P)rint output"
34660 PRINT TAB(OPTTAB);"(F)ile data to disk"
34710 PRINT TAB(OPTTAB);"(C)hange discount rates"
34760 PRINT TAB(OPTTAB);"(D)isplay output screen"
34810 PRINT TAB(OPTTAB);"(S)earch for multiple IRRs"
34860 PRINT TAB(OPTTAB);"(N)PV profile plot"
34910 PRINT TAB(OPTTAB);"(R)e-run program
34960 PRINT TAB(OPTTAB);"(H)elp
35010 PRINT TAB(OPTTAB);"(Q)uit"
35060 V$=INKEY$
35110 IF (V$="s" OR V$="S") AND IRR1$<>"NONE" THEN MULTIRR$="Y":GOSUB
58310:GOTO 23110
35160 IF (V$="S" OR V$="s") AND IRR1$="NONE" THEN GOSUB 41710:GOTO 34160
35210 IF V$="n" OR V$="N" THEN CLS:LOCATE 12,31:COLOR 31:PRINT "Please wait
...":COLOR 7,0:CHAIN "RATEPLOT",,ALL
35260 IF V$="h" OR V$="H" THEN GOSUB 47010:GOTO 34160
35310 IF V$="F" OR V$="f" THEN GOTO 32510
35360 IF V$="P" OR V$="p" THEN GOTO 35660

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35410 IF V$="Q" OR V$="q" THEN QUIT=2:GOTO 43160
35460 IF V$="C" OR V$="c" THEN SKIPFLOWS$="Y":GOTO B310
35510 IF V$="D" OR V$="d" THEN GOTO 26910
35560 IF V$="R" OR V$="r" THEN CLEAR:RERUN$="Y":GOTO 2010
35610 GOTO 35060
35660 GOSUB 35760 'LINE PRINT SUBROUTINE
35710 GOTO 34160 'RETURN TO OPTIONS MENU AFTER PRINTING
35760 REM ***** LINE PRINT OUTPUT -- TRANSACTIONS SUMMARY*****
35810 CLS
35860 LOCATE 10,35:COLOR CC1,CC2
35910 PRINT " SELECT: "
35960 COLOR 7,0
36010 PRINT:PRINT TAB(33)"Print Options"
36060 PRINT
36110 PRINT TAB(23)">(B)oth transactions summary and rates"
36160 PRINT TAB(23)">(R)ates only"
36210 V$=INKEY$
36260 IF V$="B" OR V$="b" THEN GOTO 36410
36310 IF V$="R" OR V$="r" THEN GOTO 37160
36360 GOTO 36210
36410 REM ** LANDING
36460 FORMATT$="$$###,#####"
36510 NROWS=INT((J1+1)/2)
36560 TMARGIN=24:TM2=11:TM3=19:TM4=11
36610 LPRINT TAB(TMARGIN)STRING$(53,"-")
36660 LPRINT TAB(TMARGIN+18)"TRANSACTION SUMMARY"
36710 LPRINT TAB(TMARGIN)STRING$(53,"-"):LPRINT
36760 FOR Z1=1 TO NROWS
36810 LPRINT TAB(TMARGIN-1) USING "&":B$(Z1):
36860 LPRINT TAB(TMARGIN+TM2) USING FORMATT$:B(Z1,2):
36910 LPRINT TAB(TMARGIN+TM2+TM3-3)"1";
36960 IF B(Z1+NROWS,2)=0 THEN LPRINT:GOTO 37110
37010 LPRINT TAB(TMARGIN+TM2+TM3) USING "&":B$(Z1+NROWS):
37060 LPRINT TAB(TMARGIN+TM2+TM3+TM4) USING FORMATT$:B(Z1+NROWS,2)
37110 NEXT Z1
37160 REM ***** LINE PRINT RATES DATA *****
37210 IF (V$<>"B" OR V$<>"b") AND (9+NROWS+24)>66 AND (9+NROWS+4)<=66 THEN
PAGES=2:LPRINT:LPRINT TAB(TMARGIN)STRING$(53,"-"):FOR LLLL=1 TO
(66-(9+NROWS)+1):LPRINT:NEXT LLLL
37260 LMARGIN2=24 ' LPRINT OUTPUT FORMAT
37310 COL2=66
37360 LMARGIN2A=34 'LEFT MARGIN FOR PERIOD SPAN HEADING
37410 FORMATO$="$$##,#####"
37460 FORMATOJR$="$$###,###"
37510 FORMATOJR2$="$$#,###"
37560 FORMATOJR3$="$$###"
37610 FORMATRATE$="#####,###"
37660 LPRINT:LPRINT
37710 LPRINT TAB(LMARGIN2)STRING$(53,"-")
37760 LPRINT TAB(44)" RATES OUTPUT "
37810 LPRINT TAB(LMARGIN2)STRING$(53,"-")
37860 LPRINT
37910 LPRINT TAB(LMARGIN2A)"Period of";YEARSPAN;
37960 IF G3-50=1 THEN LPRINT "year,"; ELSE LPRINT "years,"

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38010 LPRINT G1-1;
38060 IF G1-1=1 THEN LPRINT "month,"; ELSE LPRINT "months,";
38110 LPRINT G2;
38160 IF G2=1 THEN LPRINT "day" ELSE LPRINT "days"
38210 GOSUB 40260
38260 F=F1
38310 GOSUB 40260
38360 LPRINT TAB(LMARGIN2+3)"From";STR$(G1)+STR$(G2*-1)+STR$(G3*-1);
38410 F=F2
38460 GOSUB 40260
38510 LPRINT " to";STR$(G1)+STR$(G2*-1)+STR$(G3*-1)
38560 LPRINT
38610 LPRINT TAB(LMARGIN2)"Total outlays:";
38660 LPRINT TAB(COL2);
38710 LPRINT USING FORMAT0$;F3
38760 LPRINT TAB(LMARGIN2)"Total receipts:      ";
38810 LPRINT TAB(COL2);
38860 LPRINT USING FORMAT0$;F4
38910 LPRINT
38960 LPRINT TAB(LMARGIN2)"Discount rate (for outlays):";TAB(COL2-7);
39010 LPRINT USING FORMATRATE$;DRATE;
39060 LPRINT " percent"
39110 LPRINT TAB(LMARGIN2)"Safe rate (for receipts):";TAB(COL2-7);
39160 LPRINT USING FORMATRATE$;SRATE;
39210 LPRINT " percent"
39260 FORMATRATE2$="##,##"
39310 LPRINT
39360 LPRINT TAB(LMARGIN2)"Internal rate of return:";
39410 IF IRR1$="NONE" THEN LPRINT TAB(LMARGIN2+47);"NONE":GOTO 39610
39460 LPRINT TAB(COL2-7);
39510 LPRINT USING FORMATRATE$;FIRSTIRR;
39560 LPRINT " percent"
39610 LPRINT TAB(LMARGIN2)"Modified internal rate of return:";TAB(COL2-7);
39660 LPRINT USING FORMATRATE$;MIRR;
39710 LPRINT " percent"
39760 LPRINT
39810 LPRINT TAB(LMARGIN2)"Net present value at ";
39860 LPRINT USING FORMATRATE2$;FIRSTDRATE;
39910 LPRINT " percent";TAB(COL2);
39960 LPRINT USING FORMAT0$;FIRSTNPV
40010 LPRINT
40060 LPRINT TAB(LMARGIN2)STRING$(53,"-")
40110 IF PAGES<2 THEN FOR LL2=1 TO (66-(25*ROWS)):LPRINT:NEXT LL2
40160 IF PAGES=2 THEN FOR LL2=1 TO (66-19+5):LPRINT:NEXT LL2
40210 RETURN
40260 REM **** DATE MANIPULATION SUBROUTINE ****
40310 G3=INT(F/12)
40360 G1=INT(F-G3*12)
40410 G2=INT(30*(F-G1-12*G3)+.05)+1
40460 G1=G1+1
40510 G3=G3+50
40560 RETURN
40610 REM ** DATE HELP SUBROUTINE ****
40660 HELPTAB=7

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```
40710 HELP$="Y"
40760 LOCATE 23,HELPTAB
40810 COLOR 0,7
40860 PRINT " Use numeric month-day-year format, with /,- or spaces as
separators. "
