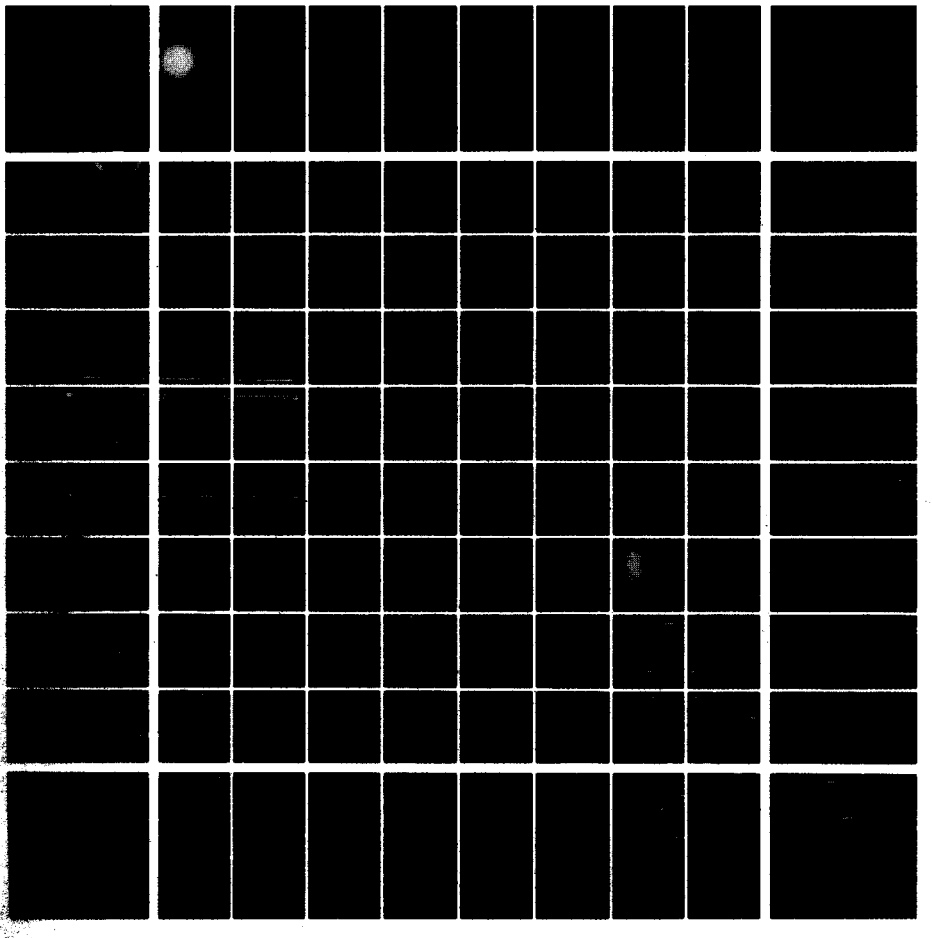
HEWLETT-PACKARD

HP-41C

SECURITIES PAC



NOTICE

INTRODUCTION

Each program in this Pac is represented by one program in the Application Module and a section in this manual. The manual provides a description of the program with relevant equations, a set of instructions for using the program, and one or more example problems, each of which includes a list of the keystrokes required for its solution.

Before plugging in your Application Module, **turn your calculator off,** and be sure you understand the section Inserting and Removing Application Modules. And before using a particular program, take a few minutes to read Format of User Instructions and A Word About Program Usage.

You should first familiarize yourself with a program by running it once or twice while following the complete User Instructions in this manual. Thereafter, the program's prompting or the mnemonics on the overlays should provide the necessary instructions, including which variables are to be input, which keys are to be pressed, and which values will be output. A quick-reference card with a brief description of each program's operating instructions has been provided for your convenience.

We hope that Securities Pac I will assist you in the solution of numerous problems in your discipline. We would appreciate knowing your reactions to the programs in this Pac, and to this end we have provided a questionnaire inside the front cover of this manual. Would you please take a few minutes to give us your comments on these programs? It is from your comments that we learn how to increase the usefulness of our programs.

CONTENTS

INSERTING AND REMOVING APPLICATION MODULES

Before you insert an Application Module for the first time, familiarize yourself with the following information.

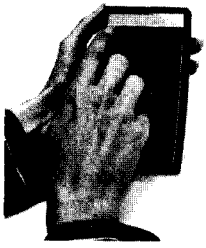
Up to four Application Modules can be plugged into the ports on the HP-41C. While plugged in, the names of all programs contained in the Module can be displayed by pressing ■ CATALOG 2.

CAUTION

Always turn the HP-41C off before inserting or removing any plug-in extension or accessories. Failure to turn the HP-41C off could damage both the calculator and the accessory.

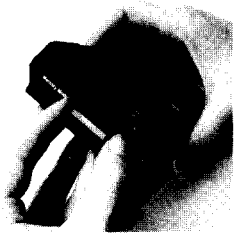
To insert Application Modules:

1. Turn the HP-41C off! Failure to turn the calculator off could damage both the Module and the calculator.



2. Remove the port covers. Remember to save the port covers; they should be inserted into the empty ports when no extensions are inserted.

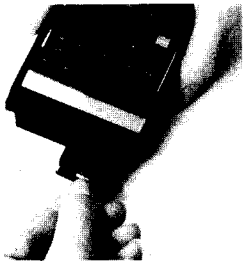
3. Insert the Application Module with the label facing downward as shown, into any port **after** the last Memory Module. For example, if you have a Memory Module inserted in port 1, you can insert an Application Module in any of ports 2, 3, or 4. (The port numbers are shown on the back of the calculator.) **Never insert an Application Module into a lower numbered port than a Memory Module.**



4. If you have additional Application Modules to insert, plug them into any port after the last Memory Module. Be sure to place port covers over unused ports.
5. Turn the calculator on and follow the instructions given in this book for the desired application functions.

To remove Application Modules:

1. Turn the HP-41C off! Failure to do so could damage both the calculator and the Module.
2. Grasp the desired Module handle and pull it out as shown.



3. Place a port cap into the empty ports.

Mixing Memory Modules and Application Modules

Any optional accessories (such as the HP-82104A Card Reader, or the HP-82143A Printer) should be treated in the same manner as Application Modules. That is, they can be plugged into any port after the last Memory Module. Also, the HP-41C should be turned off prior to insertion or removal of these extensions.

The HP-41C allows you to leave gaps in the port sequence when mixing Memory and Application Modules. For example, you can plug a Memory Module into port 1 and an Application Module into port 4, leaving ports 2 and 3 empty.

FORMAT OF USER INSTRUCTIONS

The completed User Instruction Form—which accompanies each program—is your guide to operating the programs in this Pac.

The form is composed of five labeled columns. Reading from left to right, the first column, labeled STEP, gives the instruction step number.

The INSTRUCTIONS column gives instructions and comments concerning the operations to be performed.

The INPUT column specifies the input data, the units of data if applicable, or the appropriate alpha response to a prompted question. Data input keys consist of 0 to 9 and the decimal point (the numeric keys), [EEX] (enter exponent), and [CHS] (change sign).

The FUNCTION column specifies the keys to be pressed after keying in the corresponding input data.

The DISPLAY column specifies prompts, intermediate and final answers, and their units, where applicable.

Above the DISPLAY column is a box which specifies the minimum number of data storage registers necessary to execute the program. Refer to the Owner's Handbook for information on how the SIZE function affects storage configuration.

A WORD ABOUT PROGRAM USAGE

Catalog

When an Application Module is plugged into a port of the HP-41C, the contents of the Module can be reviewed by pressing ■ CATALOG 2 (the Extension Catalog). Executing the CATALOG function lists the name of each program or function in the Module, as well as functions of any other extensions which might be plugged in.

