ATARI®800™

INVESTMENT ANALYSIS SERIES
BOND ANALYSIS*
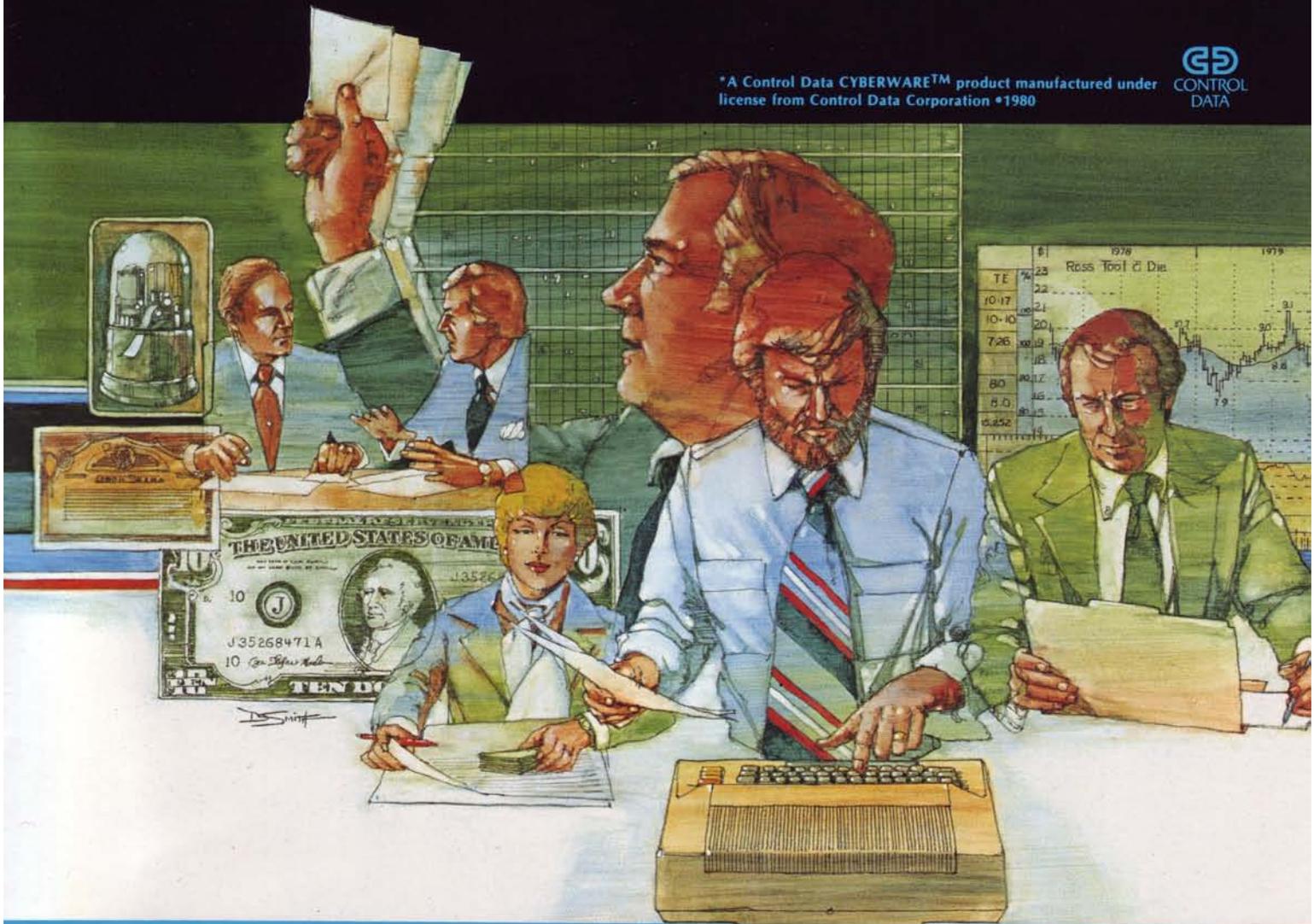
ATARI®
A Warner Communications Company

Model CX8106
Use with ATARI® 800™
PERSONAL COMPUTER SYSTEM

TABLE OF CONTENTS

PREFACE

The **BOND ANALYSIS** Program is an investment analysis aid. This manual is designed for users who are familiar with bond investments. This manual is not intended as a tutorial. It is a guide to the use of the BOND ANALYSIS Program diskette.

