

PRACTICAL APPLICATIONS

For

YOUR FINANCIAL CALCULATOR

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INTRODUCTION

Practical Applications for your Financial Calculator

The need for this book has been long apparent from the face of anxiety that accompanies a financial calculator. Students who wear this face are typically learning to use the many functions of a financial calculator for the first time to prepare for professional exams. Unfortunately, students can display a surprising lack of proficiency just weeks before an exam. Perhaps they have procrastinated or maybe they took a calculator class at the beginning of their studies and have forgotten the basics by the time the exam rolled around. In either case, it has become a crippling defect in their exam preparation. Their focus is on the calculator, diverting attention from study, wasting precious time, and preventing them from connecting their knowledge with the techniques of the calculator.

In the construction of this book, the aim has been to strike a balance between the academic concepts of time value of money and the technical aspects of a calculator manual, to produce a book and course that is user-friendly and relevant to students' needs. We sought to use language students can understand so the lessons lead to practical applications students will face on exams and in their professional lives. In other words, we wanted to create the book we wish we had been handed when we purchased a calculator.

The book can be used as a “stand-alone” calculator study guide or in conjunction with the curriculum of a Certificate Program or University Degree. It follows the same format as the two online calculator classes that Keir Educational Resources offers: The Basic Financial Calculator Class and the Formulas Class.

Each of the four calculators that the book covers – HP 10bII, HP 12c; TI BAI Plus, and HP 17bII+ – has its own section, so there is no need for the student to flip back and forth to find the pertinent information. The keystrokes are typed in bold “key fonts” so there is no need to squint to see if there was a comma “separator” or not. The language is straight forward. When technical terms need to be explained, they are done simply and translated into words that the instructor or other students are likely to use. Each individual calculator section is broken into 4 chapters: 1 – Intro: The Basics; 2 – Time Value of Money; 3 – CFP® Formulas and CH. 4 – Investment Calculations.

The introductory chapter covers the basics of the calculator. Some items are very elementary, such as turning the calculator on and off or changing the batteries. Others are simple but invaluable, for example, introducing the student to the most important keys and their functions or clearing the calculator. We also explain some of those seemingly inexplicable things that happen to your calculator (Where did that comma come from?) and how to correct it, and in the worst case scenario, how to reset the calculator.

Chapter 2 teaches the basics of Time Value of Money and how to use the calculator to solve for each of the variables. We work straight across the keyboard. And the sections are marked very simply (Solving for N; Solving for PV). There is no question as to where the student has to go for the information. We work through each variable with problems that are based upon

annualized returns and then more frequent compounding. We apply those lessons to some of the more complex TVM problems the student will encounter.

Chapter 3 covers all of the formulas that are currently found on the CFP® Certification Examination. We explain not only what the symbols mean, but their use and the investment concepts they are used for. We “demystify” the formula sheet and make it accessible.

Chapter 4 then uses the formulas and shows the necessary keystrokes associated with them in the context of investment planning. We also cover formulas commonly found on exams but not included on the formula sheet. Chapter 3 and 4 are the perfect way for students to start their investment classes. The chapters offer students concepts and applications before getting into the “meat” of the class, allowing the instructor more time for other issues.

For those who are familiar with their calculator, the language may at some times seem rudimentary, and students may notice that occasionally there are “unnecessary” steps in a calculation. These teaching techniques are employed to get students into “good habits” at the beginning of their studies. In our experience from working with students at different levels of their careers, these habits will resolve basic problems and prove beneficial to them in the long run.

All of the calculators in this book have many more functions than we discuss in this text. We have purposely limited our coverage to the functions and calculations that are most critical at the beginning of a student’s professional career. There is no good reason to confuse issues at the start of an individual’s study process. As students master the basics of the calculator, they will have the necessary tools to explore more complex uses.

Finally, to the students using this book, our present interest is for you to become successful. Your interest, compounded with the time you put into your studies, will hopefully increase exponentially to a future whose value is achievement of your goals. As you begin your professional voyage, our wish is that your triumphs increase in serial installments and your career smoothes out the uneven cash flows of life. That would be our greatest payment.