Overlays

Overlays have been included for some of the programs in this Pac. To run the program, choose the appropriate overlay, and place it on the calculator. The mnemonics on the overlay are provided to help you run the program. The program's name is given vertically on the left side. When the calculator is in USER mode, a blue mnemonic identifies the key directly above it. Gold mnemonics are similar to blue mnemonics, except that they are above the appropriate key and the shift (gold) key must be pressed before the re-defined key. Once again, USER mode must be set.

ALPHA and USER Mode Notation

This manual uses a special notation to signify ALPHA mode. Whenever a statement on the User Instruction Form is printed in gold, the ALPHA key must be pressed before the statement can be keyed in. After the statement is input, press ALPHA again to return the calculator to its normal operating mode, or to begin program execution. For example, XEQ BONDS means press the following keys: XEQ ALPHA BONDS ALPHA.

When the calculator is in USER mode, this manual will use the symbols A - J and ■ A - ■ E to refer to the reassigned keys in the top two rows. These key designations will appear on the User Instruction Form and in the keystroke solutions to sample problems.

Optional HP-82143A Printer

When the optional printer is plugged into the HP-41C along with the Securities Application Module, all results will be printed automatically. You may also want to keep a permanent record of the value input to a certain program. A convenient way to do this is to set the Print Mode switch to NORMAL before running the program. In this mode, all input values and the corresponding keystrokes will be listed on the printer, thus providing a record of the entire operation of the program.

Downloading Module Programs

If you wish to trace execution, to modify, to record on magnetic cards, or to print a program in this Application Module, it must first be copied into the HP-41C's program memory. For information concerning the HP-41C's COPY function, see the Owner's Handbook. It is not necessary to copy a program in order to run it.

Program Interruption

These programs have been designed to operate properly when run from beginning to end, without turning the calculator off (remember, the calculator may turn itself off). If the HP-41C is turned off, it may be necessary to set flag 21 (SF 21) to continue proper execution.

Use of Labels

You should generally avoid writing programs into the calculator memory that use program labels identical to those in your Application Module. In case of a label conflict, the label within program memory has priority over the label within the Application Pac program.

Assigning Program Names

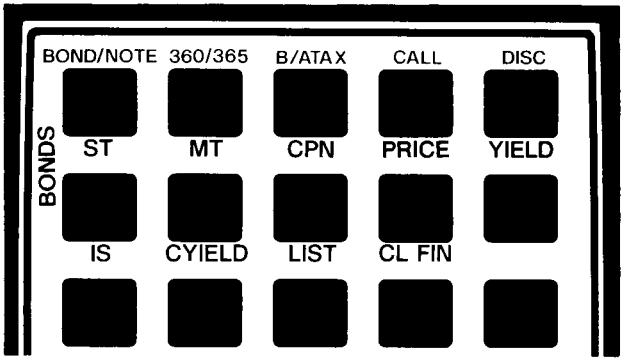
Key assignments to keys [A]-[J] and ■[A]-■[E] take priority over the automatic assignments of local labels in the Application Module. Be sure to clear previously assigned functions before executing a Module program.

Incompatible Application Module

This Pac contains a type X Application Module. Type X Modules have incompatible XROM instructions. You should never plug two type X Application Modules into your HP-41C at the same time. Type X Modules may be identified by an "X" on the Application Module label.

NOTES

BONDS AND NOTES



In the securities market there are numerous interest bearing obligations: notes, bonds, certificates, debentures, warrants, certificates of deposit, etc. Each of these can be placed in one of three categories according to the procedure by which interest is paid to the investor. Interest is either paid semi-annually, at maturity, or as a result of discounting the purchase price.

This program can be used to calculate yield, or price* and accrued interest for all three categories. If the security involves semi-annual interest payments, it is a bond. If the security is sold at a discount or pays interest at maturity, it is a note.

Program options available for the price and yield computation include redemption at maturity or at call, price and yield before and after tax, and a calendar basis of 30/360 or Actual/365. In addition, notes are also evaluated on an Actual/360 basis when in 30/360 mode. When BONDS is first executed, the program is initialized for the following conditions: bonds, 30/360 day calendar, before tax, and a redemption value of 100 (call price = 100).

Coupon equivalent yield is also provided so that an investor can determine which of two investments of similar maturity will provide a higher return—a non-interest bearing obligation purchased at a discount (i.e., Treasury Bills) or a semi-annual coupon bond on a 365-day basis.

Often the calendar basis is difficult to determine. There is seldom any indication from an obligation's name which calendar basis is appropriate. For this reason, the following alphabetical index has been included. It gives the most common U.S. securities and their classification.

Type 1: Semi-Annual Coupon, 30/360 Day Basis (Bonds)

Type 2: Semi-Annual Coupon, Actual/365 Day Basis (Bonds)

Type 3: Interest at Maturity, 30/360 Day Basis (Notes)

* Bond price is quoted as a percent of par value ($100).

Type 4: Interest at Maturity, Actual/360 Day Basis (Notes)

Type 5: Interest at Maturity, Actual/365 Day Basis (Notes)

Type 6: Discount, Actual/360 Day Basis (Notes)

	TYPE
Assessment Supported Bonds	1
Assessment Supported Notes	3
Assessment Supported Warrants	3
Bankers' Acceptances	6
Banks for Cooperatives Debentures	3
Certificates of Deposit	1, 4, 6
Certificates of Indebtedness	5
Commercial Paper	4, 6
Commodity Credit Corporation	1
Corporate Bonds	1
Export-Import Bank Participation Certificates	1
Farmers Home Administration Insured Notes	2
Federal Home Loan Bank Notes and Bonds	1
Federal Housing Administration (FHA) Debentures	2
Federal Intermediate Credit Bank Debentures	1, 3
Federal Land Bank Bonds	1
FNMA Debentures	1
FNMA Short Term Notes	6
GNMA Bonds and Participation Certificates	1
Inter-American Development Bank Bonds	1
International Bank for Reconstruction and Development Bonds	1
Merchant Marine Bonds	1
New Communities Act Debentures	1
Repurchase Agreements	4
Revenue Supported Bonds	1
Revenue Supported Notes	3
Revenue Supported Warrants	3
Special Supported Bonds	1
Special Supported Notes	3
Special Supported Warrants	3
Tax Supported Bonds	1
Tax Supported Notes	3
Tax Supported Warrants	3
Tennessee Valley Authority Bonds	1
Tennessee Valley Authority Notes	6
U.S. Postal Service Bonds	1
U.S. Treasury Bills	6
U.S. Treasury Bonds	2
U.S. Treasury Notes	2
U.S. Treasury Tax-Anticipation Bills	6

SIZE: 021

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Place overlay on calculator and initialize program		XEQ BONDS	0.00
2.	Select Bond or Note		■ A	BOND or NOTE
3.	Select calendar basis (toggles between 360 and 365 mode).		■ B	360 or 365
4.	Select tax basis (toggles between before-tax and after-tax mode).		■ C	BTAX or INC TAX?
5.	For after-tax calculations, key in marginal income tax rate	INC TAX (%)	R/S	GAINS TAX?
6.	Key in capital gains tax rate	GAINS TAX(%)	R/S	
7.	The following steps may be performed in any order:			
	Key in issue date	MM.DDYYYY	F	
	Key in settlement date	MM.DDYYYY	A	
	Key in maturity date	MM.DDYYYY	B	
	Key in annual coupon rate	CPN (%)	C	
	Key in price	PRICE	D	
	Key in yield	YIELD (%)	E	
	Key in call price if other than 100	CALL	■ D	
	Key in discount rate	DISC (%)	■ E	
8.	Calculate:			
	Price and accrued interest**		D	PRICE =
			R/S *	AI =
	Yield to maturity †		E	YIELD =
	Coupon equivalent yield		G	CYIELD =
9.	To list the values being used press H, then R/S * for successive values		H	
10.	To clear appropriate registers and set to Bond mode		I	0.00
*	Press R/S if you are not using a printer.			
**	Price and accrued interest are for 30/360 or Actual/365 calendar basis bonds or notes. For Actual/360 notes, press R/S * two additional times for price and accrued interest.			
†	When calculating note yield in 365 mode, the display contains the yield. In 360 mode, the display contains the yield on a 30/360 basis; press R/S * to obtain note yield on an actual/360 basis.			