This manual contains eight sections to guide you through two BOND ANALYSIS Programs, as well as setting-up your ATARI® 800 Personal Computer System, and interpreting the computations provided by the program. It also includes a glossary and bibliography for futher reference.

NOTE: Neither ATARI nor the author of this computer program will be responsible for any loss, including loss of profit,as a result of using the information in this program for investment purposes.

1 AN INTRODUCTION TO BOND ANALYSIS

The ATARI® BOND ANALYSIS diskette is made up of two different bond programs; **BOND YIELD** and **BOND PRICE AND INTEREST.** With the BOND ANALYSIS diskette and your ATARI 800™ Personal Computer System you will be able to calculate the yield to maturity of a bond given the annual coupon, the par value or redemption price at maturity, the current market price, and the length of time until maturity. You can also calculate the price and accrued interest for a bond, given the coupon, par value, time until maturity, and the forecasted yield. Both programs offer program instructions and a sample problem. You will be able to select a novice or expert level for inputting data. A novice user is someone who is not familiar with the program. An expert user is someone who is familiar with the program. The novice level provides more prompts for data input. The expert level can be used once you are familiar with the data input format.

2 SETTING UP YOUR ATARI 800™ PERSONAL COMPUTER SYSTEM

To use the BOND ANALYSIS Programs you will need the following ATARI equipment:

- ATARI 800 Personal Computer System
- ATARI 810™ Disk Drive
- ATARI BASIC (Computing Language) Cartridge, Model No. CXL4002
- ATARI Printer (optional)
- Minimum RAM Requirement: 24K
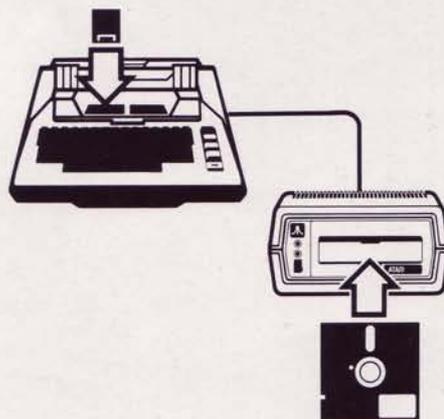
To connect your **ATARI 800 Personal Computer System**, use the following procedure:

1. Verify that the **TV Switch Box** is connected and in the **COMPUTER** or **GAME** position.

2. As shown in the ATARI 800 Operator's manual, install enough **RAM Memory Modules** to provide at least 24K RAM.

   NOTE: This may be three 8K RAM Memory Modules, two 16K RAM Memory Modules, or one 8K plus one 16K RAM Memory Module.

3. Install an ATARI BASIC (Computing Language) Cartridge into the **LEFT** cartridge slot on the ATARI 800 computer console.

4. Verify that the AC Power Adaptor is plugged into a wall outlet (115 volt) and to the jack labeled **POWER IN** on the side panel of the computer console.

5. Plug another AC Power Adaptor into a wall outlet (115 volt) and into the power jack (PWR) on your ATARI Disk Drive.

6. Plug one end of the I/O Data Cord furnished with your disk drive into the plug labeled **PERIPHERAL** on the computer console, and the other end into either of the jacks labeled **I/O CONNECTOR** on the back of the disk drive.

7. If the ATARI 820™ or ATARI 822™ Printer is used, plug its I/O Data Cord into the unused I/O CONNECTOR on the back of the disk drive and into one of the I/O CONNECTORS on the back of the printer. If the ATARI 825™ Printer is used, refer to the ATARI 825 Printer Operator's Manual for correct connections and interface requirements. Plug the printer power cord into a wall outlet (115 volt).