Sample for HP 10bII calculator

Chapter 4

Investment Calculations

In this chapter, you will encounter some additional calculations that you can use during investment analysis, whether for product selection or performance. You will start off with some calculation tools that will be incorporated later into larger problems.

Nominal and Effective Interest Rates

In previous sections, you learned about the need to set your calculator to the correct compounding periods before entering the interest rate. The interest rate you have been inputting is the “nominal” rate. What is happening inside your calculator is that the nominal rate is being converted to the effective rate.

When compounding occurs once per year, the nominal and effective annual rates are identical. If compounding occurs annually, the interest is calculated and added to the principal annually, and that is why annual nominal and effective rates are the same. If, on the other hand, compounding occurs, for example, on a monthly basis, the interest is calculated and converted to principal after one month has elapsed, again after two months, three months, etc. You saw that more frequent compounding resulted in higher future values.

The effective annual interest rate is defined as the annual rate that would produce, in one compounding period, the same amount of interest as does the nominal annual rate with its compounding frequency. For instance, a 9 percent nominal annual rate when compounded quarterly produces \$465.42 of interest in one year on a \$5,000 deposit. Thus, the effective annual interest rate was $(\$465.42 \div \$5,000 =) 9.3084$ percent.

In almost all instances, you will just have to set your calculator to the proper periods per year, enter the nominal annual rate, and let the calculator do the work for you. But there may be times when it is necessary to calculate the effective yield given the nominal rate and number of compounding periods or vice versa.

Convert Nominal Rate to Effective Rate

Problem: What is the effective rate if an investment pays 9% compounded monthly?

You will use your gold shift key to find the answer.

You enter the nominal rate, gold shift, and the I/YR key which executes the shift function NOM%. Then you enter the number of periods, in this case 12, and then the shift key and PMT key to perform the P/YR function. Finally, press the shift key once more and solve for effective rate by pressing the PV key performing the EFF% function.

The keystrokes are:

[9] [gold] [NOM%]
[12] [gold] [P/YR]
[gold] [EFF%]

9.3807 is displayed.

Convert Effective Rate to Nominal Rate

Problem: What is the nominal rate where the effective rate is 9.3807% and compounding is monthly?

As can be expected, to convert an effective rate to a nominal rate given the effective rate and compounding periods, you do the reverse.

[9] [.] [3] [8] [0] [7] [gold] [EFF%]
[1] [2] [gold] [P/YR]
[gold] [NOM%]

9 will now be displayed.

After Tax Yield / Tax Equivalent Yield

In the course of your studies and practice, there may be a call for you to calculate and compare a fully taxable bond to a tax advantaged bond or to compare a return taxed at the 15% capital gains tax rate to the return of an ordinary income product. This is basic mathematics. You simply have to remember the formulas.

In both cases, “1 – the tax rate” is the operative part to remember. For comparing a taxable bond to a tax free bond, you multiply the rate of the taxable bond by “1 – the tax rate.”

For example, to find the after-tax yield of an 11% bond for an investor in the 35% marginal tax bracket, you multiply the yield of 11% by 1 – the tax rate (1 – .35).

.11 x .65 = 7.15% representing the after-tax equivalent of a tax free municipal bond.

For the comparison of a tax free bond to a taxable, you simply divide the tax free rate by “1 – the tax rate.

In this example, you are asked to compare a 5.5% tax free yield to the yield on a taxable bond given that the investor is in the 33 percent tax bracket.

Taxable equivalent yield = $.055 \div (1 - .33)$

$.055 \div .67 = .0821$, or 8.21%, the corporate taxable equivalent.

Squares, nths, Square Roots, and nth Roots

In order to solve more complex problems, such as the standard deviation of a 2 asset portfolio, you will have to be able to compute the square of a number or the nth power of a number. (Taking the number to a power higher than 2.) You will also have to find the square root or nth root of a number.

Once again, you will be utilizing the gold/shift function of the calculator. If you look down the right hand side of your calculator, all the way at the bottom, you will see $[\sqrt{x}]$ and $[x^2]$ on the beveling of the $[-]$ and $[+]$ keys, respectively. You will use those keys along with the gold key to find the square root and square. The operation is quite simple.

Problem: What is the product of 12 squared?

When you want to square a number, you always enter the number you want to square first. You then use the gold/shift key and press the x^2 key.

