Casio Financial Consultant

A Supplementary Reader - Part 4

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CONTENTS

QED Education Scientific

INTRODUCTION

Welcome to the world of CASIO Financial Consultant calculator.

The intention of this 4-part reader is to supplement the User's Guide of FC-100V/FC-200V. We adopt the work-example approach as we believe this makes the reader both effective and efficient for use. Some examples are slightly methodical, but you should find them useful nonetheless. The goals of the 4 parts are:

❖ Part 1 – Help users get started and explore the interface and setting.
❖ Part 2 – Using CMPD and AMRT for loan and annuity related calculations.
❖ Part 3 – Help users get familiar with CASH and CNVR modes.
❖ Part 4 – Using FC-200V Bond and Depreciation calculations

The FC-200V is an extended version of the FC-100V, and for your convenience we include a comparison chart of both models in the reader. Key-strokes for all financial modes for both models are cleverly remained the same by **CASIO**, with the exception to Bond, Depreciation and Break-Even Value, which are functions only available on the FC-200V. User will also find that operations of some scientific calculations are different too. We refer ONLY to FC-200V in all examples but owner of FC-100V will find that the examples provided also work on their machine.

We have referred to these resources for inspiration: (i) Schaum's Outlines on Mathematics of Finance and (ii) Casio's Financial Activity for TVM. Screenshots in the pages are screen dumps from the Casio AFX-2.0+. For this we would like to thank Marco Corporation (M) Sdn. Bhd. for their technical support.

We did our best to reduce number of mistakes within this reader. But if you do see any, you are most welcome to report them via info@qed-edu.com. Please also send us your feedbacks.

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BOND Calculations

We can find the purchase price per $100 of face value and annual yield on the FC-200V. The initial date setup is 365 while the redemption price, or RDV, is always refers to as per $100 of face value. Similar to previous chapter, j_m (compounded m times a year) represents the nominal rate of the interest.

Example 1   ►>> What date/period should we choose for our bond calculations?
For more on how to do the setting please read page E-73 of the User Guide.

Solution
Before any bond calculation is performed, the setting of the date/period in BOND mode must correspond with the conditions of the calculations. Below are the four possible settings and when they should be selected.

Shown at Screen	Set to This When
Set: Annu/Term	Yield is compounded annually
Set: Semi/Term	Yield is compounded semiannually.
Set: Annu/Date	Yield is compounded annually and the purchase and redeem dates are provided.
Set: Semi/Date	Yield is compounded semiannually and the purchase and redeem dates are provided.

Example 2   ►>> A $1000 bond that pays interest at $j_2 = 12\%$ is redeemable at par at the end of 10 years. Find the purchase price to yield 10% compounded semiannually.
Here n is number of compound periods, RDV is redemption price, CPN is nominal interest or annual coupon rate, PRC is purchase price and YLD is annual yield. See page E-71 of User Guide for more information.

Operation
It is obvious that the date/period setting should be [Set: Semi/Term] and we have n = 2x10 = 20. RDV is always 100 unless stated otherwise, and we let CPN as 12% and YLD as 10%. Our goal is to find the purchase price, or PRC.

❖ Enter BOND mode by tapping on BOND . First check that the date/period is set to [Set: Semi/Term]. If it is not, you should set it so. The information at page E-73 of User's Guide will show you how.

[Continue next page]

❖ Now scroll down and enter 20 for [n], 100 for [RDV], 12 for [CPN], and 10 for [YLD].

▽ [2] [0] [EXE]

[1] [0] [0] [EXE] [1] [2] [EXE]

▽ [1] [0] [EXE]

```
RDV=100
CPN=12
PRC=0
YLD=10
```
Screenshot from Casio TVM
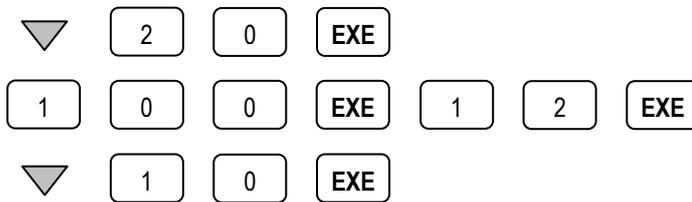
❖ Scroll up to select [PRC] and solve it.