   NOTE: The BOND ANALYSIS Program is formatted to print out on an ATARI 40-column printer. If an ATARI 825 80-Column Printer is used, the printout may not be properly aligned.

8. Verify that the ATARI 810™ Disk Drive is set to the correct DRIVE CODE NO. as shown in the ATARI 810 Disk Drive Operator's Manual.

9. Turn the disk drive POWER switch **ON**.

10. When the BUSY light on the disk drive goes out, insert your ATARI BOND ANALYSIS Program diskette, and close the disk drive door.

11. Turn the POWER switch on the computer console to **ON** and wait for the **READY** prompt to appear on your television screen.

12. If an ATARI 40-column printer is used, turn the power switch (PWR) to **ON**.

13. The ATARI logo will appear on the screen while the program loads into your computer's RAM memory.

3 RUNNING A PROGRAM

The BOND ANALYSIS Program begins with an ATARI logo and a selection MENU with two programs:

1. BOND PRICE AND INTEREST

2. BOND YIELD

Type the number of the program you wish to use.

Each program begins with a descriptive paragraph following the ATARI and Control Data Corporation credits.

Each program may be run at either the novice level or the expert level. The novice level provides a dialogue between you and the computer. It explains each computer prompt. In the expert level you can type in all data input values on a single line. Each of these values must be separated by commas. All values must be entered in the correct order.

Entering Data

Your ATARI 800 Personal Computer System along with the BOND ANALYSIS Program will prompt (ask) you for data required to run a program. When the data is requested, type it, then press the RETURN key. The computer will not act on any data entered until the RETURN key is pressed. If more than one value is requested on a single line, separate the values by commas. If an insufficient number of values is entered, the program will continue to prompt with a question mark until all necessary values are entered.

All of the data you enter must be numeric. If non-numeric data is entered, the program will display:

ERROR — Invalid data. Resubmit it.

Each screen provides you with the option to print the screen display. The bottom of the screen will display:

Type P to print, RETURN to continue.

Typing P automatically starts the printer if you have it properly connected to your ATARI Personal Computer System. (Refer to SETTING UP YOUR ATARI 800 PERSONAL COMPUTER SYSTEM for proper connection.) Additional printed copies may be obtained by typing P again after each printout.

Do not type any data in inverse video or ATARI graphic character mode. Refer to your ATARI 800 Personal Computer System Operator's Manual for special characters and how to recover from them.

At the end of each program, the screen allows you the option to exit the program or run another problem. Pressing RETURN allows you to see the BOND ANALYSIS Program MENU again. Pressing Y allows you to run another problem. If you want to stop the BOND ANALYSIS that you are running, press SYSTEM RESET. When the READY prompt appears on the screen again, you can begin either BOND ANALYSIS Program by typing:

RUN"D:BONDPRIC RETURN
(for BOND PRICE AND INTEREST)
RUN"D: BONDYIEL RETURN
(for BOND YIELD)

When entering years and months, it is customary to use integer years and a number of months less than 12, but the program interprets the entry 2.25 years and 26.1 months as 4 years and 5.1 months. Remember to place a comma between months and years. Always enter months, years or years, months in the order requested by the program.

4 BOND YIELD

The BOND YIELD Program computes the total yield of a bond held to maturity. It does not provide for state or federal taxes. The yield takes into account the appreciation to the par value from the current market price when bought at a discount or the depreciation to par value when bought at a premium. It also includes the current yield, or sum of the annual coupons.

This program can also be used to calculate the yield on a callable bond. Simply enter the call date in place of the maturity date.

This program is a modification of BONDYD by Professor J. Peter Williamson, Amos Tuck School of Business, Dartmouth College.

BOND YIELD User Input Required

Before starting the BOND YIELD Program you should be prepared to supply the following input data:

- **ANNUAL COUPON (DOLLARS)** This is the yearly interest received from a bond.

- **REDEMPTION PRICE AT MATURITY (DOLLARS)** This is the face or par value of the bond.

- **PRESENT PRICE (DOLLARS)** This is the current market price of the bond, also called purchase price.