40910 COLOR 7,0
40960 PRINT TAB(HELPTAB);
41010 COLOR 0,7
41060 PRINT " Examples: 5-5-84, 12/1/1984, or 1 1 85 ... all are acceptable.
";
41110 COLOR 7,0
41160 LOCATE 18,1:PRINT
41210 RETURN
41260 REM ** ERASE HELP MESSAGE SUBROUTINE ****
41310 LOCATE 22,1
41360 FOR Z=1 TO 3
41410 PRINT SPC(79);
41460 NEXT Z
41510 LOCATE 18,1:PRINT
41560 HELP$="N"
41610 RETURN
41660 REM ** NO REAL IRR FOUND SO DON'T TRY A MULT. IRR SEARCH SUBROUTINE**
41710 CLS:LOCATE 11,22:COLOR 0,7
41760 PRINT " NO REAL IRR FOUND FOR THIS DATA SET ":COLOR 7,0
41810 LOCATE 13,28:PRINT "Press any key to continue":BEEP
41860 V$=INKEY$:IF V$="" THEN GOTO 41860
41910 RETURN
41960 REM ** SUBROUTINE IF OUTLAYS = RECEIPTS
42010 CLS
42060 TOPLINE=11 :LMARGIN=25
42110 LOCATE 8,35
42160 COLOR 0,7
42210 PRINT " ERROR "
42260 COLOR 7,0
42310 LOCATE TOPLINE,LMARGIN
42360 PRINT "Outlays may not equal receipts"
42410 LOCATE TOPLINE+1,LMARGIN
42460 PRINT " Please re-run the program"
42510 LOCATE TOPLINE+5,LMARGIN
42560 PRINT " Press any key to continue"
42610 V$=INKEY$:IF V$="" THEN GOTO 42610
42660 CLEAR
42710 GOTO 10
42760 REM ** FLASHING "Please stand by" MESSAGE SUBROUTINE ****
42810 CLS
42860 LOCATE 12,32
42910 COLOR 31
42960 PRINT "Please wait . . ."
43010 COLOR 7,0
43060 RETURN
43110 END
43160 REM ** QUIT CONFIRMATION SUBROUTINE ****
43210 CLS
43260 LOCATE 12,33
```

```
43310 PRINT "Confirm (Y/N) ?"
43360 V$=INKEY$
43410 IF V$="y" OR V$="Y" THEN CLS:END
43460 IF V$="n" OR V$="N" THEN GOTO 43560
43510 GOTO 43360
43560 REM**
43610 IF QUIT=1 THEN GOTO 2760
43660 IF QUIT=2 THEN GOTO 34160
43710 END
43760 REM ***** QUIT *** USING FUNCTION KEY *****
43810 CLS:END
43860 REM ** ERROR TRAPPING SUBROUTINE *****
43910 IF ERR=6 OR ERR=11 THEN BEEP:RESUME 45760
43960 IF ERR=27 THEN BEEP:LOCATE 21,50:COLOR 31:PRINT "Check printer":COLOR
7,0: RESUME 34160
44010 IF ERR=68 THEN BEEP:LOCATE 21,50:COLOR 31:PRINT "Check printer":COLOR
7,0: RESUME 34160
44060 IF ERR=52 THEN GOSUB 44710:RESUME 3560'TO OPTIONS MENU
44110 IF ERR=53 AND ERL=32960 THEN RESUME 33010'IF THERE ARE NO .IRR FILES ON
THE DISK WHEN FILES "*.IRR" COMMAND IS GIVEN
44160 IF ERR=53 AND ERL=4660 THEN BEEP:CLS:LOCATE 12,21:COLOR 0,7: PRINT " NO
IRR DATA FILES FOUND ON THIS DISK ": COLOR 7,0:GOSUB 44760: RESUME 2760 'IF
THERE ARE NO IRR FILES ON THE DISK WHEN FILE INPUT IS PROMPTED
44210 IF ERR=53 AND WRITEFILE$<>"Y" THEN BEEP:CLS:LOCATE 12,32:COLOR
CC1,CC2:PRINT " FILE NOT FOUND ":COLOR 7,0: GOSUB 44760: RESUME 3560 'FOR PRESS
ANY KEY WHEN READY SUBROUTINE
44260 IF ERR=53 AND WRITEFILE$="Y" THEN RESUME 33360
44310 IF ERR=58 THEN RESUME 45010 'FILENAME SELECTED ALREADY EXISTS ON DISK
44360 IF ERR=61 THEN BEEP:CLS:LOCATE 12,32:COLOR CC1,CC2:PRINT "   DISK FULL
":COLOR 7,0:GOSUB 44760:RESUME 3560
44410 IF ERR=71 THEN BEEP:CLS:LOCATE 12,32:COLOR CC1,CC2:PRINT " DISK NOT READY
":COLOR 7,0:GOSUB 44760:RESUME 4260
44460 IF ERR=70 THEN BEEP:CLS:LOCATE 12,29:COLOR CC1,CC2:PRINT " DISK WRITE
PROTECTED ":COLOR 7,0:GOSUB 44760:RESUME 4260
44510 IF ERR=64 AND ERL=33310 THEN BEEP:CLS:LOCATE 12,32:COLOR CC1,CC2:PRINT " BAD
FILE NAME ":COLOR 7,0:GOSUB 44760:RESUME 34160
44560 IF ERR=64 THEN BEEP:CLS:LOCATE 12,32:COLOR CC1,CC2:PRINT " BAD FILE NAME
":COLOR 7,0:GOSUB 44760:RESUME 3560
44610 ON ERROR GOTO 0
44660 END
44710 BEEP:CLS:LOCATE 12,32:COLOR CC1,CC2:PRINT " FILE NOT FOUND ":COLOR 7,0:
GOSUB 44760: RETURN ' ERROR TRAP RESPONSE SUBROUTINE
44760 REM *** PRESS ANY KEY WHEN READY ERROR SUBROUTINE
44810 LOCATE 15,28
44860 PRINT "Press any key when ready"
44910 V$=INKEY$:IF V$="" THEN GOTO 44910
44960 RETURN
45010 REM ** REPLACE EXISTING FILE (?) WARNING *****
45060 CLS
45110 LOCATE 8,17
45160 COLOR 0,7
45210 PRINT " Filename: ";FILENAME$;" already exists on disk "
45260 COLOR 7,0
45310 LOCATE 10,35:COLOR 0,7
```

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45360 PRINT " SELECT ":"COLOR 7,0
45410 LOCATE 12,34
45460 PRINT "(R)eplace"
45510 PRINT TAB(34)"(C)ancel"
45560 V$=INKEY$
45610 IF V$=="R" OR V$=="r" THEN KILL FILENAME$:GOTO 33360
45660 IF V$=="C" OR V$=="c" THEN GOTO 34160
45710 GOTO 45560
45760 REM ** OVERFLOW/DIVISION BY ZERO ERROR SUBROUTINE *****
45810 ETAB=15
45860 FMT$="####.##"
45910 FMT3$="$$###,#####"