Example 1:

Given the following U.S. Treasury Bond, find its price and accrued interest:

Settlement date April 9, 1979; maturity date December 14, 1990; coupon rate 4.75%; yield 5%; calendar basis Actual/365.

Keystrokes:	**Display:**	
XEQ ALPHA SIZE ALPHA 021		Minimum size
XEQ ALPHA BONDS ALPHA	***0.00***	
■ B	***365***	Calendar basis
4.091979 A		
12.141990 B		
4.75 C		
5 E		
D	***PRICE=97.80***	
R/S	***AI=1.51***	Accrued interest

Example 2:

Using the previous example, what is the yield if the bond is purchased for $96?

Keystrokes:	**Display:**	
96 D E	***YIELD=5.21***	Yield-to-maturity

Example 3:

Calculate the yield of the following U.S. Treasury Bill:

Settlement date July 2, 1979; maturity date October 30, 1979; price $97.50; no coupons; Actual/360 basis.

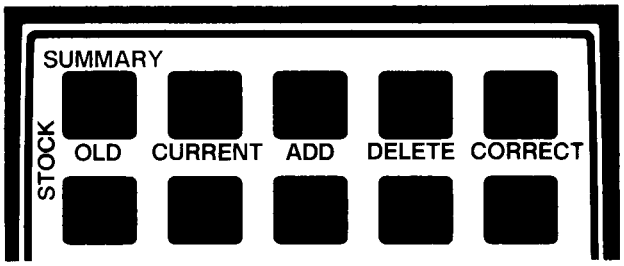
Keystrokes:	**Display:**	
I	***0.00***	Clear registers
■ A	***NOTE***	
7.021979 A		
10.301979 B		
97.5 D		
0 C E	***YIELD=7.82***	% annual yield (30/360 basis)
R/S	***YIELD=7.69***	% annual yield (Act/360 basis)

Example 4:

What is the after-tax yield of a corporate bond offered for $88 on August 10, 1977, paying 6.75% and callable May 1, 1992 at $102? Assume a marginal income tax rate of 50%, an effective capital gains tax rate of 25% and a 30/360 calendar basis.

Keystrokes:	**Display:**	
[I]	***0.00***	Clear registers
[■] [C]	***INC TAX?***	
50 [R/S]	***GAINS TAX?***	
25 [R/S]		
8.101977 [A]		
5.011992 [B]		
6.75 [C]		
102 [■] [D]		
88 [D]		
[E]	***YIELD=4.42***	After-tax yield

STOCK PORTFOLIO VALUATION WITH BETA ANALYSIS



The fundamental concern of all investors is the expected return from an investment for a given level of risk. The riskier the investment, the greater the expected return should be. This program provides the measures of risk and return necessary for evaluating an investment portfolio of as many as 56 stocks.

This program uses the beta coefficient as a measure of risk. Beta reflects the extent to which an investment's rate of return tends to vary with changes in the market's rate of return. The return of the investment is expected to be greater than that of the market if the beta is greater than one, and less than the market if beta is less than one.

The program requires the following data for each share: original purchase price per share, the number of shares owned, the annual dividends per share, and the beta coefficient. Once this data has been entered, the user enters the current (or expected) price of each stock. The program then provides the following information for the current (or expected) portfolio: total value, percentage change in value, current annual yield, and weighted beta coefficient.

With an optional card reader (HP-82104A) the user may create data cards containing the portfolio information. The data is stored (beginning with register 01 (R_{01})) and must use the format SSSSS.XXXXX, where S denotes the number of shares of a particular stock and X denotes the stock's price. For example, 250 shares of XYZ stock purchased for $42.50 would be stored as 250.04250. Because all five decimal digits are used for stock price, the price must be less than $1000.00. The registers which are used for computation (R_{57}-R_{62}) must contain zero.

				SIZE: 063
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Place overlay on calculator and initialize program.		XEQ STOCK	0.00

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
2.	To load historical data†.		[A]	NO GROUPS=?
3.	Key in number of groups of historical data.	# GROUPS	[R/S]	NO SHS_n=?
4.	Key in number of shares in group n	# SHS_n	[R/S]	PRC=?
5.	Key in price per share.	PRC	[R/S]	NO SHS_n=?
6.	Repeat steps 4 and 5 until each group of stock is entered.			
7.	If an error is made while entering historical data, press [E] and continue keying in data as in steps 4-5.		[E]	NO SHS_n=?
8.	To delete a group from the portfolio.		[D]	DELETE NO=?
9.	Input group number to be deleted.	n	[R/S]	0.00
10.	To add a group to an already established portfolio (the program counter stops at the first storage register containing zero).		[C]	NO SHS_n=?
		# SHS_n	[R/S]	PRC=?
		PRC	[R/S]	0.00
11.	To load current data and calculate % change in stock value:		[B]	PRC_n=?
	Key in current price of stock	PRC_n	[R/S]	BETA=?
	Key in stock's beta coefficient	BETA	[R/S]	DIV=?
	Key in annual dividend per share	DIV	[R/S]	%CH=
			[R/S] *	PRC=?
12.	Repeat step 11 for each group in portfolio.			
13.	After all current data has been keyed in, prepare a summary and display historical portfolio value.		[■][A]	OLD=
14.	Calculate current portfolio value.		[R/S] *	NEW=
15.	Calculate % change in portfolio value.		[R/S] *	%CH=
16.	Calculate current annual dividend.		[R/S] *	DIV=
17.	Calculate portfolio's current dividend yield.		[R/S] *	YIELD=
18.	Calculate portfolio's weighted beta coefficient.		[R/S] *	BETA=
†	NOTE: If a card reader is in use, the user may input a previously prepared data card containing historical data and proceed to step 7.			
*	Press [R/S] if you are not using a printer.			

Example:

With the following historical and current information about a portfolio containing four groups of stock, analyze the performance of the portfolio.

HISTORICAL INFORMATION			CURRENT INFORMATION		
Company	**# Shares**	**Purchase ($)**	**Market ($)**	**Beta**	**Dividend ($)**
FEXTER	200	14⅛	17	1.39	.50
BOAR	300	91¾	75	1.28	.80
ST MAL	500	88⅜	91¾	0	7.70
TIMCO	1000	40½	52¼	1.17	1.40

Keystrokes:	**Display:**	
XEQ ALPHA SIZE ALPHA 063		Minimum size
XEQ ALPHA STOCK ALPHA	***0.00***	

To enter historical data:

A	***NO GROUPS=?***	
4 R/S	***NO SHS1=?***	
200 R/S	***PRC=?***	
14.125 R/S	***NO SHS2=?***	
300 R/S	***PRC=?***	
91.75 R/S	***NO SHS3=?***	
500 R/S	***PRC=?***	
88.325 R/S	***NO SHS4=?***	Mistake, should be 88.375
E	***NO SHS3=?***	
500 R/S	***PRC=?***	
88.375 R/S	***NO SHS4=?***	
1000 R/S	***PRC=?***	
40.5 R/S	***0.00***	

To enter current data:

B	***PRC1=?***	
17 R/S	***BETA=?***	
1.39 R/S	***DIV=?***	
.5 R/S	***%CH=20.35***	Change in stock 1 value