In this case the keystrokes are:

[1] [2] [gold] [x^2]

144 is displayed on your screen.

Problem: What is 1.04 raised to the 5th power?

To raise a number to a power higher than two, you will once again use the gold/shift key. This time, however, you will use the y^x function found on the $[x]$ key. The first number you enter is the number that you want to take to the appropriate power.

To raise 1.04 to the 5th power, you enter 1.04, then press the gold key, and now you will press the y^x key. At this point, you will see 1.04. You will also notice on the display below the numbers in small letters: “PEND.” The letters stand for “pending” and mean that the calculator is waiting for additional information, i.e., the nth power. You press 5, which lets the calculator know what power to use and then you must press the “equals” key (=) to get the answer 1.2167.

The keystrokes are:

[1] [.] [0] [4] [gold] [y^x]
[5] [=]

1.2167 is displayed.

Problem: What is the square root of 12?

Now we move on to finding the square root and nth root of a number. The square root operation is very straight forward. As above, the first number you will enter is the number you want to find the square root of, 12. You once again use the gold shift key, but this time you depress the minus key to find the square root.

The keystrokes are simply:

[1] [2] [gold] [\sqrt{x}]

3.4641 is displayed.

Problem: What is the fifth root of 12?

When you solve for the nth root of a number, you will take the number to the decimal equivalent power. To explain, in this example, you want to find the 5th root of 12. You do that by taking it to the .20 power. “.20” is the decimal equivalent of 1/5. You will also have to use the “equals” key to arrive at the final answer.

First, enter the number you want to find the nth root of, 12. Press the gold/shift key and then press the y^x key as if you were solving for a power other than 2. Now you use the decimal equivalent of 1/5 or .20 and then enter the “equals” sign.

The keystrokes are:

[1] [2] [gold] [y^x]
[.] [2] [0] [=]

1.6438 is displayed.

In this example, you converted $\frac{1}{5}$ to a decimal. Some fractions are easily converted to decimals. For example, $\frac{1}{5}$, $\frac{1}{4}$, and $\frac{1}{2}$ divide evenly and are converted to .20, .25, and .50. For more difficult fractions, there is a key that finds the decimal equivalent of a number on your calculator. It is the 1/x function found on the [\div] key. To find the decimal equivalent of 5, you would press:

[5] [gold] [1/x]

You will see .20 on the calculator. If you use that key in the above example, the keystrokes are:

[1] [2] [gold] [y^x]

[5] [gold] [y^x] [=]

1.6438 is displayed

Some find this method cumbersome and prefer to do it in their heads or on paper, or they find it easier to remember the more traditional way of dividing 1 by 5. Whichever way you choose, just make sure you have the correct decimal entered.

Store and Recall

Much like speed dial on your phone, your calculator has the capacity to store numbers in different registers for recall as necessary in future calculations. If you look on your calculator in the fourth row down under the I/YR column, you will see a key labeled “RCL” in white (for recall) and “STO” on the beveling in gold (for “store”).

To store a number being displayed on your screen, simply press:

Gold... STO... and then the number of the register where you want to store the data.

For example, if you will have to use the sum of $2 + 3$ later in a chain calculation. You would press:

[2] [+] [3]

[=] (of course “5” is displayed)

[gold] [STO] [1] (You have stored “5” in the 1 key register.)

To recall that number at a later time, simply press:

[RCL] [1] (5 will be displayed on the screen.)

Be aware that if you completely clear the calculator by [gold] [C ALL], your information will be erased.

Practice Question 14. (Solution in the Appendix)

What is the average, sample standard deviation, and population standard deviation of the following set of returns:

5.5%, -3.2%, 10%, 12%, 1.8%?

Practice Question 14.

**Solving for Average, Sample Standard Deviation, and Population Standard Deviation.
5.5%, -3.2%, 10%, 12%, 1.8%?**

```
[5] [.] [5] [Σ+]
[3] [.] [2] [+/-] [Σ+]
[1] [0] [Σ+]
[1] [2] [Σ+]
[1] [.] [8] [Σ+]
[gold] [7] (gives the average of 5.2200)
[gold] [8] (gives the sample standard deviation of 6.1540)
[gold] [9] (gives population standard deviation of 5.5043)
```