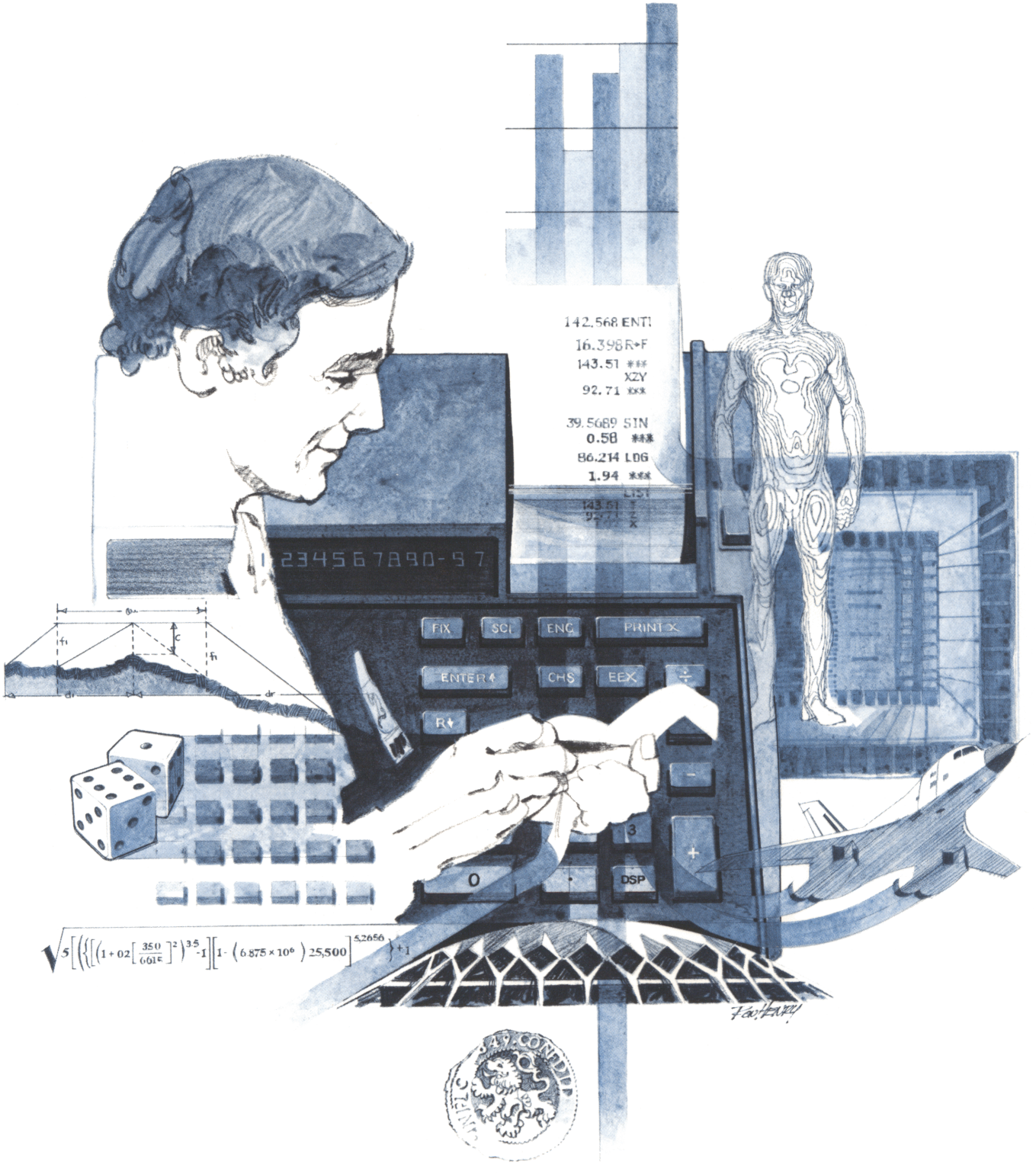
HEWLETT-PACKARD

HP-67/HP-97

Users' Library Solutions

Portfolio Management/Bonds and Notes



INTRODUCTION

In an effort to provide continued value to it's customers, Hewlett-Packard is introducing a unique service for the HP fully programmable calculator user. This service is designed to save you time and programming effort. As users are aware, Programmable Calculators are capable of delivering tremendous problem solving potential in terms of power and flexibility, but the real genie in the bottle is program solutions. HP's introduction of the first handheld programmable calculator in 1974 immediately led to a request for program **solutions** — hence the beginning of the HP-65 Users' Library. In order to save HP calculator customers time, users wrote their own programs and sent them to the Library for the benefit of other program users. In a short period of time over 5,000 programs were accepted and made available. This overwhelming response indicated the value of the program library and a Users' Library was then established for the HP-67/97 users.

To extend the value of the Users' Library, Hewlett-Packard is introducing a unique service—a service designed to save you time and money. The Users' Library has collected the best programs in the most popular categories from the HP-67/97 and HP-65 Libraries. These programs have been packaged into a series of low-cost books, resulting in substantial savings for our valued HP-67/97 users.

We feel this new software service will extend the capabilities of our programmable calculators and provide a great benefit to our HP-67/97 users.

A WORD ABOUT PROGRAM USAGE

Each program contained herein is reproduced on the standard forms used by the Users' Library. Magnetic cards are not included. The Program Description I page gives a basic description of the program. The Program Description II page provides a sample problem and the keystrokes used to solve it. The User Instructions page contains a description of the keystrokes used to solve problems in general and the options which are available to the user. The Program Listing I and Program Listing II pages list the program steps necessary to operate the calculator. The comments, listed next to the steps, describe the reason for a step or group of steps. Other pertinent information about data register contents, uses of labels and flags and the initial calculator status mode is also found on these pages. Following the directions in your HP-67 or HP-97 **Owners' Handbook and Programming Guide,** "Loading a Program" (page 134, HP-67; page 119, HP-97), key in the program from the Program Listing I and Program Listing II pages. A number at the top of the Program Listing indicates on which calculator the program was written (HP-67 or HP-97). If the calculator indicated differs from the calculator you will be using, consult Appendix E of your **Owner's Handbook** for the corresponding keycodes and keystrokes converting HP-67 to HP-97 keycodes and vice versa. No program conversion is necessary. The HP-67 and HP-97 are totally compatible, but some differences do occur in the keycodes used to represent some of the functions.

A program loaded into the HP-67 or HP-97 is not permanent—once the calculator is turned off, the program will not be retained. You can, however, permanently save any program by recording it on a blank magnetic card, several of which were provided in the Standard Pac that was shipped with your calculator. Consult your **Owner's Handbook** for full instructions. A few points to remember:

> The Set Status section indicates the status of flags, angular mode, and display setting. After keying in your program, review the status section and set the conditions as indicated before using or permanently recording the program.
>
> REMEMBER! To save the program permanently, **clip** the corners of the magnetic card once you have recorded the program. This simple step will protect the magnetic card and keep the program from being inadvertently erased.

As a part of HP's continuing effort to provide value to our customers, we hope you will enjoy our newest concept.

TABLE OF CONTENTS

Program Description I

Program Title Stock Portfolio Valuation

Contributor's Name Hewlett-Packard

Address

City **State** **Zip Code**

Program Description, Equations, Variables Data cards created with the Portfolio Data Card program provide initial purchase price of a stock and the number of shares for a portfolio of any size. This program prompts user one stock at a time. User inputs current market price and annual dividend. Price input: 25-5/8 is inputed as 25.58. Program returns the percent change of value of each stock and prompts the user for the next stock. If more than one data card is used the program prompts user by flashing repeditive 18's until a new data card is inserted.

When all current prices have been entered, user initiates the valuation of the total portfolio. Output includes original portfolio value, new portfolio value, % change in value, date original portfolio was created, and annual dividend yield as a percent of current market value.

Operating Limits and Warnings Shares selling for more than 999 dollars @ can not be used (such shares have existed although rare).

Program Description 11

Sketch(es)

Sample Problem(s) Sample data includes the following information:

1) 100 shares at 25-5/8 @, 2) 200 at 30-1/4, 3) 50 at 89-7/8, 4) deleted stock 5) 500 at 65-1/4 [data is packed by data program so that register 1 contains 100.025625] Date portfolio created 10.25 1977.

Current information: 1) $27-1/4 with $1.70 dividend 2) 33-1/2 with 2.10 3) 96-1/8 with 4.55 4) none 5) 64-3/8 with 3.50

Solution

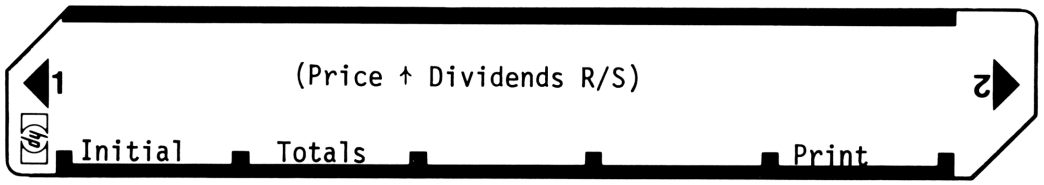
Enter data card created by the "Portfolio Data Card" program. Then key in this program (pages 5 & 6) (or enter previously created program card).

	Input	Output	Input
Prompt	A		
1	27.14 [↑] 1.7 [R/S]	6.34	[R/S]*
2	33.12 [↑] 2.1 [R/S]	10.74	[R/S]*
3	96.18 [↑] 4.55[R/S]	6.95	[R/S]*
4	(immediately outputs a zero)	0	[R/S]
5	64.38 [↑] 3.50[R/S]	-1.34	[B]
	Original value	45731.25	[R/S]*
	New value	46418.75	[R/S]*
	% change in value	1.5	[R/S]*
	total yearly dividend	2567.50	[R/S]*
	yearly dividend yield	5.53	[R/S]*
	date portfolio created	10.25 1977	

Reference(s)

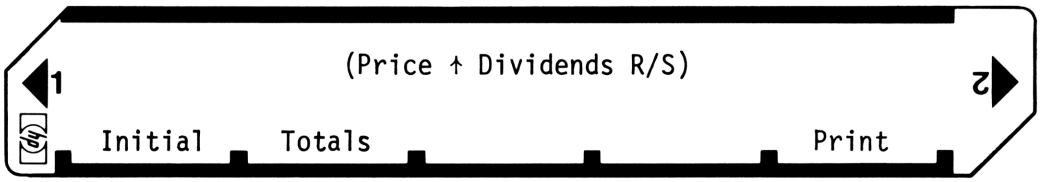
* Only necessary if print option not exercised.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Clear register: This procedure is not necessary if the calculator has just been switched on.		CL REG P≤S CL REG	
2.	Load side 1 and 2 of program			
3.	Load 1st data card			
4.	Select print option (97) Alternate presses of [E] sets (1) and unsets (0) the print option		E	1
5.	Initialize		A	1
6.	Key in current stock price 27-1/4 would enter as 27.14	27.14	ENTER	27.14
7.	Key in annual dividend	1.7	R/S	
	Output is % change in this stock			6.34
8.	Proceed with steps 6-8 until all prices are entered. If a stock has been deleted (register is filled with zeros) the program displays zero immediately. Continue by pressing R/S. If there are additional data cards (18 stocks per card), the last entry will flash 18 until a new card is entered.		R/S*	2
	* Not necessary if print option has been selected.			
	Continued on next page --------->			

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
	After all data is entered: Old portfolio		B	$
	total.			
	New portfolio total		R/S*	$
	Change in portfolio value from purchase		R/S*	%
	Total annual dividends		R/S*	$
	Portfolio dividend yield as a percent of current market value.		R/S*	$
	Date original portfolio created		R/S*	MM.DDYYYY
	* Not necessary if print option has been selected.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Set I to 0 for portfolio register run
002	DSP2	-63 02	
003	1	01	
004	STOI	35 46	
005	*LBL1	21 01	Recall ith historical stock data & check for a deleted stock
006	RCL↓	36 45	
007	X=0?	16-43	
008	GTO7	22 07	
009	INT	16 34	
010	STOE	35 15	Unpack data store # of shares in E, calculate and store original stock value in D, and accumulate original portfolio value in A
011	LSTX	16-63	
012	FRC	16 44	
013	EEX	-23	
014	3	03	
015	×	-35	
016	×	-35	
017	STOD	35 14	
018	RCLA	36 11	
019	+	-55	
020	STOA	35 11	
021	RCLI	36 46	Prompt for current input
022	RCL0	36 00	
023	+	-55	
024	F0?	16 23 00	
025	PRTX	-14	
026	R/S	51	
027	RCLE	36 15	Accumulate total dividend in C
028	×	-35	
029	RCLC	36 13	
030	+	-55	
031	STOC	35 13	
032	R↓	-31	
033	GSBα	23 16 11	Normalize price
034	RCLE	36 15	
035	×	-35	
036	RCLB	36 12	Accumulate current value in B
037	X≷Y	-41	
038	+	-55	
039	STOB	35 12	
040	LSTX	16-63	Calculate and display % change in ith stocks value
041	RCLD	36 14	
042	X≷Y	-41	
043	%CH	16 55	
044	GSB5	23 05	print option
045	*LBL2	21 02	
046	ISZI	16 26 46	Check for end of registers. If less than 18 continue else:
047	1	01	
048	8	08	
049	RCLI	36 46	
050	X≤Y?	16-35	
051	GTO1	22 01	
052	CF3	16 22 03	
053	X≷Y	-41	
054	STOI	35 46	Data card merge and prompt
055	RCL0	36 00	
056	+	-55	
057	*LBLc	21 16 13	
058	MRG	16-62	
059	PSE	16 51	
060	F3?	16 23 03	
061	GTOA	22 11	Continue prompting with i+18 & loading
062	GTOc	22 16 13	
063	*LBLB	21 12	
064	RCLA	36 11	Original portfolio value
065	GSB5	23 05	
066	RCLB	36 12	New portfolio value
067	GSB5	23 05	
068	%CH	16 55	
069	GSB5	23 05	Change in value
070	DSP2	-63 02	
071	RCLC	36 13	Total yearly dividend
072	GSB5	23 05	
073	LSTX	16-63	
074	÷	-24	Total dividend
075	1	01	
076	0	00	yield as a % of
077	0	00	current value
078	×	-35	
079	GSB5	23 05	
080	P≷S	16-51	
081	RCL9	36 09	Date portfolio
082	P≷S	16-51	Created
083	DSP6	-63 06	
084	GSB5	23 05	
085	DSP2	-63 02	
086	R/S	51	
087	*LBLE	21 15	
088	F0?	16 23 00	Print/no print
089	GTO4	22 04	
090	SF0	16 21 00	flag set
091	1	01	
092	RTN	24	
093	*LBL4	21 04	
094	0	00	
095	CF0	16 22 00	
096	RTN	24	
097	*LBL5	21 05	
098	F0?	16 23 00	Print or no
099	GTO6	22 06	
100	R/S	51	print decision
101	RTN	24	
102	*LBL6	21 06	
103	PRTX	-14	
104	SPC	16-11	
105	RTN	24	Print
106	R/S	51	
107	*LBL7	21 07	
108	RCLI	36 46	
109	RCL0	36 00	Display contents
110	+	-55	of a 0 register
111	PSE	16 51	

REGISTERS

0 Mult Crd	1	2	3	4 STOCKS	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9 Date
A Old Port Total	B New Port Total	C Total Div	D Old Stock Val.	E # of Shrs.	I Used				

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
112	X≷Y	-41	
113	R/S	51	
114	GTO2	22 02	Return to sequential review
115	*LBLa	21 16 11	
116	ENT↑	-21	
117	FRC	16 44	
118	X=0?	16-43	
119	GTOb	22 16 12	
120	EEX	-23	
121	1	01	
122	×	-35	Convert CC.DN into CC + D/N checking to avoid division by 0.
123	INT	16 34	
124	LSTX	16-63	
125	FRC	16 44	
126	÷	-24	
127	EEX	-23	
128	1	01	
129	÷	-24	
130	X≷Y	-41	
131	INT	16 34	
132	*LBLb	21 16 12	
133	+	-55	
134	RTN	24	
135	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A Initil	B Summary	C	D	E Print?	0 Print?
a Fract Dec	b	c	d	e	1
0	1 Unpack	2 End Check	3 Crd Prmpt	4 Print	2
5 Print	6 Print	7	8	9	3 Merge

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☒	☐	DEG ☐	FIX ☒
1	☒	☐	GRAD ☐	SCI ☐
2	☒	☐	RAD ☐	ENG ☐
3	☒	☐		n 2

Program Description I

Program Title Portfolio Data Card

Contributor's Name Hewlett-Packard
Address 1000 N.E. Circle Blvd.
City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program creates the data card which holds historical stock information used by the "Stock Portfolio Valuation" program. Registers 1 through 18 are used to store historic cost and quantity data on individual stocks. Each register represents one stock. If N represents number of shares, C represents the integer dollar cost and F the fractional cost, the register is packed as NNNN.CCCFFF*. Program sequentially prompts user for input. Number of shares and price are entered. User can load prices with fractions: 25-7/8 is 25.78.

Options include deleting stocks (filling a register with 0's), adding stock, and correcting erroneous entries. Register 0 contains the date the portfolio was assembled. MM.DDYYYY.

Operating Limits and Warnings *CCC is limited to three digits. Fractions are limited to single digit denominators.

Program Description II

Sketch(es)

Sample Problem(s) User has a portfolio of 5 stocks which was purchased on October 25, 1977. Stocks are as follows;

Stock No.	No. of Shares	Price
1	100	25-5/8
2	400	66
3	50	89-7/8
4	300	18-3/8
5	500	65-1/4

At a later date stock 2 and 4 are sold. Subsequent to that a new stock is purchased.

