

# 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.

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# Program Description I

**Program Title** Stock Portfolio Valuation

**Contributor's Name** Hewlett-Packard

**Address** 1000 NE Circle Blvd

**City** Corvallis

**State**

OR

**Zip Code**

97330

**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 repetitive 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).

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# Program Description II

## 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).

Then:

Prompt	Input	Output	Input
	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]*

Reference(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	

\* Only necessary if print option not exercised.

# User Instructions

3



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	
2.	Load side 1 and 2 of program		P>S	
3.	Load 1st data card		CL REG	
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

(Price + Dividends R/S)

1

### Initial

## Totals

Print

2

# 97 Program Listing I

5

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA			057	PSE		
002	DSP2			058	F3?		
003	1			059	GTOA		
004	STOI			060	GTOc		
005	*LBL1		Recall ith	061	*LBLB		Continue prompting
006	RCLI		historical stock	062	RCLA		with i+18 & loading
007	X=0?		data & check for a	063	GSB5		
008	GT07		deleted stock	064	RCLB		Original portfolio
009	INT			065	GSB5		value
010	STOE			066	%CH		
011	LSTX		Unpack data store	067	GSB5		New portfolio value
012	FRC		# of shares in E,	068	DSP2		
013	EEX		calculate and	069	RCLC		
014	3		store original	070	GSB5		Change in value
015	x		stock value in D,	071	LSTX		
016	x		and accumulate	072	=		Total yearly
017	STOD		original portfolio	073	1		dividend
018	RCLA		value in A	074	0		
019	+			075	0		Total dividend
020	STOA			076	x		yield as a % of
021	RCLI			077	GSB5		current value
022	RCL0		Prompt for current	078	P±S		
023	+		input	079	RCL9		
024	F0?			080	P±S		
025	PRTX			081	DSP6		Date portfolio
026	R/S			082	GSB5		Created
027	RCLE			083	DSP2		
028	x		Accumulate total	084	R/S		
029	RCLC		dividend in C	085	*LBL4		
030	+			086	F0?		
031	STOC			087	GT04		
032	R↓			088	SF0		
033	GSB*			089	1		Print/no print
034	RCLE		Normalize price	090	RTN		flag set
035	x			091	*LBL4		
036	RCLB			092	0		
037	X≠Y		Accumulate current	093	CF0		
038	+		value in B	094	RTN		
039	STOB			095	*LBL5		
040	LSTX			096	F0?		
041	RCLD		Calculate and	097	GT06		
042	X≠Y		display % change	098	R/S		
043	%CH		in ith stocks value	099	RTN		
044	GSB5			100	*LBL6		Print or no
045	*LBL2		print option	101	PRTX		print decision
046	IS2I			102	SPC		
047	1		Check for end of	103	RTN		
048	8		registers. If	104	R/S		
049	RCLI		less than 18	105	*LBL7		
050	X≤Y?		continue else:	106	RCLI		
051	GT01			107	RCL0		
052	CF3			108	+		
053	X≠Y			109	PSE		
054	STOI			110	X≠Y		
055	*LBLc			111	R/S		
056	MRC		Data card merge				Display contents
			and prompt				of a 0 register

## REGISTERS

0 Mult Crd	1 -----	2 -----	3 -----	4 STOCKS	5 -----	6 -----	7 -----	8 -----	9 -----
SO	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

LABELS					FLAGS		SET STATUS		
A Init1	B Summary	C	D	E Print?	0 Print?	FLAGS		TRIG	DISP
<sup>a</sup> Fract Dec	b	c	d	e	1	0 <input checked="" type="checkbox"/> <input type="checkbox"/> 1 <input checked="" type="checkbox"/> <input type="checkbox"/> 2 <input checked="" type="checkbox"/> <input type="checkbox"/> 3 <input checked="" type="checkbox"/> <input type="checkbox"/>	DEG <input type="checkbox"/>	FIX <input checked="" type="checkbox"/>	
0	<sup>1</sup> Unpack	<sup>2</sup> End Check	<sup>3</sup> Crd Prmt	<sup>4</sup> Print	2		GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>	
5	Print	<sup>6</sup> Print	7	8	9		RAD <input type="checkbox"/>	ENG <input type="checkbox"/>	
					3		Merge	n <u>2</u>	

# 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 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.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# 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
-----	--------

<b>Solution(s)</b>	<b>Prompts</b>	<b>Input</b>	<b>Output</b>
		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]	

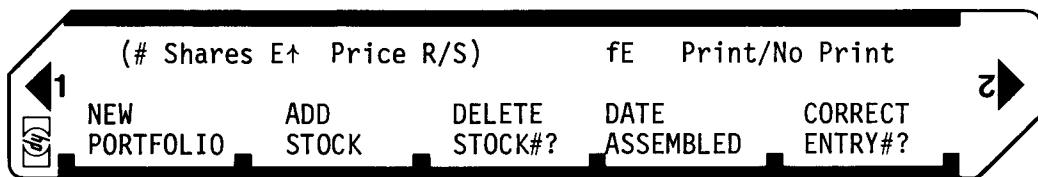
<b>Reference(s)</b>	<b>Later</b>	<b>(Enter program and data cards)</b>
	2 [C]	400.06600 [R/S] 0
	4 [C]	300.018375 [R/S] 0
	[B]	
	200 [↑] 30.14 [R/S]	200.030250
	[Write Data] or [W/Data]	

# User Instructions

(# Shares E↑ Price R/S) fE Print/No Print  
1 NEW ADD DELETE DATE CORRECT  
PORTFOLIO STOCK STOCK#? ASSEMBLED FNTRY#?  
2

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
2.	Enter program card			P>S
3.	If you have 97 and wish to have a printed record		f	E
4.	If portfolio is being created, key in the assembly or purchase date	MM.DDYYYY		D
5.	If portfolio is being created a) Number of shares b) Price(25 5/8 keyed in as 25.58) 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  Complete <u>all</u> stock entries before returning to make any corrections. If more than 1 data card is required, re-enter the appropriate card after the <u>all</u> the stocks have been entered If only one card is used, corrections (etc.) can be done after the last stock is entered.		A ENTER↑ R/S	1 Next Reg# CRD 0 19
	After the last stock has been entered, a data card is created by pressing [f] [WRITE (W/) DATA] and then inserting a blank card.			
	Continued on next page ----->			

## User Instructions



# 97 Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		056	X?Y	-41	
002	0	00		057	F0?	16 23 00	Print inputed
003	STOI	35 46	Initialize	058	PRTX	-14	
004	*LBL1	21 01		059	X?Y	-41	
005	ISZI	16 26 46	Sequential data	060	F0?	16 23 00	
006	GSB3	23 03	entry	061	PRTX	-14	Data
007	GSB <sub>a</sub>	23 16 11		062	GSB <sub>b</sub>	23 16 12	
008	GTO1	22 01		063	EEX	-23	Normalize price
009	RTN	24		064	3	03	
010	*LBLB	21 12		065	÷	-24	
011	1	01		066	+	-55	Pack register
012	STOI	35 46	Initialize	067	F0?	16 23 00	NNN.CCCFFF
013	*LBL2	21 02	sequential register	068	SPC	16-11	
014	GSB3	23 03		069	F0?	16 23 00	
015	RCLI	36 45	search for first	070	SPC	16-11	
016	X=0?	16-43	zero register	071	STOI	35 45	
017	GTO <sub>a</sub>	22 16 11		072	RTN	24	
018	ISZI	16 26 46		073	*LBL3	21 03	
019	GTO2	22 02		074	1	01	
020	RTN	24		075	8	08	Check for end of
021	*LBLC	21 13		076	RCLI	36 46	registers
022	DSP6	-63 06		077	X?Y?	16-35	
023	RCL0	36 00	Recall register to	078	RTN	24	
024	-	-45	be deleted and	079	R↓	-31	
025	STOI	35 46	display	080	WDTA	16-61	Output data
026	RCLI	36 45		081	0	00	
027	R/S	51		082	R/S	51	
028	0	00		083	R↓	-31	
029	STOI	35 45	Delete (store 0)	084	RCL0	36 00	Clear registers
030	DSP2	-63 02	designed register	085	+	-55	and begin loading
031	RTN	24		086	CLRG	16-53	data for subsequent
032	*LBLD	21 14		087	P/S	16-51	card
033	DSP6	-63 06		088	CLRG	16-53	
034	F0?	16 23 00	Store date in	089	STO0	35 00	
035	PRTX	-14	register 19	090	GTOA	22 11	
036	P/S	16-51		091	RTN	24	
037	STO9	35 09		092	*LBLb	21 16 12	
038	P/S	16-51		093	ENT1	-21	Normalize Price
039	DSP2	-63 02		094	FRC	16 44	
040	F0?	16 23 00		095	X=0?	16-43	
041	SPC	16-11		096	GTO <sub>c</sub>	22 16 13	CCC.ND
042	RTN	24		097	EEX	-23	becomes
043	*LBLE	21 15		098	1	01	CCC + <u>N</u>
044	DSP6	-63 06		099	x	-35	D
045	RCL0	36 00	Set I register to	100	INT	16 34	(Avoids ND = 0)
046	-	-45		101	LSTX	16-63	
047	STOI	35 46	store change	102	FRC	16 44	
048	GSB <sub>a</sub>	23 16 11		103	÷	-24	
049	DSP2	-63 02		104	EEX	-23	
050	R/S	51		105	1	01	
051	*LBLa	21 16 11	Prompt user with	106	÷	-24	
052	RCLI	36 46	register #	107	X?Y	-41	
053	RCL0	36 00		108	INT	16 34	
054	+	-55		109	*LBLc	21 16 13	
055	GSB5	23 05		110	+	-55	