△ [SOLVE]

Output: PRC = -112.4622103

The output of approximately $112.462 shown is based on the face value of $100. Therefore, the solution for the $1000 (10-multiple of $100) bond really is $112.462×10 = $1,124.62. The negative sign means this is a payout by the bond issuer. ▮

We saw in previous example how BOND mode is used to find purchase price of bond which yields certain given rate. The redemption price, RDV, is usually set to $100 but not so if it is given, as illustrated in the next example.

Example 3 ►>> A $5000 bond matures at 103 on October 1, 2002, has semiannual coupons at 10.5%. Find the purchase price on April 1, 1995, to yield 9.5% compounded semiannually.
For this example, RDV = 103, CPN = 10.5%, YLD = 9.5%, and date/period setting is Semi/Date.

Operation
❖ First enter BOND mode, and input the proper date/period setting.

[BOND] [EXE] [EXE] [2]

[EXE] ▽ [EXE] [1]
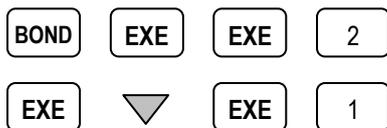
❖ Next, we enter the dates provided in the problem. In this case, it is 0401995 for [d1] and 10012002 for [d2]. Notice that we are using the date input setting of MDY.

▽ [0] [4] [0] [1] [1] [9]

[9] [5] [EXE] [1] [0] [0] [1]

[2] [0] [0] [2] [EXE]
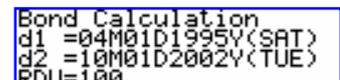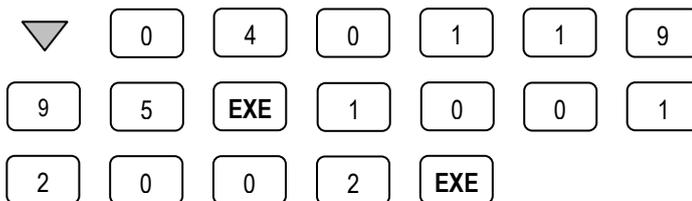
```
Bond Calculation
d1 =04M01D1995Y(SAT)
d2 =10M01D2002Y(TUE)
RDV=100
```
Screenshot from Casio TVM

If you prefer the date input in DMY format, you can change it at the **SET UP** mode.
[Continue next page]

❖ Now continue entering values for the other parameters.

| 1 | 0 | 3 | **EXE** | 1 | 0 | **.** |

| 5 | **EXE** | ▽ | 9 | **.** | 5 | **EXE** |

```
Bond Calculation
d1 =04M01D1995Y(SAT)
d2 =10M01D2002Y(TUE)
RDV=100
CPN=10.5
PRC=0
YLD=9.5
```
Screenshot from Casio TVM

❖ Scroll up to select [PRC] and solve it.

△ **SOLVE**

Output: PRC = -106.7742396

Now this output of approximately $106.774 is based on the face value of $100 with redemption value of $103. Since this is a $5000 bond, or 50-multiple of $100; hence the actual solution is $106.774×50 = $5,338.70. ■

Callable bonds allow the issuer to redeem the bond prior to the maturity date and present calculation complication since the bond term is not certain. The next example shows it is relatively easy to solve such calculation on the FC-200V.

Example 4 ►>> The QED Invest Corporation issues a 20-year, $1000 bond with coupons at $j_2 = 12\%$. The bond can be called, at par, after 15 years. Find the purchase price to yield 13% compounded semiannually.

We will calculate purchase prices using both terms to make comparison. Therefore, n = 30 (2×15 years) and 40 (2×20 years), RDV = 100, CPN = 12%, YLD = 13%, and date/period setting is Semi/Term.

