Calculator Guidance

Instructor: Feng

CONTENTS

Introduction

- Two calculators are allowed in the CFA® examinations:
  - ✓ Texas Instruments BAII+ and BAII+ Professional
  - ✓ Hewlett Packard 12C and HP12C Platinum
- BAII+ Professional is recommended as we believe it is easier to use and has more functionality for the exam.

Texas Instruments BAII+ and BAII+ Professional

Hewlett Packard 12C and HP 12C Platnum

Understanding the functions of keys of your calculator

常用键功能			
CPT	计算	PV	现值
ENTER (SET)	输入(设置)	PMT	单个复利周期的cash flow(可用于计算年金)
2ND	启用第二项功能	FV	未来值
CF	进入cash flow的数据输入	Vx	对前一个输入的数值开方
NPV	进入NPV的计算	x^2	对前一个输入的数值平方
IRR	进入IRR的计算	1/x	对前一个输入的数值求倒数
→	删除	y^x	对前面的计算结果进行x次方
N	复利周期的次数	STO	存储数据
I/Y	单个复利周期的利率	RCL	调用所存储的数据
↑ ↓	上下移动	CE/C	数据归零

Understanding the functions of keys of your calculator

常用组合键功能			
2ND + .	可设置计算结果的精确位数/设置计算法则	2ND + 8	对输入的数据进行统计分析
2ND + +/-	重新设置Chn和小数点位数	2ND + 9	可计算Bond的相关数值
2ND + 0	进入memory中所存储的数据	2ND + X	计算x！(x的阶乘)
2ND + 1	进入日期设置	2ND + -	计算排列的数量
2ND + 2	可计算Nominal rate或Effective rate	2ND + +	计算组合的数量
2ND + 3	可计算盈利	2ND + CE/C	清零
2ND + 4	可计算折旧	2ND + CPT	退回到标准计算器模式
2ND + 5	可计算百分比变化值	2ND + ENTER	转换设置
2ND + 6	可计算盈亏平衡点	2ND + PMT	转换BGN和END模式
2ND + 7	可输入数据	2ND + =	显示上一次的计算结果

Understanding the functions of keys of your calculator

Example 1:

Calculate $(3.54/2.21)^{1/4} - 1$

Steps	Display
[3.54][÷]	3.540000
[2.21][y^x]	1.601810
[4][1/x]	0.250000
[-][1][=]	0.125001

Understanding the functions of keys of your calculator

Example 2:

Calculate $\frac{0.89}{\sqrt{2.17}} \times (-7.3)^2$

Steps	Display
[0.89][÷]	0.890000
[2.17][√x]	1.473092
[x]	0.604171
[7.3][+/-][x²][=]	32.196292

Clearing the Memory

- Clearing **TVM** memory
  [CE/C][2nd][FV]
- Clearing **CF** function memory
  [CF][2nd][CE/C]
- Clearing **BOND** function memory
  [2nd][9][2nd][CE/C]
- Clearing data in **MEM** function
  [2nd][0][2nd][CE/C]
- Clearing all the data stored and all settings
  Press "RESET" on the back of calculator

CONTENTS

Setting up the calculator

- Setting up the decimal points
- Setting up the algorithm (CHN/AOS)
- Setting up the BGN/END mode

P.S. All the examples in these slides are presented by using TI BAII Plus.

Setting up the decimal points

Example:

Setting up to 6 decimal points

Steps	Display
[2nd][.]	DEC = 2.00
[6][ENTER]	DEC = 6.000000
[2nd][CPT]	0.000000

P.S. We recommend candidates to use up to 6 decimal points as it will meet our accuracy requirements.

Setting up the algorithm (CHN/AOS)

Changing from CHN to AOS

Most students prefer to use the calculator in AOS mode however the calculator default is CHN.

Steps	Display
[2nd][.]	DEC = 6.000000
[↓] …	Chn
[2nd][ENTER]	AOS

P.S. Should you like to change it back from AOS to CHN, just need to press [2nd][ENTER] again.