## REGISTERS

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

## 97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
111	RTN	24					
112	*LBL4	21 16 15		170			
113	F0?	16 23 00					
114	GT04	22 04	Print/No Print				
115	SF0	16 21 00					
116	1	01	SET				
117	RTN	24					
118	*LBL4	21 04					
119	0	00					
120	CF0	16 22 00					
121	RTN	24					
122	*LBL5	21 05		180			
123	F0?	16 23 00					
124	GT06	22 06					
125	R/S	51	Operationalize				
126	RTN	24					
127	*LBL6	21 06					
128	PRTX	-14	print/no print				
129	R/S	51					
130	RTN	24					
131	R/S	51		190			
140							
150				200			
160				210			
				220			

LABELS					FLAGS	SET STATUS		
A Start	B Add	C Delete	D Date	E Correct	0 Print/ No Print	FLAGS	TRIG	DISP
a Used	b Normalize Price	c Used	d	e Print/ No Print	1 Additional data card	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input type="checkbox"/>	FIX <input checked="" type="checkbox"/>
0	1 Data Entry	2 Add, Search Routine	3 Last, Reg Check	4 Used	2	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
5 Used	6 Used	7	8	9	3	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		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**  
 **$\beta$  = 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 ] \$15 PRICE ; 5,000 SHRS ; 1.1 BETA  
AS 2 ISSUES**

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# 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 Pl.	300	50	1.2
INT'L HAIRBURN	400	30	1.3

**Solution(s) KEYSTROKES: [A] (INIT.)**

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, ZINGRUG, ZEIKEL  
 INVESTMENT ANALYSIS AND PORTFOLIO  
 MANAGEMENT  
 6<sup>TH</sup> EDITION, PAGE 769  
 RICHARD D. IRWIN, PUBL., 1976

## User Instructions



## 67 Program Listing I

# 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

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# 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 <sub>1</sub> = refined rate, %	m <sub>1</sub> = 1 + (i <sub>1</sub> /100)
i <sub>2</sub> = further refined rate, %	m <sub>2</sub> = 1 + (i <sub>2</sub> /100)
i <sub>c</sub> = 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.

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# Program Description I

Program Title

TRUE ANNUAL GROWTH RATE (DCF) OF INVESTMENT PORTFOLIO

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

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

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

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

## Operating Limits and Warnings

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# Program Description I

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

$$\text{Pass 2: } \text{TDW} = \sum (W_L)(m^{-n}) + \sum (W_S) \left( \frac{m^{I'N} - 1}{m^{I'} - 1} \right) (m^{-(n' + I'N - I')})$$

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

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

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  $m$

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

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

Operating Limits and Warnings

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# Program Description II

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	
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	-Amnt
	(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)(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 <sub>1</sub> /100
16	Press E until 3.0000 is displayed		E	3 (Pass)
17	Repeat step 3			-Amount
18	Repeat step 4			P.Value <sub>1</sub>
19	Repeat step 5			P.Value <sub>1</sub>
20	Repeat step 6			P.Value <sub>1</sub>
21	Repeat step 7			P.Value <sub>1</sub>
22	To calculate further refined and final rates, press		D	1+i <sub>2</sub> /100*** i <sub>c</sub> (%)
	(If a mistake is made during data entry and noticed before completing the step, it is only necessary to start <u>that</u> 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

\_\_\_\_\_ [ ♀ ] \_\_\_\_\_ [ ♂ ]

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

SERIES PAYMENTS (PORTFOLIO) OR REVENUES (CASH FLOW)  
 ST. DATE NUMBER INTERVAL AMOUNT

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

SERIES WITHDRAWALS (PORTFOLIO) OR INVESTMENT OUTLAYS (CASH FLOW)  
ST. DATE NUMBER INTERVAL AMOUNT

## 6 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	g LBL fe	32 25 15	Convert date to -n		X	71	(-N)(I)
	h X=Y	35 52	Amount in y; Date in X		h LST X	35 82	Bring back I
	↑	41	MM, YYYY in X & Y Regs.		+	61	I - NI
	g FRAC	32 83	.YYYY in X Reg.	060	2	02	(I - NI)/2
	-	51	MM		4	04	= (I' - NI')/2
	h LST X	35 82	Bring back .YYYY		÷	81	
	EEX	43	YYYY		g GSB fe	32 22 15	Calculate -n'
	4	04			+	61	$\bar{n} = -n' + [(I' - NI')/2]$
	X	71			RCL 6	34 06	Amnt in X; $\bar{n}$ in y Reg.
010	h X=Y	35 52	MM. in X; YYYY. in Y		GTO 0	22 00	Common lump sum & series
	1	01			g LBL fa	32 25 11	Pass 2 or 3 Initialize
	2	02	fraction of year	070	0	00	
	÷	81	= MM/12		STO 1	33 01	Initialize TDW & TDP
	+	61	YYYY. fraction		STO 2	33 02	
	RCL 5	34 05	Eval. Date (0 in Pass 1)		h X=Y	35 52	0 in y; mkt value in X
	h X=Y	35 52	{ -n = (Eval. Date) - Date		-	51	- mkt. value in X
	-	51			g LBL fb	32 25 12	Pass 2 or 3 lump sum
	h RTN	35 22			0	00	
	f LBL A	31 25 11	Initialize		STO 3	33 03	Not series
020	h F? O	35 71 00	Test for Pass		+	61	Amnt in X; date in Y
	GTO f a	22 31 11	Flag 0 set; Pass 2 or 3		f LBL 2	31 25 02	Common lump sum & series
	f CLR REG	31 43	Pass 1. Clear all regs.		g GSB fe	32 22 15	Calc. -n
	STO 1	33 01	and init. TW with		RCL 3	34 03	$(I'N - I')$ or 0
	g GSB fe	32 22 15	Value on Eval. Date	080	-	51	$-n' - (I'N - I')$ or -n
	CHS	42	Convert Eval. Date		RCL (i)	34 24	$\pm PV = \pm \text{Amount}$
	STO 5	33 05	from MM.YYYY to		h X=Y	35 52	$\times (1 + \frac{i}{100})^{-n}$
	RCL 1	34 01	YY, fraction & store		h y <sup>x</sup>	35 63	
	h RTN	35 22	Display value on		X	71	
	f LBL B	31 25 12	Eval. Date		f X<0	31 71	PMT or WDL?
030	h F? O	35 71 00	Lump Sum		GTO 3	22 03	WDL; Go to LBL 3
	GTO f b	22 31 12	Test for Pass		STO +2	33 61 02	$\Sigma PV_{PMT} = TDP$
	g GSB fe	32 22 15	Flag 0 set. Pass 2 or 3		h RTN	35 22	Display PV <sub>PMT</sub>
	h X=Y	35 52	Pass 1. Cnvt date in		f LBL 3	31 25 03	WDL
	f LBL 0	31 25 00	Y Reg to -n; amount	090	STO -1	33 51 01	$\Sigma -(PV_{WDL}) = TDW$
	X	71	in X Reg.		h RTN	35 22	Display -PV <sub>WDL</sub>
	h LST X	35 82	Common lump sum & series		g LBL fc	32 25 13	Pass 2 or 3 Series
	f X<0	31 71	(-WDL)(-n) or (PMT)(-n)		STO 4	33 04	Temp. Store amount
	GTO 1	22 01	Bring back PMT or WDL		CLX	44	
	STO +2	33 61 02	PMT or WDL?		1	01	$I' = I/12$
040	h RT	35 53	WDL; Go to LBL 1		2	02	
	STO -4	33 51 04	$\Sigma PMT$		÷	81	
	h RTN	35 22	(-n)(PMT) to X Reg		X	71	$I'N$
	f LBL 1	31 25 01	Display -n(PMT)		STO 3	33 03	$(1 + i/100)$ in X; $I'N$ in Y
	STO -1	33 51 01	WDL	100	RCL (i)	34 24	Bring back $I'$
	h RT	35 53	$\Sigma -(-WDL)$		h LST X	35 82	$(I'N - I')$ in Reg. 3
	STO +3	33 61 03	(-n)(-WDL) to X Reg		STO -3	33 51 03	
	h RTN	35 22	$\Sigma (-n)(-WDL)$		h y <sup>x</sup>	35 63	$A = [1 + \frac{i}{100}]^{I'}$
	f LBL C	31 25 13	Display (n)(WDL)		1	01	
	h F? O	35 71 00	Series		-	51	
050	GTO f C	22 31 13	Test for Pass		h X=Y	35 52	A in y; $I'N$ in X
	STO 6	33 06	Flag 0 set. Pass 2 or 3		RCL (i)	34 24	$(1 + \frac{i}{100})$ in X; $I'N$ in Y
	h RT	35 53	Pass 1. Temp. store amnt.		h X=Y	35 52	$(1 + \frac{i}{100})$ in y; $I'N$ in X
	h X=Y	35 52	N in X Reg; I in y Reg;		h y <sup>x</sup>	35 63	
	STO X 6	33 71 06	date in $\Sigma$ Reg.	110	1	01	$B = (1 + \frac{i}{100})^{I'N} - 1$
	CHS	42	(N)(PMT) or (N)(-WDL)		-	51	
	h X=Y	35 52	-N		h X=Y	35 52	
			I in x; -N in y Reg.				