45960 CLS
46010 LOCATE 9,35:COLOR 0,7
46060 PRINT " ERROR "
46110 COLOR 7,0
46160 LOCATE 11,27
46210 PRINT "Overflow/Division by zero"
46260 PRINT
46310 PRINT TAB(ETAB)"Unable to calculate internal rate of return (IRR)"
46360 PRINT TAB(ETAB)"for this set of data. "
46410 P1=0
46460 FOR J = 1 TO J1
46510 P1=P1+8(J,2)/X1^((B(J,1)-F1)*K1/12)
46560 NEXT J
46610 PRINT
46660 PRINT TAB(ETAB)"Net present value at ";
46710 PRINT USING FMT$;100*X1-100;
46760 PRINT " percent is ";
46810 PRINT USING FMT3$;P1
46860 V$=INKEY$:IF V$="" THEN GOTO 46860
46910 GOTO 2010'START OVER
46960 END
47010 REM *** RATES HELP SUBROUTINE *****
47060 CLS
47110 X14=2
47160 LOCATE 1,34:COLOR 0,7:PRINT " RATES HELP ":"COLOR 7,0:PRINT
47210 PRINT TAB(X14)" Given a schedule of outlays and receipts, RATES will
calculate (1) the
47260 PRINT TAB(X14)"period covered by the cash flows, (2) the starting and
ending dates of the
47310 PRINT TAB(X14)"schedule, (3) the total outlays and receipts, and (4) the
internal rate of
47360 PRINT TAB(X14)"return (IRR).
47410 PRINT
47460 PRINT TAB(X14)" In addition, net present value (NPV) is calculated by
applying the user-
47510 PRINT TAB(X14)"specified discount rate or required rate of return to the
cash flows.
47560 PRINT
47610 PRINT TAB(X14)" Modified internal rate of return (MIRR) is computed
by (1) discounting
47660 PRINT TAB(X14)"all outlays to their present value that the opportunity
cost of equity

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47710 PRINT TAB(X14)"capital rate, and (2) compounding all receipts to the end of the schedule
47760 PRINT TAB(X14)"period at the indicated reinvestment rate. The modified internal rate of
47810 PRINT TAB(X14)"return is then calculated to be that rate which will compound the present
47860 PRINT TAB(X14)"value of all outlays to equal the future value of all receipts.
47910 PRINT
47960 PRINT TAB(X14)" The user may then (1) print a copy of the output and a summary of
48010 PRINT TAB(X14)"outlays and receipts, (2) re-run the analysis using different discount rates,
48060 PRINT TAB(X14)"(3) search for any other internal rates of return that may exist, (4) plot
48110 PRINT TAB(X14)"the net present value profile of the investment proposal on the screen, or
48160 PRINT TAB(X14)"(5) save cash flow schedules in diskette data files for re-use in later analyses."
48210 PRINT TAB(28)"Press any key to continue";:LOCATE 1,1:PRINT
48310 VS=INKEY\$:IF VS="" THEN GOTO 48310
48360 CLS
48410 KEY OFF
48460 LOCATE 2,35: COLOR 0,7:PRINT " RATES HELP ": COLOR 7,0
48510 TLIN=4
48560 X=0
48610 LOCATE TLIN,1
48660 PRINT TAB(X)" Discount rates may be entered as decimals or percents.
48710 PRINT TAB(X)" Key in transaction dates in response to the prompt, 'Enter date'. The date should be specified in numerical month-day-year format, using either dashes, slashes or spaces as separators (examples: 1-3-1984, 7/17/55, or 1 1 1980). The total time span must be longer than a day. The range of permissible years is 1950 to 2050. After keying in the date, press Enter.
49110 PRINT TAB(X)" Outlays must be entered first. Key in all outlays and receipts as absolute amounts. Both outlays and receipts must be greater than zero.
49510 PRINT TAB(X)" Total outlays cannot equal total receipts.
49610 MMARG=42
49710 LOCATE TLIN,MMARG: PRINT " When the prompt, 'Enter Amount:' appears, you may (1) enter a single dollar amount or (2) enter cash flow groups or installments by pressing F9";:COLOR 0,7:PRINT " Cash flow

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groups/Annuities ";;COLOR 7,0:PRINT".  If
49960 LOCATE CSRLIN,MMARG: PRINT "you select F9, the program will
50010 LOCATE CSRLIN,MMARG: PRINT "prompt you for (a) the number of
50060 LOCATE CSRLIN,MMARG: PRINT "installments, (b) the number of
50110 LOCATE CSRLIN,MMARG: PRINT "months separating each installment,
50160 LOCATE CSRLIN,MMARG: PRINT "(c) whether or not the installments
50210 LOCATE CSRLIN,MMARG: PRINT "are equal, and (d) the amount of the
50260 LOCATE CSRLIN,MMARG: PRINT "installments. Key in the appropriate
50310 LOCATE CSRLIN,MMARG: PRINT "data, pressing Enter after each data
50360 LOCATE CSRLIN,MMARG: PRINT "entry.