Operation

❖ Enter BOND mode and input the proper date/period setting.

| **BOND** | **EXE** | **EXE** | 2 | **EXE** | ▽ | **EXE** | 2 |

❖ First, we find the purchase price corresponds to when the bond is called after 15-years. Scroll down to enter 30 for [n], 100 for [RDV], 12 for [CPN], and 13 for [YLD].

| ▽ | 3 | 0 | **EXE** |

| 1 | 0 | 0 | **EXE** | 1 | 2 | **EXE** |

| ▽ | 1 | 3 | **EXE** |
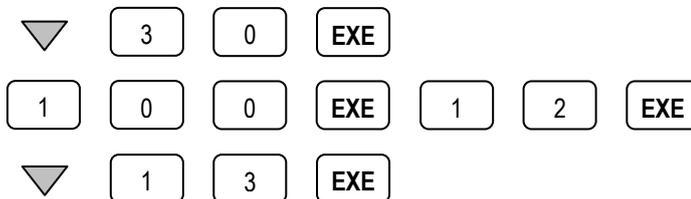
❖ Scroll up to select [PRC] and solve it.

△ **SOLVE**

Output: PRC = -93.47066205

The output of approximately $93.471 means that the corresponding purchase price if the bond is called after 15 years is $93.4671×10 = $934.71.

❖ Next to find the purchase price when the bond reaches maturity, we put 40 for [n] and recalculate it.

[ESC]   △   △   △

[4]   [0]   [EXE]
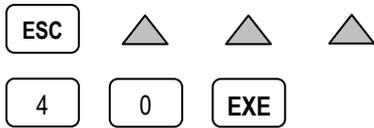
❖ Now scroll down to select [PRC] and solve it.

▽   ▽   [SOLVE] | Output: PRC = -92.92723657 |

So the corresponding purchase price is $92.927×10 = $929.27. Therefore to guarantee a return of 13% compounded semiannually, we choose the lowest of these two purchase prices, which is $929.27. ■

For Understanding►>> For the problem in Example 4, assume that the call feature specifies that if the bond is called after 15 years, the redemption value will be $1050. Otherwise, it matures at par in 20 years. Find the price to guarantee a yield of 11% compounded semiannually.

Answer: $1080.23

When we need to determine the yield rate of certain bonds, the FC-200V can easily help us do so when relevant and sufficient information is provided.

Example 5   ►>> A $2000 bond, paying semiannual coupons at 9.5% and redeemable at par on July 20 2009, is quoted at 96.5 on July 20, 1995. Find an approximate value of the yield rate to maturity, j_2.

In this example we set the dates as provided, RDV = 100(at par), CPN = 9.5%, PRC = -96.5(payout). The date/period setting is Semi/Date.

❖ First enter BOND mode, and input the proper date/period setting if it is not yet so.

[BOND]   [EXE]   [EXE]   [2]   [EXE]   ▽   [EXE]   [1]

❖ Next, we enter the dates provided. They are: 07201995 for [d1] and 07202009 for [d2]. Notice that we are using the date input setting of MDY.

▽   [0]   [7]   [2]   [0]   [1]   [9]   [9]   [5]   [EXE]

[0]   [7]   [2]   [0]   [2]   [0]   [0]   [9]   [EXE]
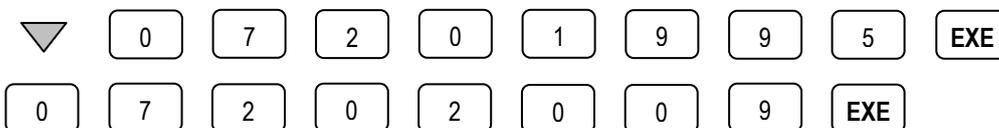
❖ Now enter the values for rest of the parameters.

| 1 | | 0 | | 0 | | **EXE** |

| 9 | | • | | 5 | | **EXE** |

| (−) | | 9 | | 6 | | • | | 5 | | **EXE** |

```
Bond Calculation
d1 =07M20D1995Y(THU)
d2 =07M20D2009Y(MON)
RDV=100
CPN=9.5
PRC=-96.5
YLD=0
```
Screenshot from Casio TVM

❖ With [YLD] selected press **SOLVE** to solve it.