## REGISTERS

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

# 67 Program Listing II

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	÷	81	{ B/A		÷	81	{ A/B
	RCL 4	34 04	Amount =	170	RCL 7	34 07	
	X	71	Amount $\times$ (B/A)		1	01	
	GTO 2	22 02	Common Lump sum & series		-	51	
	f LBL D	31 25 14	Calculate Rates		+	61	
	h F? 0	35 71 00	Test for pass		EEX	43	
120	GTO f d	22 31 14	Flag 0 set. Pass 2 or 3		2	02	
	RCL 2	34 02	Pass 1. Calc. initial		X	71	
	RCL 1	34 01	rate.		h RTN	35 22	Display i <sub>c</sub>
	÷	81	TP/TW		f LBL E	31 25 15	Set up next pass
	STO 6	33 06	STORE TP/TW	180	h F? 0	35 71 00	Is current pass 1?
	RCL 4	34 04	$x_p = [\sum (PMT \times n)] / TP$		GTO 8	22 08	Current pass is 2 or 3
	RCL 2	34 02			h SF 0	35 51 00	Pass 1. Increase to 2
	÷	81			h CF 1	35 61 01	Clear pass 3 flag
	RCL 3	34 03			7	07	
	RCL 1	34 01			h STI	35 33	{ Set I Reg. to 7
	÷	81			2	02	for i <sub>1</sub>
130	-	51			h RTN	35 22	Display pass 2
	h 1/x	35 62			f LBL B	31 25 08	Current pass is 2 or 3
	h y <sup>x</sup>	35 63			h F? 1	35 71 01	Is current pass 3?
	STO 7	33 07	Store 1+(i/100)	190	GTO 9	22 09	Current pass is 3
	h RTN	35 22	Display 1+(i/100)		h SF 1	35 51 01	Pass 2. Increase to 3
	f LBL fd	32 25 14	Pass 2 or 3 Rates		8	08	
	RCL (i)	34 24	$(1+i/100)$ or $(1+i_1/100)$		h STI	35 33	{ Set I Reg. to 8
	RCL 6	34 06			3	03	for i <sub>2</sub>
	f LOG	31 53			h RTN	35 22	Display Pass 3
	RCL 6	34 06			f LBL 9	31 25 09	Current pass is 3
140	RCL 2	34 02			h CF 0	35 61 00	Reset to 1. Clear
	÷	81			h CF 1	35 61 01	Pass 2 or 3 flag
	RCL 1	34 01			1	01	Clear pass 3 flag
	X	71			h RTN	35 22	Display Pass 1
	f LOG	31 53					
	÷	81					
	h y <sup>x</sup>	35 63					
	h F? 1	35 71 01					
	GTO 5	22 05					
	STO 8	33 08					
150	h RTN	35 22					
	f LBL 5	31 25 05					
	STO 3	33 03					
	f -x-	31 84					
	RCL 8	34 08					
	RCL 7	34 07					
	-	51					
	↑	41					
	X	71					
	h LST X	35 82					
160	RCL 3	34 03					
	-	51					
	RCL 8	34 08					
	+	61					
	f x#0	31 61					
	GTO 6	22 06	Are i, i <sub>1</sub> , and i <sub>2</sub> all equal?	220			
	CLX	44	No. Proceed				
	1	01					
	f LBL 6	31 25 06	Yes. Set B=1				

## LABELS

LABELS					FLAGS		SET STATUS	
A	B	C	D	E	0	FLAGS	TRIG	DISP
Start	Lump Sum	Series	Calc. Rate	Next Pass	Pass 2 or 3	ON OFF	DEG	FIX
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	1 Pass 3	0 <input checked="" type="checkbox"/> <input type="checkbox"/>	GRAD <input checked="" type="checkbox"/> <input type="checkbox"/>	SCI <input type="checkbox"/>
0 Pass 1 Common	1 Pass 1 WDL	2 Pass 2 or 3 Common	3 Pass 2 or 3 WDL	4	2	1 <input checked="" type="checkbox"/> <input type="checkbox"/>	RAD <input type="checkbox"/> <input checked="" type="checkbox"/>	ENG <input type="checkbox"/>
5 Pass 3 Final Rate	6 used	7	8 Current Pass 2 or 3	9 Current Pass 1	3	2 <input type="checkbox"/> <input type="checkbox"/>	3 <input type="checkbox"/> <input type="checkbox"/>	n <u>4</u>

# 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  $\Sigma Prem*YY/\Sigma YY$ , 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.

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## Program Description II

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

<u>Conv. Fac</u>	<u># of Bonds</u>	<u>Bond Price</u>	<u>Stock Price</u>
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

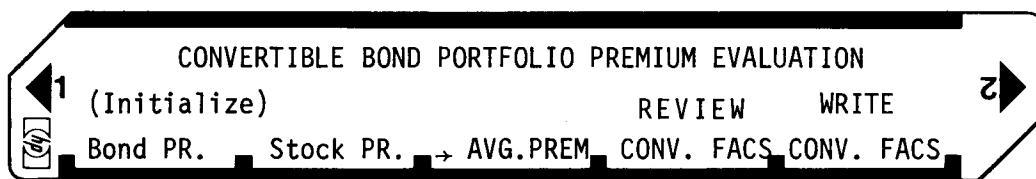
88 [A] ----> 8.03 , 6 [B] ----> 33.8

[C] ----->51.8

[E] ----->Crd ----->0.00

### Reference(s)

## User Instructions



# 97 Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11		057	Ø	00	
002	RCLD	36 14		058	X≤Y?	16-35	
003	RCLC	36 13		059	DSPØ	-63 00	
004	RCLB	36 12		060	X≠Y	-41	
005	RCLA	36 11		061	ENT↑	-21	
006	P±S	16-51		062	ENT↑	-21	
007	CLRG	16-53		063	RCLC	36 15	
008	P±S	16-51		064	ENT↑	-21	
009	STOA	35 11		065	R↓	-31	
010	R↓	-31		066	X	-35	
011	STOB	35 12		067	R↑	16-31	
012	R↓	-31		068	Z+	56	
013	STOC	35 13		069	CF3	16 22 03	
014	R↓	-31		070	R↓	-31	
015	STOD	35 14		071	R↓	-31	
016	CF3	16 22 03		072	RTN	24	
017	RTN	24		073	*LBLC	21 13	
018	*LBLA	21 11		074	RCLI	36 45	
019	DSP2	-63 02		075	÷	-24	
020	RCLI	36 45		076	DSP1	-63 01	
021	F3?	16 23 03		077	RTN	24	
022	GT03	22 03		078	*LBLD	21 14	
023	GT02	22 02		079	DSP4	-63 04	
024	*LBL3	21 03		080	Ø	00	
025	EEX	-23		081	STOI	35 46	
026	2	02		082	*LBL4	21 04	
027	X	-35		083	RCLI	36 45	
028	ENT↑	-21		084	PSE	16 51	
029	FRC	16 44		085	ISZI	16 26 46	
030	STOE	35 15		086	1	01	
031	-	-45		087	Ø	00	
032	EEX	-23		088	RCLI	36 46	
033	3	03		089	X=Y?	16-33	
034	÷	-24		090	GSB7	23 07	
035	÷	-24		091	2	02	
036	*LBL2	21 02		092	3	03	
037	ISZI	16 26 46		093	RCLI	36 46	
038	1	01		094	X>Y?	16-34	
039	Ø	00		095	RTN	24	
040	RCLI	36 46		096	GT04	22 04	
041	X=Y?	16-33		097	*LBLE	21 15	
042	GSB7	23 07		098	GSBa	23 16 11	
043	R↓	-31		099	WDTA	16-61	
044	R↓	-31		100	RTN	24	
045	RTN	24		101	R/S	51	
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	ZCH	16 55					
054	DSP1	-63 01		110			
055	1	01					
056	Ø	00					

## REGISTERS

<sup>0</sup> C.F.1	<sup>1</sup> C.F.2	<sup>2</sup> C.F.3	<sup>3</sup> C.F.4	<sup>4</sup> C.F.5	<sup>5</sup> C.F.6	<sup>6</sup> C.F.7	<sup>7</sup> C.F.8	<sup>8</sup> C.F.9	<sup>9</sup> C.F.10
S0	S1	S2	S3	S4 Σ bonds	S5 Σ (bonds) <sup>2</sup>	S6 Σ(bondxprem)	S7 Σ( ) <sup>2</sup>	S8 Σ( )	S9 n
<sup>A</sup> C.F. 11	<sup>B</sup> C.F. 12	<sup>C</sup> C.F. 13	<sup>D</sup> C.F. 14	<sup>E</sup> # of bonds	<sup>I</sup> 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<sup>4</sup>, and breakeven point<sup>3</sup>. Calculations consider whether the stock is purchased on a cash basis (full price) or on a margin basis<sup>2</sup>.