	200	30-1/4

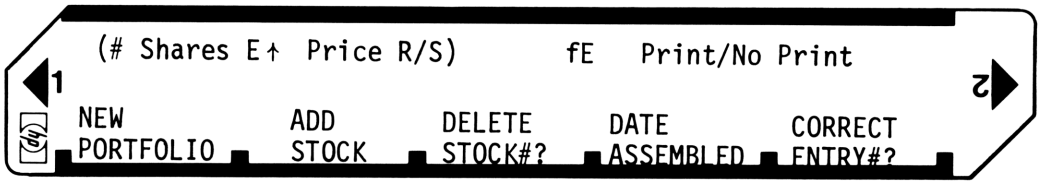
Solution(s)

Prompts	Input	Output
	10.25 1977 [D]	10.25 1977
	[A]	
1	100 [↑] 25.58 [R/S]	
2	400 [↑] 66 [R/S]	
3	50 [↑] 89.78 [R/S]	
4	300 [↑] 18.38 [R/S]	
5	500 [↑] 65.14 [R/S]	
6 (ignore)	[Write Data] or [W/Data]	

Reference(s)

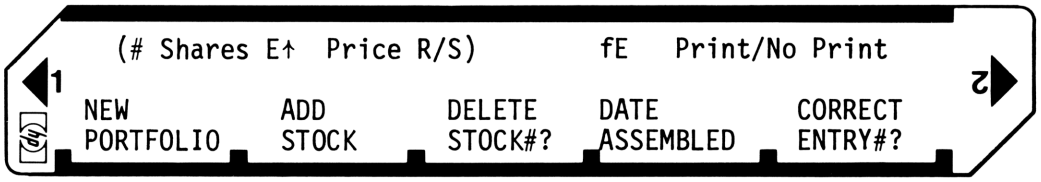
Later	(Enter program and data cards)	
	2 [C]	400.06600 [R/S] 0
	4 [C]	300.018375[R/S] 0
	[B]	
	200 [↑] 30.14 [R/S]	200.030250
	[Write Data] or [W/Data]	

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Clear registers - this is not necessary if calculator has just been switched on		CL REG P<S> CL REG	
2.	Enter program card			
3.	If you have 97 and wish to have a printed record		f E	1
4.	If portfolio is being created, key in the assembly or purchase date	MM.DDYYYY	D	
5.	If portfolio is being created		A	1
	a) Number of shares		ENTER↑	
	b) Price (25 5/8 keyed in as 25.58)		R/S	Next Reg#
	Repeat a & b until all stocks are entered			
	If more than 18 stocks are being entered, the program will automatically prompt for a data (blank) card after the 18th entry. After the card has been entered a 0 appears. Press [R/S] to continue		R/S	CRD 0 19
	Complete all stock entries before returning to make any corrections. If more than 1 data card is required, re-enter the appropriate card after the all the stocks have been entered If only one card is used, corrections (etc.) can be done after the last stock is entered.			
	After the last stock has been entered, a data card is created by pressing [f] [WRITE DATA] and then inserting a blank card.			
	Continued on next page --------->			

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
	OPTIONS			
B	ADD STOCK - To a previously created data card enter program and data cards and press → If space is available, the program will prompt user with the register #. Use 5 a & b, then back to B for additional available registers.		B	
C	DELETE STOCK - Key in register # and press → Program displays current register contents. If user desires to delete press → Or else go back to B,C, or E.	REG #	C R/S	
E	CORRECT ENTRY # - Key in register # of reg to be corrected and press → then 3 a & b.	REG #	E	Reg #
	PRINT/NO PRINT - 1 represents print. Alternate presses of [f] [E] sets and unsets the print option.		f e	

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Initialize
002	0	00	
003	STOI	35 46	
004	*LBL1	21 01	Sequential data entry
005	ISZI	16 26 46	
006	GSB3	23 03	
007	GSBa	23 16 11	
008	GTO1	22 01	
009	RTN	24	
010	*LBLB	21 12	
011	1	01	
012	STOI	35 46	Initialize
013	*LBL2	21 02	sequential register
014	GSB3	23 03	search for first
015	RCLi	36 45	zero register
016	X=0?	16-43	
017	GTOa	22 16 11	
018	ISZI	16 26 46	
019	GTO2	22 02	
020	RTN	24	
021	*LBLC	21 13	
022	DSP6	-63 06	
023	RCL0	36 00	Recall register to
024	-	-45	be deleted and
025	STOI	35 46	display
026	RCLi	36 45	
027	R/S	51	
028	0	00	
029	STOi	35 45	Delete (store 0)
030	DSP2	-63 02	designed register
031	RTN	24	
032	*LBLD	21 14	
033	DSP6	-63 06	
034	F0?	16 23 00	Store date in
035	PRTX	-14	register 19
036	P≠S	16-51	
037	STO9	35 09	
038	P≠S	16-51	
039	DSP2	-63 02	
040	F0?	16 23 00	
041	SPC	16-11	
042	RTN	24	
043	*LBLE	21 15	
044	DSP6	-63 06	
045	RCL0	36 00	Set I register to
046	-	-45	
047	STOI	35 46	store change
048	GSBa	23 16 11	
049	DSP2	-63 02	
050	R/S	51	
051	*LBLa	21 16 11	
052	RCLI	36 46	Prompt user with
053	RCL0	36 00	register #
054	+	-55	
055	GSB5	23 05	
056	X≠Y	-41	
057	F0?	16 23 00	Print inputed
058	PRTX	-14	
059	X≠Y	-41	Data
060	F0?	16 23 00	
061	PRTX	-14	
062	GSBb	23 16 12	Normalize price
063	EEX	-23	
064	3	03	
065	÷	-24	
066	+	-55	Pack register
067	F0?	16 23 00	
068	SPC	16-11	NNN.CCCFFF
069	F0?	16 23 00	
070	SPC	16-11	
071	STOi	35 45	
072	RTN	24	
073	*LBL3	21 03	
074	1	01	
075	8	08	
076	RCLI	36 46	Check for end of
077	X≤Y?	16-35	registers
078	RTN	24	
079	R↓	-31	
080	WDTA	16-61	Output data
081	0	00	
082	R/S	51	
083	R↓	-31	
084	RCL0	36 00	Clear registers
085	+	-55	and begin loading
086	CLRG	16-53	data for subsequent
087	P≠S	16-51	card
088	CLRG	16-53	
089	STO0	35 00	
090	GTOA	22 11	
091	RTN	24	
092	*LBLb	21 16 12	
093	ENT↑	-21	
094	FRC	16 44	Normalize Price
095	X=0?	16-43	
096	GTOc	22 16 13	CCC.ND
097	EEX	-23	becomes
098	1	01	CCC + $\frac{N}{D}$
099	x	-35	
100	INT	16 34	(Avoids ND = 0)
101	LSTX	16-63	
102	FRC	16 44	
103	÷	-24	
104	EEX	-23	
105	1	01	
106	÷	-24	
107	X≠Y	-41	
108	INT	16 34	
109	*LBLc	21 16 13	
110	+	-55	

REGISTERS

0 DATE	1	2	3	4	5 STOCKS	6	7	8	9
S0	S1	S2	S3	S4	S5 STOCKS	S6	S7	S8	S9
A	B	C	D	E	I USED				

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
111	RTN	24	
112	*LBLe	21 16 15	
113	F0?	16 23 00	
114	GTO4	22 04	Print/No Print
115	SF0	16 21 00	SET
116	1	01	
117	RTN	24	
118	*LBL4	21 04	
119	0	00	
120	CF0	16 22 00	
121	RTN	24	
122	*LBL5	21 05	
123	F0?	16 23 00	
124	GTO6	22 06	
125	R/S	51	Operationalize
126	RTN	24	
127	*LBL6	21 06	print/no print
128	PRTX	-14	
129	R/S	51	
130	RTN	24	
131	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
140			
150			
160			
170			
180			
190			
200			
210			
220			

LABELS

A Start	B Add	C Delete	D Date	E Correct	0 Print/ No Print
a Used	b Normalize Price	c Used	d	e Print/ No Print	1 Additional data card
0	1 Data Entry	2 Add Search Routine	3 Last Reg Check	4 Used	2
5 Used	6 Used	7	8	9	3

FLAGS

	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

SET STATUS

TRIG	DISP
DEG ☐	FIX ☒
GRAD ☐	SCI ☐
RAD ☐	ENG ☐
	n 2

Program Description I

Program Title STOCK PORTFOLIO BETA COEFFICIENT ANALYSIS

Contributor's Name DAVE ROSE

Address 196 GOVERNORS DRIVE

City FOREST PARK State GEORGIA Zip Code 30050

Program Description, Equations, Variables

PROGRAM DETERMINES A BETA COEFFICIENT FOR AN ENTIRE STOCK PORTFOLIO BASED ON INFORMATION ABOUT THE INDIVIDUAL STOCKS HELD.

FORMULA:

$$B = \sum_{i=1}^{n} \frac{(P_i)(S_i)(\beta_i)}{T}$$

WHERE n = NUMBER OF ISSUES HELD

P = CURRENT MARKET PRICE/SHR.

S = NUMBER OF SHARES HELD

β = BETA COEFFICIENT FOR INDIVIDUAL STOCK

T = TOTAL VALUE OF PORTFOLIO

Operating Limits and Warnings PROGRAM WILL NOT WORK FOR PORTFOLIOS OF MORE THAN 46 STOCKS.

IF THE VALUE OF ANY STOCK HELD EXCEEDS 5 DIGITS ($100,000 OR MORE), IT SHOULD BE BROKEN DOWN INTO ISSUES OF VALUE < $100,000. FOR EXAMPLE:

$15 PRICE; 10,000 SHRS; 1.1 BETA

COULD BE REPORTED AS 2 ISSUES

$15 PRICE; 5,000 SHRS; 1.1 BETA

Program Description II

Sketch(es)

Sample Problem(s) WHAT IS THE BETA COEFFICIENT OF THE FOLLOWING STOCK PORTFOLIO?

STOCK	# SHRS HELD	CURRENT MKT. PRICE	STOCK BETA
		#	
DATAWHACK	1000	13	.80
DIGITAL SAFETY PIN	300	50	1.2
INT'L HAIRBURN	400	30	1.3

Solution(s) KEYSTROKES: [A] (INIT.) - 0.00

13 [B], 1000 [C], * .8 [D] - 0.00

50 [B], 300 [C], 1.2 [D] - 0.00

30 [B], 400 [C], 1.3 [D] - 0.00

[E] - - - - - - - 1.10

(ANS.)

* AFTER ENTERING # SHRS., VALUE OF THAT STOCK IS DISPLAYED (HERE, #13000)

Reference(s) COHEN, ZINBARG, ZEIKEL

INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT

6TH EDITION, PAGE 769

RICHARD D. IRWIN, PUB., 1976

User Instructions

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	LOAD CARD (SIDE 1 ONLY NEEDED)			
2	INITIALIZE		A	0.00
3	ENTER CURRENT PRICE PER SHARE OF STOCK n	PRICE	B	PRICE
4	ENTER NUMBER OF SHARES OF STOCK n IN PORTFOLIO	#SHRS	C	P X S (VALUE OF STOCK n)
5	ENTER BETA OF STOCK n	BETA	D	0.00
—	REPEAT STEPS 3, 4, & 5 FOR EACH STOCK IN THE PORTFOLIO (n = 1, 2, 3 .....)			
6	PRESS E TO DETERMINE THE BETA FOR THE PORTFOLIO		E	ANS.

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001 *	f LBL A	31 25 11	
	f CL REG	31 43	
	1	01	
	h STI	36 33	INITIALIZE
	h CF 2	36 61 02	
	0	00	
	h RTN	36 22	
*	f LBL B	31 25 12	
	STO 0	33 00	P_i
010	h RTN	36 22	
*	f LBL C	31 25 13	
	RCL 0	34 00	
	X	71	$(P_i)(S_i)$
	STO 0	33 00	
	STO + 1	33 61 01	T IS TOTALLED IN R_1
	h RTN	36 22	
*	f LBL D	31 25 14	
	RCL 0	34 00	
	X	71	$(P_i)(S_i)(\beta_i)$
020	STO 0	33 00	
	h F? 2	36 71 02	
	GTO 0	22 00	
	f ISZ	31 34	
	h RCL I	36 34	
	2	02	
	5	05	$(P_i)(S_i)(\beta_i)$ IS
	g x=y	32 51	
	g SIN^{-1}	32 62	STORED IN
	RCL 0	34 00	
030	STO (i)	33 24	MEMORY UNTIL
	h SF 2	36 61 02	
	0	00	T CAN BE
	h RTN	36 22	
*	f LBL 0	31 25 00	DETERMINED
	EEX	43	
	5	05	
	÷	81	
	STO + (i)	33 61 24	
	0	00	
040	h RTN	36 22	
*	f LBL E	31 25 15	
	0	00	
	STO 0	33 00	
	1	01	
	h STI	36 33	
*	f LBL 1	31 25 01	
	f ISZ	31 34	
	RCL (i)	34 24	
	f X=0	31 51	
050	GTO 2	22 02	
	f INT	31 83	
	RCL 1	34 01	$\frac{(P_i)(S_i)(\beta_i)}{T}$
	÷	81	
	STO + 0	33 61 00	Σ
	RCL (i)	34 24	
	g FRAC	32 83	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	EEX	43	
	5	05	
	X	71	$\frac{(P_i)(S_i)(\beta_i)}{T}$
060	RCL 1	34 01	
	÷	81	
	STO + 0	33 61 00	Σ
	GTO 1	22 01	
*	f LBL 2	31 25 02	
	RCL 0	34 00	ANSWER
	h RTN	36 22	
070			
080			
090			
100			
110			

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☐	FIX ☐
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n____

REGISTERS

0	1	2	3	4	5	6	7	8	9
USED	Σ (T)	USED	USED	USED	USED	USED	USED	USED	USED

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
USED	USED	USED	USED	USED	USED	USED	USED	USED	USED

A	B	C	D	E	I
USED	USED	USED	USED	USED	USED

Program Description I

Program Title TRUE ANNUAL GROWTH RATE (DCF) OF INVESTMENT PORTFOLIO

Contributor's Name Ken L. Singer
Address 2323 Augusta Drive
City Houston **State** Texas **Zip Code** 77057

Program Description, Equations, Variables, etc. This program finds the true annual growth rate (discounted cash flow rate of return) of an investment portfolio or any unlimited cash flow stream. Inputs are as follows:

1. Evaluation date and market value
2. Lump-sum payments and/or withdrawals: date and amount
3. Series payments and/or withdrawals: starting date of series; number of payments or withdrawals in series; months between each payment or withdrawal; and amount of each payment or withdrawal

(The program can be used to find the DCF rate of return of a standard cash flow stream by treating cash flow investment outlays the same as portfolio withdrawals and cash flow revenues the same as portfolio payments; the date and amount of the initial cash flow investment is input as the portfolio evaluation date and market value.) For an investment portfolio, a dividend which is not reinvested is treated as a withdrawal. For a cash flow stream, a continuous flow can be approximated by many small series payments. For example, $1000 received continuously over a year can be approximated by 100 revenues, received

Operating Limits and Warnings (1) Total payments cannot equal total withdrawals (including market value), i.e. zero growth rate. (2) As in any discounted cash flow analysis, if the year by year cumulative net cash flow (payments minus withdrawals) changes sign more than once, there may not be a unique rate of return. Such a case will be indicated by widely differing values of i, i_1, and i_2; accordingly, the final rate will be incorrect. (3) The growth rate must be algebraically greater

Program Description I

Program Title TRUE ANNUAL GROWTH RATE (DCF) OF INVESTMENT PORTFOLIO

Contributor's Name

Address

City **State** **Zip Code**

Program Description, Equations, Variables, etc. (cont'd)

at intervals of 12/100 months, in the amount of $1000/100 each.

Input data are entered three times. Program determines its own initial guess for the rate from the first entry of the data (Pass 1). The initial rate is then used to discount the payments/withdrawals input in the second entry, and the resulting ratio of total discounted withdrawals to total discounted payments is used to calculate a refined rate (Pass 2). In the same manner data are entered a third time and discounted using the refined rate to obtain a further refined rate; then the initial, refined, and further refined rates are combined to obtain a final rate (Pass 3). Accuracy averages 99.999 %.

Let: i = initial rate, % $m = 1 + (i/100)$

i_1 = refined rate, % $m_1 = 1 + (i_1/100)$

i_2 = further refined rate, % $m_2 = 1 + (i_2/100)$

i_c = final rate, %

L = "lump-sum" S = "series"

W = withdrawal amount P = payment amount

TW = total withdrawals TP = total payments

Operating Limits and Warnings (cont'd)

than -100 percent. (4) In some other rare instances a particular set of data could cause division by zero. If this instance should occur, it is suggested that the market value (portfolio) or initial investment outlay (cash flow) be changed by a very small amount; the entire program should then be rerun.