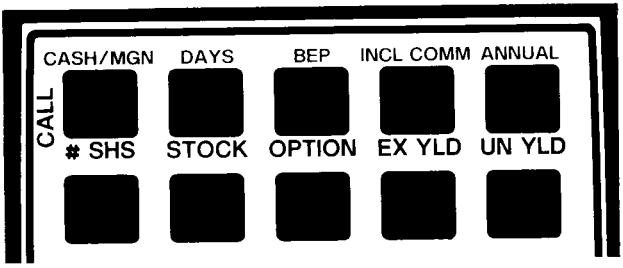
Keystrokes:	Display:	
R/S	*PRC2=?*	
75 R/S	*BETA=?*	
1.28 R/S	*DIV=?*	
.8 R/S	*%CH=-18.26*	Change in stock 2 value
R/S	*PRC3=?*	
91.75 R/S	*BETA=?*	
0 R/S	*DIV=?*	
7.7 R/S	*%CH=3.82*	Change in stock 3 value
R/S	*PRC4=?*	
52.25 R/S	*BETA=?*	
1.17 R/S	*DIV=?*	
1.4 R/S	*%CH=29.01*	Change in stock 4 value

To prepare portfolio summary:

■ A	*OLD=115,037.50*	
R/S	*NEW=124,025.00*	
R/S	*%CH=7.81*	Change in portfolio value
R/S	*DIV=5,590.00*	
R/S	*YIELD=4.51*	
R/S	*BETA=0.76*	

From the above calculations, we can see that the portfolio has increased in value by 7.81% and the dividends are currently $5,590.00 or 4.51% of the portfolio value. Based upon our weighted beta coefficient, the portfolio should be less risky than the market (i.e., $0.76 < 1.00$).

YIELD ON CALL OPTION SALES



This program calculates various yields (actual and annualized) useful in evaluating call option sales (writing): yield if exercised, yield if unexercised, and break-even point[1]. Calculations consider whether the stock is purchased on a cash basis (full price) or on a margin basis.

$$\text{exercised} = \frac{\text{net prem.} - \text{net pur.} + \text{net sale} + \text{div.} - \text{int.}}{(1 - \%\ \text{margin})\ \text{net pur.} - \text{net prem.}}$$

$$\text{unexercised} = \frac{\text{net prem.} + \text{div.} - [2 \times \text{comm.}]_2 - \text{int.}}{(1 - \%\ \text{margin})\ \text{net pur.} - \text{net prem.}}$$

$$\text{break-even} = \frac{\text{net pur.} - \text{net prem.} - \text{div.} + \text{int.}}{\#\ \text{shares}}$$

where:

net pur. = (# shares × stock price) + comm.

net prem. = (# shares × option premium) − option commission

net sale = (# shares × exercise price) − exercise commission

int. = interest rate × (1 − % margin) (net pur.) × T/365

comm. = commission on stock purchase

T = # days

[1] Stock price below which the writer has a loss (the loss point on the downside).

[2] Stock is purchased for one option period and then sold.

SIZE: 021

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Place overlay on calculator and initialize program.		XEQ CALL (■A)	CASH?
2.	If stock is purchased on cash basis, press R/S and go to step 5; otherwise answer no (N) for margin basis.	N	R/S	% MARGIN=?
3.	Key in margin percentage rate.	% MARGIN	R/S	MARGIN INT=?
4.	Key in interest rate charged on margin account.	MARGIN INT	R/S (A)	NO SHS=?
5.	Key in number of shares purchased.	# SHS	R/S (B)	STOCK PRC=?
6.	Key in stock price.	STOCK PRC	R/S	DIVIDEND=?
7.	Key in dividends per share before expiration.	DIVIDEND	R/S	STOCK COMM%=?
8.	Key in stock commission as a percent.	STOCK COMM%	R/S	FLAT FEE=?
9.	Key in additional flat fee.	FLAT FEE	R/S (C)	OPT EXPRC=?
10.	Key in option exercise price.	OPT EXPRC	R/S	OPT PREM=?
11.	Key in option premium.	OPT PREM	R/S (■B)	NO DAYS=?
12.	Key in number of days to expiration.	# DAYS	R/S	OPT COMM=?
13.	Key in option commission as a percent.	OPT COMM	R/S	FLAT FEE=?
14.	Key in additional flat fee and calculate actual yield if option is exercised.	FLAT FEE	R/S (D)	ACYLD=
15.	Calculate actual yield assuming stock price remains constant and option expires unexercised (no commissions included).		R/S * (E)	UNEX=
16.	Calculate break-even point (loss point on downside).		■C	BEP=
17.	Convert actual yield to an annualized yield.		■E	ANYLD=
18.	Calculate yield with buy and sell commissions (double) included. Flag 1 is set by program.		■D	YLD/C=
*	Press R/S if you are not using a printer.			

You wish to write 3 calls on 300 shares of XYZ stock, which you intend to buy at $20. The calls trade at $1^3/_{16}$, 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. The margin interest rate is 7.2%.

1. Calculate: the yield if called, the yield if not called (assuming you own the stock), and the break-even 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 the yield if not called on the same stock, but if the striking price is 30, expiring in 190 days and trading at 2⅛ (both for margin and cash basis)?

Example 1:

Keystrokes:	**Display:**	
XEQ ALPHA SIZE ALPHA 021		Minimum size
XEQ ALPHA CALL ALPHA	***CASH?***	
R/S	***NO SHS=?***	
300 R/S	***STOCK PRC=?***	
20 R/S	***DIVIDEND=?***	
.5 R/S	***STOCK COMM%=?***	
1.2 R/S	***FLAT FEE=?***	
44.5 R/S	***OPT EXPRC=?***	
25 R/S	***OPT PREM=?***	
3 ENTER↑ 16 ÷ 1 + R/S	***NO DAYS=?***	
100 R/S	***OPT COMM%=?***	
1.43 R/S	***FLAT FEE=?***	
33 R/S	***ACYLD=29.61***	Actual yield if exercised
R/S	***UNEX=8.07***	Actual yield if unexercised
■ C	***BEP=18.83***	Break-even point

Example 2:

If the stock in Example 1 is purchased on 50% margin, calculate the yield if called and the yield if not called (assuming you liquidate your shares at the time of expiration of the option).

Keystrokes:	**Display:**	
[■] [A]	***CASH?***	
N [R/S]	***% MARGIN=?***	
50 [R/S]	***MARGIN INT=?***	
7.2 [R/S]	***NO SHS=?***	Since this data has already been keyed in, calculation is possible
[D]	***ACYLD=60.47***	
[■] [D]	***YLD/C=6.38***	Yield if not called and shares are sold

Example 3:

Using the previous two examples, what is the yield if not called on the same stock, but if the striking price is 30, expiring in 190 days and trading at 2⅛ (both for margin and cash basis)?

Keystrokes:	**Display:**	
[■] [A]	***CASH?***	
[R/S]	***NO SHS=?***	Number of shares does not change
[C]	***OPT EXPRC=?***	
30 [R/S]	***OPT PREM=?***	
1 [ENTER↑] 8 [÷] 2 [+] [R/S]	***NO DAYS=?***	
190 [R/S]	***OPT COMM%=?***	Option commission does not change
[E]	***UNEX=13.50***	Actual yield (cash)
[■] [A]	***CASH?***	
N [R/S]	***% MARGIN=?***	% margin does not change
[E]	***UNEX=25.61***	Actual yield (margin)

ROUTINES FOR OPTION WRITERS USING THE BLACK-SCHOLES EVALUATION MODEL

Option writers use many different mathematical models for evaluating the value of an option, among these is the Black-Scholes model.

Using this method, the value of an option, the hedge ratio (which indicates the number of options to write per share), the maximum yield on the investment, the cash flow yield, and the annual rate of return can be calculated. In addition, the low and high break-even points, and the point of maximum profit is found.

Required inputs for these calculations are stock and strike price, interest rate, stock dividend, days to expiration, and volatility.

Volatility is the annual standard deviation of the return on the underlying stock. There are several ways of estimating it. One method is to use the equation:

$$\text{Volatility} = \frac{\text{High} - \text{Low}}{\frac{1}{2}\,(\text{High} + \text{Low})}$$

where the high and low values are those of the stock over a period of time. However, experience has shown that using this method produces values which are too high. Thus, use 6 month highs and lows (those printed in the newspaper during June and July), or dispense with dividing the denominator by 2.