Output: YLD = 9.969068265

Obviously, the approximate yield rate to maturity is j_2= 9.97% from FC-200V. ■

Depreciation Accounting With DEPR

[For FC-200V User Only]

The FC-200V allows us to calculate depreciation using four methods, namely: Straight-Line, Fixed-Percentage, Sum-of-the-Year's Digits and Declining Balance. In this reader we will discuss examples involving these methods. In the DEPR mode, n stands for estimated useful life of the asset, PV is the original cost while FV is the estimated residual book value. For more information about the parameters please read page E-67 of User's Guide.

The first example is on the simple and straightforward Straight-Line Method.

Example 1   ►>> Straight-Line Method

A machine costing $300,000 has an estimated lifetime of 15 years and zero scrap value at that time. At the end of 6 years, the machine becomes obsolete because of the development of a better machine. What are the total accumulated depreciation and the book value of the asset at that time, under the straight-line method?

Here n = 15, PV = 300,000, FV = 0, j = 6 and YR1 = 12. Other parameters are not relevant here.

❖ First enter DEPR mode, then key in the values as provided, i.e. enter 15 for [n], 300,000 for [PV], 0 for [FV], 6 for [j] and 12 for [YR1].
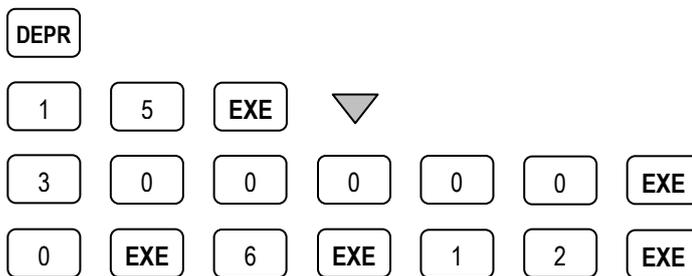
Screenshot from Casio TVM

❖ With [SL] selected just solve it.

Output: SL = 20000
         RDV = 180000

At the FC-200V we have two main outputs; **SL** is the depreciation expense for year j found using Straight-Line Method, while **RDV** is the remaining depreciable value at the end of jth year. Obviously for this problem the accumulated depreciation is 6×20,000 = $120,000 and the book value is $180,000. ∎

As we can see it is relatively easy to calculate depreciation using Straight-Line Method on the FC-200V. In the next example we will solve a problem using the Fixed-Percentage Method provided in the calculator.

Example 2   ►>> Fixed-Percentage Method

Equipment costing $60,000 depreciates 10% of its value each year. Find the book value at the end of 6 years and the depreciation expense in year 7.

Here we should choose a value greater than 7 for n for the calculation to be relevant. In this case we arbitrarily let n = 10. Here we also have I% = 10%, PV = 60,000, FV = 0 and YR1 = 12. For the first part of the problem we let j = 6. Other parameters are not relevant here.

❖ Enter DEPR mode and then key in 10 for [n], 10 for [I%], 60,000 for [PV], 0 for [FV], 6 for [j] and 12 for [YR1].

DEPR

| 1 | 0 | EXE | 1 | 0 | EXE |

| 6 | 0 | 0 | 0 | 0 | EXE |

| 0 | EXE | 6 | EXE | 1 | 2 | EXE |

```
Depreciation
n  =10
I% =10
PV =60000
FV =0
j  =6
YR1=12
```
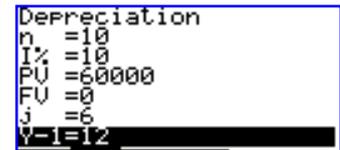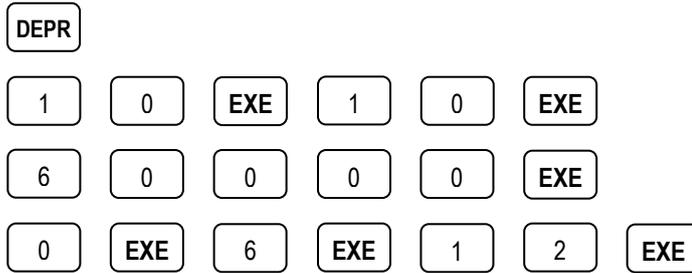
Screenshot from Casio TVM

❖ Now scroll down to select [FP] and solve it.

▽   SOLVE

Output: FP = 3542.94
         RDV = 31886.46

The book value of the equipment at the end of 6 year is $31886.46 while the corresponding depreciation expense is $3542.94.