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

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

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

$$\text{Net Pur} = (\# \text{ Shares} \times \text{Stock price}) + \text{Stock Commission}$$

$$\text{Net Prem} = (\# \text{ Shares} \times \text{Option premium}) - \text{Option Commission}$$

$$\text{Net Sale} = (\# \text{ Shares} \times \text{Exercise price}) - \text{Commission}$$

$$\text{Im} = \text{Interest rate} \times 1/2 \text{ Net Pur} \times T/365$$

## Operating Limits and Warnings

<sup>1</sup> Stock is purchased for one option period and then sold.

<sup>2</sup> Applicable for 50% margin requirement.

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

<sup>4</sup> Unexercised yield does not include commissions unless the commission flag is set. With the flag set two commissions (buy and sell: By & S1) are included in the yield calculation.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# Program Description II

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## 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

## Solution(s)

A.

1) 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 II

## Sketch(es)

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	

## 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

## Solution(s)

[R/S]. . . . . 23.29 annualized yield

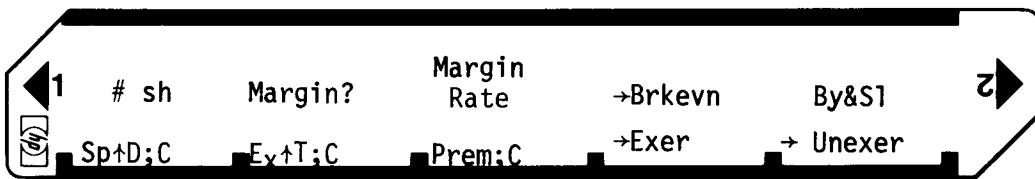
3) There is no need to re-enter the # of shares (f [A]) or purchase price and dividends ([A]) since they remain the same from the previous calculation. The margin flag is also similarly set (1) from the last calculation.

30 [+]	190 [B].	9000.00	gross exercise
1.2 [%]	44.5 + [R/S]	8847.50	net exercise
2 [+]	1 [+]	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

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STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Enter number of shares of stock on which calls are written (# sh)		f A	
2	Margin (1), cash (0),		f B	0 or 1
3°	a) Stock price (sp)	\$	↑ A	gross purchase
	b) Dividend per share received before option expiration (d)	\$		
	c) Compute & input stock commission, (C)		R/S	net cost
4°	a) Option exercise price (Ex)	\$	↑ B	gross exercise
	b) Time to exercise (T)	days		proceeds if called
	c) Exercise commission (C)	\$	R/S	
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 and option expires unexercised (no dividends included)		E	actual yield(%)
			R/S	annual yield
8*	Same as 7 but with buy and sell (double) commissions included		f E	annual yield
			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	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11		056	R/S	51	
002	ST01	35 01	Store # Shares	057	RCL5	36 05	Compute, store & display net prem
003	RTN	24		058	X $\div$ Y	-41	
004	*LBLb	21 16 12		059	-	-45	
005	F0?	16 23 00	Alternately set	060	ST05	35 05	
006	GT04	22 04		061	R/S	51	
007	SF0	16 21 00	and unset margin	062	*LBLD	21 14	
008	1	01		063	RCL6	36 06	Exercise numerator
009	RTN	24	flag f 0	064	RCL5	36 05	less Im
010	*LBL4	21 04		065	+	-55	
011	CF0	16 22 00		066	RCL4	36 04	
012	0	00		067	+	-55	
013	RTN	24		068	RCL2	36 02	
014	*LBLc	21 16 13		069	-	-45	
015	ST08	35 08	Store margin rate	070	GSB4	23 04	Margin calculations
016	R/S	51		071	$\div$	-24	
017	*LBLA	21 11		072	EEX	-23	Divide and normalize
018	RCL1	36 01		073	2	02	
019	ST04	35 04		074	X	-35	
020	ST02	35 02	Compute store, &	075	RTN	24	
021	R $\downarrow$	-31	display gross	076	RCL7	36 07	Annualize using day factor
022	ST $\times$ 4	35-35 04		077	1/X	52	
023	X $\div$ Y	-41		078	X	-35	
024	ST $\times$ 2	35-35 02	purchase	079	RTN	24	
025	RCL2	36 02		080	*LBL4	21 15	
026	R/S	51		081	RCL4	36 04	Unexercised numerator less double dividend and Im
027	ST03	35 03		082	RCL5	36 05	
028	X=0?	16-43		083	+	-55	
029	ST04	35 04	Cancel dividends if purchase	084	F1?	16 23 01	Double dividend
030	RCL2	36 02	commission is 0	085	GSB2	23 02	
031	+	-55		086	GSB4	23 04	Margin calcualtions
032	ST02	35 02		087	$\div$	-24	
033	R/S	51	Compute, display & store net	088	EEX	-23	Divide and normalize
034	*LBLB	21 12	purchase	089	2	02	
035	RCL1	36 01		090	X	-35	
036	ST06	35 06	Initialize R6 with # shares	091	CF1	16 22 01	clear buy and sell flag
037	R $\downarrow$	-31		092	RTN	24	
038	3	03		093	RCL7	36 07	
039	6	06	Compute and store	094	1/X	52	
040	5	05		095	X	-35	
041	$\div$	-24		096	RTN	24	Annualize
042	ST07	35 07	day factor T/365	097	*LBL4	21 16 15	
043	R $\downarrow$	-31		098	SF1	16 21 01	By & S1, double dividends
044	ST $\times$ 6	35-35 06		099	GTOE	22 15	
045	RCL6	36 06		100	RTN	24	
046	R/S	51	Compute, store, & display gross exer	101	*LBL2	21 02	
047	RCL6	36 06		102	RCL3	36 03	
048	X $\div$ Y	-41		103	2	02	
049	-	-45		104	X	-35	
050	ST06	35 06	Compute, store &	105	X=0?	16-43	Compute double dividends
051	R/S	51	display net exer	106	GTO3	22 03	
052	*LBLC	21 13		107	-	-45	
053	RCL1	36 01		108	RTN	24	Create error message if By & S1 used in conjunction with 0 commission
054	X	-35		109	*LBL3	21 03	
055	ST05	35 05	Compute, store &	110	$\div$	-24	
			display gross prem	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	F	G	H	I	J

## 97 Program Listing II

LABELS					FLAGS	SET STATUS		
A Purchase	B Exercise	C Prem	D →Exercise	E →Unexer	0 Margin	FLAGS	TRIG	DISP
a	b Margin Flag	c Margin %	d →brkeven	e →By & S1	1 By & S1	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input type="checkbox"/>	FIX <input checked="" type="checkbox"/>
0	1 Im	2 Double Div	3 error	4 Margin Compute	2 Used	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
5	6	7	8	9	3	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		n 2

# Program Description I

Program Title **BOND PRICE AND YIELD**

Contributor's Name **HEWLETT-PACKARD COMPANY**

Address **Corvallis Division**

**1000 N.E. Circle Boulevard**

City **Corvallis, OR 97330**

**State**

**Zip Code**

**Program Description**

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.

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

**Operating Limits and Precautions**

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# 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 reemptions 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

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## Program Description II

### 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  $\text{PER} < 1$

### Solution(s)

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

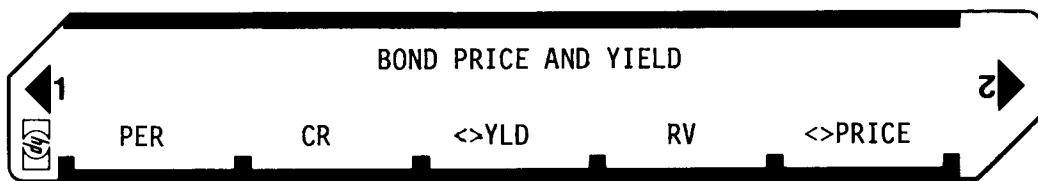
### Reference(s)