Program Description I

Program Title TRUE ANNUAL GROWTH RATE (DCF) OF INVESTMENT PORTFOLIO

Contributor's Name

Address

City **State** **Zip Code**

Program Description, Equations, Variables, etc. (cont'd)

TDW = total discounted wdls. TDP = total discounted pmts.

n = time (years) of payment/withdrawal (relative to evaluation date)

n' = time (years) series payment/withdrawal starts

I = interval (months) between series pmt./wdl. I' = I/12

N = number of series payments/withdrawals

Pass 1: $\bar{n} = n' + (I'N - I)/2$

$$x_w = \frac{1}{TW}\left[\sum(W_L)(n) + \sum(W_S)(N)(\bar{n})\right]$$

$$x_p = \frac{1}{TP}\left[\sum(P_L)(n) + \sum(P_S)(N)(\bar{n})\right]$$

$$a = x_w - x_p \qquad m = (TW/TP)^{\frac{1}{a}}$$

Operating Limits and Warnings

Program Description I

Program Title TRUE ANNUAL GROWTH RATE (DCF) OF INVESTMENT PORTFOLIO

Contributor's Name

Address

City **State** **Zip Code**

Program Description, Equations, Variables, etc. (cont'd)

Pass 2:

$$TDW = \sum(W_L)(m^{-n}) + \sum(W_S)\left(\frac{m^{I'N} - 1}{m^{I'} - 1}\right)(m^{-(n' + I'N - I')})$$

$$TDP = \sum(P_L)(m^{-n}) + \sum(P_S)\left(\frac{m^{I'N} - 1}{m^{I'} - 1}\right)(m^{-(n' + I'N - I')})$$

$$1/b = (\log \frac{TW}{TP})/(\log \frac{TW/TP}{TDP/TDW}) \qquad m_1 = m^{\frac{1}{b}}$$

Pass 3:

TDW_1 = same as Pass 2, except m_1 used instead of m

TDP_1 = same as Pass 2, except m_1 used instead of m

$$1/b_1 = (\log \frac{TW}{TP})/(\log \frac{TW/TP}{TDP_1/TDW_1}) \qquad m_2 = m_1^{\frac{1}{b_1}}$$

$$i_c = \left(m + \frac{(m_1 - m)^2}{2m_1 - m - m_2} - 1\right)(100)$$

Operating Limits and Warnings

Sketch(es)

Sample Problem(s)

(1) Investment portfolio: $2600 and $3600 were paid into a fund on 3/1/67 and 5/1/70 respectively. $2000 was withdrawn on 4/1/73. Five quarterly dividends of $60 each were paid by the fund (and not reinvested) starting 11/1/68. Additionally, twelve monthly amounts of $100 each were invested in the fund beginning 2/1/74. What was the true annual growth rate of the fund as of 4/1/76, when it had a value of $7000?

Solution(s)

```
E  4.1976 ↑ 7000 A
   3.1967 ↑ 2600 B
   5.1970 ↑ 3600 B
   2.1974 ↑ 12 ↑ 1 ↑ 100 C
   4.1973 ↑ 2000 CHS B
  11.1968 ↑  5 ↑ 3 ↑ 60 CHS C D → 1.0425(965)      (Pass 1)
                                → 1.0420(671)      (Pass 2)
                                → 1.0420(730)
                                  4.2072(893) pct. (Pass 3)
```

Reference(s)

Program Description II

Sketch(es)

Sample Problem(s)

(2) Cash flow: (All figures, except those with asterisk, are lump-sum at end of year)

Year	0	1	2	3	4	5	6	7	8
Investment	5	0	8	8	8	7	0	0	0
Revenue	0	3	4	4	4	4	4	9*	9*

*continuously received from start of year to end of year

Solution(s)

```
E  0.0000 ↑ 5 A
   0.0001 ↑ 3 B
   0.0002 ↑   5 ↑ 12 ↑   4 C
   0.0006 ↑ 200 ↑.12 ↑.09 C
   0.0005 ↑ 7 CHS B
   0.0002 ↑   3 ↑ 12 ↑   8 CHS C D→1.0631(700)      (Pass 1)
                                →1.0652(102)      (Pass 2)
                                →1.0652(778)
                                  6.5280(152) pct.(Pass 3)
```

Reference(s) (1) "Changing Times computer service: Find out how your investments are really doing", Changing Times Magazine, March 1970, pgs. 47-49; (2) Wild, N. H., "Return on Investment made easy", Chemical Engineering Magazine, April 12, 1976, pgs. 153-154

User Instructions

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load sides 1 and 2			
2	Press E until 1.0000 is displayed		E	1 (Pass)
3	Initialize data entry sequence as			
	follows:			
	Enter evaluation date for investment			
	portfolio or date of initial capital			
	investment for cash flow	MM.YYYY	↑	
	Enter market value of portfolio or			
	initial investment amount of cash flow	Amount	A	Amount
4	If there are any lump-sum payments (for			
	portfolio) or revenues (for cash flow),			
	input them as follows:			
	Enter date	MM.YYYY	↑	
	Enter amount	Amnt (A)	B	-(A)(n)
	(Repeat step 4 as necessary)			
5	If there are any series payments (for			
	portfolio) or revenues (for cash flow),			
	input them as follows:			
	Enter starting date of series	MM.YYYY	↑	
	Enter number of payments in series	N	↑	
	Enter interval (months) between			
	payments	Months	↑	
	Enter amount of each payment	Amnt (A)	C	$-A\bar{N}\overline{n}$
	(Repeat step 5 as necessary)			
6	If there are any lump-sum withdrawals			
	(for portfolio) or investment outlays			
	(for cash flow), input them as follows:			
	Enter date	MM.YYYY	↑	
	Enter amount	Amnt (A)	CHS B	(A)(n)
	(Repeat step 6 as necessary)			
7	If there are any series withdrawals (for			
	portfolio) or investment outlays (for			
	cash flow), input them as follows:			
	Enter starting date of series	MM.YYYY	↑	
	Enter number of withdrawals in series	N	↑	
	Enter interval (months) between			
	withdrawals	Months	↑	
	Enter amount of each withdrawal	Amnt (A)	CHS C	$(A)(N)(\overline{n})$
	(Repeat step 7 as necessary)			

User Instructions

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
8	To calculate initial rate, press		D	1+i/100
9	Press E until 2.0000 is displayed		E	2 (Pass)
10	Repeat step 3			-Amount
11	Repeat step 4			P.Value
12	Repeat step 5			P.Value
13	Repeat step 6			P.Value
14	Repeat step 7			P.Value
15	To calculate refined rate, press		D	$1+i_1/100$
16	Press E until 3.0000 is displayed		E	3 (Pass)
17	Repeat step 3			-Amount
18	Repeat step 4			$P.Value_1$
19	Repeat step 5			$P.Value_1$
20	Repeat step 6			$P.Value_1$
21	Repeat step 7			$P.Value_1$
22	To calculate further refined and final rates, press		D	$1+i_2/100$*** i_c (%)
	(If a mistake is made during data entry and noticed before completing the step, it is only necessary to start that step over again.)			
	(If a mistake is made during data entry and noticed after completing a step, it is only necessary to go back to the step immediately following the "Press E until ..." at the start of the pass in which the error was made.)			
	(For another problem, repeat steps 2-22.)			
	*** pause on HP-67; print on HP-97			
	P.Value = Present (discounted) Value			

EVALUATION DATE AND MARKET VALUE (PORTFOLIO)
OR DATE AND AMOUNT OF INITIAL INVESTMENT OUTLAY (CASH FLOW)

DATE AMOUNT

________ [↑] ________ [A]

LUMP-SUM PAYMENTS (PORTFOLIO) OR REVENUES (CASH FLOW)

DATE AMOUNT

________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]
________ [↑] ________ [B]

SERIES PAYMENTS (PORTFOLIO) OR REVENUES (CASH FLOW)

ST. DATE NUMBER INTERVAL AMOUNT

________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]
________ [↑] ________ [↑] ________ [↑] ________ [C]

LUMP-SUM WITHDRAWALS (PORTFOLIO) OR INVESTMENT OUTLAYS (CASH FLOW)

DATE AMOUNT

________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]
________ [↑] ________ [CHS] [B]

SERIES WITHDRAWALS (PORTFOLIO) OR INVESTMENT OUTLAYS (CASH FLOW)

ST. DATE NUMBER INTERVAL AMOUNT

________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]
________ [↑] ________ [↑] ________ [↑] ________ [CHS] [C]

67 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	g LBL fe	32 25 15	Convert date to -n
	h X≠Y	35 52	Amount in y; Date in X
	↑	41	MM.YYYY in X & Y Regs.
	g FRAC	32 83	.YYYY in X Reg.
	−	51	MM
	h LST X	35 82	Bring back .YYYY
	EEX	43	YYYY
	4	04	
	X	71	
010	h X≠Y	35 52	MM. in X; YYYY. in y
	1	01	fraction of year = MM/12
	2	02	
	÷	81	
	+	61	YYYY. fraction
	RCL 5	34 05	Eval. Date (0 in Pass 1)
	h X≠Y	35 52	-n = (Eval. Date) - Date
	−	51	
	h RTN	35 22	
	f LBL A	31 25 11	Initialize
020	h F? 0	35 71 00	Test for Pass
	GTO f a	22 31 11	Flag 0 set; Pass 2 or 3
	f CLREG	31 43	Pass 1. Clear all regs. and init. TW with value on Eval. Date
	STO 1	33 01	
	g GSB fe	32 22 15	Convert Eval. Date from MM.YYYY to YY. fraction & store
	CHS	42	
	STO 5	33 05	
	RCL 1	34 01	Display value on Eval. Date
	h RTN	35 22	
	f LBL B	31 25 12	Lump Sum
030	h F? 0	35 71 00	Test for Pass
	GTO f b	22 31 12	Flag 0 set. Pass 2 or 3
	g GSB fe	32 22 15	Pass 1. Cnvt date in Y Reg to -n; amount in X Reg.
	h X≠Y	35 52	
	f LBL 0	31 25 00	Common lump sum & series
	X	71	(-WDL)(-n) or (PMT)(-n)
	h LST X	35 82	Bring back PMT or WDL
	f X<0	31 71	PMT or WDL?
	GTO 1	22 01	WDL; Go to LBL 1
	STO + 2	33 61 02	Σ PMT
040	h R↓	35 53	(-n)(PMT) to X Reg
	STO − 4	33 51 04	Σ − (-n)(PMT)
	h RTN	35 22	Display − (n)(PMT)
	f LBL 1	31 25 01	WDL
	STO − 1	33 51 01	Σ − (-WDL)
	h R↓	35 53	(-n)(-WDL) to X Reg
	STO + 3	33 61 03	Σ (-n)(-WDL)
	h RTN	35 22	Display (n)(WDL)
	f LBL C	31 25 13	Series
	h F? 0	35 71 00	Test for Pass
050	GTO f c	22 31 13	Flag 0 set. Pass 2 or 3
	STO 6	33 06	Pass 1. Temp. store amnt
	h R↓	35 53	N in X Reg; I in y Reg; date in Σ Reg.
	h X≠Y	35 52	
	STO X 6	33 71 06	(N)(PMT) or (N)(-WDL)
	CHS	42	-N
	h X≠Y	35 52	I in X; -N in y Reg.

STEP	KEY ENTRY	KEY CODE	COMMENTS
	X	71	(-N)(I)
	h LST X	35 82	Bring back I
	+	61	I - NI
060	2	02	(I - NI)/24 = (I' - NI')/2
	4	04	
	÷	81	
	g GSB fe	32 22 15	Calculate -n'
	+	61	$\bar{n} = -n' + [(I' - NI')/2]$
	RCL 6	34 06	Amnt in X; $\bar{n}$ in y Reg.
	GTO 0	22 00	Common lump sum & series
	g LBL fa	32 25 11	Pass 2 or 3 Initialize
	0	00	Initialize TDW & TDP
	STO 1	33 01	
070	STO 2	33 02	
	h X≠Y	35 52	0 in y; mkt value in X
	−	51	- mkt. value in X
	g LBL f b	32 25 12	Pass 2 or 3 lump sum
	0	00	Not series
	STO 3	33 03	
	+	61	Amnt in X; date in y
	f LBL 2	31 25 02	Common lump sum & series
	g GSB fe	32 22 15	Calc. -n
	RCL 3	34 03	(I'N - I') or 0
080	−	51	-n' - (I'N - I') or -n
	RCL (i)	34 24	$\pm PV = \pm \text{Amount} \times (1 + i/100)^{-n}$
	h X≠Y	35 52	
	h y^x	35 63	
	X	71	
	f X<0	31 71	PMT or WDL?
	GTO 3	22 03	WDL; Go to LBL 3
	STO + 2	33 61 02	ΣPV_{PMT} = TDP
	h RTN	35 22	Display PV_{PMT}
	f LBL 3	31 25 03	WDL
090	STO − 1	33 51 01	$\Sigma - (PV_{WDL})$ = TDW
	h RTN	35 22	Display $-PV_{WDL}$
	g LBL fc	32 25 13	Pass 2 or 3 Series
	STO 4	33 04	Temp. Store amount
	CLX	44	I' = I/12
	1	01	
	2	02	
	÷	81	
	X	71	I'N
	STO 3	33 03	
100	RCL (i)	34 24	$(1 + i/100)$ in X; I'N in y
	h LST X	35 82	Bring back I'
	STO − 3	33 51 03	(I'N - I') in Reg 3
	h y^x	35 63	$A = [1 + i/100]^{I'} - 1$
	1	01	
	−	51	
	h X≠Y	35 52	A in y; I'N in X
	RCL (i)	34 24	$(1 + i/100)$ in X; I'N in y
	h X≠Y	35 52	$(1 + i/100)$ in y; I'N in X
	h y^x	35 63	$B = (1 + i/100)^{I'N} - 1$
110	1	01	
	−	51	
	h X≠Y	35 52	

REGISTERS

0	1 TW or TDW	2 TP or TDP	3 Temp; $1 + (i_2/100)$	4 Temp.	5 Eval. Date	6 TW/TP	7 $1 + (i/100)$	8 $1 + (i_1/100)$	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
					7 or 8

67 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
	÷	81	B/A
	RCL 4	34 04	Amount =
	X	71	Amount × (B/A)
	GTO 2	22 02	Common lump sum & series
	f LBL D	31 25 14	Calculate Rates
	h F? 0	35 71 00	Test for pass
	GTO f d	22 31 14	Flag 0 set. Pass 2 or 3
120	RCL 2	34 02	Pass 1. Calc. initial rate.
	RCL 1	34 01	TP/TW
	÷	81	
	STO 6	33 06	Store TP/TW
	RCL 4	34 04	$x_p = [\Sigma(PMT \times n)]/TP$
	RCL 2	34 02	
	÷	81	
	RCL 3	34 03	$x_w = [\Sigma(WDL \times n)]/TW$
	RCL 1	34 01	
	÷	81	
130	−	51	$a = x_p - x_w$
	h 1/x	35 62	$(1 + i/100) = (TP/TW)^{1/a}$
	h y^x	35 63	
	STO 7	33 07	store $1 + (i/100)$
	h RTN	35 22	Display $1 + (i/100)$
	g LBL f d	32 25 14	Pass 2 or 3 Rates
	RCL (i)	34 24	$(1 + i/100)$ or $(1 + i_1/100)$
	RCL 6	34 06	$A = \log(TW/TP)$
	f LOG	31 53	
	RCL 6	34 06	$B = \log\left[\frac{(TW/TP)}{(TDP/TDW)}\right]$
140	RCL 2	34 02	
	÷	81	
	RCL 1	34 01	
	X	71	
	f LOG	31 53	
	÷	81	$1/b = A/B$
	h y^x	35 63	$(1 + i_1/100) = (1 + i/100)^{1/b}$
	h F? 1	35 71 01	Test for Pass 3
	GTO 5	22 05	Flag 1 set. Pass 3
	STO 8	33 08	Pass 2. Store $(1 + i_1/100)$
150	h RTN	35 22	Display $1 + (i_1/100)$
	f LBL 5	31 25 05	Pass 3. Calc. final rate
	STO 3	33 03	Store $(1 + i_2/100)$
	f −x−	31 84	Display $1 + (i_2/100)$
	RCL 8	34 08	$A = [(i_1/100) - (i/100)]^2$
	RCL 7	34 07	
	−	51	
	↑	41	
	X	71	
	h LST x	35 82	$B = (i_1/100) - (i/100)$
160	RCL 3	34 03	$-(i_2/100) + (i_1/100)$
	−	51	
	RCL 8	34 08	
	+	61	
	f x≠0	31 61	Are i, i_1, and i_2 all equal?
	GTO 6	22 06	No. Proceed
	CLX	44	Yes. Set B = 1
	1	01	
	f LBL 6	31 25 06	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	÷	81	A/B
170	RCL 7	34 07	
	1	01	
	−	51	$i_c = [(i/100) + (A/B)] \times 100$
	+	61	
	EEX	43	
	2	02	
	X	71	
	h RTN	35 22	Display i_c
	f LBL E	31 25 15	Set up next pass
	h F? 0	35 71 00	Is current pass 1?
180	GTO 8	22 08	Current pass is 2 or 3
	h SF 0	35 51 00	Pass 1. Increase to 2
	h CF 1	35 61 01	clear pass 8 flag
	7	07	Set I Reg. to 7
	h STI	35 33	for i_1
	2	02	
	h RTN	35 22	Display pass 2
	f LBL 8	31 25 08	Current pass is 2 or 3
	h F? 1	35 71 01	Is current pass 3?
	GTO 9	22 09	Current pass is 3
190	h SF 1	35 51 01	Pass 2. Increase to 3
	8	08	Set I Reg. to 8
	h STI	35 33	for i_2
	3	03	
	h RTN	35 22	Display Pass 3
	f LBL 9	31 25 09	Current pass is 3
	h CF 0	35 61 00	Reset to 1. Clear
	h CF 1	35 61 01	pass 2 or 3 flag
	1	01	Clear pass 8 flag
	h RTN	35 22	Display Pass 1
200			
210			
220			

LABELS

A Start	B Lump Sum	C Series	D Calc. Rate	E Next Pass
a Pass 2 or 3 Start	b Pass 2 or 3 Lump Sum	c Pass 2 or 3 Series	d Pass 2 or 3 Calc. Rate	e Convert Date to −n
0 Pass 1 Common	1 Pass 1 WDL	2 Pass 2 or 3 Common	3 Pass 2 or 3 WDL	4
5 Pass 3 Final Rate	6 used	7	8 Current Pass 2 or 3	9 Current Pass 1

FLAGS

0	Pass 2 or 3
1	Pass 3
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☒	☐
1	☒	☐
2	☐	☐
3	☐	☐

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	4

Program Description I

Program Title Convertible Bond Portfolio Premium Evaluation

Contributor's Name Ralston W. Barnard

Address 2811 Ridgecrest Drive S.E.