50410 LOCATE CSRLIN,MMARG: PRINT " Press F10";;COLOR 0,7: PRINT" No more
outlays ";;COLOR 7,0:PRINT " to
50460 LOCATE CSRLIN,MMARG: PRINT "terminate outlay and specification
50510 LOCATE CSRLIN,MMARG: PRINT "and begin entry of receipts.
50560 LOCATE 23,28:PRINT "Press any key to continue"
50610 V$=INKEY$:IF V$="" THEN GOTO 50610
50660 CLS
50710 RETURN
50760 END
50810 REM ** TRANSACTION SORT SUBROUTINE ****
50860 FOR FIRST=1 TO J1-1
50910 FOR SECOND = FIRST+1 TO J1
50960 IF B(FIRST,1)<=B(SECOND,1) THEN 51160
51010 T1=B(FIRST,1):T2=B(FIRST,2):T$=B$(FIRST)
51060 B(FIRST,1)=B(SECOND,1):B(FIRST,2)=B(SECOND,2):B$(FIRST)=B$(SECOND)
51110 B(SECOND,1)=T1:B(SECOND,2)=T2:B$(SECOND)=T$
51160 NEXT SECOND
51210 NEXT FIRST
51260 RETURN
51310 REM **** MULTIPLE IRR SEARCH SUBROUTINE ****
51360 FOR I = 1 TO 10
51410 P1 = 0
51460 FOR J = 1 TO J1
51510 P1=P1+B(J,2)/X1^((B(J,1)-F1)*K1/12) ' SEE LINE 1790, WITS VERSION
51560 NEXT J
51610 X0 = X1 - P1 * (X2-X1)/(P2-P1)+S
51660 IF X0 < .5 THEN X0 = .5
51710 IF ABS(X0-X1) < .0000005 THEN
NIRRS=NIRRS+1:IRR=((X1-1)*N2):I(NIRRS)=IRR:LOCATE TLIN+6+NIRRS,LM:PRINT USING
SR$;NIRRS,IRR:DRATE2=IRR: GOTO 52060
51760 X2=X1
51810 X1=X0
51860 S = 0
51910 P2 = P1
51960 NEXT I
52010 NIRRS=NIRRS+1:IRR=((X1-1)*N2):I(NIRRS)=IRR:LOCATE TLIN+6+NIRRS,LM:PRINT
USING SR$;NIRRS,IRR:DRATE2=IRR: GOTO 52060
52060 REM~~~
52110 GOSUB 56210
52160 IF IRR2$="NONE" THEN NIRRS=NIRRS-1:GOTO 54510
52210 REM~~~MAIN PROGRAM AND IRR SEARCH SUBROUTINE ENTER HERE LOOKING AT
REGULAR INTERVALS FOR LOCAL MINS. AND MAXS. **
52260 REM ~~~
52310 MULTIRR$="N" 'clear variable

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52360 SP$=" NPV:      $$,#####.## "
52410 SQ$=" Disc. Rate (%):####.## "
52460 SR$=" IRR #:####.## "
52510 IF NIRRS=1 THEN ! (NIRRS)=IRR
52560 IF TRIALNUM=0 THEN DRATE2=FIRSTIRR+5 'STARTING VALUE FOR SEARCH FOR MORE
IRR'S
52610 END RATE=1000 'END SEARCH FOR IRR HERE
52660 IF DRATE2<500 THEN INCREMENT=10 ELSE INCREMENT=25
52710 IF DRATE2<0 THEN DRATE2=0 'START SEARCH NO LOWER THAN 0
52760 DEF FNR(Y)=(Y/100)/K1+1 ' Y CHANGES FROM PERCENT TO DECIMAL FORM
52810 REM ** CALCULATE NPV, MIRR --SEARCH LOOP RETURNS HERE ****
52860 REM ** NIRRS=1 WHEN THIS SUBROUTINE IS ENTERED, BECAUSE 1 IRR HAS ALREADY
BEEN FOUND
52910 IRR=((X1-1)*N2)
52960 LASTNPV=NPV
53010 LASTDELTA=DELTA
53060 LM=47
53110 IF TRIALNUM=0 THEN LOCATE TLIN+6+NIRRS,LM:PRINT USING SR$;NIRRS,IRR
53160 TRIALNUM=TRIALNUM+1
53210 F1 = B(1,1)
53260 SRATE2=DRATE2
53310 R1=FNR(DRATE2) 'OUTLAYS CAP RATE IN DECIMAL FORM
53360 R2=FNR(SRATE2) 'RECEIPTS CAP RATE IN DECIMAL FORM
53410 GOTO 53510'WITS GOTO 1480
53460 R2=R1 'WITS LINE 1470
53510 PP1=0 :PP2=0 : PP3=0
53560 FOR J=1 TO J1
53610 B1=B(J,1)
53660 B2=B(J,2)
53710 PP8=B2/R1^((B1-F1)*K1/12)
53760 PP1=PP1+PP8
53810 IF B2>0 GOTO 53960 'WITS LINE 1570
53860 PP2=PP2-PP8
53910 GOTO 54010 'WITS LINE 1580
53960 PP3=PP3+B2*R2^((F2-B1)*K1/12)
54010 NEXT J
54060 NPV=PP1 'N2=K1*100
54110 LASTDRATE=DRATE2
54160 DRATE2=DRATE2+INCREMENT
54210 DELTA=NPV-LASTNPV
54260 IF LASTDELTA<>0 THEN DELTADELTA=(DELTA-LASTDELTA)/LASTDELTA
54310 LOCATE TLIN+3,43:PRINT USING SQ$;DRATE2
54360 LOCATE TLIN+4,43:PRINT USING SP$;NPV
54410 IF ((DELTA<=0 AND LASTDELTA>0) OR (DELTA>0 AND LASTDELTA<=0)) AND
TRIALNUM>2 THEN X1=FNR(DRATE2):X2=FNR(LASTDRATE):GOTO 51310 'LOOKS FOR A SIGN
CHANGE
54460 IF DRATE2<=1000 THEN GOTO 52210
54510 BEEP ' ATTENTION! SEARCH FINISHED
54560 REM ** PRINT MULTIPLE IRR OUTPUT
54610 MTAB=29
54660 CLS
54710 LOCATE 8,26:COLOR 0,7:PRINT "          RESULTS OF SEARCH FOR      ":COLOR
7,0
54760 LOCATE 9,26:COLOR 0,7:PRINT " MULTIPLE INTERNAL RATES OF RETURN ":COLOR