Be careful not to confuse volatility with beta. The beta of a stock or option measures the variability with respect to the market: i.e., if the market goes up ten points, how far should the stock go? Volatility, on the other hand, measures the stock or option's variability with respect only to itself. How much does this stock tend to move around? Most brokerage houses can provide you with the numbers they are using as of any given date.

References:

Black, Fisher. "Fact and Fantasy in the Use of Options" *Financial Analysts Journal*, July/August 1975.

Black and Scholes. "The Pricing of Options and Corporate Liabilities" *Journal of Political Economy*, May/June 1973.

McGinley, John R. Jr. HP-67/97 Users' Library program #00869D.

				SIZE: 015
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		XEQ OPTION	PRC=?
2.	Key in stock price.	PRC	R/S	STRK=?
3.	Key in strike price.	STRK	R/S	INT=?
4.	Key in interest rate.	INT	R/S	DIV=?
5.	Key in stock dividend.	DIV	R/S	DAYS=?
6.	Key in days to expiration.	DAYS	R/S	VOL=?
7.	Key in stock volatility and calculate option's theoretical value.	VOL	R/S	VAL=
8.	Calculate hedge ratio.		R/S *	HR=
9.	Calculate number of options to write per 100.		R/S *	SHS=
10.	Calculate maximum yield on investment and cash flow yield in percent.		R/S *	MYOI=
			R/S *	CFYLD=
11.	Calculate annualized return.		R/S *	%RTN=
12.	Determine high and low break-even points and point of maximum profit.		R/S *	LO=
			R/S *	MAX=
			R/S *	HI=
*	Press R/S if you are not using a printer.			

Example:

Given the stock of XYZ Corporation at $118.25 per share, a $120 option with 35 days to go, a dividend expected of $1.50, the stock's volatility at .28, and an interest rate of 6%, what is the expected value of the option now? How many options should be written against 100 shares of the stock given its hedge ratio? What are the variously figured returns which should be expected? Where is the most money made? Where are the break-even points?

Keystrokes:	**Display:**
XEQ ALPHA SIZE ALPHA 015	Minimum size
XEQ ALPHA OPTION ALPHA	***PRC=?***
118.25 R/S	***STRK=?***
120 R/S	***INT=?***
6 R/S	***DIV=?***
1.5 R/S	***DAYS=?***
35 R/S	***VOL=?***

Keystrokes:	Display:	
.28 R/S	*VAL=3.60*	Option's theoretical value
R/S	*HR=0.48*	Hedge ratio
R/S	*SHS=200.00*	Number of options to write per 100
R/S	*MYOI=8.83*	Maximum yield on investment
R/S	*CFYLD=6.09*	Cash flow yield (%)
R/S	*%RTN=63.47*	Annualized return
R/S	*LO=128.95*	Low break-even point
R/S	*MAX=120.00*	Maximum profit
R/S	*HI=111.05*	Hi break-even point

WARRANT AND OPTION HEDGING

A certificate that entitles the holder to purchase shares of stock at a specified price is a warrant. Generally, warrants sell for less than the actual cost of the stock, so the percentage increase is higher for the warrant than for the stock, thus the warrant tends to sell at a premium. This program evaluates the investment value of the warrant premium, presuming that the warrant is sold short and the stock is bought.

gross return =

$$\frac{\dfrac{\text{conversion price}}{\text{conversion rate}} + \text{warrant price} \times \text{number sold} - \text{stock price}}{\text{warrant price} \times \text{number sold} + (1 - \%\ \text{margin})\ \text{stock price} + \text{interest}}$$

lower break-even point = max (0, stock price − warrant price × number sold)

upper break-even point =

$$\frac{\text{stock price} - \text{number warrants sold} \times (\text{warrant price} + \text{conversion price})}{1 - \text{conversion rate} \times \text{number of warrants sold}}$$

Remarks:

The dividends should be the expected amount to be received over a year. Since the time of payment is not used the calculated rate of return is the apparent rate rather than the true rate (a very small difference here).

The program assumes equity of 100% of the price or $5, whichever is greater on the short sales.

References:

Kassouf, Sheet T., and Thorp, Edward O. *Beat the Market*, New York: Random House, 1967.

Latone, Henry P. and Tuttle, Donald L. *Securities Analysis and Portfolio Management*, New York: The Ronald Press, 1970.

				SIZE: 010
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		[XEQ] HEDGING	DIV=?
2.	Key in stock's annual dividend.	DIV	[R/S]	DAYS=?
3.	Key in number of days to expiration.	DAYS	[R/S]	SPRC=?
4.	Key in stock price.	SPRC	[R/S]	WPRC=?
5.	Key in warrant price.	WPRC	[R/S]	CPRC=?
6.	Key in convertible price.	CPRC	[R/S]	CRATE=?
7.	Key in convertible rate.	CRATE	[R/S]	% MARGIN=?
8.	Key in margin percentage rate.	% MARGIN	[R/S]	INT=?
9.	Key in margin interest rate (in percent).	INT	[R/S]	MRTN=
10.	Calculate low break-even point.		[R/S] *	LBE=
11.	Calculate upper break-even point.**		[R/S] *	UBE=
12.	Repeat for i+1 warrants sold for each share of stock purchased.†		[C] [R/S] * [R/S] *	MRTN= LBE= UBE=
13.	Press [R/S] to continue.		[R/S] *	XPRC=?
14.	Key in hypothetical expiration price to calculate annual return, or press [R/S] alone to return to step 9.	XPRC	[R/S]	ARTN=
15.	Press [R/S] to prompt for another price.		[R/S] *	XPRC=?
16.	Go to step 14.			
*	Press [R/S] if you are not using a printer.			
**	NOTE: If the calculator displays NO UBE, the upper break-even point is non-existent.			
†	One, two, ... warrants sold short for each purchase of stock. Each additional press of [C] produces an additional warrant sold. For example, the first [C] you get 2 warrants, second [C] pressed gives 3 warrants, etc.			

Example:

XYZ corporation stock, which pays a $.50 annual dividend, is trading at $9¾ and a warrant, convertible 1 for 1 at $34, is selling for $1.75 expiring in 547 days. For various investment strategies, what is the maximum return (in percent), lower break-even point and upper break-even point assuming 50% margin at 10%? Furthermore, what are the possible annual returns if we assume various stock closing prices on the expiration date (e.g., $5, $10 and $20 closing prices)?

Keystrokes:	**Display:**	
XEQ ALPHA SIZE ALPHA 012		Minimum size
XEQ ALPHA HEDGING ALPHA	***DIV=?***	
.5 R/S	***DAYS=?***	
547 R/S	***SPRC=?***	
9.75 R/S	***WPRC=?***	
1.75 R/S	***CPRC=?***	
34 R/S	***CRATE=?***	
1 R/S	***% MARGIN=?***	
50 R/S	***INT=?***	
10 R/S	***MRTN=133.28***	Margin interest rate (%)
R/S	***LBE=8.00***	Low break-even point
R/S	***NO UBE***	No upper break-even point
R/S	***XPRC=?***	
5 R/S	***ARTN=-15.18***	Annual return
R/S	***XPRC=?***	
10 R/S	***ARTN=16.93***	
R/S	***XPRC=?***	
20 R/S	***ARTN=70.41***	
C	***MRTN=100.95***	
R/S	***LBE=6.25***	
R/S	***UBE=61.75***	
R/S	***XPRC=?***	
5 R/S	***ARTN=-2.21***	

(Typically, these keystrokes would be repeated until a desirable investment strategy is reached.)