City Albuquerque **State** N.M **Zip Code** 87108

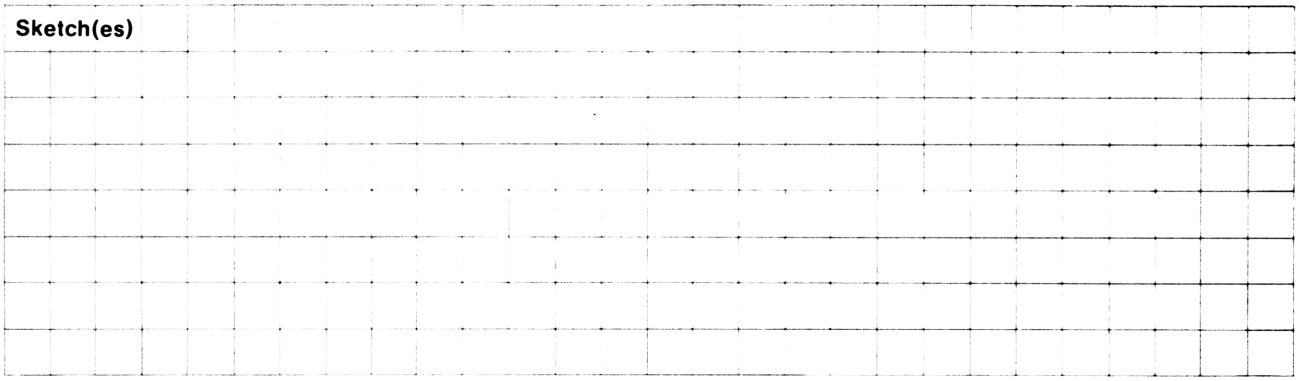
Program Description, Equations, Variables This program calculates the conversion values and premiums over conversion value for a portfolio of up to 14 convertible bonds. The program also calculates the weighted average of the premiums. The weighting factors can range from 1 to 99. The conversion factors and weighting factors are stored in the form XXX.XXYY, where the X's are conversion factors, and the Y's the weighting factors. The conversion value is given by CV=BP/Cf, where C.V. is conv. value, BP is bond price, and Cf is conversion factor. BP is entered as a percent of par (100), so Cf is modified accordingly. The premium is given by [(CV-SP)/SP]*100, where SP is stock price. The weighted average of premium is given by ΣPrem*YY/ΣYY, when YY is the weighting factors.

Both the conversion factors and weight factors can be stored on the second side of the program card. If no price is available for a bond issue, the calculations are bypassed and the weighted average does not include that issue.

Operating Limits and Warnings If the portfolio consists of less than 14 bond issues, Steps 91 and 92 can be changed to reflect the actual number of issues: for 14, use 23; for 13, use 22, for 12, use 21, etc.

Program Description 11

Sketch(es)



Sample Problem(s) Assume a portfolio consisting of the following numbers of bonds:

Conv. Fac	# of Bonds	Bond Price	Stock Price
19.74	5	88	20
50.00	15	80	10
28.56	1	70	20
109.59	25	88	6

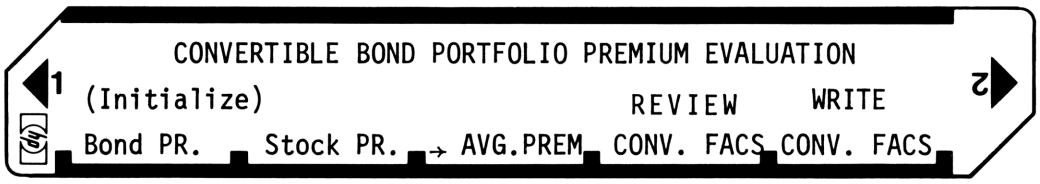
Calculate the conversion value and premium for each. Calculate the weighted average premium, and write the data for future use.

Solution(s) Prepare: 19.7405 [STO] [0], 50.0015 [STO] [1], 28.5601 [STO] [2], 109.5925 [STO] [3]. [f] [A] (initializes) ----------> 0.00

88 [A] ------>44.58 (conv. val), 20 [B] ------>123 (prem).
80 [A] ------>16.00 , 10 [B] ------> 60.0
70 [A] ------>24.51 , 20 [B] ------> 22.5
88 [A] ------> 8.03 , 6 [B] ------> 33.8
[C] ------>51.8
[E] ------>Crd ------>0.00

Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load Side 1 (program) and Side 2 (Data)			0.00
2.	Initialize		f A	C.F.#14
3.	Enter bond price* as percent of par.	XX.XXX	A	Conv.Vol.
4.	Enter stock price	XX.XXX	B	Conv.Prem
5.	Repeat 3 and 4 for each bond issue			
	* for a bond not traded, or no price given, just press [A]		A	Conv.Fac
6.	To calculate the weighted average of premiums		C	Avg.
7.	To review conv. factors		D	"Conv.facs"
8.	To write data on side 2 of card		E	Crd,C.f.#14

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLα	21 16, 11	
002	RCLD	36 14	
003	RCLC	36 13	
004	RCLB	36 12	
005	RCLA	36 11	
006	P≠S	16-51	
007	CLRG	16-53	
008	P≠S	16-51	
009	STOA	35 11	
010	R↓	-31	
011	STOB	35 12	
012	R↓	-31	
013	STOC	35 13	
014	R↓	-31	
015	STOD	35 14	
016	CF3	16 22 03	
017	RTN	24	
018	*LBLA	21 11	
019	DSP2	-63 02	
020	RCLi	36 45	
021	F3?	16 23 03	
022	GTO3	22 03	
023	GTO2	22 02	
024	*LBL3	21 03	
025	EEX	-23	
026	2	02	
027	x	-35	
028	ENT↑	-21	
029	FRC	16 44	
030	STOE	35 15	
031	-	-45	
032	EEX	-23	
033	3	03	
034	÷	-24	
035	÷	-24	
036	*LBL2	21 02	
037	ISZI	16 26 46	
038	1	01	
039	0	00	
040	RCLI	36 46	
041	X=Y?	16-33	
042	GSB7	23 07	
043	R↓	-31	
044	R↓	-31	
045	RTN	24	
046	*LBL7	21 07	
047	ENT↑	-21	
048	+	-55	
049	STOI	35 46	
050	RTN	24	
051	*LBLB	21 12	
052	X≠Y	-41	
053	%CH	16 55	
054	DSP1	-63 01	
055	1	01	
056	0	00	
057	0	00	
058	X≤Y?	16-35	
059	DSP0	-63 00	
060	X≠Y	-41	
061	ENT↑	-21	
062	ENT↑	-21	
063	RCLE	36 15	
064	ENT↑	-21	
065	R↓	-31	
066	x	-35	
067	R↑	16-31	
068	Σ+	56	
069	CF3	16 22 03	
070	R↓	-31	
071	R↓	-31	
072	RTN	24	
073	*LBLC	21 13	
074	RCLΣ	36 56	
075	÷	-24	
076	DSP1	-63 01	
077	RTN	24	
078	*LBLD	21 14	
079	DSP4	-63 04	
080	0	00	
081	STOI	35 46	
082	*LBL4	21 04	
083	RCLi	36 45	
084	PSE	16 51	
085	ISZI	16 26 46	
086	1	01	
087	0	00	
088	RCLI	36 46	
089	X=Y?	16-33	
090	GSB7	23 07	
091	2	02	
092	3	03	
093	RCLI	36 46	
094	X>Y?	16-34	
095	RTN	24	
096	GTO4	22 04	
097	*LBLE	21 15	
098	GSBα	23 16 11	
099	WDTA	16-61	
100	RTN	24	
101	R/S	51	
110			

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☒	FIX ☒
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n 2

REGISTERS

0 C.F.1	1 C.F.2	2 C.F.3	3 C.F.4	4 C.F.5	5 C.F.6	6 C.F.7	7 C.F.8	8 C.F.9	9 C.F.10
S0	S1	S2	S3	S4 Σ bonds	S5 Σ (bonds)²	S6 Σ(bondxprem)	S7 Σ( )²	S8 Σ( )	S9 n
A C.F. 11	B C.F. 12	C C.F. 13	D C.F. 14	E # of bonds	I control				

Program Description I

Program Title Yield on Call Option Sales

Contributor's Name Hewlett-Packard
Address 1000 NE Circle Boulevard
City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables

This program calculates various yields (actual and annualized) useful in evaluating call option sales (writing): yield if exercised, yield if unexercised[4], and breakeven point[3]. Calculations consider whether the stock is purchased on a cash basis (full price) or on a margin basis[2].

$$\text{exercised} = \frac{\text{Net Prem} - \text{Net Pur} + \text{Net Sale} + \text{Div} - [\text{Im}]_2}{[.5]_2\ \text{Net Pur} - \text{Net Prem}}$$

$$\text{unexercised} = \frac{\text{Net Prem} + \text{Div} - [2 \times C_{sp}]_1 - [\text{Im}]_2}{[.5]_2\ \text{Net Pur} - \text{Net Prem}}$$

$$\text{breakeven} = \frac{\text{Net Pur} - \text{Net Prem} - \text{Div} + [\text{Im}]_2}{N}$$

Net Pur = (# Shares x Stock price) + Stock Commission
Net Prem = (# Shares x Option premium) - Option Commission
Net Sale = (# Shares x Exercise price) - Commission
Im = Interest rate x 1/2 Net Pur x T/365

Operating Limits and Warnings

1 Stock is purchased for one option period and then sold.

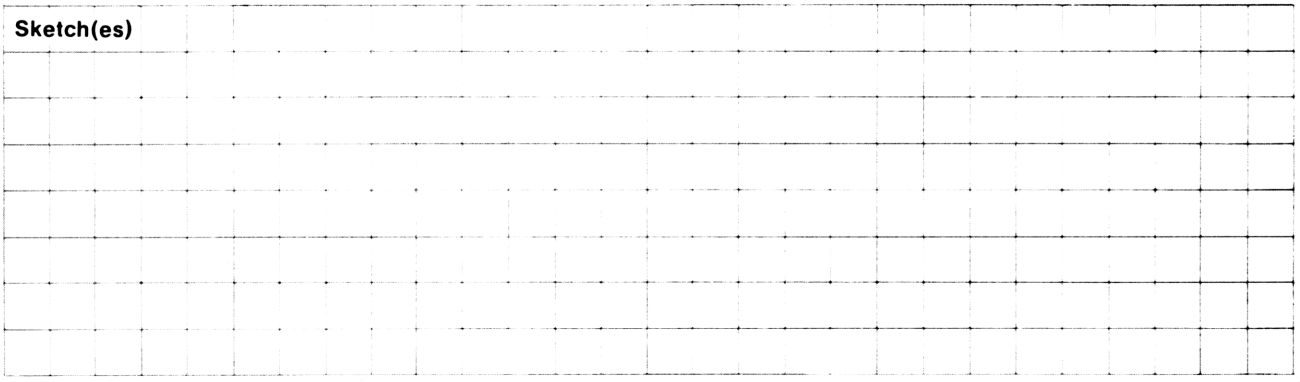
2 Applicable for 50% margin requirement.

3 Stock price below which the writer has a loss (the loss point on the downside).

4 Unexercised yield does not include commissions unless the commission flag is set. With the flag set two commissions (buy and sell: By & Sl) are included in the yield calculation.

Program Description 11

Sketch(es)



Sample Problem(s)

A. You wish to write 3 calls vs 300 shares of XYZ stock, which you intend to buy at $20. The calls trade at 1 3/16 and the exercise price is 25 and the time remaining is 100 days. During that time, the stock pays dividends of $.50 per share. Stock commissions are 1.20% of the money involved in the transaction plus $44.50. Option commissions are 1.43% of the money involved plus $33.00. Margin interest rate is 7.2%.

1) Calculate: the yield if called, the yield if not called (assuming you own the stock), and the breakeven point.
2) If the stock is purchased on margin, calculate the yield if called, the yield if not called (assuming you liquidate your shares at time of expiration of option).
3) What is yield if not called on the same stock, but if the striking price is 30, expiring in 190 days and trading at 2 1/8 (both for margin and cash basis).

Solution(s)

A.

300 [f] [A]	300.00	# shares
20[↑].5 [A].	6000.00	gross purchase
1.2 [%] 44.5 [+].	116.50	purchase commission
[R/S]	6116.50	net purchase cost (cash)
25[↑]100 [B]	7500.00	gross exercise
1.2 [%] 44.5 [+].	134.50	exercise commission
[R/S]	7365.50	net exercise proceeds

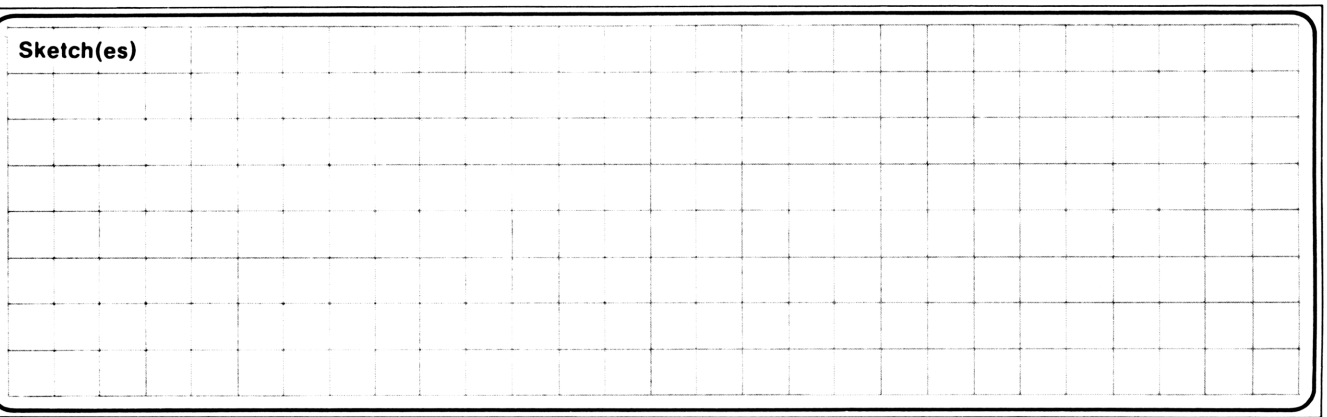
Reference(s)

1[↑]3[↑]16 [÷] [+].	1.19	convert 1 3/16 to fraction
[C]	356.25	gross option proceeds

continued on next page

Program Description 11

Sketch(es)



Sample Problem(s)

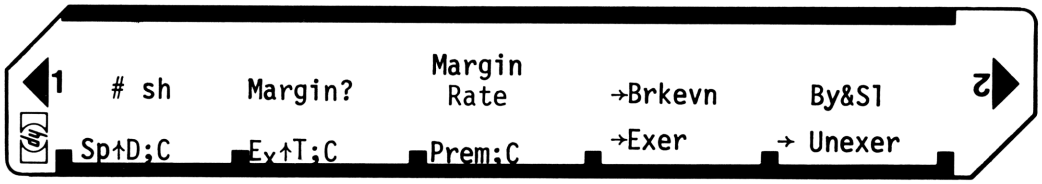
	1.43 [%] 33 [+]	38.09	option commission
	[R/S].	318.16	net option proceeds
	[D]	29.61	exercised yield
	[R/S].	108.09	annualized yield
	[E]	8.07	unexercised yield
	[R/S].	29.47	annualized yield
	f [D]	18.83	breakeven point
2)	[f] [B]	1.00	(sets for margin acct)
	7.2 [f] [C]	7.2	(enters margin rate)
	[D]	64.87	yield if called
	[f] [E]	6.38	yield (un called) including buy & sell (double) commission
	[R/S].	23.29	annualized yield

Solution(s)

3) There is no need to re-enter the # of shares (f [A]) or purchase price and dividends ([A]) since they remain the same from the previous calculation. The margin flag is also similarly set (1) from the last calculation.