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```

7,0
54810 PRINT:PRINT
54860 IF NIRRS>1 THEN GOTO 55310
54910 PRINT TAB(MTAB+4)"Only one IRR found in"
54960 PRINT TAB(MTAB+4)"search to 1000 percent"
55010 PRINT:PRINT
55060 QQ$="####,###"
55110 PRINT TAB(MTAB-5)::COLOR 0,7:PRINT " Internal Rate of Return = ";
55160 PRINT USING QQ$;I(1);
55210 PRINT " % " :COLOR 7,0
55260 GOTO 55710
55310 REM***PRINT MULTIPLE RATES TO SCREEN ****
55360 QZ$=" Internal Rate of Return No. # = ####.### % "
55410 FOR ZZ=1 TO NIRRS
55460 PRINT TAB(MTAB-8);
55510 COLOR 0,7
55560 PRINT USING QZ$;ZZ,I(ZZ)
55610 COLOR 7,0
55660 NEXT ZZ
55710 REM***END OF PRINTING OUTPUT OF MULT. RATES
55760 LOCATE 21,31
55810 PRINT "Press any key to continue"
55860 V$=INKEY$:IF V$="" THEN GOTO 55840
55910 TRIALNUM=0
55960 NIRRS=0
56010 LASTNPV=0
56060 NPV=0
56110 DRATE=FIRSTDRATE:NPV=FIRSTNPV:IRR=FIRSTIRR
56160 GOTO 34160
56210 REM *** IRR TESTING SUBROUTINE - SCREENS GLITCHES ****
56260 DEF FNR(Y)=(Y/100)/K1+1 ' Y CHANGES FROM PERCENT TO DECIMAL FORM
56310 R1=FNR(FIRSTIRR)
56360 IF NIRRS>0 THEN R1=FNR(IRR)
56410 PP1=0:PP2=0:PP3=0
56460 FOR J=1 TO J1
56510 B1=B(J,1)
56560 B2=B(J,2)
56610 PP8=B2/R1^((B1-F1)*K1/12)
56660 PP1=PP1+PP8
56710 NEXT J
56760 FOR J=1 TO J1
56810 TOTALOUTLAYS=TOTALOUTLAYS+B(J,2)
56860 NEXT J
56910 DTOLER=ABS((TOTALOUTLAYS *.05))
56960 TNPV=PP1
57010 IF NIRRS=0 AND (TNPV>DTOLER OR TNPV<DTOLER*-1) THEN IRR1$="NONE"
57060 IF NIRRS>0 AND (TNPV>DTOLER OR TNPV<DTOLER*-1) THEN IRR2$="NONE": 'IRR
THAT BIG IS INTERPRETED AS NO IRR BY THE PROGRAM
57110 RETURN
57160 REM ** SUBROUTINE TO CREATE RANDOM DISK FILE FOR DATA STORAGE ****
57210 OPEN FILENAME$ AS #3 LEN=33
57260 FIELD #3, 1 AS TAG$, 9 AS MONTHNUM$, 10 AS DT$, 12 AS AMOUNT$, 1 AS LF$
57310 FOR I=1 TO J1
57360 LSET TAG$=CHR$(128)

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57410 LSET MONTHNUM$=STR$(B(I,1))
57460 LSET DT$=B$(I)
57510 LSET AMOUNT$=STR$(B(I,2))
57520 LSET LF$=CHR$(10)
57560 PUT #3, I
57610 NEXT I
57660 LSET MONTHNUM$="" :LSET DT$="" :LSET AMOUNT$="" 'CLEAR
57710 LSET TAG$=CHR$(1)
57760 LSET MONTHNUM$=STR$(DRATE)
57810 LSET DT$=STR$(SRATE)
57860 LSET AMOUNT$=STR$(K1)
57910 PUT #3, I
57960 LSET DT$="" :LSET AMOUNT$="" 'CLEAR
58010 LSET TAG$=CHR$(27)
58060 LSET MONTHNUM$=CHR$(27)+"JK"
58110 PUT #3, I+1
58160 CLOSE
58210 GOTO 34160
58260 END
58310 REM ** SEARCH SCREEN ****
58360 CLS:STAB=40:TLIN=6:LOCATE TLIN,STAB
58410 PRINT TAB(STAB);:COLOR 0,7:PRINT SPC(30):COLOR 7,0
58460 PRINT TAB(STAB);:COLOR 24,7:PRINT "           SEARCHING           " :COLOR
7,0
58510 FOR I=1 TO 11
58560 PRINT TAB(40);:COLOR 0,7:PRINT SPC(30);:COLOR 7,0:PRINT SPC(1)
58610 NEXT I
58660 LOCATE 12,10:PRINT "Please wait ... "
58710 RETURN
58760 REM ** READ RANDOM DISK FILE ****
58810 J1=0
58860 ERASE B:DIM B(DIMROWS,2)
58910 OPEN GETFILENAME$ AS #3 LEN=33
58960 FIELD #3, 1 AS TAG$, 9 AS MONTHNUM$, 10 AS DT$, 12 AS AMOUNT$, 1 AS LF$
59010 FOR I=1 TO 500
59060 GET #3, I
59110 IF TAG$=CHR$(1) THEN
    DRATE=VAL(MONTHNUM$):SRATE=VAL(DT$):K1=VAL(AMOUNT$):GOTO 59460
59160 IF TAG$=CHR$(27) THEN GOTO 59510
59210 IF TAG$=CHR$(128) THEN J1=J1+1
59260 IF TAG$<>CHR$(128) AND TAB$<>CHR$(1) THEN BEEP:CLS:CLOSE:LOCATE
    12,24:COLOR CC1,CC2:PRINT " FILE NOT FOUND OR ILLEGAL FILE " :COLOR 7,0:GOSUB
    44760:KILL GETFILENAME$:GOTO 2760
59310 B(I,1)=VAL(MONTHNUM$)
59360 B(I,2)=VAL(AMOUNT$)
59410 B$(I)=DT$
59460 NEXT I
59510 REM~~~
59560 FIRSTDRATE=DRATE:FIRSTSRATE=SRATE
59610 CLOSE
59660 GOTO 25510 'START COMPUTATIONS
59710 END

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10 REM *****<RATEPLOT>*****<CREATES AND PLOTS A NET PRESENT VALUE PROFILE>***