BULL SPREAD OPTION STRATEGY

A bull spread option is the purchase of one option with a low exercise price, and another with a high exercise price, both with corresponding expiration dates. This program is used in determining hedging calls in one stock. It calculates upside and downside break-even points, less commissions, for perpendicular spreads. This program can also be used to evaluate matched or unmatched lots, sold or bought.

$$\text{upside break-even} = \frac{R(C_S + E_S) - (C_L + E_L)}{R - 1}$$

$$\text{downside break-even} = RC_S - C_L$$

where:

R = The ratio of the calls with higher exercise price sold short to the calls with lower exercise price purchased

C_S = Market price of calls sold short

E_S = Exercise price of calls sold short

C_L = Market price of calls bought long

E_L = Exercise price of calls bought long

Registers:

R_{01} number sold short
R_{02} price (short)
R_{03} exercise price (short)
R_{04} number bought (long)
R_{05} price (long)
R_{06} exercise price (long)
R_{07} current price

				SIZE: 009
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		XEQ BULL	NO SOLD=?
2.	Key in number of options sold short.	# SOLD	R/S	PRC=?
3.	Key in price of options sold short.	PRC	R/S	EXPRC=?
4.	Key in exercise price of options sold short.	EXPRC	R/S	NO BOUGHT=?
5.	Key in number of options bought long.	# BOUGHT	R/S	PRC=?
6.	Key in price of options bought long.	PRC	R/S	EXPRC=?

Bull Spread Option Strategy

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
7.	Key in exercise price of options bought long.	EXPRC	R/S	CPRC=?
8.	Key in current underlying stock price and calculate downside break-even stock price.**	CPRC	R/S	DBE=
9.	Calculate percent change from current stock price to downside break-even price.		R/S *	%CH=
10.	Calculate upside break-even stock price.		R/S *	UBE=
11.	Calculate percent change from current stock price to upside break-even price.		R/S *	%CH=
12.	If the input data is stored in the appropriate registers (R_{01}-R_{07}), the downside and upside break-even stock prices may be calculated by XEQ DBEP and XEQ UBEP respectively.			
*	Press R/S if you are not using a printer.			
**	On matched hedges, the upside break-even is infinite. When this occurs, the HP-41C will display UBE=INT. Press R/S to continue.			

Example:

I. Matched:

Buy 5 Oct. ITT 25's @ 6
Sell 5 Oct. ITT 30's @ 2⅞

Calculate upside and downside break-even's and what percentage the stock moves.

II. Unmatched:

Buy 7 Oct. ITT 25's @ 6
Sell 10 Oct. ITT 30's @ 2⅞

Calculate upside and downside break-even's and what percentage the stock moves.

In both cases the stock is now trading at 28¾

Keystrokes:	Display:	
XEQ ALPHA SIZE ALPHA 009		Minimum size
XEQ ALPHA BULL ALPHA	*NO SOLD=?*	
5 R/S	*PRC=?*	
2.875 R/S	*EXPRC=?*	
30 R/S	*NO BOUGHT=?*	
5 R/S	*PRC=?*	
6 R/S	*EXPRC=?*	
25 R/S	*CPRC=?*	
28.75 R/S	*DBE=28.13*	
R/S	*%CH=-2.17*	
R/S	*UBE=INF*	
R/S	*%CH=-100.00*	
10 STO 01		
7 STO 04		
XEQ ALPHA DBEP ALPHA	*DBE=26.89*	
R/S	*%CH=-6.46*	
XEQ ALPHA UBEP ALPHA	*UBE=37.25*	
R/S	*%CH=29.57*	

BUTTERFLY OPTIONS

A butterfly option is actually the combination of one bull spread option and one bear spread option, i.e., the purchase of one high, one low, and the sale of two middle options on the same underlying stock. If the stock closes between the high and the low strike prices (including consideration of commissions and premiums), the investor will generally profit with the maximum profit occurring at the middle strike price.

The following formulas are used:

Maximum profit = $(E_M - E_L - P_L + 2P_M - P_H)(100) - (100 + \text{Commission})$

Maximum loss =

$$\{[P_M - (E_H - E_M)]\,2 + E_H - E_L - P_L - P_H\}\,100 - (200 - \text{Commission})$$

Break-even high = $BE_H = 2(E_H + P_M) - E_L - P_L - P_H - (2 - \text{Commission})$

Break-even low = $2E_M - BE_H + .5$

where:

E_L = lowest exercise price

P_L = price of low strike option

E_M = middle exercise price

P_M = price of middle strike option

E_H = high exercise price

P_H = price of high strike option

BE_H = high break-even price

Maximum profit may be negative indicating minimum loss. Similarly, if premiums work out right, maximum loss may be positive, equaling minimum profit (and meaning that no cash is needed as an investment).

				SIZE: 008
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		XEQ BFLY	LOEX=?
2.	Key in exercise price of lowest strike option.	LOEX	R/S	LOPRC=?
3.	Key in market price of lowest strike option.	LOPRC	R/S	MIDEX=?
4.	Key in exercise price of middle strike option.	MIDEX	R/S	MIDPRC=?
5.	Key in market price of middle strike option.	MIDPRC	R/S	HIEX=?

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
6.	Key in exercise price of high strike option.	HIEX	R/S	HIPRC=?
7.	Key in market price of high strike option.	HIPRC	R/S	COMM=?
8.	Key in option commission and calculate maximum profit.	COMM	R/S	MAXPR=
9.	Calculate maximum loss.		R/S *	MAXLS=
10.	Calculate high break-even point.		R/S *	BEHI=
11.	Calculate low break-even point.		R/S *	BELO=
*	Press R/S if you are not using a printer.			

Example:

Given XYZ stock with the following options available and due simultaneously:

strike price 40 selling at 13¼
strike price 50 selling at 7
strike price 60 selling at 1⅝

calculate the maximum profit, maximum loss (investment), and upside and downside break-even prices if a butterfly is developed and commissions are $25 per option per transaction.

Keystrokes:	Display:
XEQ ALPHA SIZE ALPHA 008	Minimum size
XEQ ALPHA BFLY ALPHA	***LOEX=?***
40 R/S	***LOPRC=?***
13.25 R/S	***MIDEX=?***
50 R/S	***MIDPRC=?***
7 R/S	***HIEX=?***
60 R/S	***HIPRC=?***
5 ENTER↑ 8 + 1 + R/S	***COMM=?***
25 R/S	***MAXPR=787.50***
R/S	***MAXLS=-262.50***
R/S	***BEHI=57.38***
R/S	***BELO=42.13***

CONVERTIBLE SECURITY ANALYSIS

Given a convertible security (bond or preferred stock), price (CPRC), coupon or dividend rate (CPN or DIV), the underlying common stock's price (PRC), annual dividend (ANNDIV), and shares per conversion (CRATIO), this program computes:

indicated convertible price = (CRATIO)(PRC)

$$\text{anticipated stock price} = \frac{\text{CPRC}}{\text{CRATIO}}$$

$$\text{conversion parity price (bonds only)} = \frac{1000}{\text{CRATIO}}$$

$$\text{conversion premium percentage} = \frac{\text{CPRC} - (\text{CRATIO})(\text{PRC})}{\text{CPRC}}$$

$$\text{current convertible yield} = \frac{\text{CPN or DIV}}{\text{CPRC}}$$

$$\text{incremental payout return} = \frac{(\text{CRATIO})(\text{ANNDIV}) - (\text{CPN or DIV})(\text{CPRC})}{\text{CPRC} - (\text{CRATIO})(\text{PRC})}$$

The program assumes that the convertible security pays either interest or dividends. It also assumes that all bonds are $1,000 par value.

				SIZE: 007
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		XEQ CSEC	CBOND?
2.	If a convertible bond press R/S and go to step 3. Otherwise, key in N and press R/S.	N	R/S	CPRC=?
3.	Key in convertible price.	CPRC	R/S	CPN=? or DIV=?
4.	Key in either coupon or dividend of convertible issue.	CPN or DIV	R/S	PRC=?
5.	Key in common price.	PRC	R/S	ANNDIV=?
6.	Key in common stock annual dividend.	ANNDIV	R/S	CRATIO=?
7.	Key in conversion ratio and calculate indicated convertible price.	CRATIO	R/S	CPRC=

STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
8.	Compute:			
	Anticipated stock price		R/S *	STPRC=
	Conversion parity price (bonds only)		R/S *	CPAR=
	Conversion premium percentage		R/S *	CPREM=
	Current convertible yield		R/S *	CYLD=
	Incremental payout return		R/S *	POUT=
*	Press R/S if you are not using a printer.			