30 [↑] 190 [B].	9000.00	gross exercise
1.2 [%] 44.5 + [R/S]	8847.50	net exercise
2 [↑] 1 [↑] 8 [÷] [+] [C]	637.50	gross option proceeds
1.43 [%] 33 [+] [R/S]	595.38	net option proceeds
[E].	25.61	actual yield (margin basis)
f [B]	0	reset for cash purchase
[E]	13.50	actual yield (cash basis)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter number of shares of stock on which		f	A	
	calls are written (# sh)				
2	Margin (1), cash $(0)_2$		f	B	0 or 1
3°	a) Stock price (sp)	$		↑	
	b) Dividend per share received	$		A	gross purchase
	before option expiration (d)				
	c) Compute & input stock commission$_1$ (C)			R/S	net cost
4°	a) Option exercise price (Ex)	$		↑	
	b) Time to exercise (T)	days		B	gross exercise
	c) Exercise commission (C)	$		R/S	proceeds
					if called
5°	a) Option premium (Pm)	$		C	gross premium
	b) Option commission (C)	$		R/S	net premium
6*	Yield if option is exercised			D	actual yield(%)
				R/S	annual yield(%)
7*	Yield assuming stock price remains constant			E	actual yield(%)
	and option expires unexercised (no dividends			R/S	annual yield
	included)				
8*	Same as 7 but with buy and sell (double)		f	E	annual yield
	commissions included			R/S	annual yield
9*	Breakeven point (loss point on downside)		f	D	$
°	3,4 & 5 may be used in any order				
*	6,7, 8 & 9 may be used in any order				
1	Commissions may be computed as if calculator				
	were in ordinary manual mode (see example)				
2	Alternate presses of [f] [B] set and unset				
	margin status				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	Store # Shares
002	STO1	35 01	
003	RTN	24	
004	*LBLb	21 16 12	Alternately set and unset margin flag f 0
005	F0?	16 23 00	
006	GTO4	22 04	
007	SF0	16 21 00	
008	1	01	
009	RTN	24	
010	*LBL4	21 04	
011	CF0	16 22 00	
012	0	00	
013	RTN	24	
014	*LBLc	21 16 13	Store margin rate
015	STO8	35 08	
016	R/S	51	
017	*LBLA	21 11	Compute store, & display gross purchase
018	RCL1	36 01	
019	STO4	35 04	
020	STO2	35 02	
021	R↓	-31	
022	STx4	35-35 04	
023	X⇄Y	-41	
024	STx2	35-35 02	
025	RCL2	36 02	
026	R/S	51	
027	STO3	35 03	Cancel dividends if purchase commission is 0
028	X=0?	16-43	
029	STO4	35 04	
030	RCL2	36 02	
031	+	-55	
032	STO2	35 02	Compute, display & store net purchase
033	R/S	51	
034	*LBLB	21 12	Initialize R6 with # shares
035	RCL1	36 01	
036	STO6	35 06	
037	R↓	-31	
038	3	03	Compute and store day factor T/365
039	6	06	
040	5	05	
041	÷	-24	
042	STO7	35 07	
043	R↓	-31	
044	STx6	35-35 06	Compute, store, & display gross exer
045	RCL6	36 06	
046	R/S	51	
047	RCL6	36 06	Compute, store & display net exer
048	X⇄Y	-41	
049	-	-45	
050	STO6	35 06	
051	R/S	51	
052	*LBLC	21 13	Compute, store & display gross prem
053	RCL1	36 01	
054	x	-35	
055	STO5	35 05	
056	R/S	51	Compute, store & display net prem
057	RCL5	36 05	
058	X⇄Y	-41	
059	-	-45	
060	STO5	35 05	
061	R/S	51	
062	*LBLD	21 14	Exercise numerator less Im
063	RCL6	36 06	
064	RCL5	36 05	
065	+	-55	
066	RCL4	36 04	
067	+	-55	
068	RCL2	36 02	
069	-	-45	
070	GSB4	23 04	Margin calculations
071	÷	-24	
072	EEX	-23	Divide and normalize
073	2	02	
074	x	-35	
075	RTN	24	
076	RCL7	36 07	Annualize using day factor
077	1/X	52	
078	x	-35	
079	RTN	24	
080	*LBLE	21 15	Unexercised numerator less double dividend and Im
081	RCL4	36 04	
082	RCL5	36 05	
083	+	-55	
084	F1?	16 23 01	Double dividend
085	GSB2	23 02	
086	GSB4	23 04	Margin calcualtions
087	÷	-24	
088	EEX	-23	Divide and normalize clear buy and sell flag
089	2	02	
090	x	-35	
091	CF1	16 22 01	
092	RTN	24	
093	RCL7	36 07	Annualize
094	1/X	52	
095	x	-35	
096	RTN	24	
097	*LBLe	21 16 15	By & Sl, double dividends
098	SF1	16 21 01	
099	GTOE	22 15	
100	RTN	24	
101	*LBL2	21 02	Compute double dividends
102	RCL3	36 03	
103	2	02	
104	x	-35	
105	X=0?	16-43	Create error message if By & Sl used in conjunction with 0 commission
106	GTO3	22 03	
107	-	-45	
108	RTN	24	
109	*LBL3	21 03	
110	÷	-24	
111	RTN	24	

REGISTERS

0	1 # sh	2 Net Pur	3 Pur Comm	4 Dividends	5 Net Prem	6 Net Exer	7 Day Factor	8 Margin Rate	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
112	*LBL4	21 04	
113	F0?	16 23 00	Calculate de-
114	GTO1	22 01	nominator with
115	RCL2	36 02	margin
116	RCL5	36 05	
117	-	-45	
118	RTN	24	
119	*LBL1	21 01	
120	RCL8	36 08	Compute Im
121	ENT↑	-21	
122	EEX	-23	T x Margin rate
123	2	02	365
124	÷	-24	x .5 x net
125	RCL7	36 07	purchase
126	x	-35	
127	RCL2	36 02	
128	.	-62	
129	5	05	
130	x	-35	
131	x	-35	
132	F2?	16 23 02	Modify to add Im
133	CHS	-22	for breakeven
134	-	-45	
135	RCL2	36 02	
136	.	-62	Compute denomina-
137	5	05	tor (net out of
138	x	-35	pocket)
139	RCL5	36 05	
140	-	-45	
141	RTN	24	
142	*LBLd	21 16 14	
143	SF2	16 21 02	Set breakeven flag
144	RCL2	36 02	and compute
145	RCL5	36 05	
146	-	-45	numerator
147	RCL4	36 04	
148	-	-45	
149	F0?	16 23 00	Adjust for margin
150	GSB4	23 04	considerations
151	F0?	16 23 00	
152	R↓	-31	
153	RCL1	36 01	
154	÷	-24	
155	RTN	24	
156	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
160			
170			
180			
190			
200			
210			
220			

LABELS

A Purchase	B Exercise	C Prem	D →Exercise	E →Unexer
a	b Margin Flag	c Margin %	d →brkeven	e →By & Sl
0	1 Im	2 Double Div	3 error	4 Margin Compute
5	6	7	8	9

FLAGS

0	Margin
1	By & Sl
2	Used
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG		DISP	
DEG	☐	FIX	☒
GRAD	☐	SCI	☐
RAD	☐	ENG	☐
		n	2

Program Description I

Program Title BOND PRICE AND YIELD

Contributor's Name HEWLETT-PACKARD COMPANY
Corvallis Division
Address 1000 N.E. Circle Boulevard
City Corvallis, OR 97330 **State** **Zip Code**

Program Descripti

This program calculates the "flat" price (i.e., not including accrued interest) or annual yield of a semiannual coupon bond. Data required for input are the number of coupon periods (PER) between settlement date and redemption date (maturity date, call date, etc.), the annual coupon rate expressed as a percent (CR), the redemption value (RV) if other than 100, and either the annual yield expressed as a percent (YLD) or the bond price (PRICE).

All prices are expressed as a percent of the face value. (e.g., since most bonds have a face value of $1,000, a call price of 107 implies an actual redemption value of $1,070 if the bond is "called".)

The amount of the accrued interest for the expired portion of the current coupon period is available in register 8 and may be recalled (RCL 8).

Each time the coupon rate is entered by pressing B, the redemption value is automatically set to 100. This is the proper value for a price-to-maturity calculation, and no value must be keyed in for redemption value (RV). If however, the price-to-call is desired and the call price is other than 100, the call price has to be entered for RV *after* the coupon rate has been keyed in.

All input data are retained so that when alternative calculations are to be performed, only changed data must be keyed in. This permits, for instance, calculating the price for each of several different yields. In addition, the settlement date is retained throughout the bond calculations, and need not be reentered when returning to the calendar program for another bond calendar calculation.

The number of remaining coupon periods between settlement date and redemption date may be calculated and entered in two ways. If the calendar program is used to calculate the number of days between the settlement date and redemption date, the number of remaining semiannual coupon periods is automatically calculated and stored in register 0 for use by the bond program. In this case the instruction to enter the number of remaining coupon periods in step 3 below may be ignored. If however, the number of remaining coupon periods is already known, or the method used to calculate this value by the calendar program is deemed inappropriate, it may be entered in step 3. Choosing between an actual or 30/360 calendar calculation depends on trade custom for the particular security. Corporate bonds are traditionally traded on a 30/360 basis, while many government securities use an "actual" calendar.

Operating Limits a

This program may be used for after-tax as well as before-tax yield calculations. The procedure is to reduce the coupon and redemption values to their after-tax net values prior to entering them in the program. This can be important when

Program Description I

Program Title

Contributor's Name

Address

City **State** **Zip Code**

Program Description, Equations, Variables

comparing a bond with taxable coupons to one whose coupons are tax-free.

The program may also be used to calculate a yield when a bond is purchased, and then sold prior to redemption by the issuer. The procedure is simple to treat the exit date and price as the redemption date and reemption value respectively. The yield calculated is the precise yield if the exit date is also a coupon date, and is an approximate yield for other exit dates.

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

15. Bond Price and Yield

for PER > 1

$$\text{PRICE} = \text{RV}\left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}} + 100\,\frac{\text{CR}}{\text{YLD}}\left[\left(1 + \frac{\text{YLD}}{2}\right)^{\text{J}} - \left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}\right] - 100\left(\frac{\text{CR}}{2}\right)^{\text{J}}$$

where

J = 1 − FRAC (PER)

FRAC (PER) = fractional portion of the number of remaining coupon periods

i.e., if PER = 12.6, FRAC (PER) = .6, and J = 1 − .6 = .4

for PER < 1

Solution(s)

$$\text{PRICE} = \frac{\text{RV} + \frac{\text{CR}}{2}}{1 + \frac{\text{YLD}}{2} \cdot \text{PER}} - \left(\frac{\text{CR}}{2}\right)^{\text{J}}$$

Reference(s)

Program Description II

Sketch(es)

Example 1:

What is the price of a semiannual 3% bond to yield 10% with settlement date of January 1, 1972? The bond matures March 6, 1978, and a 30/360 calendar is used.

Keystrokes: **Outputs:**

Enter program BD-14

1.011972 [A] 3.061978 [B] [D] ⟶ 2225.00 (days settlement to maturity, 30/360 basis)

Now enter program BD-15

3 [B] 10 [C] [E] ⟶ 68.29 (price-to-maturity)

Sample Problem(s)

Example 2:

Having performed the above calculation, determine the price of the same bond using the "actual" number of days. Remember, the settlement date has been retained and need not be reentered.

Keystrokes: **Outputs:**

Enter program BD-14

3.061978 [B] [C] ⟶ 2256.00 (actual days settlement to maturity)

Enter program BD-15

3 [B] 10 [C] [E] ⟶ 68.31 (price-to-maturity)

Example 3:

A U.S. Treasury Note with a 5.75% coupon and 88 days from settlement to maturity is purchased at 100 18/32. If there are assumed to be 183 days in a coupon period, what is the yield-to-maturity?

Keystrokes: **Outputs:**

5.75 [B] 88 [ENTER↑] 183 [÷] [A] ⟶ 0.48 (fraction of a coupon period remaining)

Solution(s)

18 [ENTER↑] 32 [÷] 100 [+] [E] [C] ⟶ 3.34 (% annual yield-to-maturity)

Example 4:

Assuming that the previous problem has just been performed as shown, calculate the yield if there are assumed to be 182 days in a coupon period instead of 183.

Keystrokes: **Outputs:**

88 [ENTER↑] 182 [÷] [A] [C] ⟶ 3.35 (% annual yield-to-maturity)

Example 5:

An **annual** coupon bond with a 5% coupon is settled on March 1, 1974. If the yield is 5.5%, and the bond matures on February 1, 1984 what is the price-to-maturity on a 30/360 basis?

Reference(s)

Keystrokes: **Outputs:**

Enter program BD-14

3.011974 [A] 2.011984 [B] [D] ⟶ 3570.00 (days settlement to maturity, 30/360 basis)

Program Description II

Sketch(es)

Determine the number of **annual coupon periods** remaining by dividing by the number of days in a coupon period.

360 [÷] ⟶ 9.92 (number of annual coupon periods)

Enter program BD-15

[A] ⟶ 9.92 (the correct value for PER is entered)

The coupon rate and yield rate must be multiplied by a factor prior to input. This factor is determined by dividing the number of coupon periods per year into 2. For annual coupon bonds the factor is therefore 2 (for quarterly coupons the factor is 0.5 etc.).

5 [ENTER↑] 2 [×] [B] 5.5 [ENTER↑]
2 [×] [C] [E] ⟶ 96.24 (price-to-maturity)

Sample Problem(s)

Example 6:

A semiannual coupon bond with a 5% coupon rate maturing February 6, 1993 was purchased November 15, 1973 for a price of 99. The bond is callable on February 6, 1980 at a call price of 101. What is the yield-to-call and yield-to-maturity if the 30/360 calendar is used?

Keystrokes: **Outputs:**

Enter program BD-14

11.151973 [A] 2.061980 [B] [D] ⟶ 2241.00 (days settlement to call)

Enter Program BD-15

5 [B] 101 [D] 99 [E] [C] ⟶ 5.33 (% yield-to-call)

Enter program BD-14

2.061993 [B] [D] ⟶ 6921.00 (days settlement to maturity)

Enter program BD-15

5 [B] 99 [E] [C] ⟶ 5.08 (% yield-to-maturity)

Solution(s)

Example 7:

Having just completed the before tax yield-to-maturity calculation in the previous example, the bond purchaser wishes to perform an after tax yield-to-maturity calculation. He is in a 40% income tax bracket and a 25% tax is to be applied to capital gains.

Keystrokes: **Outputs:**

First, calculate and enter the after tax value of the coupon.

5 [ENTER↑] [ENTER↑] .4 [×] [−] [B] ⟶ 3.00 (net after tax coupon)

Now calculate and enter the net after tax proceeds when the bond is redeemed for 100 at maturity.

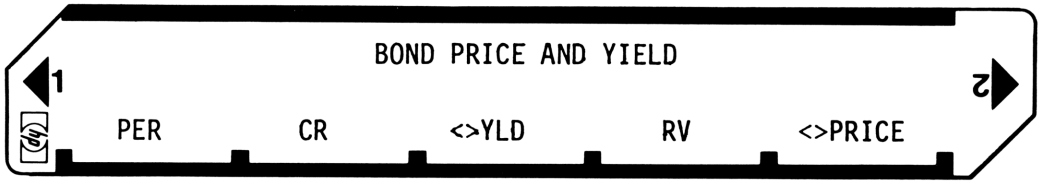
100 [ENTER↑] [ENTER↑] 99 [−] ⟶ 1.00 (capital gain)
.25 [×] ⟶ 0.25 (capital gains tax)
[−] [D] ⟶ 99.75 (net proceeds from bond redemption)

Reference(s)

(The price and remaining coupon periods have been retained from the previous calculation.)

[C] ⟶ 3.06 (% after tax yield)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
	Optional: Use program BD-14			
	to calculate the number of re-			
	maining coupon periods.			
2	Load side 1 and side 2 of the			
	bond program.			
3	Key in:			
	• Number of remaining cou-			
	pon periods (may be omitted			
	if step 1 is performed)	PER	A	PER
	• Annual coupon rate	CR (%)	B	CR (%)
	• Redemption value if other			
	than 100.	RV	D	RV
4	To determine the yield, key in			
	the bond price.	PRICE	E	PRICE
5	Calculate the annual yield.		C	YLD (%)
6	To find the price, key in the			
	annual yield rate.	YLD (%)	C	YLD (%)
7	Calculate the "flat" price.		E	PRICE
8	Optional: Recall the accrued			
	interest		RCL 8	ACC INT
	AND			
	add it to the "flat" price to obtain			
	total bond value as of the			
	settlement date.		+	Bond Value
9	For a new case go to step 1 or 3			
	and change appropriate values.			
	NOTE: When CR is entered,			
	RV is automatically set to 100.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	CF3	16 22 03	
003	CHS	-22	
004	STO0	35 00	-PER→R_0
005	CHS	-22	
006	RTN	24	
007	*LBLB	21 12	
008	EEX	-23	
009	2	02	
010	STO3	35 03	100→R_3
011	R↓	-31	
012	STO1	35 01	CR→R_1
013	RTN	24	
014	*LBLD	21 14	
015	CF3	16 22 03	
016	STO3	35 03	RV→R_3
017	RTN	24	
018	*LBLC	21 13	
019	F3?	16 23 03	
020	GTO5	22 05	YLD→R_2
021	RCL0	36 00	
022	ABS	16 31	
023	1	01	
024	X>Y?	16-34	1>PER?
025	GTO0	22 00	
026	SF2	16 21 02	
027	RCL1	36 01	Calculate initial
028	2	02	guess
029	÷	-24	
030	RCL4	36 04	
031	STO5	35 05	
032	÷	-24	
033	STO6	35 06	
034	*LBL1	21 01	
035	1	01	Calculate f(y)
036	RCL3	36 03	
037	RCL5	36 05	
038	÷	-24	
039	1	01	
040	RCL6	36 06	
041	+	-55	
042	RCL0	36 00	
043	Y^x	31	
044	STO8	35 08	
045	x	-35	
046	-	-45	
047	RCL6	36 06	
048	x	-35	
049	1	01	
050	RCL8	36 08	
051	-	-45	
052	÷	-24	
053	RCL1	36 01	
054	2	02	
055	÷	-24	
056	RCL5	36 05	
057	÷	-24	
058	-	-45	
059	ST-6	35-45 06	
060	ABS	16 31	Has limit been
061	EEX	-23	reached?
062	CHS	-22	
063	6	06	
064	X≤Y?	16-35	
065	GTO1	22 01	
066	F2?	16 23 02	
067	GTO2	22 02	
068	RCL6	36 06	
069	GTO3	22 03	
070	*LBL2	21 02	
071	RCL5	36 05	
072	1	01	Modify price for
073	RCL0	36 00	next set of
074	FRC	16 44	iterations.
075	+	-55	
076	LSTX	16-63	
077	x	-35	
078	4	04	
079	÷	-24	
080	RCL1	36 01	
081	x	-35	
082	RCL6	36 06	
083	x	-35	
084	-	-45	
085	STO5	35 05	
086	GTO1	22 01	
087	*LBL0	21 00	
088	RCL3	36 03	Calculate yield if
089	RCL1	36 01	less than 1 coupon
090	2	02	period remaining
091	÷	-24	
092	+	-55	
093	LSTX	16-63	
094	RCL0	36 00	
095	1	01	
096	+	-55	
097	x	-35	
098	RCL4	36 04	
099	+	-55	
100	÷	-24	
101	1	01	
102	-	-45	
103	RCL0	36 00	
104	CHS	-22	
105	÷	-24	
106	*LBL3	21 03	Display answer if
107	2	02	second time through
108	0	00	
109	0	00	
110	x	-35	
111	STO2	35 02	
112	RTN	24	