Setting up the algorithm (CHN/AOS)

- **CHN Mode**

  The calculator will work out the figure based on the numbers you key in orderly.

  e.g. [3][+][5][x][4] = 32

- **AOS Mode**

  The calculator will work out the figure according to mathematical algorithm.

  e.g. [3][+][5][x][4] = 23

Setting up the BGN/END mode

- The default setting of the calculator is END mode.

Example:

Setting the calculator from END mode to BGN mode

Steps	Display
[2nd][PMT]	END
[2nd][ENTER]	BGN

CONTENTS

Storing figures

- Storing one figure in the memory

Example:

Storing 2.55 in to memory keystroke 1

Steps	Display
[2.55]	2.55
[STO]	2.55
[1]	2.550000

You are allowed to store up to 10 figures in BAII PLUS calculator.

Recalling figures

- Recalling the figure saved in memory previously

Example:

Recalling 2.55 saved previously

Steps	Display
[RCL][1]	2.550000

Reviewing the data saved

- Reviewing the data saved in memory

(Using previous example)

Steps	Display
[2nd][0]	M0=0.000000
[↓]	M1=2.550000
.....	.....
[↓]	M9=0.000000

CONTENTS

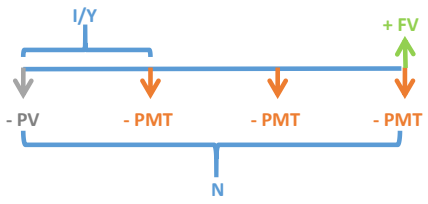
Time Value of Money

- Keystrokes we would use in **TVM** problems:

N - Number of compounding periods
I/Y - Periodic rate
PV - Present Value
PMT - Periodic Payments (e.g., annuities, any constant cash flows)
FV - Future Value

Time Value of Money

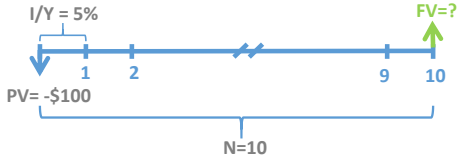
- Understanding the Time Line



FV of Single Sum

Example:

What is the value of $100 in ten years with the annually compounding interest rate of 5%?



FV of Single Sum

Steps	Display
[100][+/-][PV]	PV = -100.000000
[10][N]	N = 10.000000
[5][I/Y]	I/Y = 5.000000
[0][PMT]	PMT = 0.000000
[CPT][FV]	FV = 162.889463

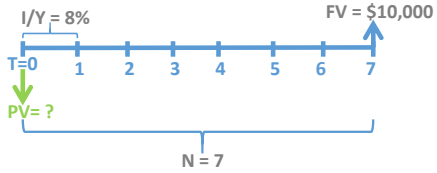
The order that the data entered does not matter

P.S. Input is usually entered with a negative sign so as to make the output come out with a positive sign.

PV of Single Sum

Example:

How much must be invested today, at 8% interest, to accumulate enough to retire a $10,000 debt due seven years from today?



PV of Single Sum

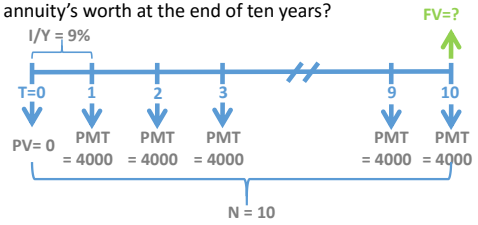
Steps	Display
[10000][FV]	FV = 10,000.000000
[7][N]	N = 7.000000
[8][I/Y]	I/Y = 8.000000
[0][PMT]	PMT = 0.000000
[CPT][PV]	PV = -5,834.903953

The order that the data entered does not matter

FV of Ordinary Annuity

Example:

An investor will receive an annuity of $4000 a year for ten years. The first payment is to be received at the end of the first year. At a annual interest rate of 9%, what is this annuity's worth at the end of ten years?