- **MATURITY (YEARS, MONTHS)** This is the length of time until the bond matures. It is not entered as the date of maturity.

After all data has been entered, the program calculates the before tax yield, or the rate of return on the present price including the appreciation to par from the purchase price when bought at a premium.

5 BOND PRICE AND INTEREST

When purchasing a bond you pay a purchase price plus accrued interest. The ATARI BOND PRICE AND INTEREST Program computes the correct price and accrued interest for a particular bond when given the annual coupon payment, redemption price at maturity, time to maturity, and the desired rate of return.

The price is determined by adding the present value of all future coupon payments to the redemption price at maturity and subtracting the accrued interest. The program assumes that all coupons are paid semiannually. If the time to maturity is an exact multiple of six months, and the purchase date is a coupon payment date, then the coupon due immediately is assumed to be received by the new owner.

If the time to maturity is twelve years and five months, and the coupon is paid semiannually, then the last coupon must have been paid one month ago, and the accrued interest will be for one month.

The BOND PRICE AND INTEREST Program is a modified version of BONDPR by PROFESSOR J. Peter Williamson, Amos Tuck School of Business, Dartmouth College.

BOND PRICE AND INTEREST User Input Required

Before starting the BOND PRICE AND INTEREST Program you should prepared to supply the following input data:

- **ANNUAL COUPON (DOLLARS)** This is the yearly interest income received from a bond.

- **REDEMPTION PRICE (DOLLARS)** This is the par or face value of a bond.

- **MATURITY (YEARS, MONTHS)** This is the length of time until the bond matures. It is not the date of maturity.

- **YIELD TO MATURITY (PERCENTAGE)** Enter the percentage of the yield you expect to receive on this bond. This yield includes the appreciation to par when purchased at a discount or the depreciation to par when purchased at a premium. This calculation does not take into account any state or federal tax computations.

After all data has been entered, the program calculates the price and accrued interest of the bond. This is the price and interest that you would pay in order to receive the yield to maturity that you expect. The accrued interest is calculated according to the length of time until maturity. The accrued interest would be due at time of purchase, and it is payable to the seller of the bond.

```
Coupon          $      6.00
Redemption      $    100.00
Present price   $    104.45
Maturity             12.00 year(s)
                      5.00 month(s)



YIELD
-----
    Before taxes       5.50 percent


Type P to print, RETURN to continue▮
```

6 BOND ANALYSIS FORMULAS

The ATARI BOND ANALYSIS Programs use the following algorithms for their calculations.

BOND YIELD

The calculations used to predict the yield on a bond held to maturity are as follows:

C	=	semi-annual coupon
R	=	maturity price (redemption price)
P	=	present price
M1	=	maturity year
M2	=	maturity month
M3	=	time to maturity in semi-annual coupon periods
M4	=	number of coupons, including final coupon to maturity
M5	=	time to next coupon period
Y	=	.0001
U1	=	market value of bond plus accrued interest
M41	=	number of coupons minus one

Semi-annual amortization of the premium = d:
$$d = (P - R) / (M4 + 1)$$

Book value at maturity = b:
$$b = (P - D) * (M4 + 1)$$

Accrued interest:
$$C * (1 - M5)$$

The following formulas are used in the program:
Q	=	U1 * log (.0001 * M5)
EYM41	=	log (.0001 * M41)
EM4Y	=	log (-M41 * Y)

If the time to maturity is less than or equal to three years then the following calculations are performed:
EYM3	=	log (-.0001 * M3)
V2	=	R * log (-.0001 * M3)
		(C * log (.0001 * J))

Where J = time to next coupon period plus coupon period
$$(J * log (.0001 * J))$$
$$(C * log (.0001 * J) + M3 * R * log (.0001 * M3))$$

Y	=	2 * (log (Y) −1)
Y	=	Y * 100

Where Y = percent of yield

If time to maturity is greater than three years, the following calculations are performed:

$$V1 = \frac{C * (1 - log (-M41 * Y))}{.0001}$$

$$V2 = R * log (-M41 * Y)$$

$$V3 = ((V2 * M4) - (P * M5) + (C/.00000001) * (1.0001 - (M4/log (.0001 * M41)) + ((C/.00000001) * (M41/log (.0001 * M41)))$$

$$D = Q - (V1 + V2 + C)$$

If D/V3 is equal to zero then Y = 2 * (log (Y) −1)

Y = Y * 100 where Y = percentage of yield

If D/V3 is not equal to zero, then the yield is decreased and the above comparison is made again.