REGISTERS

0	1	2	3	4	5	6	7	8	9
-PER	CR	YLD	RV	PRICE	Used	Used	DT_1	Acc. Int.	
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	*LBL5	21 05	
114	STO2	35 02	
115	RTN	24	
116	*LBLE	21 15	
117	F3?	16 23 03	Price→R_4,R_5
118	GTO6	22 06	
119	RCL2	36 02	
120	2	02	
121	0	00	Calculate J
122	0	00	
123	÷	-24	
124	1	01	
125	+	-55	
126	STO5	35 05	
127	1	01	
128	RCL0	36 00	
129	FRC	16 44	
130	+	-55	
131	STO6	35 06	
132	RCL0	36 00	
133	CHS	-22	
134	1	01	Is PER<1?
135	X>Y?	16-34	
136	GTO4	22 04	
137	RCL5	36 05	
138	RCL6	36 06	
139	Y^x	31	
140	RCL5	36 05	Calculate price for
141	RCL0	36 00	long term bonds.
142	Y^x	31	
143	STO5	35 05	
144	-	-45	
145	RCL1	36 01	
146	x	-35	
147	RCL2	36 02	
148	÷	-24	
149	EEX	-23	
150	2	02	
151	x	-35	
152	RCL6	36 06	
153	2	02	
154	÷	-24	
155	RCL1	36 01	
156	x	-35	
157	STO8	35 08	
158	-	-45	
159	RCL5	36 05	
160	RCL3	36 03	
161	x	-35	
162	+	-55	
163	RTN	24	
164	*LBL4	21 04	
165	RCL1	36 01	Calculate price for
166	2	02	short term bonds.
167	÷	-24	
168	RCL3	36 03	
169	+	-55	
170	RCL5	36 05	
171	1	01	
172	-	-45	
173	RCL0	36 00	
174	x	-35	
175	CHS	-22	
176	1	01	
177	+	-55	
178	÷	-24	
179	RCL1	36 01	
180	2	02	
181	÷	-24	
182	RCL6	36 06	
183	x	-35	
184	STO8	35 08	
185	-	-45	
186	RTN	24	
187	*LBL6	21 06	
188	STO4	35 04	
189	STO5	35 05	
190	RTN	24	

STEP	KEY ENTRY	KEY CODE
200		
210		
220		

COMMENTS

LABELS

A PER	B CR	C YLD	D RV	E Price	0
a	b	c	d	e	1
0 Used	1 Used	2 Used	3 Used	4 Used	2 Used
5 Used	6 Used	7	8	9	3 Digit?

FLAGS

SET STATUS

FLAGS		TRIG	DISP
	ON OFF		
0	☐ ☒	DEG ☒	FIX ☒
1	☐ ☒	GRAD ☐	SCI ☐
2	☐ ☒	RAD ☐	ENG ☐
3	☐ ☒		n 2

Program Description I

Program Title DAYS BETWEEN DATES

Contributor's Name HEWLETT-PACKARD COMPANY
Address Corvallis Division
1000 N.E. Circle Boulevard
City Corvallis, OR 97330 **State** **Zip Code**

Program Description, Equations, Variables

This program calculates the number of days between two dates on an actual or 30/360 basis (30 day month, 360 day year). When the actual number of days is desired, the two dates must occur between January 1, 1901 and December 31, 2099. There is no limitation for the 30/360 basis.

The earlier date is keyed in for DT 1 (A), the later date is keyed in for DT 2 (B). The calculation is performed by pressing C for the actual number of days or by pressing D for the number of days on a 30/360 basis. Both input dates are retained, so that only a changed date must be keyed in for a new calculation.

The date format for input is MM.DDYYYY (March 3, 1976 is keyed in as 3.031976). The program does not check input data. Thus, if an improper format or an invalid date (i.e., February 30) is keyed in, erroneous answers will result.

An important feature of this program is that it is designed to be used in conjunction with BOND PRICE AND YIELD (BD-15). When the settlement date is entered for DT 1 and the redemption date (maturity date, call date, etc.) is entered for DT 2, pressing C or D also causes the number of remaining semiannual coupon periods to be stored for use by the bond program. The number of semiannual coupon periods on an actual day basis is determined by subtracting the number of leap days (February 29 of a leap year) from the actual number of days (the displayed value) and dividing this by 182.5 (days per semiannual period). On a 30/360 basis the number of semiannual coupon periods is found by dividing the number of days (displayed value) by 180 days per semiannual period).

In addition, the settlement date is retained throughout the bond calculations. Therefore, on return to this program, it is only necessary to key in a new DT 1 if the settlement date is different.

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

14. Days Between Dates

Actual

$$DAYS = f(DT2) - f(DT1)$$

where

$$f(DT) = 365\,(yyyy) + 31\,(mm - 1) + dd + Int\,(z/4) - x$$

and

for $mm \leq 2$

$$x = 0$$
$$z = (yyyy) - 1$$

for $mm > 2$

$$x = Int\,(.4\,mm + 2.3)$$
$$z = (yyyy)$$
$$Int = \text{Integer portion}$$

Solution(s)

30/360 Basis

$$DAYS = f(DT2) - f(DT1)$$
$$f(DT) = 360\,(yyyy) + 30\,mm + z$$

for f(DT1)

if $dd_1 = 31$ then $z = 30$
if $dd_1 \neq 31$ then $z = dd_1$

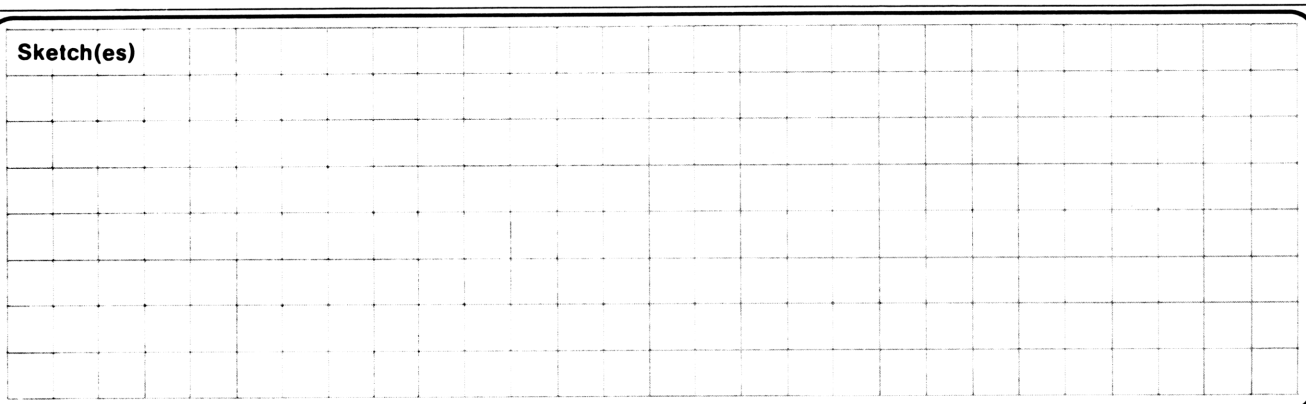
for f (DT2)

if $dd_2 = 31$ and $dd_1 = 30$ or 31 then $z = 30$
if $dd_2 = 31$ and $dd_1 < 30$ then $z = dd_2$
if $dd_2 < 31$ then $z = dd_2$

Reference(s)

Program Description 11

Sketch(es)



Sample Problem(s)

Example 1:

Calculate the actual number of days between June 24, 1974 and December 5, 1985.

Keystrokes: **Outputs:**

6.241974 A 12.051985 B C → 4182.00 (actual)

Example 2:

Having just performed the above calculation, now calculate the actual number of days between June 24, 1974 and March 21, 1990.

Keystrokes: **Outputs:**

3.211990 B C → 5749.00 (actual)

Example 3:

Calculate the number of days, on both an actual and 30/360 basis, between May 1, 1975 and November 1, 1980.

Keystrokes: **Outputs:**

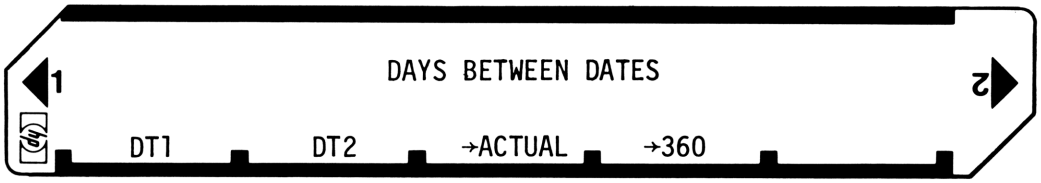
Solution(s)

5.011975 A 11.011980 B C → 2011.00 (actual)

D → 1980.00 (30/360)

Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load side 1 and side 2.			
2	Key in the following:			
	• Earliest date (DT 1)	MM.DDYYYY	A	DT 1
	• Latest date (DT 2)	MM.DDYYYY	B	DT 2
3	Calculate the number of days			
	between the two dates on an			
	"actual" day basis.		C	Actual Days
4	Calculate the number of days			
	between the two dates on a			
	30/360 basis.		D	30/360 Days
5	For a new case, go to step 2			
	and change DT 1 and/or DT 2			
	as appropriate.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO7	35 07	$DT_1 \rightarrow R_7$
003	RTN	24	
004	*LBLB	21 12	
005	STO1	35 01	$DT_2 \rightarrow R_1$
006	RTN	24	
007	*LBLC	21 13	
008	RCL7	36 07	
009	GSBE	23 15	
010	STO2	35 02	
011	LSTX	16-63	Control & storage.
012	STO0	35 00	
013	RCL1	36 01	
014	GSBE	23 15	
015	LSTX	16-63	
016	ST-0	35-45 00	
017	CLX	-51	
018	RCL2	36 02	
019	-	-45	
020	RCL4	36 04	
021	2	02	
022	÷	-24	
023	ST÷0	35-24 00	
024	X⇄Y	-41	
025	RTN	24	
026	*LBLE	21 15	
027	GSB4	23 04	
028	STO6	35 06	
029	3	03	
030	6	06	
031	5	05	
032	STO4	35 04	
033	x	-35	
034	2	02	z=y-1
035	RCL3	36 03	
036	X>Y?	16-34	
037	GTO0	22 00	
038	x	-35	
039	CLX	-51	
040	RCL6	36 06	
041	1	01	
042	-	-45	
043	STO6	35 06	
044	GTO1	22 01	
045	*LBL0	21 00	
046	.	-62	
047	4	04	
048	x	-35	x=INT (.4M+2.3)
049	.	-62	
050	3	03	
051	+	-55	
052	+	-55	
053	INT	16 34	
054	-	-45	
055	RCL6	36 06	
056	*LBL1	21 01	
057	CLX	-51	
058	RCL5	36 05	
059	+	-55	Compute days since 0 AD neglecting 400s and 100s.
060	RCL3	36 03	
061	1	01	
062	-	-45	
063	3	03	
064	1	01	
065	x	-35	
066	+	-55	
067	RCL6	36 06	
068	4	04	
069	÷	-24	
070	INT	16 34	
071	X⇄Y	-41	
072	+	-55	
073	RTN	24	
074	*LBLD	21 14	
075	3	03	
076	0	00	
077	STO2	35 02	Control & storage.
078	RCL7	36 07	
079	GSBe	23 16 15	
080	STO0	35 00	
081	RCL1	36 01	
082	GSBe	23 16 15	
083	RCL0	36 00	
084	-	-45	
085	STO0	35 00	
086	RCL4	36 04	
087	CHS	-22	
088	2	02	
089	÷	-24	
090	ST÷0	35-24 00	
091	R↓	-31	
092	RTN	24	
093	*LBLe	21 16 15	
094	GSB4	23 04	Sum years & months.
095	3	03	
096	6	06	
097	0	00	
098	STO4	35 04	
099	x	-35	
100	RCL3	36 03	
101	3	03	
102	0	00	
103	x	-35	
104	+	-55	
105	RCL5	36 05	
106	3	03	
107	1	01	Are days equal to 31?
108	X=Y?	16-33	
109	GTO2	22 02	
110	R↓	-31	No, add & return.
111	STO2	35 02	
112	+	-55	

REGISTERS

0 PER	1 DT_2	2 Used	3 M	4 365/360	5 D	6 y,z	7 DT_1	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	RTN	24	
114	*LBL2	21 02	
115	R↓	-31	Is register 2 equal
116	R↓	-31	to 30?
117	RCL2	36 02	
118	3	03	
119	0	00	
120	X=Y?	16-33	
121	GTO3	22 03	No, add and return.
122	R↓	-31	
123	CLX	-51	
124	RCL5	36 05	
125	STO2	35 02	
126	+	-55	
127	RTN	24	
128	*LBL3	21 03	
129	R↓	-31	31→30 add & return
130	STO2	35 02	
131	+	-55	
132	RTN	24	
133	*LBL4	21 04	
134	ENT↑	-21	
135	INT	16 34	Break up year.
136	STO3	35 03	
137	-	-45	
138	EEX	-23	
139	2	02	
140	x	-35	
141	ENT↑	-21	
142	INT	16 34	
143	STO5	35 05	
144	-	-45	
145	EEX	-23	
146	4	04	
147	x	-35	
148	RTN	24	
149	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A DT_1	B DT_2	C days actual	D days 360	E Used
a	b	c	d	e Used
0 Used	1 Used	2 Used	3 Used	4 Used
5	6	7	8	9 Used

FLAGS

0
1
2
3

SET STATUS

FLAGS		TRIG		DISP	
	ON OFF				
0	☐ ☒	DEG	☒	FIX	☒
1	☐ ☒	GRAD	☐	SCI	☐
2	☐ ☒	RAD	☐	ENG	☐
3	☐ ☒			n 2	

Program Description I

Program Title Bond Yield to Maturity

Contributor's Name Ralston W. Barnard

Address 2811 Ridgecrest Drive S.E.

City Albuquerque **State** New Mexico **Zip Code** 87108

Program Description, Equations, Variables This program calculates yield to maturity, current yield, and accrued interest for semiannual coupon bonds using the 360 day calendar. Inputs are settlement date, maturity date, annual coupon, and price. All time periods, from less than 6 months to 99+ years, are valid.

Dates are entered in the format MM.DDYY, bond coupons in percent, and bond prices as percents of par (100), i.e., a bond selling for $950.00 is entered as 95. Accrued interest is in dollars, cents and tenths to ensure accurate determinations for multiple bond transactions.

Equations used are: for a bond with more than 6 mos. to maturity,

$$\text{price} = \left\{100/(1+i)^{N} + (C/2i)\left[(1+i)^{i}-(1+i)^{-N}\right] - (C/2i)\right\}$$

, where i = interest rate, C = Coupon, N - Number of semiannual periods from settlement date to maturity date, i = 1 - frac (N)

The secant method is used to solve for i. The yield to maturity, expressed as an annual percent, is given by Y-200i.

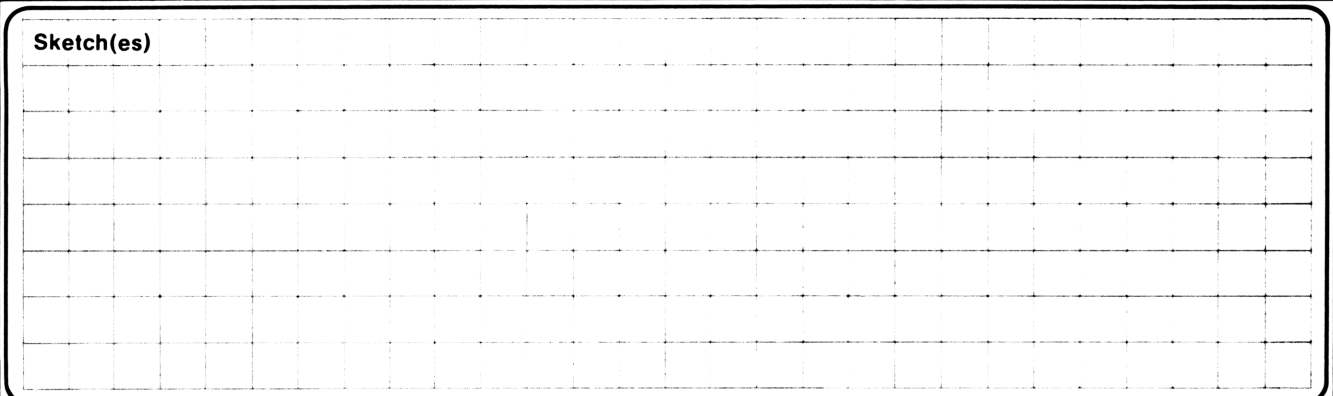
For a bond with less than 6 months to maturity, $i=\left\{(100+C/2)/(\text{price}-c/2j)-1\right\}\frac{1}{N}$.