60 REM **** BY JOHN KRAUS *** PROGRAMS WORKS IN CONJUNCTION WITH RATES PROGRAM
110 REM ** PLOTTING ROUTINES FROM NWA STATPAK PLOT PROGRAM WITH ALTERATIONS
160 IF B(1,1)=0 OR B(2,1)=0 THEN BEEP ELSE GOTO 710
210 CLS
260 TABRT=20
310 LOCATE 8,TABRT:PRINT "Error!"
360 PRINT:PRINT
410 PRINT TAB(TABRT)"This program is not intended to be run by itself."
460 PRINT TAB(TABRT)"It works in conjunction with RATES."
510 PRINT:PRINT
560 PRINT TAB(TABRT)"Press any key to proceed to RATES."
610 V$=INKEY$:IF V$="" THEN GOTO 610
660 CHAIN "RATES"
710 STAB=9
760 GOTO 910
810 CLS:LOCATE 3,26:COLOR 0,7:PRINT " NPV PROFILE PARAMETER SELECTION ": COLOR
7,0:RETURN
860 LOCATE 3,26:COLOR 0,7:PRINT " NPV PROFILE PARAMETER SELECTION ": COLOR
7,0:RETURN
910 REM"
960 GOSUB 810
1010 LOCATE 13,STAB
1060 PRINT TAB(STAB+5);
1110 INPUT "Begin NPV profile at what discount rate (in percent) ";DRATE2
1160 GOSUB 810
1210 LOCATE 13,STAB+14:INPUT "Select ending discount rate (in percent)
";ENDRATE
1260 IF ENDRATE<=DRATE2 THEN CLS:BEEP:LOCATE 6,12:PRINT"Error! -- Ending
discount rate cannot be":PRINT TAB(12)"greater than or equal to beginning
discount rate (";DRATE2;" percent).":GOSUB 860:GOTO 1210
1310 GOSUB 810
1360 LOCATE 13,STAB+15:INPUT "Spacing of data points (in percent) ";INCREMENT
1410 IF INCREMENT>(ENDRATE-DRATE2)/3 THEN CLS:BEEP:LOCATE 6,STAB:PRINT"Error!
-- Spacing of data points cannot be less than ";(ENDRATE-DRATE2)/2;""
percent.":GOSUB 860:GOTO 1360
1460 IF INCREMENT=0 THEN CLS:BEEP:LOCATE 6,12:PRINT"Error! -- Spacing of data
points must be greater than zero.":GOSUB 860:GOTO 1360
1510 INCREMENT=ABS(INCREMENT)
1560 CLS
1610 TRIALS=((ENDRATE-DRATE2)/INCREMENT)+1
1660 DIM Q(TRIALS,2)
1710 TRIALNUM=0
1760 FOR ZZ=1 TO TRIALS
1810 TRIALNUM=TRIALNUM+1
1860 F1 = B(1,1)
1910 DEF FN(R(Y)=(Y/100)/K1+1 ' WITS PROGRAM LINE 2930; Y CHANGES FROM PERCENT
TO DECIMAL FORM
1960 SRATE2=DRATE2
2010 COLOR 7,0
2060 R1=FN(R(DRATE2)) 'OUTLAYS CAP RATE IN DECIMAL FORM
2110 R2=FN(R(SRATE2)) 'RECIPEPTS CAP RATE IN DECIMAL FORM
2160 GOTO 2260'WITS GOTO 1480
2210 R2=R1 'WITS LINE 1470

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2260 PP1=0 :PP2=0 : PP3=0
2310 FOR J=1 TO J1
2360 B1=B(J,1)
2410 B2=B(J,2)
2460 PP8=B2/R1^((B1-F1)*K1/12)
2510 PP1=PP1+PP8
2560 NEXT J
2610 NPV=PP1 'N2=K1*100
2660 Q(TRIALNUM,1)=DRATE2
2710 Q(TRIALNUM,2)=NPV
2760 QZ$="##### | Disc. Rate = #####.#### percent | NPV =
$####,#####.##"
2810 PRINT USING QZ$:TRIALNUM,Q(TRIALNUM,1),Q(TRIALNUM,2);
2860 IF (NPV<=0 AND Q(TRIALNUM-1,2)>0) OR (NPV>=0 AND Q(TRIALNUM-1,2)<0) THEN
PRINT " <---<<":GOTO 3010
2910 IF NPV<1 AND NPV>-1 THEN PRINT " <---<<":GOTO 3010
2960 PRINT
3010 REM ** LANDING
3060 DRATE2=DRATE2+INCREMENT
3110 NEXT
3160 FILENAMEII$="PLOTDATA"
3210 ZERO=0
3260 OPEN FILENAMEII$ FOR OUTPUT AS #3
3310 FOR ZZ=1 TO TRIALS
3360 WRITE #3,Q(ZZ,1),Q(ZZ,2),ZERO
3410 NEXT ZZ
3460 CLOSE
3510 ERASE Q
3560 PRINT TAB(26);:COLOR 15:PRINT "(N)ew parameters or (P)lot (N/P) ?":COLOR
7,0
3610 V$=INKEY$
3660 IF V$="N" OR V$="n" THEN GOTO 1060
3710 IF V$="o" OR V$="P" THEN CLS:GOTO 3810
3760 GOTO 3610
3810 ' PLOT.BAS : 30 MAR 82 : DMF : 3920: <COLS -> <1
3860 'COPYRIGHT 1980, NORTHWEST ANALYTICAL -- PORTLAND, OR
3910 '
3960 ' >>----> INITIALIZATION <----<< (100-395)
4010 ON ERROR GOTO 14710: WIDTH 80
4060 '
4110 OPEN"1",1,"PARAM.SYS"
4160 INPUT #1,K(0),K(1),K(2),K(3),K(4),K(5),K(6),K(7),K(8),K(9)
4210 FOR I=0 TO 9: CS$=CS$+CHR$(K(I)): NEXT
4260 CLOSE: ERASE K
4310 '
4360 BL$=CHR$(7): FF$=CHR$(12)
4410 MF=5:ME=5:MC=10
4460 DIM ET(ME),EP$(ME),CE(ME,MC)
4510 DIM EF(MF)
4560 DIM FX(MF),FY(MF)
4610 DIM FL$(MF),FP$(MF)
4660 DIM TB(MF)
4710 DIM X0(MF),X9(MF),Y0(MF),Y9(MF)
4760 XA$="!": YA$="-": TK$="+"

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4810 FORMAT$="####.###"
4860 TL$= "#####"      ' ticktbl mask (DEF)
4910 ETYP$(1)="LIN":ETYP$(2)="EXP":ETYP$(3)="LOG":ETYP$(4)="PWR":ETYP$(5)="POL"
4960 COLS=2:MXIC=25
5010 ' >>----> INPUT SECTION <----<< (3000-3995)