# Program Description II

<b>Sketch(es)</b>	<p>Determine the number of <b>annual coupon periods</b> remaining by dividing by the number of days in a coupon period.</p> <p>360 <b>B</b> → 9.92 (number of annual coupon periods)</p> <p>Enter program BD-15</p> <p><b>A</b> → 9.92 (the correct value for PER is entered)</p> <p>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.).</p>
<b>Sample Problem(s)</b>	<p>5 <b>ENTER</b> 2 <b>X</b> <b>B</b> 5.5 <b>ENTER</b>  <b>2 X C E</b> → 96.24 (price-to-maturity)</p> <p><b>Example 6:</b>  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?</p> <p><b>Keystrokes:</b></p> <p>Enter program BD-14</p> <p>11.151973 <b>A</b> 2.061980 <b>B D</b> → 2241.00 (days settlement to call)</p> <p>Enter Program BD-15</p> <p>5 <b>B</b> 101 <b>D</b> 99 <b>E C</b> → 5.33 (% yield-to-call)</p> <p>Enter program BD-14</p> <p>2.061993 <b>B D</b> → 6921.00 (days settlement to maturity)</p> <p>Enter program BD-15</p> <p>5 <b>B</b> 99 <b>E C</b> → 5.08 (% yield-to-maturity)</p>
<b>Solution(s)</b>	<p><b>Example 7:</b>  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.</p> <p><b>Keystrokes:</b></p> <p>First, calculate and enter the after tax value of the coupon.</p> <p>5 <b>ENTER</b> <b>ENTER</b> .4 <b>X</b> <b>-</b> <b>B</b> → 3.00 (net after tax coupon)</p> <p>Now calculate and enter the net after tax proceeds when the bond is redeemed for 100 at maturity.</p> <p>100 <b>ENTER</b> <b>ENTER</b> 99 <b>-</b> → 1.00 (capital gain)  .25 <b>X</b> → 0.25 (capital gains tax)  <b>- D</b> → 99.75 (net proceeds from bond redemption)</p>
<b>Reference(s)</b>	<p>(The price and remaining coupon periods have been retained from the previous calculation.)</p> <p><b>C</b> → 3.06 (% after tax yield)</p>

# User Instructions



STEP	INSTRUCTIONS				INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Optional: Use program BD-14 to calculate the number of remaining coupon periods.						
2	Load side 1 and side 2 of the bond program.						
3	Key in:						
	• Number of remaining coupon 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 AND add it to the "flat" price to obtain total bond value as of the settlement date.	RCL B	ACC INT				
		+	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	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		057	÷	-24	
002	CF3	16 22 03		058	-	-45	
003	CHS	-22		059	ST-6	35-45 06	
004	ST00	35 06	-PER→R <sub>0</sub>	060	ABS	16 31	
005	CHS	-22		061	EEX	-23	
006	RTN	24		062	CHS	-22	
007	*LBLB	21 12		063	6	06	
008	EEX	-23		064	X≤Y?	16-35	
009	2	02		065	GT01	22 01	
010	ST03	35 03	100→R <sub>3</sub>	066	F2?	16 23 02	
011	R↓	-31		067	GT02	22 02	
012	ST01	35 01	CR→R <sub>1</sub>	068	RCL6	36 06	
013	RTN	24		069	GT03	22 03	
014	*LBLD	21 14		070	*LBL2	21 02	
015	CF3	16 22 03	RV→R <sub>3</sub>	071	RCL5	36 05	
016	ST03	35 03		072	1	01	Modify price for
017	RTN	24		073	RCL0	36 00	next set of
018	*LBLC	21 13		074	FRC	16 44	iterations.
019	F3?	16 23 03	YLD→R <sub>2</sub>	075	+	-55	
020	GT05	22 05		076	LSTX	16-63	
021	RCL0	36 00		077	x	-35	
022	ABS	16 31		078	4	04	
023	1	01		079	÷	-24	
024	X>Y?	16-34	1>PER?	080	RCL1	36 01	
025	GT00	22 00		081	x	-35	
026	SF2	16 21 02	Calculate initial	082	RCL6	36 06	
027	RCL1	36 01	guess	083	x	-35	
028	2	02		084	-	-45	
029	÷	-24		085	ST05	35 05	
030	RCL4	36 04		086	GT01	22 01	
031	ST05	35 05		087	*LBL0	21 00	
032	÷	-24		088	RCL3	36 03	Calculate yield if
033	ST06	35 06		089	RCL1	36 01	less than 1 coupon
034	*LBL1	21 01		090	2	02	period remaining
035	1	01	Calculate f(y)	091	÷	-24	
036	RCL3	36 03		092	+	-55	
037	RCL5	36 05		093	LSTX	16-63	
038	÷	-24		094	RCL0	36 00	
039	1	01		095	1	01	
040	RCL6	36 06		096	+	-55	
041	+	-55		097	x	-35	
042	RCL0	36 00		098	RCL4	36 04	
043	Y <sup>x</sup>	31		099	+	-55	
044	ST08	35 08		100	÷	-24	
045	x	-35		101	1	01	
046	-	-45		102	-	-45	
047	RCL6	36 06		103	RCL0	36 00	
048	x	-35		104	CHS	-22	
049	1	01		105	÷	-24	
050	RCL8	36 08		106	*LBL3	21 03	Display answer if
051	-	-45		107	2	02	second time through
052	÷	-24		108	0	00	
053	RCL1	36 01		109	0	00	
054	2	02		110	x	-35	
055	÷	-24		111	ST02	35 02	
056	RCL5	36 05		112	RTN	24	

REGISTERS

0	1	2	3	4	5	6	7	8	9
-PER	CR	YLD	RV	PRICE	Used	Used	DT <sub>1</sub>	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	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	*LBL5	21 05		169	+	-55	
114	ST02	35 02		170	RCL5	36 05	
115	RTN	24		171	1	01	
116	*LBL6	21 15		172	-	-45	
117	F3?	16 23 03	Price $\rightarrow R_4, R_5$	173	RCL0	36 00	
118	GT06	22 06		174	x	-35	
119	RCL2	36 02		175	CHS	-22	
120	2	02		176	1	01	
121	0	00	Calculate J	177	+	-55	
122	0	00		178	$\div$	-24	
123	$\div$	-24		179	RCL1	36 01	
124	1	01		180	2	02	
125	+	-55		181	$\div$	-24	
126	ST05	35 05		182	RCL6	36 06	
127	1	01		183	x	-35	
128	RCL0	36 00		184	ST08	35 08	
129	FRC	16 44		185	-	-45	
130	+	-55		186	RTN	24	
131	ST06	35 06		187	*LBL6	21 06	
132	RCL0	36 00		188	ST04	35 04	
133	CHS	-22		189	ST05	35 05	
134	1	01	Is PER<1?	190	RTN	24	
135	X?Y?	16-34					
136	GT04	22 04					
137	RCL5	36 05					
138	RCL6	36 06					
139	Y $\times$	31					
140	RCL5	36 05	Calculate price for long term bonds.				
141	RCL0	36 00					
142	Y $\times$	31					
143	ST05	35 05		200			
144	-	-45					
145	RCL1	36 01					
146	x	-35					
147	RCL2	36 02					
148	$\div$	-24					
149	EEX	-23					
150	2	02					
151	x	-35					
152	RCL6	36 06					
153	2	02					
154	$\div$	-24		210			
155	RCL1	36 01					
156	x	-35					
157	ST08	35 08					
158	-	-45					
159	RCL5	36 05					
160	RCL3	36 03					
161	x	-35					
162	+	-55					
163	RTN	24					
164	*LBL4	21 04		220			
165	RCL1	36 01	Calculate price for short term bonds.				
166	2	02					
167	$\div$	-24					
168	RCL3	36 03					

# Program Description I

## Program Title    DAYS BETWEEN DATES

**Contributor's Name** HEWLETT-PACKARD COMPANY  
**Address** Corvallis Division  
**City** 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

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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## Program Description II

### Sketch(es)

A 5x5 grid of 25 small squares, each containing a small black dot at its center. The grid is composed of 12 horizontal and 12 vertical lines, with the top-left and bottom-right squares empty.

### Sample Problem(s)

## 14. Days Between Dates

### Actual

$$\text{DAYS} = f(\text{DT2}) - f(\text{DT1})$$

where

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

and

for  $mm \leq 2$

$$x = 0$$

$$z = (yyyy) - 1$$

for  $mm > 2$

$$x = \text{Int} (.4 \text{ mm} + 2.3)$$

$$z = (yyyy)$$

Int = Integer portion

### Solution(s)

30/360 Basis

$$\text{DAYs} = f(\text{DT2}) - f(\text{DT1})$$

$$f(DT) = 360(yyyy) + 30\text{ mm} + z$$

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  $dd_2 \leq 31$  then  $z = dd_2$

### Reference(s)

# Program Description II

## Sketch(es)



## Sample Problem(s)

### Example 1:

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

#### Keystrokes:

6.241974 **A** 12.051985 **B** **C** → 4182.00 (actual)

#### Outputs:

### Example 2:

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

#### Keystrokes:

3.211990 **B** **C** → 5749.00 (actual)