BOND PRICE AND INTEREST

C	=	yearly bond coupon
R	=	redemption price
M1	=	maturity in years
M2	=	maturity in months
Y	=	yield to maturity

Calculations are as follows:

Let M3 = M1 * 2 + M2/G6	# of coupon periods to maturity
Let M4 = INT(M3)	# of whole coupon periods to maturity
Let M5 = M3 − M4	time to next coupon
Let V1 = C/2 *(1−(1 + Y/2)$^{(M4)}$)	present value of future coupons
Let V2 = R/(1 + Y/2$^{(M4)}$)	present value of principal at time of next coupon
Let P = $\dfrac{(V1 + V2 + C/2)}{((1 + Y/2)^{M5})-(C/2)*(1-M5)}$	value of the bond at present
C/2 * (1−M5)	accrued interest

The above calculations were taken directly from the BOND PRICE AND INTEREST Program. It conforms to the following equation found in "INVESTMENTS" by J. Peter Williamson.

$$Price = \frac{\dfrac{C}{2} \cdot \dfrac{1 - (1 + Y/2)^{-N1}}{\dfrac{Y}{2}} + \dfrac{R}{(1+Y/2)^{N1}} + \dfrac{C}{2}}{(1 + Y/2)^{N2}} - \frac{C}{2}(1 - N2)$$

where
P	=	price
C/2	=	semiannual coupon
Y	=	yield
R	=	principal payment at maturity
N1	=	number of half-years to maturity
N2	=	time interval from the present to the time of the next coupon payment (in half-years)

GLOSSARY

TERM	DEFINITION
ACCRUED INTEREST	The amount of interest accumulated since last payment. It is included in the sale price of a bond.
CALLABLE BOND	The bond issuer may exercise the right, stated on the face of the bond, to retire (call) the bond before its maturity date.
DISCOUNT	The amount a bond may sell below its par value.
FACE VALUE	The amount that appears on the face of a bond.
MUNICIPAL BOND	A bond that is issued by a state or governmental agency.
PAR	The dollar value on which interest is figured on a bond.
REDEMPTION PRICE	The price at which a bond may be redeemed, at or before maturity.
REGISTERED BOND	A bond registered on the books of the issuing corporation.
YIELD	The interest earned as a percentage of the current price.
YIELD TO MATURITY	The percentage of return one expects to receive from the purchase of a bond held to maturity.

REFERENCES

1) C. Colburn Hardy, *Dun & Bradstreet's Guide to $Your Investments$*, 1980-1981

2) C. Norman Stabler, *How To Read The Financial News*, Tenth Edition, Barnes & Noble Books

3) Homer and Leibowitz, *Inside The Yield Book*, 1972

4) Glenn G. Munn, *Encyclopedia Of Banking And Finance*, Seventh Edition, 1973

5) Jeffrey B. Little and Lucien Rhodes, *Understanding Wall Street*, Liberty Publishing Company, 1980

6) J. Peter Williamson, *Investments*, Praeger Publishers, 1970

The BOND ANALYSIS Program diskette is a selection from the ATARI INVESTMENT ANALYSIS SERIES. The INVESTMENT ANALYSIS SERIES includes these programs:

- STOCK ANALYSIS Diskette Program (CX8107)
- MORTGAGE AND LOAN ANALYSIS Cassette Program (CX4115)
- STOCK CHARTING Diskette Program (CX8108)
- BOND ANALYSIS Diskette Program (CX8106)

LIMITED 90-DAY WARRANTY ON ATARI® PERSONAL COMPUTER PRODUCTS