5060 PRINT CS$: PRINT: PRINT
5110 CLS
5160 PRINT TAB(32);:COLOR 0,7:PRINT" PLEASE STAND BY ":COLOR 7,0
5210 LOCATE 8,1
5260 ON ERROR GOTO 5310: GOTO 5360
5310 IF ERR=52 THEN RESUME 5510 ELSE IF ERR=53 THEN RESUME 5610 ELSE 14710
5360 J=MF: MF=0
5410 FOR I=J TO 1 STEP -1: OPEN"O",I,"TEMP.$$$"
5460   MF=I: I=1
5510 NEXT
5560 CLOSE: KILL"TEMP.$$$"
5610 ON ERROR GOTO 14710
5660 NF=2:IF NF>MF OR NF<0 THEN PRINT BL$::: GOTO 5660
5710 DIM COL!(COLS), SEL(NF, MXIC), ICOLS(NF), HICOL(NF)
5760 DIM XIN(NF), XDL(NF), XAG(NF)
5810 NE=0: IF NE>ME OR NE<0 THEN PRINT BL$::: GOTO 5810
5860 IF NF>NE = 0 THEN PRINT"Nothing to do...quitting.": GOTO 15260
5910 IF NF=0 THEN 7010
5960 FOR F=1 TO NF  ' read files; get min/max
6010 IF F=1 THEN FP$(F)="*": ELSE FP$(F)="|" 'PLOT SYMBOL
6060 GOSUB 9210: FL$(F)="PLODATA"
6110 PRINT"Finding limits."
6160 WHILE NOT EOF(F): GOSUB 8810: X=COL!(1): Y=COL!(2)
6210 IF F=1 AND ROWS=1 THEN X0=X: X9=X: Y0=Y: Y9=Y
6260 IF ROWS=1 THEN X0(F)=X: X9(F)=X: Y0(F)=Y: Y9(F)=Y
6310 IF X < X0 THEN X0=X ELSE IF X > X9 THEN X9=X
6360 IF Y < Y0 THEN Y0=Y ELSE IF Y > Y9 THEN Y9=Y
6410 IF X < X0(F) THEN X0(F)=X ELSE IF X > X9(F) THEN X9(F)=X
6460 IF Y < Y0(F) THEN Y0(F)=Y ELSE IF Y > Y9(F) THEN Y9(F)=Y
6510 WEND
6560 CLOSE F: IF F=2 THEN GOTO 6860
6610 PRINT:PRINT:PRINT"Min discount rate:"X0(F);TAB(35);"Min NPV:"Y0(F)
6660 PRINT"Max discount rate:"X9(F);TAB(35);"Max NPV:"Y9(F): PRINT
6710 IF F=1 THEN MINNPV=Y0(F)
6760 IF F=1 THEN MAXNPV=Y9(F)
6810 IF F=1 THEN MINRATE2=X0(F)
6860 NEXT F
6910 PRINT
6960 IF NE=0 THEN 7610
7010 FOR E=1 TO NE: PRINT: PRINT"--> Function #'E
7060 LINE INPUT"Plot Symbol: ";EP$(E)
7110 PRINT"1=Linear 2=Exponential 3=Logarithmic 4=Power 5=Polynomial"
7160 PRINT"A+B*X    A*B*X^B    A+B1*LOG(X)    A*B*X^B    B0+B1*X+B2*X^2..."
7210 PRINT: INPUT"Which type (1-5)":ET: IF ET<1 OR ET>5 THEN PRINT BL$::: GOTO 7210
7260 ET(E)=ET
7310 IF ET<5 THEN INPUT"Value of A":CE(E,1): INPUT"Value of B":CE(E,2): GOTO 7510
7360 INPUT"Order of Polynomial (3-9)":O: IF O<3 OR O>9 THEN PRINT BL$::: GOTO 7510

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7360 ELSE CE(E,0)=0
7410 FOR T=0 TO O: PRINT"Coeficient" T;; INPUT CE(E,T+1)
7460 NEXT T
7510 NEXT E
7560 GOTO 7960
7610 GOTO 7960: PRINT: PRINT"To keep displayed values, just enter RETURN:"
7660 PRINT
7710 PRINT"(X0)": LINE INPUT"Min X: "; I$: IF I$<>"" THEN X0=VAL(I$)
7760 PRINT"(X9)": LINE INPUT"Max X: "; I$: IF I$<>"" THEN X9=VAL(I$)
7810 PRINT"(Y0)": LINE INPUT"Min Y: "; I$: IF I$<>"" THEN Y0=VAL(I$)
7860 PRINT"(Y9)": LINE INPUT"Max Y: "; I$: IF I$<>"" THEN Y9=VAL(I$)
7910 PRINT
7960 I$="20": IF I$="" THEN XL=50 ELSE XL=((VAL(I$)+9)\10)*10
8010 I$="60": IF I$="60" THEN YL=60 ELSE YL=((VAL(I$)+9)\10)*10
8060 XR=X9-X0: YR=Y9-Y0
8110 XS=XL/XR: YS=YL/YR
8160 DX=XR/XL: DY=YR/YL
8210 X1=X0+DX: Y1=Y0+DY
8260 I$="N": TF=INSTR(" YyNn",I$)\2: IF TF<1 THEN PRINT BL$;: GOTO 8260 ELSE
TF=TF-2 'NO EXTRA TIC MARKS
8310 FROM$="-Axis Tick Label Picture (NULL for default): "
8360 IF I$="" THEN XTL$=TL$ ELSE XTL$=LEFT$(I$+",10")
8410 IF I$="" THEN YTL$=TL$ ELSE YTL$=LEFT$(I$+",10")
8460 CM$="IRR" ' COLLISION PLOT SYMBOL
8510 IF NF=0 THEN 10160
8560 FOR F=1 TO NF: CLOSE F: XAG(F)=XIN(F)
8610 OPEN "I",F,FL$(F): EF(F)=0: GOSUB 13510
8660 NEXT F
8710 GOTO 10160
8760 ' ===<GET ROW>===
8810 PRINT ".";
8860 IF EOF(F) THEN RETURN
8910 IF SEL(F,0)=1 THEN COL1(1)=XAG(F): XAG(F)=XAG(F)+XDL(F)
8960 FOR COL=1 TO HCOL(F): INPUT #F,COL1(SEL(F,COL)):NEXT
9010 IF HCOL(F)<ICOLS(F) THEN LINE INPUT #F,G1$
9060 ROWS=ROWS+1
9110 RETURN
9160 ' ===<INPARAMSET>===
9210 ROWS=0
9260 IF IL$="PLODATA"
9310 ON ERROR GOTO 10060
9360 CLOSE F: OPEN "I",F,IFIL$
9410 ON ERROR GOTO 14710
9460 WHILE ICOLS(F)<1: ICOLS(F)=3: WEND
9510 FOR COL=1 TO COLS: TS=0: MNTS=1: TS=-1: MNTS=0
9560 WHILE TS<MNTS OR TS>ICOLS(F): IF COL=1 THEN TS=1
9610 IF COL=1 THEN TS=1
9660 IF COL=2 THEN TS=2
9710 IF COL=2 AND F=1 THEN TS=2
9760 IF COL=2 AND F=2 THEN TS=3: WEND
9810 SEL(F,TS)=COL
9860 IF TS=0 THEN INPUT"Initial X-Value";XIN(F): WHILE XDL(F)<=0: INPUT"Delta
X";XDL(F): WEND: XAG(F)=XIN(F)
9910 NEXT COL

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9960 FOR COL=1COLS(F) TO 1 STEP -1: IF SEL(F,COL) THEN HICOL(F)=COL: RETURN
10010 NEXT
10060 PRINT BL$"*** ""IFIL$;" : BAD FILE NAME!": RESUME 9260
10110 ' >----> MAIN ALGORITHM SECTION <----<< (4000-5995)
10160 L$=XA$+SPACE$(YL-1)+XA$: LO$=TK$+SPACE$(YL-1)+TK$