Current yield = C/price x 100. Accured interest - c/2 j x 10.

Operating Limits and Warnings Program will not correctly determine time periods for maturity dates more than 100 years away. If greater accuracy is desired, change step 97 from DSP 3 to DSP 4. This will increase the time to calculate YTM, however.

Program Description 11

Sketch(es)



Sample Problem(s) 1. For a settlement date of February 10, 1977, which of the following bonds provides a greater yield to maturity?

5's, due 6/1/1987 priced at 80 or

8.75's, due 5/15/1989 priced at 108.

What are the accrued interested values for each?

2. For a settlement date of May 6, 1977, what are the YTMs and CYs for the first bond listed above, if its prices are 75, 82, 87.024?

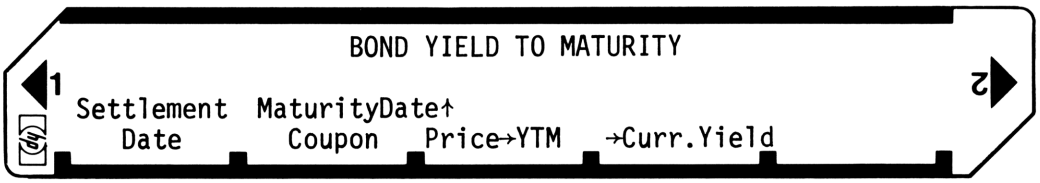
Solution(s) 1) Keystrokes

2.1077 [A] ---------->	100.000
6.0187 [ENT] 5[B]------>	9.583 (Accrued Int)
80 [C] ---------->	7.866 (Yield to Maturity)*
[D] ---------->	6.250 (Current Yield)
5.1589 [ENT] 8.75 [B]-->	20.660 (Accrued Int.)
108 [C] ---------->	7.726 (Yield to Mat.)
[D] ---------->	8.102 (Current Yield)

2) 3.0677 [A] ---> 100.000, 6.0187 [ENT] 5[B] ---> 13.194, 75 [C] -----> 8.744, [D] ---> 6.667, 82 [C] ---> 7.555, [D] ---> 6.098, 87.024 [C] ---> 6.777, [D] ---> 5.746

Reference(s) Homer, Sidney, and Martin Lebowitz, "Inside the Yield Book", Appendix A, Prentice-Hall, 1972.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Load side 1 and side 2			0.000
2.	Enter settlement date	MM.DDYY	A	100.000
3.	Enter maturity date, coupon (%)	MM.DDYY	ENTER	Accrued
		Coupon	B	Interest
4.	Enter price (% of par-100)	Price	C	YTM (%)
5.	To calculate current yield		D	C.Y. (%)
6.	To calculate a new TYM for the same bond at a different price	Price	C	YTM
			D	.Y.
7.	To evaluate a new bond for the same settlement date, repeat steps 3,4, and 5			
8.	For a new settlement date, repeat steps 2,3,4, and 5			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Stores settlement Date
002	CLRG	16-53	
003	GSB0	23 00	M1
004	GSB0	23 00	D1
005	STO2	35 02	Y1
006	EEX	-23	
007	2	02	
008	STOD	35 14	
009	RTN	24	
010	*LBLB	21 12	Stores Mat Date, Coupon, Calculates N
011	STO6	35 06	
012	CF0	16 22 00	
013	3	03	
014	STOI	35 46	
015	R↓	-31	
016	X≠Y	-41	
017	GSB0	23 00	M2
018	GSB0	23 00	D2
019	STO5	35 05	Y2
020	RCL3	36 03	
021	RCL0	36 00	
022	-	-45	ΔM
023	RCL4	36 04	
024	RCL1	36 01	
025	-	-45	ΔD
026	X<0?	16-45	
027	GSB1	23 01	
028	X≠Y	-41	
029	X<0?	16-45	
030	GSB2	23 02	
031	3	03	
032	0	00	
033	×	-35	
034	+	-55	
035	1	01	
036	8	08	
037	0	00	
038	÷	-24	
039	RCL5	36 05	
040	RCL2	36 02	
041	-	-45	ΔY
042	X<0?	16-45	
043	GSB3	23 03	
044	2	02	
045	×	-35	
046	+	-55	
047	STO5	35 05	N
048	1	01	
049	X≠Y	-41	
050	X≤Y?	16-35	N ≤ 6 mo?
051	SF0	16 21 00	
052	FRC	16 44	
053	-	-45	
054	STO8	35 08	
055	2	02	
056	÷	-24	

STEP	KEY ENTRY	KEY CODE	COMMENTS
057	RCL6	36 06	
058	×	-35	
059	STOE	35 15	
060	1	01	
061	0	00	
062	×	-35	
063	RTN	24	
064	*LBL0	21 00	
065	ENT↑	-21	
066	INT	16 34	
067	STOi	35 45	
068	-	-45	
069	EEX	-23	
070	2	02	
071	×	-35	
072	ISZI	16 26 46	
073	RTN	24	
074	*LBL1	21 01	
075	3	03	
076	0	00	
077	+	-55	
078	X≠Y	-41	
079	1	01	
080	-	-45	
081	X≠Y	-41	
082	RTN	24	
083	*LBL2	21 02	
084	1	01	
085	2	02	
086	+	-55	
087	1	01	
088	ST-5	35-45 05	
089	R↓	-31	
090	RTN	24	
091	*LBL3	21 03	
092	RCLD	36 14	
093	+	-55	
094	RTN	24	
095	*LBLC	21 13	
096	FIX	-11	
097	DSP3	-63 03	
098	STO7	35 07	
099	RCLD	36 14	
100	F0?	16 23 00	
101	GTO4	22 04	
102	-	-45	
103	CHS	-22	
104	RCL6	36 06	
105	RCL5	36 05	
106	×	-35	
107	+	-55	
108	RCLD	36 14	
109	RCL7	36 07	
110	+	-55	
111	RCL5	36 05	
112	×	-35	

REGISTERS

0	1	2	3	4	5	6	7	8	9
M1	D1	Y1	Used,i	Used	Used,N	Coupon	Price	j	Used
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
Used	Used	Used	100	Coupon/2 j	Control

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	÷	-24	
114	GSB8	23 08	Initial guess for i
115	RCLC	36 13	
116	GTO7	22 07	
117	*LBL6	21 06	
118	RCL3	36 03	
119	GSB9	23 09	
120	STOC	35 13	
121	*LBL7	21 07	Iteration
122	RCL9	36 09	(secant method
123	RCL3	36 03	of root finding)
124	STO9	35 09	
125	-	-45	
126	RCLA	36 11	
127	RCLC	36 13	
128	STOA	35 11	
129	-	-45	
130	÷	-24	
131	x	-35	
132	ST-3	35-45 03	
133	RCL3	36 03	
134	÷	-24	
135	RND	16 24	
136	X≠0?	16-42	
137	GTO6	22 06	
138	RCL3	36 03	
139	GTO5	22 05	
140	*LBL8	21 08	Calculates
141	RCLD	36 14	
142	1/X	52	i ± Δ i/2
143	%	55	
144	STOB	35 12	
145	2	02	
146	÷	-24	
147	-	-45	
148	STO9	35 09	
149	STO3	35 03	
150	GSB9	23 09	
151	STOA	35 11	
152	RCL9	36 09	
153	RCLB	36 12	
154	+	-55	
155	STO3	35 03	
156	GSB9	23 09	
157	STOC	35 13	
158	RTN	24	
159	*LBL9	21 09	Evaluates
160	STO3	35 03	Price -
161	1	01	
162	+	-55	
163	STO4	35 04	
164	RCL5	36 05	
165	Y^x	31	
166	1/X	52	
167	RCL4	36 04	
168	RCL8	36 08	
169	Y^x	31	
170	X⇄Y	-41	
171	STO4	35 04	
172	-	-45	
173	RCL6	36 06	
174	2	02	
175	÷	-24	
176	RCL3	36 03	
177	÷	-24	
178	x	-35	
179	RCLE	36 15	
180	-	-45	
181	RCLD	36 14	
182	RCL4	36 04	
183	x	-35	
184	+	-55	
185	RCL7	36 07	
186	X⇄Y	-41	
187	-	-45	
188	RTN	24	
189	*LBL5	21 05	Calculates YTM
190	RCLD	36 14	from i
191	x	-35	
192	2	02	
193	x	-35	
194	RTN	24	
195	*LBL4	21 04	Calculates i for
196	RCL6	36 06	M ≤ 6 mos
197	2	02	
198	÷	-24	
199	+	-55	
200	X⇄Y	-41	
201	RCLE	36 15	
202	+	-55	
203	÷	-24	
204	1	01	
205	-	-45	
206	RCL5	36 05	
207	÷	-24	
208	GTO5	22 05	
209	*LBLD	21 14	Calculates current
210	RCL6	36 06	yield
211	RCL7	36 07	
212	÷	-24	
213	RCLD	36 14	
214	x	-35	
215	DSP2	-63 02	
216	RTN	24	
217	R/S	51	
220			

LABELS

A Sett. date	B Mat,Dt.,Coup	C Price	D →Curr.Yld	E	0 N ≤ 6 mos
a	b	c	d	e	1
0 Stores dates	1 N Cal	2 N Cal	3 N Cal	4 i,N≤6Mo	2
5 i → YTM	6 Iterate	7 Secant	8 Δ i Cal	9 f(i) Cal	3

FLAGS

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☒	FIX ☒
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n 3

Program Description I

Program Title INTEREST AT MATURITY/DISCOUNTED SECURITIES

Contributor's Name HEWLETT-PACKARD COMPANY
Address Corvallis Division
1000 N.E. Circle Boulevard
City Corvallis, OR 97330 **State** **Zip Code**

Program Description, Equations, Variables

The first part of this program calculates the price or yield of interest at maturity securities. The necessary inputs are the days from issue to maturity (DIM), the days from settlement to maturity (DSM), the calendar basis (360 or 365), the coupon rate (CR), and either the price (to calculate yield) or the yield (to calculate price).

The second part of the program calculates the price or yield of discounted securities such as U.S. Treasury Bills. The required inputs are the number of days from settlement to maturity and one of the following: discount rate (to calculate price and/or yield), yield (to calculate price) or price (to calculate yield).

Operating Limits and Warnings

Program Description 11

Sketch(es)

Sample Problem(s)

16. Interest at Maturity/Discounted Securities

Price (given yield) =

$$\frac{\left(\frac{DIM}{B} \times \frac{CR}{100} + 1\right)}{\left(\frac{DSM}{B} \times \frac{YLD}{100} + 1\right)} - \left(\frac{DIM - DSM}{B} \times \frac{CR}{100}\right)$$

Yield (given price) =

$$\left[\frac{\left(\frac{DIM}{B} \times CR + 100\right)}{\frac{DIM - DSM}{B} \times CR + PRICE} - 1\right]\left(\frac{B}{DSM}\right)(100)$$

$$\text{Price (given yield)} = \frac{100}{1 + \frac{YLD}{100} \times \frac{DSM}{360}}$$

Solution(s)

$$\text{YLD (given price)} = \left(\frac{100 - PRICE}{PRICE} \times \frac{360}{DSM}\right) \times 100$$

$$\text{Price (given discount rate)} = 100 - \left(\frac{DR \times DSM}{360}\right)$$

Reference(s)

Program Description 11

Sketch(es)

Sample Problem(s)

Example 1:

Find the yield of the following interest at maturity security:

DIM = 220
DSM = 117
Basis = 360
CR = 5%
Price = 99.531250

Keystrokes: **Outputs:**

220 ENTER↑ 117 A
360 B 5 C
99.531250 E D ——→ 6.38 (% yield)

Example 2:

Having just performed the above calculation, what is the price of this interest at maturity security to give a yield of 7%?

Keystrokes: **Output:**

7 D E ——→ 99.33 (price)

Solution(s)

Example 3:

Given the number of days from settlement to maturity and the discount rate of the following security, find the price and yield.

DSM = 81
DR = 5.60

Keystrokes: **Outputs:**

81 f A 5.6 f B
f E ——→ 98.74 (price)
f D ——→ 5.67 (% yield)

Example 4:

Find the yield of the following discounted security:

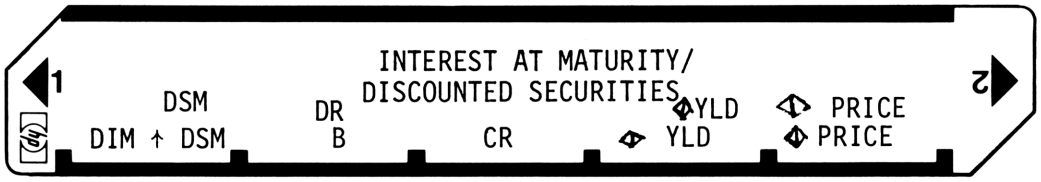
DSM = 307
Price = 96.27

Keystrokes: **Outputs:**

307 f A 96.27 f E
f D ——→ 4.54 (% yield)

Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Load side 1 and side 2			
	Interest at Maturity			
2	Enter the following:			
	• Days issue to maturity	DIM	ENTER↑	DIM
	• Days settlement to maturity	DSM	A	DSM
	• Basis (360 or 365)	BASIS	B	BASIS
	• Coupon rate (as a percent)	CR (%)	C	CR (%)
3	Enter one of the following:			
	• Yield (%)	YLD (%)	D	YLD (%)
	• Price	PRICE	E	PRICE
4	Calculate remaining variable		D	YLD (%)
			E	PRICE
	Discounted Securities			
5	Key in days settlement to			
	maturity	DSM	f A	DSM
6	Input one of the following:			
	• Discount rate	DR	f B	DR
	• Yield (as a %)	YLD (%)	f D	YLD (%)
	• Price	PRICE	E	PRICE
7	Calculate either or both		D	YLD (%)
			E	PRICE

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STOA	35 11	DSM→R_A
003	X≷Y	-41	
004	STO9	35 09	DIM→R_9
005	X≷Y	-41	
006	RTN	24	
007	*LBLB	21 12	----------
008	STOB	35 12	Basis→R_B
009	EEX	-23	
010	2	02	100→R_8
011	STO8	35 08	
012	X≷Y	-41	
013	RTN	24	
014	*LBLC	21 13	----------
015	STOC	35 13	CR→R_C
016	RTN	24	
017	*LBLD	21 14	----------
018	STOD	35 14	
019	F3?	16 23 03	YLD→R_D
020	RTN	24	
021	RCL9	36 09	----------
022	RCLB	36 12	Calc. Yield
023	÷	-24	
024	RCLC	36 13	
025	x	-35	
026	RCL8	36 08	
027	+	-55	
028	RCL9	36 09	
029	RCLA	36 11	
030	-	-45	
031	RCLB	36 12	
032	÷	-24	
033	RCLC	36 13	
034	x	-35	
035	RCLE	36 15	
036	+	-55	
037	÷	-24	
038	1	01	
039	-	-45	
040	RCLB	36 12	
041	x	-35	
042	RCLA	36 11	
043	÷	-24	
044	RCL8	36 08	
045	x	-35	
046	STOD	35 14	Store yield in R_D.
047	RTN	24	----------
048	*LBLE	21 15	
049	STOE	35 15	
050	F3?	16 23 03	Price→R_E
051	RTN	24	----------
052	RCL9	36 09	
053	RCLB	36 12	Calc. price
054	÷	-24	
055	RCLC	36 13	
056	x	-35	
057	RCL8	36 08	
058	÷	-24	
059	1	01	
060	+	-55	
061	RCLA	36 11	
062	RCLB	36 12	
063	÷	-24	
064	RCLD	36 14	
065	x	-35	
066	RCL8	36 08	
067	÷	-24	
068	1	01	
069	+	-55	
070	÷	-24	
071	RCL9	36 09	
072	RCLA	36 11	
073	-	-45	
074	RCLB	36 12	
075	÷	-24	
076	RCLC	36 13	
077	x	-35	
078	RCL8	36 08	
079	÷	-24	
080	-	-45	
081	EEX	-23	
082	2	02	Store price in R_E.
083	x	-35	
084	STOE	35 15	
085	RTN	24	----------
086	*LBLa	21 16 11	DSM→R_A
087	STOA	35 11	
088	CF1	16 22 01	
089	RTN	24	----------
090	*LBLb	21 16 12	
091	SF1	16 21 01	
092	STOI	35 46	
093	RCLA	36 11	Calc. price given DR
094	x	-35	
095	3	03	
096	6	06	
097	0	00	
098	÷	-24	
099	EEX	-23	
100	2	02	
101	X≷Y	-41	
102	-	-45	
103	STO7	35 07	
104	GSBc	23 16 13	
105	RCLI	36 46	
106	RTN	24	----------
107	*LBLc	21 16 13	Calc. yield given price
108	EEX	-23	
109	2	02	
110	X≷Y	-41	
111	-	-45	
112	LSTX	16-63	

REGISTERS

0	1	2	3	4	5	6	7 Used	8 100	9 DIM
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A DSM	B 360/365	C CR(%)	D YLD	E PRICE	I DISC RATE				

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	÷	-24	
114	RCLA	36 11	
115	÷	-24	
116	3	03	
117	.	-62	
118	6	06	
119	EEX	-23	
120	4	04	
121	x	-35	
122	STOD	35 14	
123	RTN	24	
124	*LBLd	21 16 14	
125	F1?	16 23 01	
126	GTO2	22 02	
127	STOD	35 14	
128	F3?	16 23 03	
129	RTN	24	
130	RCLE	36 15	
131	GSBc	23 16 13	
132	RTN	24	----------
133	*LBLe	21 16 15	
134	STOE	35 15	
135	F1?	16 23 01	
136	GTO1	22 01	
137	F3?	16 23 03	Calc. price given
138	RTN	24	yield
139	1	01	
140	RCLD	36 14	
141	EEX	-23	
142	2	02	
143	÷	-24	
144	RCLA	36 11	
145	x	-35	
146	3	03	
147	6	06	
148	0	00	
149	÷	-24	
150	+	-55	
151	EEX	-23	
152	2	02	
153	X≷Y	-41	
154	÷	-24	
155	STOE	35 15	
156	RTN	24	
157	*LBL1	21 01	
158	RCL7	36 07	
159	STOE	35 15	
160	RTN	24	
161	*LBL2	21 02	
162	RCLD	36 14	
163	RTN	24	
164	R/S	51	

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS					FLAGS
A DIM/DSM	B Basis	C CR	D YLD	E PRICE	0
a DSM	b DR	c Used	d YLD	e PRICE	1 DR
0	1	2	3	4	2
5	6	7	8	9	3 Digit?