#### Outputs:

### Example 3:

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

#### Keystrokes:

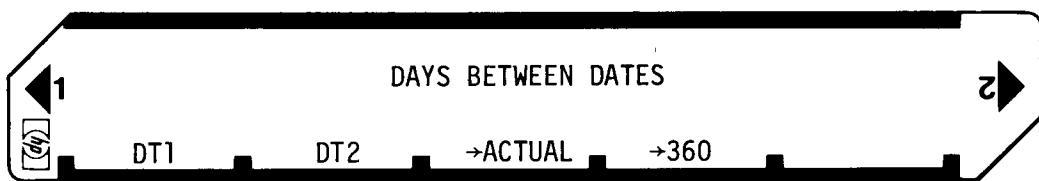
5.011975 **A** 11.011980 **B** **C** → 2011.00 (actual)  
**D** → 1980.00 (30/360)

#### Outputs:

## Solution(s)

## Reference(s)

## User Instructions



# 97 Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		057	CLX	-51	
002	ST07	35 07	DT <sub>1</sub> → R <sub>7</sub>	058	RCL5	36 05	
003	RTN	24		059	+	-55	
004	*LBLB	21 12		060	RCL3	36 03	
005	ST01	35 01		061	1	01	Compute days since
006	RTN	24		062	-	-45	0 AD neglecting
007	*LBLC	21 13		063	3	03	400s and 100s.
008	RCL7	36 07		064	1	01	
009	GSBE	23 15		065	x	-35	
010	ST02	35 02		066	+	-55	
011	LSTX	16-63	Control & storage.	067	RCL6	36 06	
012	ST00	35 00		068	4	04	
013	RCL1	36 01		069	÷	-24	
014	GSBE	23 15		070	INT	16 34	
015	LSTX	16-63		071	X $\neq$ Y	-41	
016	ST-0	35-45 00		072	+	-55	
017	CLX	-51		073	RTN	24	
018	RCL2	36 02		074	*LBLD	21 14	
019	-	-45		075	3	03	
020	RCL4	36 04		076	0	00	
021	2	02		077	ST02	35 02	Control & storage.
022	÷	-24		078	RCL7	36 07	
023	ST=0	35-24 00		079	GSBe	23 16 15	
024	X $\neq$ Y	-41		080	ST00	35 00	
025	RTN	24		081	RCL1	36 01	
026	*LBLE	21 15		082	GSBe	23 16 15	
027	GSB4	23 04		083	RCL0	36 00	
028	ST06	35 06		084	-	-45	
029	3	03		085	ST00	35 00	
030	6	06		086	RCL4	36 04	
031	5	05		087	CHS	-22	
032	ST04	35 04		088	2	02	
033	x	-35		089	÷	-24	
034	2	02	z=y-1	090	ST=0	35-24 00	
035	RCL3	36 03		091	R↓	-31	
036	X>Y?	16-34		092	RTN	24	
037	GT00	22 00		093	*LBLE	21 16 15	
038	x	-35		094	GSB4	23 04	Sum years & months.
039	CLX	-51		095	3	03	
040	RCL6	36 06		096	6	06	
041	1	01		097	0	00	
042	-	-45		098	ST04	35 04	
043	ST06	35 06		099	x	-35	
044	GT01	22 01		100	RCL3	36 03	
045	*LBL0	21 00		101	3	03	
046	.	-62		102	0	00	
047	4	04		103	x	-35	
048	x	-35	x=INT (.4M+2.3)	104	+	-55	
049	.	-62		105	RCL5	36 05	
050	3	03		106	3	03	
051	+	-55		107	1	01	Are days equal to 31?
052	+	-55		108	X=Y?	16-33	
053	INT	16 34		109	GT02	22 02	
054	-	-45		110	R↓	-31	No, add & return.
055	RCL6	36 06		111	ST02	35 02	
056	*LBL1	21 01		112	+	-55	

REGISTERS

0	PER	1	DT <sub>2</sub>	2	Used	3	M	4	365/360	5	D	6	y, z	7	DT <sub>1</sub>	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9								
A	B	C	D	E	F									I			

# 97 Program Listing II

51

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	RTN	24					
114	*LBL2	21 02		170			
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	GT03	22 03	No, add and return.				
122	R↓	-31					
123	CLX	-51		180			
124	RCL5	36 05					
125	ST02	35 02					
126	+	-55					
127	RTN	24					
128	*LBL3	21 03					
129	R↓	-31	31→30 add & return				
130	ST02	35 02					
131	+	-55					
132	RTN	24					
133	*LBL4	21 04		190			
134	ENT↑	-21					
135	INT	16 34	Break up year.				
136	ST03	35 03					
137	-	-45					
138	EEX	-23					
139	2	02					
140	x	-35					
141	ENT↑	-21					
142	INT	16 34					
143	ST05	35 05		200			
144	-	-45					
145	EEX	-23					
146	4	04					
147	x	-35					
148	RTN	24					
149	R/S	51					
160				210			
				220			

## LABELS

A	DT <sub>1</sub>	B	DT <sub>2</sub>	C	days actual	D	days 360	E	Used	0
a		b		c		d		e	Used	1
0	Used	1	Used	2	Used	3	Used	4	Used	2
5		6		7		8		9	Used	3

## FLAGS

FLAGS		SET STATUS	
FLAGS		TRIG	DISP
0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DEG <input checked="" type="checkbox"/>
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	SCI <input type="checkbox"/>
2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ENG <input type="checkbox"/>
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	n <u>2</u>

# Program Description I

Program Title	Bond Yield to Maturity		
Contributor's Name	Ralston W. Barnard		
Address	2811 Ridgecrest Drive S.E.		
City	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,  

$$\text{price} = \left\{ 100/(1+i)^N + (C/2i)[(1+i)^i - (1+i)^{-N}] - (C/2i) \right\}$$
, where  $i$  = interest rate,  
 $C$  = Coupon,  $N$  = Number of semiannual periods from settlement date to maturity date,  $i = 1 - \text{frac}(N)$

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,  $i = \left\{ (100+C/2)/(price-C/2j) - 1 \right\} \frac{1}{N}$ .

Current yield =  $C/\text{price} \times 100$ . Accrued interest =  $c/2j \times 10$ .

**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.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# Program Description II

**Sketch(es)**

Sketch(es) area, consisting of four horizontal lines for drawing.

**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.

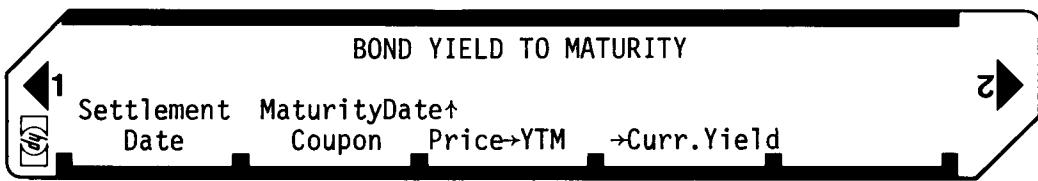
What are the accrued interest values for each?

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?

<b>Solution(s)</b>	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



# 97 Program Listing I

55

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	Stores settlement	057	RCL6	36 06	
002	CLRG	16-53	Date	058	X	-35	
003	GSB0	23 00	M1	059	STOE	35 15	
004	GSB0	23 00	D1	060	1	01	
005	ST02	35 02	Y1	061	0	00	
006	EEX	-23		062	X	-35	
007	2	02		063	RTN	24	
008	ST00	35 14		064	*LBL0	21 00	
009	RTN	24		065	ENT1	-21	
010	*LBLB	21 12	Stores Mat Date,	066	INT	16 34	
011	ST06	35 06	Coupon,	067	ST01	35 45	
012	CF0	16 22 00	Calculates N	068	-	-45	
013	3	03		069	EEX	-23	
014	ST01	35 46		070	2	02	
015	R↓	-31		071	X	-35	
016	X#Y	-41		072	ISZI	16 26 46	
017	GSB0	23 00	M2	073	RTN	24	
018	GSB0	23 00	D2	074	*LBL1	21 01	
019	ST05	35 05	Y2	075	3	03	
020	RCL3	36 03		076	0	00	
021	RCL0	36 00		077	+	-55	
022	-	-45	ΔM	078	X#Y	-41	
023	RCL4	36 04		079	1	01	
024	RCL1	36 01		080	-	-45	
025	-	-45	ΔD	081	X#Y	-41	
026	X<0?	16-45		082	RTN	24	
027	GSB1	23 01		083	*LBL2	21 02	
028	X#Y	-41		084	1	01	
029	X<0?	16-45		085	2	02	
030	GSB2	23 02		086	+	-55	
031	3	03		087	1	01	
032	0	00		088	ST-5	35-45 05	
033	X	-35		089	R↓	-31	
034	+	-55		090	RTN	24	
035	1	01		091	*LBL3	21 03	
036	8	08		092	RCLD	36 14	
037	0	00		093	+	-55	
038	÷	-24		094	RTN	24	
039	RCL5	36 05		095	*LBL0	21 13	
040	RCL2	36 02		096	FIX	-11	
041	-	-45	ΔY	097	DSP3	-63 03	
042	X<0?	16-45		098	ST07	35 07	
043	GSB3	23 03		099	RCLD	36 14	
044	2	02		100	F0?	16 23 00	
045	X	-35		101	GT04	22 04	
046	+	-55		102	-	-45	
047	ST05	35 05	N	103	CHS	-22	
048	1	01		104	RCL6	36 06	
049	X#Y	-41		105	RCL5	36 05	
050	X≤Y?	16-35	N ≤ 6 mo?	106	X	-35	
051	SF0	16 21 00		107	+	-55	
052	FRC	16 44		108	RCLD	36 14	
053	-	-45		109	RCL7	36 07	
054	ST08	35 08		110	+	-55	
055	2	02		111	RCL5	36 05	
056	÷	-24		112	X	-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 Used	B Used	C Used		D 100	E 2	F Coupon	G	H Control	I