[**Note**] Book Value above is calculated with RDV + FV = 31886.46 + 0 = 31886.46. Recall that RDV here is the <u>remaining depreciable</u> value at the end of jth year, <u>NOT</u> the book value.

❖ Next to calculate the depreciation expense in year 7 we return to the main DEPR screen and put 7 for [j].

ESC   △   △   △

7   EXE
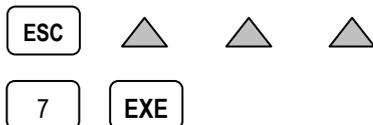
❖ Now scroll down to select [FP] and solve it.

▽   ▽   SOLVE
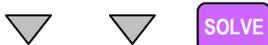
Output: FP = 3188.646
         RDV = 26697.814

From the calculator we can read that the depreciation expense for year 7 is $3188.646. █

For the next example, we redo the problem from Example 1 with an accelerated depreciation method, the Sum-Of-Year's Digits Method.

Example 3   ►>> Sum-Of-Year's Digits Method

A machine costing $300,000 has an estimated lifetime of 15 years and zero scrap value at that time. At the end of 6 years, the machine becomes obsolete because of the development of a better machine. What are the total accumulated depreciation and the book value of the asset at that time, under the sum-of-year's digits method?
Here $n = 15$, PV = 300,000, FV = 0, $j = 6$ and YR1 = 12. Other parameters are not relevant here.

❖ While in DEPR mode, key in the values as provided, similar to Example 1.

[1] [5] [EXE] ▽

[3] [0] [0] [0] [0] [0] [EXE]

[0] [EXE] [6] [EXE] [1] [2] [EXE]

```
Depreciation
n  =15
I% =0
PV =300000
FV =0
j  =6
Y-1=12
```
Screenshot from Casio TVM
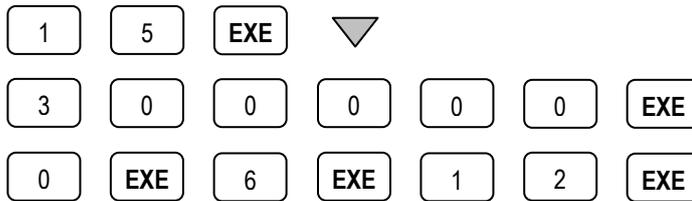
❖ Now scroll down to select [SYD] and solve it.

▽   ▽   [SOLVE]

> Output: SYD = 25000
>   RDV = 112500

As we can see the book value of the asset is $112,500 and the accumulated depreciation is $300,000–$112,500 = $187,500. ∎

Constructing depreciation schedule can greatly help the accounting process. In the next example we construct such schedules using the Declining Balance Method.

Example 4   ►>> Declining Balance Method

A server that costs $40,000 is estimated to have a scrap value of $5,000 after 5 years. Construct depreciation schedules using the Single Declining Balance Method.
We have $n = 5$, I% = 100 (factor of 1), PV = 20,000, FV = 5,000 and YR1 = 12. We start the calculations from $j = 1$ and repeat with $j = 2, 3, 4, 5$.

❖ Enter DEPR mode and key in 5 for [n], 100 for [I%], 40,000 for [PV], 5,000 for [FV], and 12 for [YR1]. We start with 1 for [j].

[DEPR] [5] [EXE] [1] [0] [0] [EXE]

[4] [0] [0] [0] [0] [EXE]

[5] [0] [0] [0] [EXE]
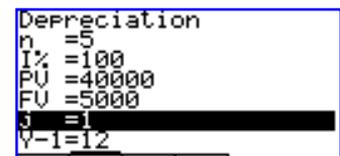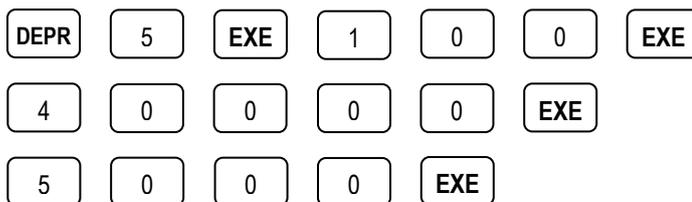
```
Depreciation
n  =5
I% =100
PV =40000
FV =5000
j  =1
Y-1=12
```
Screenshot from Casio TVM

[Continue next page]

[1] [EXE] [1] [2] [EXE]

❖ Now scroll down to select [DB] and solve it.