FV of Ordinary Annuity

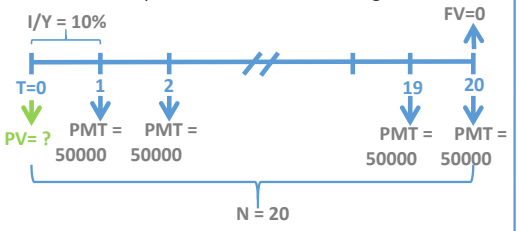
Steps	Display
[4000][+/-][PMT]	PMT = -4,000.000000
[10][N]	N = 10.000000
[9][I/Y]	I/Y = 9.000000
[0][PV]	PV = 0.000000
[CPT][FV]	FV = 60,771.71887

The order that the data entered does not matter

PV of Ordinary Annuity

Example:

An investor has just won the lottery and will receive $50000 per year at the end of the next 20 years. At a 10% interest rate, what is the present value of this winnings?



PV of Ordinary Annuity

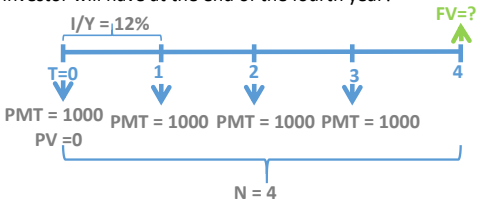
Steps	Display
[50000][+/-][PMT]	PMT = -50,000.000000
[20][N]	N = 20.000000
[10][I/Y]	I/Y = 10.000000
[0][FV]	FV = 0.000000
[CPT][PV]	PV = 425,678.1860

The order that the data entered does not matter

FV of Annuity Due

Example:

If $1000 is invested today and $1000 is invested at the beginning of each of the next three years at 12% interest(compounded annually), what is the amount that an investor will have at the end of the fourth year?



FV of Annuity Due

➢ 1st Method (END Mode)

Steps	Display
[1000][+/-][PMT]	PMT = -1,000.000000
[4][N]	N = 4.000000
[12][I/Y]	I/Y = 12.000000
[0][PV]	PV = 0.000000
[CPT][FV]	FV = 4,779.328000 (at end of year 3)
[x][1.12][=]	5352.847360 (FV at end of year 4)

FV of Annuity Due

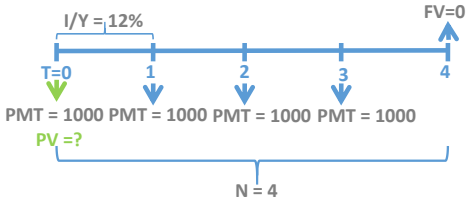
➢ 2nd Method (BGN Mode)

Steps	Display
[1000][+/-][PMT]	PMT = -1,000.000000
[4][N]	N = 4.000000
[12][I/Y]	I/Y = 12.000000
[0][PV]	PV = 0.000000
[CPT][FV]	FV = 5,352.847360 (FV at end of year 4)

PV of Annuity Due

Example:

If $1000 is invested today and $1000 is invested at the beginning of each of the next three years at 12% interest(compounded annually), what is the present value of these four investments?



PV of Annuity Due

➢ 1st Method (END Mode)

Steps	Display
[1000][+/-][PMT]	PMT = -1,000.000000
[4][N]	N = 4.000000
[12][I/Y]	I/Y = 12.000000
[0][FV]	FV = 0.000000
[CPT][PV]	PV = 3,037.349347 (T=-1)
[x][1.12][=]	3,401.831268 (T=0)

PV of Annuity Due

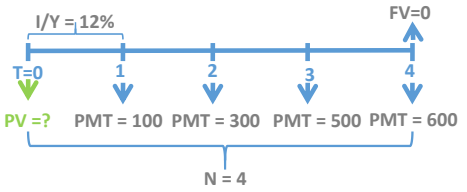
- **2nd Method (BGN Mode)**

Steps	Display
[1000][+/-][PMT]	PMT = -1,000.000000
[4][N]	N = 4.000000
[12][I/Y]	I/Y = 12.000000
[0][FV]	FV = 0.000000
[CPT][PV]	PV = 3,401.831268 (T=0)

PV of Unequal Cash Flows

Example:

If $100, $300, $500 and $600 are invested at the end of each of the next four years at 12% interest(compounded annually)from now, what is the present value of these four investments?