## 97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	÷	-24		169	YX	31	
114	GSB8	23 08		170	X <sup>2</sup> Y	-41	
115	RCLC	36 13		171	ST04	35 04	
116	GT07	22 07		172	-	-45	
117	*LBL6	21 06		173	RCL6	36 06	
118	RCL3	36 03		174	2	02	
119	GSB9	23 09		175	÷	-24	
120	ST0C	35 13		176	RCL3	36 03	
121	*LBL7	21 07		177	÷	-24	
122	RCL9	36 09		178	X	-35	
123	RCL3	36 03		179	RCLE	36 15	
124	ST09	35 09		180	-	-45	
125	-	-45		181	RCLD	36 14	
126	RCLA	36 11		182	RCL4	36 04	
127	RCLC	36 13		183	X	-35	
128	ST0A	35 11		184	+	-55	
129	-	-45		185	RCL7	36 07	
130	÷	-24		186	X <sup>2</sup> Y	-41	
131	X	-35		187	-	-45	
132	ST-3	35-45 03		188	RTN	24	
133	RCL3	36 03		189	*LBL5	21 05	
134	÷	-24		190	RCLD	36 14	Calculates YTM from i
135	RND	16 24		191	X	-35	
136	X <sup>2</sup> Y	16-42		192	2	02	
137	GT06	22 06		193	X	-35	
138	RCL3	36 03		194	RTN	24	
139	GT05	22 05		195	*LBL4	21 04	
140	*LBL8	21 08		196	RCL6	36 06	Calculates i for M ≤ 6 mos
141	RCLD	36 14		197	2	02	
142	1/X	52		198	÷	-24	
143	2	55		199	+	-55	
144	ST0B	35 12		200	X <sup>2</sup> Y	-41	
145	2	02		201	RCLE	36 15	
146	÷	-24		202	+	-55	
147	-	-45		203	÷	-24	
148	ST09	35 09		204	1	01	
149	ST03	35 03		205	-	-45	
150	GSB9	23 09		206	RCL5	36 05	
151	ST0A	35 11		207	÷	-24	
152	RCL9	36 09		208	GT05	22 05	
153	RCLB	36 12		209	*LBLD	21 14	
154	+	-55		210	RCL6	36 06	
155	ST03	35 03		211	RCL7	36 07	
156	GSB9	23 09		212	÷	-24	
157	ST0C	35 13		213	RCLD	36 14	
158	RTN	24		214	X	-35	
159	*LBL9	21 09	Evaluates Price -	215	DSP2	-63 02	
160	ST03	35 03		216	RTN	24	
161	1	01		217	R/S	51	
162	+	-55					
163	ST04	35 04					
164	RCL5	36 05		220			
165	YX	31					
166	1/X	52					
167	RCL4	36 04					
168	RCL8	36 08					

## LABELS

## FLAGS

## SET STATUS

A	B	C	D	E	0	N	≤	6	MOS	FLAGS	TRIG	DISP
Sett. date	Mat, Dt., Coup	Price	Curr. Yld	E	1					ON OFF		
a	b	c	d	e	0	1	0	0	0	0	DEG	FIX
Stores dates	1 N Cal	2 N Cal	3 N Cal	4 i, N < 6 Mo	2	1	1	1	1	1	GRAD	SCI
i → YTM	6 Iterate	7 Secant	8 Δ i Cal	9 f(i) Cal	3	2	2	2	2	2	RAD	ENG
						3	3	3	3	3	n	

# 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

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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## Program Description II

### Sample Problem(s)

## 16. Interest at Maturity/Discounted Securities

Price (given yield) =

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

**Yield (given price) =**

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

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

### Solution(s)

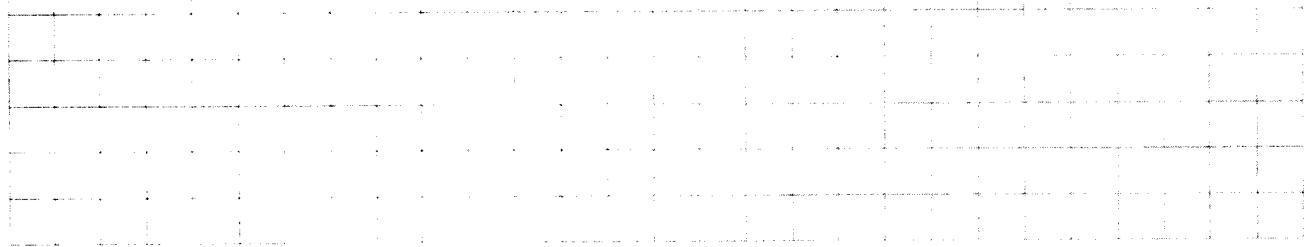
$$\text{YLD (given price)} = \left( \frac{100 - \text{PRICE}}{\text{PRICE}} \times \frac{360}{\text{DSM}} \right) \times 100$$

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

### Reference(s)

# Program Description II

## Sketch(es)



### Example 1:

Find the yield of the following interest at maturity security:

DIM = 220

DSM = 117

Basis = 360

CR = 5%

Price = 99.531250

## Sample Problem(s)

### Keystrokes:

220 **ENTER** 117 **A**

360 **B** 5 **C**

99.531250 **E** **D** →

### Outputs:

6.38 (% yield)

## Solution(s)

### 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:

7 **D** **E** →

### Output:

99.33 (price)

## Reference(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:

81 **f** **A** 5.6 **f** **B**

**f** **E** →

### Outputs:

98.74 (price)

**f** **D** →

5.67 (% yield)

### Example 4:

Find the yield of the following discounted security:

DSM = 307

Price = 96.27

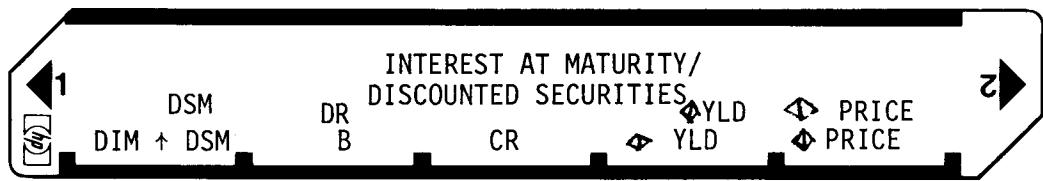
### Keystrokes:

307 **I** **A** 96.27 **f** **E**

### Outputs:

4.54 (% yield)

# User Instructions



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

# 97 Program Listing I

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STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		057	RCL8	36 08	
002	STOA	35 11	DSM $\rightarrow$ R <sub>A</sub>	058	$\div$	-24	
003	X $\neq$ Y	-41	DIM $\rightarrow$ R <sub>9</sub>	059	1	01	
004	ST09	35 09		060	+	-55	
005	X $\neq$ Y	-41		061	RCLA	36 11	
006	RTN	24	-----	062	RCLB	36 12	
007	*LBLB	21 12	Basis $\rightarrow$ R <sub>B</sub>	063	$\div$	-24	
008	STOB	35 12		064	RCLD	36 14	
009	EEX	-23	100 $\rightarrow$ R <sub>8</sub>	065	$\times$	-35	
010	2	02		066	RCL8	36 08	
011	ST08	35 08		067	$\div$	-24	
012	X $\neq$ Y	-41		068	1	01	
013	RTN	24	-----	069	+	-55	
014	*LBLC	21 13	CR $\rightarrow$ R <sub>C</sub>	070	$\div$	-24	
015	STOC	35 13		071	RCL9	36 09	
016	RTN	24	-----	072	RCLA	36 11	
017	*LBLD	21 14		073	-	-45	
018	STOD	35 14	YLD $\rightarrow$ R <sub>D</sub>	074	RCLB	36 12	
019	F3?	16 23 03		075	$\div$	-24	
020	RTN	24	-----	076	RCLC	36 13	
021	RCL9	36 09	Calc. Yield	077	$\times$	-35	
022	RCLB	36 12		078	RCL8	36 08	
023	$\div$	-24		079	$\div$	-24	
024	RCLC	36 13		080	-	-45	
025	$\times$	-35		081	EEX	-23	
026	RCL8	36 08		082	2	02	
027	$+$	-55		083	$\times$	-35	Store price in R <sub>E</sub> .
028	RCL9	36 09		084	STOE	35 15	
029	RCLA	36 11		085	RTN	24	-----
030	-	-45		086	*LBLa	21 16 11	DSM $\rightarrow$ R <sub>A</sub>
031	RCLB	36 12		087	STOA	35 11	
032	$\div$	-24		088	CF1	16 22 01	
033	RCLC	36 13		089	RTN	24	-----
034	$\times$	-35		090	*LBLb	21 16 12	
035	RCLE	36 15		091	SF1	16 21 01	
036	$+$	-55		092	STOI	35 46	
037	$\div$	-24		093	RCLA	36 11	Calc. price given
038	1	01		094	$\times$	-35	DR
039	-	-45		095	3	03	
040	RCLB	36 12		096	6	06	
041	$\times$	-35		097	0	00	
042	RCLA	36 11		098	$\div$	-24	
043	$\div$	-24		099	EEX	-23	
044	RCL8	36 08		100	2	02	
045	$\times$	-35		101	X $\neq$ Y	-41	
046	STOD	35 14	Store yield in R <sub>D</sub> .	102	-	-45	
047	RTN	24	-----	103	ST07	35 07	
048	*LBLE	21 15		104	GSBc	23 16 13	
049	STOE	35 15		105	RCLI	36 46	
050	F3?	16 23 03	Price $\rightarrow$ R <sub>E</sub>	106	RTN	24	-----
051	RTN	24	-----	107	*LBLc	21 16 13	Calc. yield given
052	RCL9	36 09		108	EEX	-23	price
053	RCLB	36 12	Calc. price	109	2	02	
054	$\div$	-24		110	X $\neq$ Y	-41	
055	RCLC	36 13		111	-	-45	
056	$\times$	-35		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	
<sup>A</sup> DSM	<sup>B</sup> 360/365		<sup>C</sup> CR(%)		<sup>D</sup> YLD		<sup>E</sup> PRICE		<sup>I</sup> DISC RATE			