Example 1:

bond price = $50; coupon rate = 4.5%

stock price = $20; annual dividend = $1.00

shares per bond = 20

Keystrokes:	Display:	
XEQ ALPHA SIZE ALPHA 007		Minimum size
XEQ ALPHA CSEC ALPHA	***CBOND?***	
R/S	***CPRC=?***	
50 R/S	***CPN=?***	
4.5 R/S	***PRC=?***	
20 R/S	***ANNDIV=?***	
1 R/S	***CRATIO=?***	
20 R/S	***CPRC=40.00***	
R/S	***STPRC=25.00***	
R/S	***CPAR=50.00***	
R/S	***CPREM=20.00***	
R/S	***CYLD=9.00***	
R/S	***POUT=25.00***	

Example 2:

preferred stock price = $60⅜; dividend = $5.25

common stock = $28.50; annual dividend = $0.00

shares per bond = 2.03

Keystrokes:	Display:
XEQ ALPHA CSEC ALPHA	***CBOND?***
N R/S	***CPRC=?***
3 ENTER↑ 8 ÷ 60 + R/S	***DIV=?***

Keystrokes:	Display:
5.25 R/S	*PRC=?*
28.5 R/S	*ANNDIV=?*
0 R/S	*CRATIO=?*
2.03 R/S	*CPRC=57.86*
R/S	*STPRC=29.74*
R/S	*CPREM=4.17*
R/S	*CYLD=8.70*
R/S	*POUT=208.33*

CONVERTIBLE BOND INVESTMENT ANALYSIS

This program calculates the major investment attributes of convertible bonds: the premium of conversion value over stock price (PREM), current yield (CYLD), dividend income per bond (DYLD), income differential between stock and bond (% D), and investment value (IV).

The conversion value is calculated from bond price (expressed as a percent of par), and the conversion factor (the number of shares received per bond on conversion). The premium is then the percentage difference from the current stock price. Given a current bond price and the associated premium, the program assumes a linear decrease in premium to zero, when the bond price reaches par. Using this relationship, the stock price predicts the estimated bond price. The investment value is the price the bond would have without the conversion privilege, and is given by the standard formula which discounts coupon flow and price change at a given yield. A 360 day calendar is used.

$$\text{conversion value} = \frac{\text{bond price}}{\text{conversion factor}}$$

$$\text{premium} = \Delta\% \left(\frac{\text{stock price}}{\text{bond price}} \right)$$

$$\text{current yield} = \frac{\text{coupon}}{\text{bond price}}$$

$$\frac{\text{dividend}}{\text{bond}} = \text{dividend} \cdot \text{conversion factor}$$

$$\text{income differential} = \text{coupon} - \frac{\text{dividend}}{\text{bond}}$$

investment value =

$$\frac{100}{(1 + i)^N} + \frac{\text{coupon}}{2i} \left[(1 + i)^j - (1 + i)^{-N} \right] - \left(\frac{\text{coupon}}{2} \right) j$$

where:

N = number of semiannual periods between settlement date and maturity date.

j = 1 − frac(N).

i = yield as decimal/2

				SIZE: 016
STEP	**INSTRUCTIONS**	**INPUT**	**FUNCTION**	**DISPLAY**
1.	Initialize program.		XEQ CBOND	CFACT=?
2.	Key in convertible bond conversion factor.**	CFACT	R/S	BPRC=?
3.	Key in convertible bond current price to calculate conversion value.	BPRC	R/S	CVAL=
4.	Press R/S to continue.		R/S *	SPRC=?
5.	Key in stock price to calculate conversion premium.	SPRC	R/S	PREM=
6.	Press R/S to continue.		R/S *	CPN=?
7.	Key in convertible bond coupon rate to calculate current yield.	CPN	R/S	CYLD=
8.	Press R/S to continue.		R/S *	DIV=?
9.	Key in current annual dividend to calculate dividend yield and income differential between bond coupon and DYLD.	DIV	R/S R/S *	DYLD= %D=
10.	Press R/S to continue.		R/S *	SPRC=?
11.	Key in projected stock price to calculate estimated bond price.	SPRC	R/S	BPRC=
12.	Press R/S * to repeat step 11 as desired. To continue, press R/S without data entry.		R/S	ST=?
13.	Key in convertible bond settlement date (MM.DDYYYY).	ST	R/S	MT=?
14.	Key in maturity date (MM.DDYYYY) to calculate remaining coupon periods and accrued interest.	MT	R/S R/S *	N= AI=
15.	Press R/S to continue.		R/S *	YLD=?
16.	Key in yield (as %) and calculate investment value.	YLD	R/S	IV=
17.	Press R/S to repeat step 16 as desired.		R/S *	YLD=?
*	Press R/S if you are not using a printer.			
**	If conversion price is known rather than conversion factor, key in price, press XEQ CONV, then press R/S to continue.			

Example:

A bond has the following attributes:

conversion factor	— 24.39 shares/bond
price	— $88.50
coupon	— 3.125%
maturity date	— August 15, 1980

The common stock has the following attributes:

price	— $22.50
dividend	— $1.70

1. What is the conversion value, premium, current yield, dividend per bond, and differential income? For a stock price of $35, what is the projected bond price? For a stock price of $42, what is the bond price? For a settlement date of March 10, 1977 and a yield of 8%, what is the investment value? For a yield of 9%, what is the investment value?
2. Given the above conversion factor, what is the price/share on conversion?

Keystrokes:	**Display:**	
XEQ ALPHA SIZE ALPHA 016		Minimum size
XEQ ALPHA CBOND ALPHA	***CFACT=?***	
24.39 R/S	***BPRC=?***	
88.5 R/S	***CVAL=36.29***	Conversion value
R/S	***SPRC=?***	
22.5 R/S	***PREM=61.27***	Premium
R/S	***CPN=?***	
3.125 R/S	***CYLD=3.53***	Current yield
R/S	***DIV=?***	
1.7 R/S	***DYLD=41.46***	Dividend per bond
R/S	***%D=-10.21***	Differential income
R/S	***SPRC=?***	
35 R/S	***BPRC=97.36***	Projected bond price
R/S	***SPRC=?***	
42 R/S	***BPRC=102.44***	Projected bond price
R/S R/S	***ST=?***	Proceed to settlement date

Keystrokes:	Display:	
3.101977 [R/S]	*MT=?*	
8.151980 [R/S]	*N=6.86*	# of coupons remaining
[R/S]	*AI=0.22*	Accrued interest
[R/S]	*YLD=?*	
8 [R/S]	*IV=85.62*	Investment value
[R/S]	*YLD=?*	
9 [R/S]	*IV=82.98*	Investment value
24.39 [XEQ] [ALPHA] CONV [ALPHA]	*41.00*	Conversion price in dollars/share

BOND SPECULATION USING MARGIN

This program allows the user to rapidly analyze bond issues using data obtained from financial page listings and bond dealers or brokers when the bonds are to be purchased on margin. Inputs required to operate this program include: quoted bond price (PRC), face value interest rate (INT), expected future selling price (SELL), number of months to sale (MOS), percent margin (%MAR), number of days since last coupon payment (DAYS), the broker's interest rate (BINT), and the broker's fee (FEE).

Once this data has been input, the program then calculates the dollars required for speculation ($REQ), gross sale dollars (SALE$), borrowed principal plus interest ($LOAN), dollars net profit ($NET), percent profit on invested funds (%PROFIT), and the annualized profit earned on invested funds (ANN%).