10210 IF TF THEN FOR I=11 TO YL STEP 10: MID$(LO$,I)=TK$: NEXT
10260 YY$=TK$+STRING$(YL-1,YA$)+TK$
10310 FOR I=11 TO YL STEP 10: MID$(YY$,I)=TK$: NEXT
10360 T1=13: T2=26: T3=39: T4=52: T5=65
10410 TB(1)=T1: TB(2)=T2: TB(3)=T3: TB(4)=T4: TB(5)=T5
10460 '
10510 GOSUB 13710
10560 IF MO=2 THEN LINE INPUT "Header Line: ";HD$: GOTO 11010
10610 REM***PRINT:IF COUNTER=1 THEN BEEP:INPUT " Press
return key to display plot",DUMMY:CLS
10660 CLS:LOCATE CSRLIN,29: COLOR 0,7:PRINT " NET PRESENT VALUE PROFILE ":COLOR
7,0
10710 PRINT "<-(min.)-----Net Present Value-----(max.)->|"
Discount Rate"
10760 QQQ$="$$$$#####.##      (vertical ' |' line = 0)      #####.##|"
10810 PRINT USING QQQ$;MINNPV,MAXNPV
10860 PRINT YY$;
10910 PRINT USING FORMAT$;MINRATE2
10960 GOTO 11610
11010 LPRINT FF$: LPRINT HD$: LPRINT
11060 LPRINT"DX ="DX"    DY ="DY"    COLLISION SYMBOL: ("CMS"): LPRINT
11110 IF NF=0 THEN 11360
11160 LPRINT"FILES:   ";
11210 FOR F=1 TO NF: LPRINT FL$(F)"/"FP$(F),: NEXT
11260 LPRINT
11310 IF NE=0 THEN 11460
11360 LPRINT"FUNCTIONS:   ";
11410 FOR E=1 TO NE: LPRINT ETYP$(ET(E))"/"EP$(E),: NEXT
11460 LPRINT: LPRINT: LPRINT TAB(T1-2);
11510 FOR IY=0 TO YL STEP 10: LPRINT USING YTL$:Y0+(IY*DY));: NEXT
11560 LPRINT: LPRINT USING XTL$:X0;: LPRINT TAB(T1)YY$
11610 FOR IX=1 TO XL-1
11660 IF (IX MOD 10)=0 THEN YL$=LO$ ELSE YL$=L$
11710 X=X0+IX*DX
11760 '
11810 IF NF=0 THEN 12260
11860 R0=X-DX/2: R9=R0+DX
11910 FOR F=1 TO NF: PS$=FP$(F)
11960 IF EF(F) THEN 12160
12010 IF FX(F)<R0 THEN GOSUB 13510: GOTO 11960
12060 Y=FY(F)
12110 IF FX(F)<R9 THEN GOSUB 13360: GOSUB 13510: IF NOT EF(F) THEN 12060
12160 NEXT F
12210 '
12260 IF NE=0 THEN 12960
12310 FOR E=1 TO NE: PS$=EP$(E)
12360 ON ERROR GOTO 13260
12410 ON ET(E) GOTO 12460,12510,12560,12610,12660
12460 Y=CE(E,1)+CE(E,2)*X: GOTO 12760

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12510 Y=CE(E,1)*EXP(CE(E,2)*X): GOTO 12760
12560 Y=CE(E,1)+CE(E,2)*LOG(X): GOTO 12760
12610 Y=CE(E,1)*X^CE(E,2): GOTO 12760
12660 Y=CE(E,1)
12710 FOR C=2 TO CE(E,0)+1: Y=Y+CE(E,C)*X^(C-1): NEXT
12760 GOSUB 13360
12810 NEXT E
12860 ON ERROR GOTO 14710
12910 '
12960 IF MO=1 THEN PRINT YL$::PRINT USING FORMAT$;COL!(1): GOTO 13110
13010 IF (IX MOD 10)=0 THEN LPRINT USING XTL$;X;
13060 LPRINT TAB(T1)YL$
13110 NEXT IX
13160 IF MO=2 THEN LPRINT USING XTL$;X0+XL*DX:: LPRINT TAB(T1)YY$
13210 GOTO 8510
13260 IF ERR=6 THEN Y=1E+38: RESUME 12710 ELSE 14710
13310 ' --<PLACE Y IN YL$ IF IN RANGE>--
13360 IF Y>=Y1 AND Y<Y9 THEN 1Y= (Y-Y0)*YS +1: C$=MID$(YL$,IY,1): IF C$=" "
OR C$=TK$ OR C$=PS$ THEN MID$(YL$,IY)=PS$ ELSE MID$(YL$,IY)=CM$
13410 RETURN
13460 ' --<READ NXT DATA PR FOR FL F>--
13510 IF EOF(F) THEN CLOSE F: EF(F)=-1: RETURN ELSE GOSUB 8660
13560 FX(F)=COL!(1): FY(F)=COL!(2)
13610 RETURN
13660 ' ---< SET OUTPUT MODE >---
13710 COUNTER=COUNTER+1: IF COUNTER=1 THEN MO=1:RETURN:LINE INPUT"Output:
Screen or Printer - or Quit (S,P,Q)? ";I$
13760 MO=1:PRINT TAB(24): PRINT "Press Enter key to return to menu"::LOCATE
2,76:COLOR 0,0:INPUT":,REPEAT
13810 COLOR 7,0
13860 CLS
13910 LOCATE 12,32
13960 COLOR 31
14010 PRINT "Please wait ..."
14060 COLOR 7,0
14110 CLOSE
14160 ERASE ET:ERASE EP$:ERASE CE:ERASE EF:ERASE FX:ERASE FY: ERASE FL$:ERASE
FP$:ERASE TB:ERASE X0:ERASE X9:ERASE Y0:ERASE Y9
14210 ERASE COL!:ERASE SEL:ERASE ICOLS:ERASE HICOL:ERASE XIN:ERASE XDL:ERASE
XAG
14260 KILL "PLOTDATA"
14310 CHAIN "RATES",34160!,ALL
14360 LOCATE 2,1
14410 MO=1: 'MO: Mode of Output (1=Screen;2=Printer;3=EXIT)
14460 IF MO<3 THEN RETURN
14510 LINE INPUT"Reset parameters or eXit (R/X)? ";I$
14560 RX= INSTR(" RrXx",I$)\2: IF RX=0 THEN 14510
14610 IF RX=1 THEN 7610 ELSE 15260
14660 ' <----<< ERROR TRAPS >>----> (9000-9995)
14710 ' [ERRORECOVERY STARTS HERE - IF IMPLEMENTED; DON'T DELETE THIS REM]
14760 IF ERL=4110 OR ERL=4160 THEN CS$=CHR$(10): RESUME 4360
14810 IF ERR=62 AND ERL=8960 THEN PRINT BL$"*** BAD INPUT: ABORTING ***": GOTO
15260
14860 ' * * * * UNRECOVERABLE ERRORS * * * * *

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14910 PRINT: PRINT
14960 PRINT BL$ "      * * * E R R O R * * *"
15010 PRINT "Check your input data for validity..."
15060 PRINT "Try re-running the program..."
15110 PRINT "And/or call NORTHWEST ANALYTICAL for help!"
15160 PRINT "ERROR DESCRIPTION --"
15210 ' >>----> EGRESS >>---->
15260 ON ERROR GOTO 0
15310 CLOSE: CLEAR 200: DEFSNG A-Z
```