▽   ▽   ▽   [SOLVE]

> Output: DB = 8000
>   RDV = 27000

As we can see the depreciation expense for the first year is $8,000 and the corresponding book value is $27,000 + $5,000 = $ 32,000.

[**Note**] Recall that Book Value is calculated as RDV + FV or $27000 + $5000 = $32000 in this case.

❖ We then return to the DEPR home screen and repeat the calculation with 2 in place of 1 for the parameter [j].

[ESC]   △   △   △   △   △

[2] [EXE]

▽   ▽   ▽   ▽   [SOLVE]

> Output: DB = 6400
>   RDV = 20600

From the FC-200V, the depreciation expense for year 2 is $6,400 and the book value at the end of year 2 is $20,600 + $5,000 = $25,600. We repeat this calculation with values of 3, 4, and 5 for [j], and then we can arrange these values to construct the depreciation schedule, as follow.

End of Year	Yearly Depreciation	Book Value (RDV + FV)
0	0	$40,000
1	$8,000	$27,000 + $5,000 = $32,000
2	$6,400	$20,600 + $5,000 = $25,600
3	$5,120	$15,480 + $5,000 = $20,480
4	$4,096	$11,384 + $5,000 = $16,384
5	$11,384	0 + $5,000 = $5,000

The numbers at year 5 are a bit inconsistent with the rest, and in most events you may decide to switch to the Straight-Line Method perhaps after year 3. This is however beyond our scope of discussion here. ▇

Some countries allow a higher factor to be used for working out depreciation using the Declining Balance Method. In this case, if we use factor of 2 (or 200 in FC-200V) for solving the problem in Example 4, we are using what commonly known as the Double Declining Balance Method.

Example 5   ►>> Double Declining Balance Method
Redo problem in Example 4 using the Double Declining Balance Method,

❖ Simply let [I%] = 200 (factor of 2) and then start the calculations from [j] = 1 and repeat with 2, 3, 4, and 5. We should be able to construct the depreciation schedule, as follow.

End of Year	Yearly Depreciation	Book Value (RDV + FV)
0	0	$40,000
1	$16,000	$19,000 + $5,000 = $24,000
2	$9,600	$9,400 + $5,000 = $14,400
3	$5,760	$3,640 + $5,000 = $8,640
4	$3,456	$184 + $5,000 = $5184
5	$184	$5,000

Note that in year 5 the asset depreciation is calculated as $5184–$5000 = $184. ■

FC-200V/FC-100V Comparison Chart

Calculator Functions	FC-200V	FC-100V
Scientific Calculation	Yes	Yes
1- & 2- Variable Statistics	Yes	Yes
Statistical Regression	Yes	Yes
Simple Interest	Yes	Yes
Compound Interest	Yes	Yes
Cash Flow (IRR, NPV, PBP, NFV)	Yes	Yes
Amortization	Yes	Yes
Interest Rate Conversion	Yes	Yes
Cost & Margin Calculation	Yes	Yes
Days and Date Calculation	Yes	Yes
Depreciation	Yes	-
Bonds	Yes	-
Breakeven Point	Yes	-

Key Applications

	FC-200V	FC-100V
Business and Finance Studies	●	●
Banking and Banking Studies	●	●
Insurance and Financial Planning	●	●
Investment Appraisal	●	●
Stock Market and Bonds	●	
Business and Financial Investment	●	

Product Features

	FC-200V	FC-100V
Expression Entry Method	Algebraic	
Screen Display	4 Lines x 16 Characters	
Memory (plus Ans Memory)	8	
Programmable?	No	
Settings and Functions Short Cut Keys	Yes, 2	
Function Catalog	Yes	
Batteries	Solar Cell & LR44	1 x AAA-Size
Dimension (mm)	12.2 x 80 x 161	13.7 x 80 x 161
Weight	105g	110g