The equations used are:

$$\$REQ = \frac{(PRC)(\%MAR)}{10} + \frac{(INT)(DAYS)}{36.5} + FEE$$

$$SALE\$ = 10\left[\left(\frac{MOS}{12}\right)(INT) + SELL\right] - FEE$$

$$\$LOAN = \left[1 + \left(\frac{BINT}{100}\right)\left(\frac{MOS}{12}\right)\right]\left[(PRC)\left(\frac{100 - \%MAR}{10}\right)\right]$$

$$\$NET = SALE\$ - \$LOAN - \$REQ$$

$$\%PROFIT = \left(\frac{\$NET}{\$REQ}\right)(100)$$

$$ANN\% = \left(\frac{12}{MOS}\right)(\%PROFIT)$$

Reference:

HP-67 program #01390D by Wallace Enderle.

				SIZE: 009
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Initialize program.		XEQ SPEC	PRC=?
2.	Key in quoted price of bond as % of par.	PRC	R/S	INT=?
3.	Key in face value interest rate.	INT	R/S	SELL=?
4.	Key in expected future selling price.	SELL	R/S	MOS=?
5.	Key in number of months between purchase and sale.	MOS	R/S	%MAR=?
6.	Key in percent margin allowed.	%MAR	R/S	DAYS=?
7.	Key in number of days since last semi-annual interest payment.	DAYS	R/S	BINT=?
8.	Key in interest rate charged by broker for borrowed money.	BINT	R/S	FEE=?
9.	Key in broker's fee for buying and selling.	FEE		
10.	Compute dollars required for speculation.		R/S	$REQ=
11.	Compute gross dollars resulting from sale.		R/S *	SALE$=
12.	Compute borrowed dollars including the interest due.		R/S *	$LOAN=
13.	Compute dollars net profit.		R/S *	$NET=
14.	Compute percent profit.		R/S *	%PROFIT=
15.	Compute annualized net profit.		R/S *	ANN%=
*	Press R/S if you are not using a printer.			

Example:

Given a soon-to-be issued bond with the following attributes, what amount of money is required to purchase the bond on margin? What is the profit we should expect to realize?

quoted bond price = $900.00

face interest rate = 5.5%

expected sale price = $1,000.00

number of months to sale = 24

percent margin allowed = 30%

days since last coupon payment = 45

broker's interest rate = 8%

broker's fee = 5%

Keystrokes:	Display:	
XEQ ALPHA SIZE ALPHA 009		Minimum size
XEQ ALPHA SPEC ALPHA	***PRC=?***	What is price as % of par?
90 R/S	***INT=?***	
5.5 R/S	***SELL=?***	
100 R/S	***MOS=?***	
24 R/S	***%MAR=?***	
30 R/S	***DAYS=?***	
45 R/S	***BINT=?***	
8 R/S	***FEE=?***	
5 R/S	***$REQ=281.78***	
R/S	***SALE$=1,105.00***	
R/S	***$LOAN=730.80***	
R/S	***$NET=92.42***	
R/S	***%PROFIT=32.80***	
R/S	***ANN%=16.40***	

Program	# Regs. to COPY	Data Registers	Flags	Display Format
Bonds and Notes	88	00-20	00-03, 05 21, 22, 27	FIX 2/FIX 6
Stock Portfolio Valuation	49	00-62	21, 27, 29	FIX 0/FIX 2
Yield on Call Option Sales	64	00-20	00-02 21, 27	FIX 2
Routines for Option Writers	48	00-14	00, 21	FIX 0/FIX 2
Warrant and Option Hedging	42	00-11	21, 22, 27	FIX 2
Butterfly Options	30	00-07	21	FIX 2
Bull Spread Option Strategy	27	00-08	21, 25	FIX 2
Convertible Security Analysis	33	01-06	01, 21	FIX 2
Convertible Bond Investment Analysis	50	00-02 04-15	00, 21, 22	FIX 0/FIX 2
Bond Speculation Using Margin	31	00-08	21	FIX 2
PRC, ATY, ATP, YLD, JDAY	90	00-20	00-03, 05 21, 22, 27	

APPENDIX B

FORMULAS

Bonds

6 months or less to maturity

$$\text{Price} = \left[\frac{\left(\frac{\text{CALL}}{100} + \frac{\text{CPN}}{2} \right)}{1 + \left(\frac{\text{YLD}}{2} \cdot \text{PER} \right)} - \left(\frac{\text{CPN}}{2} \right) \text{J} \right] 100$$

more than 6 months to maturity

$$\text{Price} = \frac{\text{CALL}(1 - T_C)\left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}}{1 - T_C\left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}}$$

$$+ \frac{100\,(1 - T_I)\frac{\text{CPN}}{\text{YLD}}\left[\left(1 + \frac{\text{YLD}}{2}\right)^{\text{J}} - \left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}\right]}{1 - T_C\left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}}$$

$$- \frac{100\left[\frac{\text{CPN}}{2}(1 - T_I)\text{J}\right]}{1 - T_C\left(1 + \frac{\text{YLD}}{2}\right)^{-\text{PER}}}$$

where:

CALL = call price

CPN = annual coupon rate (as decimal)

YLD = annual yield (as decimal)

PER = number of coupon periods

J = 1 − FRAC(PER)

T_I = income tax rate (as decimal)

T_C = capital gains tax rate (as decimal)

Notes

$$\text{Price} = 100\left[\frac{\text{CALL} + \left(\frac{\text{DIM}}{\text{B}} \cdot \overline{\text{CPN}}\right)}{100 + \left(\frac{\text{DSM}}{\text{B}} \cdot \text{YLD}\right)}\right] - \left(\frac{\text{DIS}}{\text{B}} \cdot \overline{\text{CPN}}\right)$$

$$\text{Price} = \text{CALL} - \left[\text{DISC} \cdot \text{CALL} \cdot \frac{\text{DSM}}{\text{B}}\right]$$

where:

DIM = days from issue to maturity

DSM = days from settlement to maturity

DIS = days issue to settlement

B = number of days in year (360 or 365)

YLD = annual yield (as decimal)

$$\overline{\text{CPN}} = \frac{\text{annual coupon rate (as decimal)} \times \text{CALL}}{100}$$

DISC = discount rate (as decimal)

CALL = call price

$$\text{Price}\left(1 + \frac{\text{i}}{2}\right)\left[1 + \left(\frac{2 \cdot \text{DSM} - 365}{365}\right)\frac{\text{i}}{2}\right] = 100$$

where i = coupon equivalent yield (as decimal)

Black-Scholes

$$\text{Cash Flow Return} = \frac{\text{Premium}}{\text{Stock Price}}$$

where: Premium = (# options)(price per option received)

$$\text{MYOI} = \frac{\text{Premium} + (\text{strike} - \text{stock prices}) + \text{dividends}}{\text{stock price}}$$

Annualized Return =

$$\left(\frac{\text{days in year}}{\text{days to expiration}}\right) \text{(lessor of cash flow or MYOI return)}$$

$$\#\text{ of options to write} = \frac{1}{\text{hedge ratio}}$$

Downside protection point = stock cost price − premium

Maximum profit point = stock cost or strike price, whichever is higher

Upside protection point = premium + absolute difference between the strike and stock cost prices added to the strike price

$$\text{Value} = P_{stock}N(D_1) - P_{strike}N(D_2)e^{-R\Delta t}$$

$$\text{where } D_1 = \frac{\ln(P_{stock} \div P_{strike}) + (R + \tfrac{1}{2}V^2)\Delta t}{V\sqrt{\Delta t}}$$

$$D_2 = \frac{\ln(P_{stock} \div P_{strike}) + (R - \tfrac{1}{2}V^2)\Delta t}{V\sqrt{\Delta t}}$$

$$N(D_i) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{D_i} e^{-\frac{1}{2}t^2}dt$$

R = interest rate as a decimal

Δt = time remaining to expiration in years

V = stock's volatility

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