## 97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
113	÷	-24					
114	RCL A	36 11		170			
115	÷	-24					
116	3	03					
117	.	-62					
118	6	06					
119	EEX	-23					
120	4	04					
121	X	-35					
122	STO D	35 14					
123	RTN	24					
124	*LBLd	21 16 14		180			
125	F1?	16 23 01					
126	GT02	22 02					
127	STO D	35 14					
128	F3?	16 23 03					
129	RTN	24					
130	RCL E	36 15					
131	GSB e	23 16 13					
132	RTN	24					
133	*LBL e	21 16 15		190			
134	STO E	35 15					
135	F1?	16 23 01					
136	GT01	22 01					
137	F3?	16 23 03					
138	RTN	24					
139	1	01					
140	RCL D	36 14		200			
141	EEX	-23					
142	2	02					
143	÷	-24					
144	RCL A	36 11					
145	X	-35					
146	3	03					
147	6	06					
148	8	08					
149	÷	-24					
150	+	-55					
151	EEX	-23					
152	2	02					
153	X <sup>2</sup> Y	-41		210			
154	÷	-24					
155	STO E	35 15					
156	RTN	24					
157	*LBL1	21 01					
158	RCL 7	36 07					
159	STO E	35 15					
160	RTN	24					
161	*LBL2	21 02					
162	RCL D	36 14					
163	RTN	24					
164	R/S	51		220			

## LABELS

LABELS					FLAGS	SET STATUS		
A	B	C	D	E	0	FLAGS	TRIG	DISP
<sup>a</sup> DSM	<sup>b</sup> DR	<sup>c</sup> Used	<sup>d</sup> YLD	<sup>e</sup> PRICE	0	ON OFF		
0	1	2	3	4	1	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
5	6	7	8	9	2	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
					3	2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		n <u>2</u>

# 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.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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## Program Description II

Solution(s)	Day of the Year		Days Between Dates	Price per \$100	Total Value
	Quote Date	Due Date			
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

<b>Reference(s)</b>	<input type="text"/>
---------------------	----------------------

# User Instructions

1	Treasury Bill Valuation			2
	Maturity Date	Bid/Ask	Face Amt.	
 <b>Quote Date</b>				

## 97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		057	-	-45	
002	GSBe	23 16 15		058	3	03	
003	ST01	35 01	Quote date day of year	059	1	01	
004	RTN	24		060	x	-35	
005	*LBLB	21 12	Maturity date day of year	061	+	-55	
006	GSBe	23 16 15		062	RTN	24	
007	RCL1	36 01	days between dates	063	*LBLC	21 13	
008	-	-45		064	R/S	51	
009	0	00		065	*LBLC	21 13	enter quotes and determine mean
010	ST01	35 01		066	+	-55	
011	X>Y?	16-35		067	2	02	
012	GT03	22 03		068	÷	-24	
013	CLX	-51		069	x	-35	
014	3	03		070	3	03	
015	6	06		071	6	06	
016	5	05		072	0	00	
017	+	-55		073	÷	-24	
018	ENT↑	-21		074	EEX	-23	
019	*LBL3	21 03		075	2	02	
020	CLX	-51		076	-	-45	
021	3	03		077	CHS	-22	
022	6	06		078	RTN	24	
023	0	00		079	*LBLD	21 14	
024	X>Y?	16-34		080	LSTX	16-63	
025	R↓	-31		081	÷	-24	
026	RTN	24		082	x	-35	
027	*LBL4	21 16 15		083	RTN	24	
028	ENT↑	-21					
029	INT	16 34					
030	ST02	35 02	store month				
031	-	-45					
032	EEX	-23					
033	2	02					
034	x	-35					
035	ST03	35 03	store days of month				
036	2	02					
037	RCL2	36 02					
038	X>Y?	16-34					
039	GT01	22 01					
040	0	00					
041	GT02	22 02	clear and lift register				
042	*LBL1	21 01					
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					
053	RCL3	36 03	Determine Day of year				
054	+	-55					
055	RCL2	36 02					
056	1	01					

## REGISTERS

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

FLAGS	TRIG		DISP	
	ON	OFF	DEG	FIX
0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

GRAD	SCI
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>

# 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:

$$\text{Indicated Convertible Price} = (C) (Pc)$$

$$\text{Anticipated Stock Price} = Pb/C$$

$$\text{Conversion Parity Price (Bonds only)} = 1000/C$$

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

$$\text{Current Convertible Yield} = i/Pb$$

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

## Operating Limits and Warnings

Convertible must pay interest or dividend.

Program assumes all bonds are \$1000 units.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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# Program Description II

Sketch(es)

N O N E

**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

## Convertible Security Analysis

1

2

Pb, 1

Pc, D

6

### Bond

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		
0		1		2		3	Skip par	4		2			
5		6		7		8		9		3			

## 97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11		056	RCL4	36 04	
002	ENT↑	-21		057	RCL5	36 05	
003	ENT↑	-21		058	X	-35	Calculate incre-
004	F1?	16 23 01	If bond, mult. by 10	059	-	-45	mental payout re-
005	GSB6	23 06	to reflect \$ value	060	RCL1	36 01	turn and display
006	ST01	35 01		061	RCL6	36 06	as a percentage
007	R↓	-31		062	-	-45	
008	R/S	51		063	÷	-24	
009	ENT↑	-21		064	1	01	
010	ENT↑	-21		065	0	00	
011	F1?	16 23 01	If bond, mult. by 10	066	0	00	
012	GSB6	23 06	to reflect \$ value	067	X	-35	
013	ST02	35 02		068	R/S	51	
014	R↓	-31		069	CF1	16 22 01	Set program for
015	RTN	24		070	CLX	-51	preferred stock
016	*LBLB	21 12		071	ENT↑	-21	clear stack to
017	ST03	35 03		072	ENT↑	-21	show ready for next
018	R/S	51		073	ENT↑	-21	case
019	ST04	35 04		074	RTN	24	
020	RTN	24		075	*LBLE	21 15	Set program for an-
021	*LBLC	21 13		076	SF1	16 21 01	alysis of a bond
022	ST05	35 05		077	RTN	24	case
023	RCL3	36 03		078	*LBLE	21 06	Produce the number
024	X	-35		079	1	01	10 here, to be
025	ST06	35 06		080	0	00	called as needed
026	F1?	16 23 01	If bond, 10% for	081	X	-35	to save prog. steps
027	GSB7	23 07	Market price	082	RTN	24	
028	R/S	51		083	*LBL7	21 07	
029	RCL1	36 01		084	1	01	
030	RCL5	36 05		085	0	00	
031	÷	-24		086	÷	-24	
032	R/S	51		087	RTN	24	
033	F1?	16 23 01	Test for Pfd. Stk.	088	*LBL8	21 08	
034	GSB8	23 08	If so skip	089	1	01	
035	R/S	51		090	EEX	-23	
036	*LBL3	21 03		091	3	03	
037	RCL1	36 01		092	RCL5	36 05	
038	RCL6	36 06		093	÷	-24	
039	-	-45		094	RTN	24	
040	RCL1	36 01		095	R/S	51	
041	÷	-24					
042	1	01					
043	0	00					
044	0	00					
045	X	-35					
046	R/S	51					
047	RCL2	36 02					
048	RCL1	36 01					
049	÷	-24					
050	1	01					
051	0	00					
052	0	00					
053	X	-35					
054	R/S	51					
055	RCL2	36 02					

## 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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