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

Program Description I

Program Title U.S. Treasury Bill Valuation

Contributor's Name Howard B. Kutner, CPA
Address 370 Lexington Avenue - Rm 909
City New York **State** New York **Zip Code** 10017

Program Description, Equations, Variables

Calculates price per $100 and dollar value of U.S. Treasury Bills using as input
a) Face Amount b) Quote date C) Maturity date
d) Quotation - as a percentage yield - bid and ask

As a subroutine the program also calculates actual days between and/or day of the year for any date.

Program determines value based on mean between bid and ask quotes. To find value based on either bid or ask enter that quotation for both bid and ask

$$\text{Price per \$100} = 100 - \left(\frac{\text{bid task}}{2}\right)\left(\frac{\text{days to maturity}}{360}\right)$$

$$\text{Day of Year} = 31\,(\text{mo}-1) + (\text{day of mo}) - \text{INT}\,[0.4(\text{mo.}) + 2.3]$$

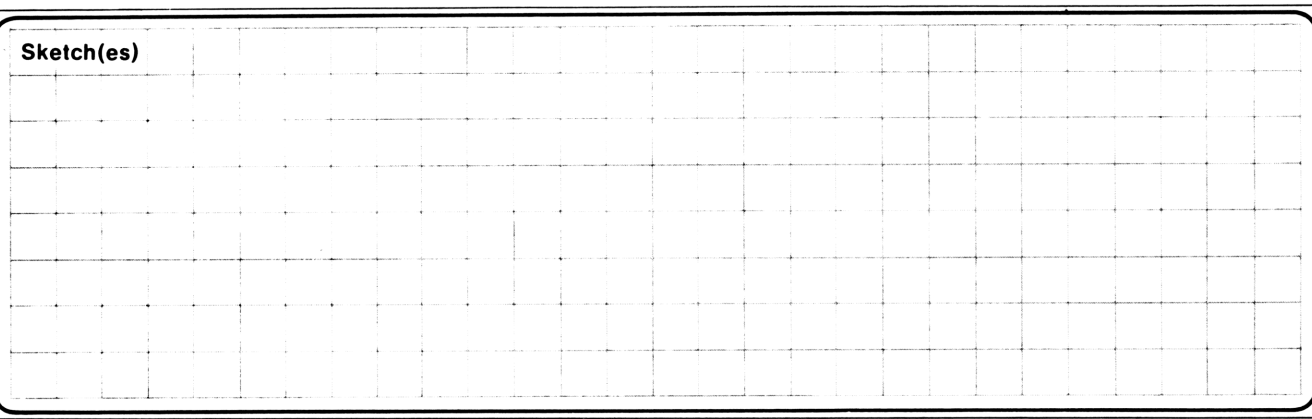
For Jan + Feb last term is ignored

Operating Limits and Warnings No provision is made for leap years. To compensate it is only necessary to advance maturity date by one day before entering it when the time span includes Feb 29.

Although the year is not entered as part of the date the program recognizes when a time period spans Jan 1 and determines actual period.
Program limits days to maturity to a maximum of 360 in accordance with standard practice.

Program Description 11

Sketch(es)



Sample Problem(s)

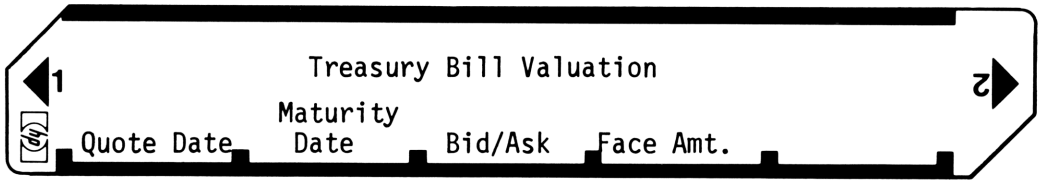
	Face Amt	Due	Bid	Ask	Quotation Date
a)	100,000	5/15	5.75	5.5	2/10
b)	50,000	3/20	5.5	5.25	11/15
c)	70,000	1/15	5.25	5.0	12/10

Solution(s)

	Day of the Year		Days Between Dates	Price per	Total
	Quote Date	Due Date		$100	Value
a)	41	135	94	98.53	$98,531.25
b)	319	79	125	98.13	$49,066.84
c)	344	15	36	99.49	$69,641.25

Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1.	Enter Program			
2.	Enter Quotation date	mm.dd	A	
	Note: Step 2 may be omitted if quotation date is 12.31			
3.	Enter Maturity date (note below)	mm.dd	B	Days to Maturity
4.	Enter Quotation (Discount Basis)			
	a) Bid	X.XX%	C	
	b) Ask	X.XX%	C	$price per 100
	Note: Above procedure determines price using mean between bid and ask quotes- For price based on either bid or ask quote enter the quote and press key C twice			
5.	Enter Face Amount		D	Market Value
	Note: No provision is made for leap years if time period spans Feb. 29, simply increase maturity date by one day.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Quote date day of year
002	GSBe	23 16 15	
003	STO1	35 01	
004	RTN	24	
005	*LBLB	21 12	Maturity date day of year
006	GSBe	23 16 15	
007	RCL1	36 01	
008	-	-45	days between dates
009	0	00	
010	STO1	35 01	
011	X≤Y?	16-35	if days between dates is negative, life spans year-end
012	GTO3	22 03	
013	CLX	-51	clear zero and add 365 To get True days between dates
014	3	03	
015	6	06	
016	5	05	
017	+	-55	
018	ENT↑	-21	
019	*LBL3	21 03	
020	CLX	-51	
021	3	03	
022	6	06	
023	0	00	
024	X>Y?	16-34	if days between dates is less than 360 display days - else display 360
025	R↓	-31	
026	RTN	24	
027	*LBLe	21 16 15	
028	ENT↑	-21	
029	INT	16 34	
030	STO2	35 02	store month
031	-	-45	
032	EEX	-23	
033	2	02	
034	x	-35	
035	STO3	35 03	store days of month
036	2	02	
037	RCL2	36 02	if month is later than Feb go to adjust routine
038	X>Y?	16-34	
039	GTO1	22 01	
040	0	00	clear and lift register
041	GTO2	22 02	
042	*LBL1	21 01	Adjust routine for months later than Feb
043	.	-62	
044	4	04	
045	x	-35	
046	.	-62	
047	3	03	
048	+	-55	
049	+	-55	
050	INT	16 34	
051	CHS	-22	
052	*LBL2	21 02	Determine Day of year
053	RCL3	36 03	
054	+	-55	
055	RCL2	36 02	
056	1	01	
057	-	-45	
058	3	03	
059	1	01	
060	x	-35	
061	+	-55	
062	RTN	24	
063	*LBLC	21 13	enter quotes and determine mean
064	R/S	51	
065	*LBLC	21 13	
066	+	-55	
067	2	02	
068	÷	-24	
069	x	-35	Determine equivalent price
070	3	03	
071	6	06	
072	0	00	
073	÷	-24	
074	EEX	-23	
075	2	02	
076	-	-45	
077	CHS	-22	
078	RTN	24	
079	*LBLD	21 14	recover 100 convert to decimal obtain value
080	LSTX	16-63	
081	÷	-24	
082	x	-35	
083	RTN	24	

090

100

110

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☒	DEG	☒	FIX	☒
1	☐	☒	GRAD	☐	SCI	☐
2	☐	☒	RAD	☐	ENG	☐
3	☐	☒			n	✓

REGISTERS

0	1 Quote day of year	2 MONTH	3 Day	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Convertible Security Analysis

Contributor's Name Hewlett-Packard
Address 1000 Circle Blvd.
City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

Given a convertible security (bond or preferred stock) Price (Pb), coupon or dividend rate (i) and the underlying common stock's price (Pc), annual dividend (D) and shares per convertible (C), computes:

Indicated Convertible Price = (C) (Pc)

Anticipated Stock Price = Pb/C

Conversion Parity Price (Bonds only) = 1000/C

Conversion Premium Percentage = $\frac{Pb - ((C)\ (Pc))}{Pb}$

Current Convertible Yield = i/Pb

Incremental Payout Return = $\frac{(C)\ (D) - (i)\ (Pb)}{Pb - ((C)\ (Pc)}$

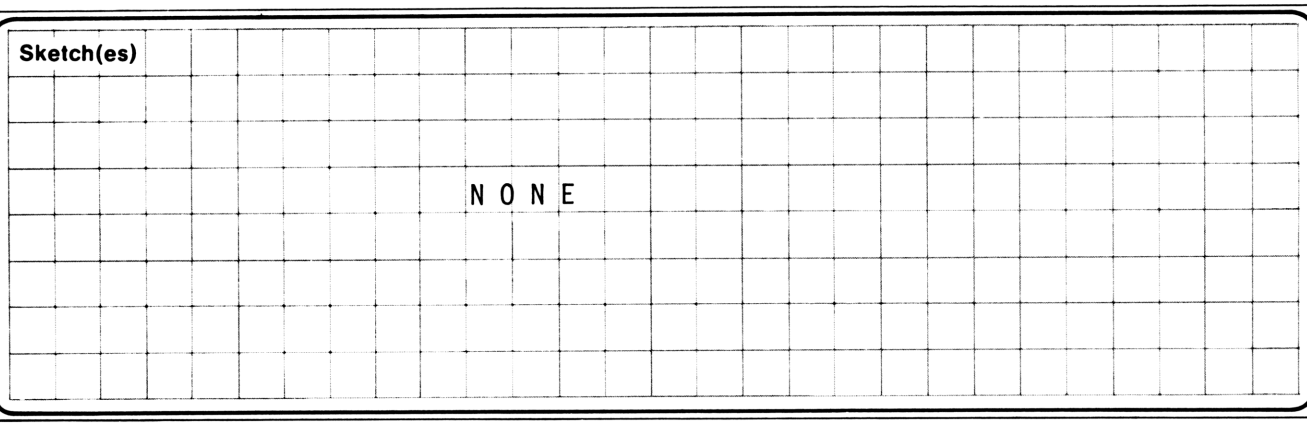
Operating Limits and Warnings

Convertible must pay interest or dividend.

Program assumes all bonds are $1000 units.

Program Description II

Sketch(es)



Sample Problem(s)

I. Bond Price = 50; Coupon Rate = 4.5%
Stock Price= 20; Annual Dividend = $1.00
Shares per Bond = 20

II. Preferred Stock Price - 60 3/8; Dividend = $5.25
Common Stock = 28 1/2; Annual Dividend = $0.00
Shares Per Bond = 2.03

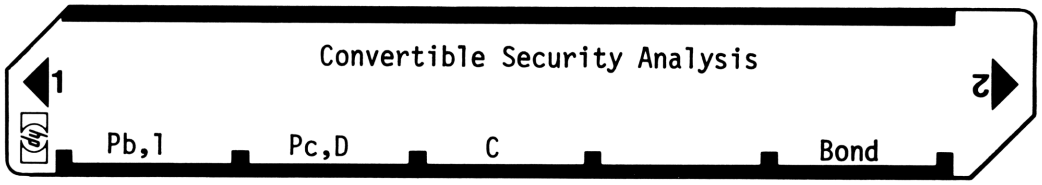
Solution(s)

I. E 50 A 4.5 R/S 20 B 1 R/S 20 C 40.00 Ind. Conv. Price
R/S 25.00 R/S 50.00 R/S 20.00 R/S 9.00 R/S 25
Antic. Stk.P. Conv. Pr. Conv. Prem. Curr. Yld. Incr. Payout
R/S 0.00
Ready for next case, hit E if another bond.

II.
60.375 A 5.25 R/S 28.5 B 0 R/S 2.03 C 57.86 Antic. Conv. Price
R/S 29.74 R/S 4.17 R/S 8.70 R/S 208.33 R/S 0.00
Antic. Com.Pr. Cnv. Prem. Curr. Yld. Incr. Payout Ready for next

Reference(s) This program is a one for one translation of the 65 user contributed program #1399 written by Morris A. Nunes.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Enter Program			
1a	If a bond		E	0.00
2	Enter convertible price	Pb	A	Pb
3	Enter coupon/dividend	i	R/S	i
4	Enter com price	Pc	B	Pc
5	Enter annu. dividend	D	R/S	D
6	Enter shs/conversion	C	C	Indic.Convert Price
7	Compute Antic. Com stock price		R/S	$xx.yy
7a	Compute conversion parity price (bond)		R/S	$xx.yy
8	Compute conversion Premium %		R/S	$xx.yy
9	Compute current yield		R/S	$xx.yy
10	Compute Incremental payout return		R/S	$xx.yy
11	Clear and set for preferred stock		R/S	0.00
	For new case go to step 1a or 2.			

LABELS					FLAGS	SET STATUS		
A Pb,i	B Pc,D	C C	D Subroute	E Bond	0	FLAGS	TRIG	DISP
a	b	c	d	e	1 Bond	ON OFF 0 ☐ ☐ 1 ☐ ☐ 2 ☐ ☐ 3 ☐ ☐	DEG ☐ GRAD ☐ RAD ☐	FIX ☐ SCI ☐ ENG ☐ n ____
0	1	2	3 Skip par	4	2			
5	6	7	8	9	3			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Enter Pb
002	ENT↑	-21	
003	ENT↑	-21	
004	F1?	16 23 01	If bond, mult.by 10
005	GSB6	23 06	to reflect $ value
006	STO1	35 01	
007	R↓	-31	Display Ph
008	R/S	51	Enter i
009	ENT↑	-21	
010	ENT↑	-21	
011	F1?	16 23 01	If bond, mult. by 10
012	GSB6	23 06	to reflect $ value
013	STO2	35 02	
014	R↓	-31	Display i
015	RTN	24	
016	*LBLB	21 12	Enter Pc
017	STO3	35 03	
018	R/S	51	
019	STO4	35 04	Enter D
020	RTN	24	
021	*LBLC	21 13	Enter shs/convert
022	STO5	35 05	
023	RCL3	36 03	Calculate indicate
024	x	-35	convertible price &
025	STO6	35 06	save
026	F1?	16 23 01	If bond,10÷ for
027	GSB7	23 07	Market price
028	R/S	51	Display/go
029	RCL1	36 01	Calculate anticipat-
030	RCL5	36 05	ed common stock price
031	÷	-24	Display/go
032	R/S	51	
033	F1?	16 23 01	Test for Pfd. Stk.
034	GSB8	23 08	If so skip
035	R/S	51	
036	*LBL3	21 03	
037	RCL1	36 01	
038	RCL6	36 06	Calculate conversion
039	-	-45	premium percentage
040	RCL1	36 01	and display as a
041	÷	-24	percentage
042	1	01	
043	0	00	
044	0	00	
045	x	-35	
046	R/S	51	
047	RCL2	36 02	
048	RCL1	36 01	Calculate current
049	÷	-24	convertible yield
050	1	01	and display as a
051	0	00	percentage
052	0	00	
053	x	-35	
054	R/S	51	
055	RCL2	36 02	
056	RCL4	36 04	Calculate incre-
057	RCL5	36 05	mental payout re-
058	x	-35	turn and display
059	-	-45	as a percentage
060	RCL1	36 01	
061	RCL6	36 06	
062	-	-45	
063	÷	-24	
064	1	01	
065	0	00	
066	0	00	
067	x	-35	
068	R/S	51	
069	CF1	16 22 01	Set program for
070	CLX	-51	preferred stock
071	ENT↑	-21	clear stack to
072	ENT↑	-21	show ready for next
073	ENT↑	-21	case
074	RTN	24	
075	*LBLE	21 15	Set program for an-
076	SF1	16 21 01	alysis of a bond
077	RTN	24	case
078	*LBL6	21 06	Produce the number
079	1	01	10 here, to be
080	0	00	called as needed
081	x	-35	to save prog. steps
082	RTN	24	
083	*LBL7	21 07	
084	1	01	
085	0	00	
086	÷	-24	
087	RTN	24	
088	*LBL8	21 08	
089	1	01	
090	EEX	-23	Produce $1000 par
091	3	03	value and calculate
092	RCL5	36 05	conversion parity
093	÷	-24	principle
094	RTN	24	
095	R/S	51	

100

110

REGISTERS

0	1 Pb	2 i	3 Pc	4 D	5 C	6 Indic. conv Price	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

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