PV of Unequal Cash Flows

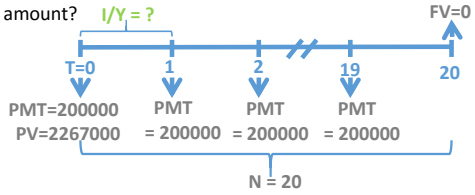
Steps	Display
[CF]	CF0 = 0.000000
[2nd][CE/C]	CF0 = 0.000000 (Clear previous works)
[↓][100][ENTER]	C01 = 100.000000
[↓][↓][300][ENTER]	C02 = 300.000000
[↓][↓][500][ENTER]	C03 = 500.000000
[↓][↓][600][ENTER]	C04 = 600.000000
[NPV][12][ENTER]	I=12.000000
[↓][CPT]	NPV=1065.644849

Thus PV0=1065.644849

Calculating I/Y (Discounted Rate)

Example:

Elmer has won his state lottery and has been offered 20 annual payments of $200,000 each year beginning today or a single payment of $2,267,000. What is the annual discount rate used to calculate the lump-sum payout amount?



Calculating I/Y (Discounted Rate)

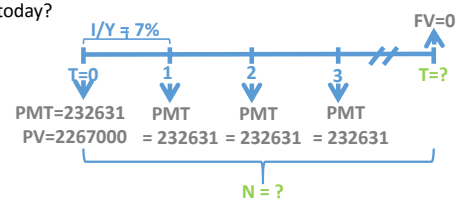
- We have to switch to BGN Mode firstly

Steps	Display
[200000][+/-][PMT]	PMT = -200,000.000000
[20][N]	N = 20.000000
[2267000][PV]	PV= 2,267,000.000000
[0][FV]	FV = 0.000000
[CPT][I/Y]	I/Y = 7.000768 (7%)

Calculating N (The Number of Compounding Periods)

Example:

If Elmer can choose the amount of his annual payout, based on the same discount rate used above, how many payments of $232,631 could Elmer receive if his first payment were today?



Calculating N (The Number of Compounding Periods)

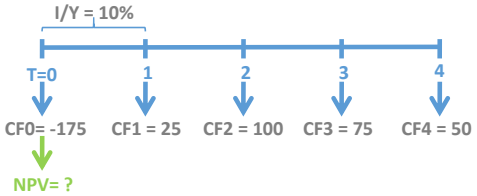
- We have to switch to BGN Mode firstly

Steps	Display
[232631][+/-][PMT]	PMT = -232,631.000000
[7][I/Y]	I/Y = 7.000000
[2267000][PV]	PV= 2,267,000.000000
[0][FV]	FV = 0.000000
[CPT][N]	N = 14.998877 (N=15)

CONTENTS

NPV

Example:

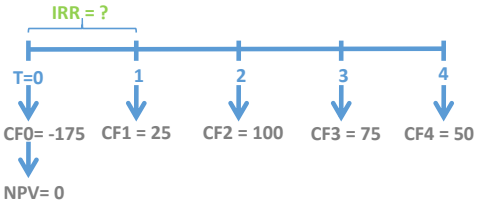


NPV

Steps	Display
[CF]	CF0 = 0.000000
[2nd][CE/C]	CF0 = 0.000000(Clear previous works)
[175][+/-][ENTER]	CF0 = -175.000000
[↓][25][ENTER]	C01 = 25.000000
[↓][↓][100][ENTER]	C02 = 100.000000
[↓][↓][75][ENTER]	C03 = 75.000000
[↓][↓][50][ENTER]	C04 = 50.000000
[NPV][10][ENTER]	I=10.000000
[↓][CPT]	NPV=20.871184

IRR

Example:



IRR

Steps	Display
[CF]	CF0 = 0.000000
[2nd][CE/C]	CF0 = 0.000000 (Clear previous works)
[175][+/-][ENTER]	CF0 = -175.000000
[↓][25][ENTER]	C01 = 25.000000
[↓][↓][100][ENTER]	C02 = 100.000000
[↓][↓][75][ENTER]	C03 = 75.000000
[↓][↓][50][ENTER]	C04 = 50.000000
[IRR][CPT]	IRR = 15.067416

CONTENTS

Mean

Example:

Over the last 3 years Cerny Plc's stock returns have been as follows, calculate the mean return：

Year	% Return
1	6
2	8
3	4

May be entered as decimals or whole numbers

Mean

Steps	Display
[2nd][7]	X01 = 0.000000
[2nd][CE/C]	X01 = 0.000000(Clear previous works)
[6][ENTER]	X01 = 6.000000
[↓][↓][8][ENTER]	X02 = 8.000000
[↓][↓][4][ENTER]	X03 = 4.000000
[2nd][8]	Lin
[2nd][ENTER]-**Repeatedly**	1-V (One variable)
[↓][↓]	$\bar{X} = 6$

Mean with probabilities

Example:

Over the last 3 years Cerny Plc's stock returns have been as follows, calculate the mean return：

May be entered as decimals or whole numbers

% Return	Probability
6	0.3
8	0.2
4	0.5

Must be entered as **whole numbers**

Mean with probabilities

Steps	Display
[2nd][7]	X01 = 0.000000
[2nd][CE/C]	X01 = 0.000000 (Clear previous works)
[6][ENTER]	X01 = 6.000000
[↓][30][ENTER]	Y01 = 30.000000
[↓][8][ENTER]	X02 = 8.000000
[↓][20][ENTER]	Y02 = 20.000000
[↓][4][ENTER]	X03 = 4.000000
[↓][50][ENTER]	Y03 = 50.000000
[2nd][8]	Lin
[2nd][ENTER]-**Repeatedly**	1-V (One variable)
[↓][↓]	$\bar{X}$ = 5.400000

Population Standard Deviation & Sample Standard Deviation

Example:

Over the last 3 years Cerny Plc's stock returns have been as follows, calculate the standard deviation：

Year	% Return
1	6
2	8
3	4

May be entered as decimals or whole numbers

Population Standard Deviation & Sample Standard Deviation

Steps	Display
[2nd][7]	X01 = 0.000000
[2nd][CE/C]	X01 = 0.000000(Clear previous works)
[6][ENTER]	X01 = 6.000000
[↓][↓][8][ENTER]	X02 = 8.000000
[↓][↓][4][ENTER]	X03 = 4.000000
[2nd][8]	Lin
[2nd][ENTER]-**Repeatedly**	1-V (One variable)
[↓][↓][↓]	S_x = 2.000000(Sample Standard Deviation)
[↓]	σ_x = 1.632993(Population Standard Deviation)

Population Standard Deviation & Sample Standard Deviation With Probabilities

Example:

Over the last 3 years Cerny Plc's stock returns have been as follows, calculate the mean return：

May be entered as decimals or whole numbers

% Return	Probability
6	0.3
8	0.2
4	0.5

Must be entered as **whole numbers**

Population Standard Deviation & Sample Standard Deviation With Probabilities

Steps	Display
[2nd][7]	X01 = 0.000000
[2nd][CE/C]	X01 = 0.000000(Clear previous works)
[6][ENTER]	X01 = 6.000000
[↓][30][ENTER]	Y01 = 30.000000
[↓][8][ENTER]	X02 = 8.000000
[↓][20][ENTER]	Y02 = 20.000000
[↓][4][ENTER]	X03 = 4.000000
[↓][50][ENTER]	Y03 = 50.000000
[2nd][8]	Lin
[2nd][ENTER]-**Repeatedly**	1-V (One variable)
[↓][↓][↓]	S_x = 1.569919(Sample Standard Deviation)
[↓]	σ_x = 1.562050 (Population Standard Deviation)

CONTENTS

Covariance and Correlation

Example:

Calculate the covariance between the return on the two stocks indicated below:

Year	Stock 1	Stock 2
1	+0.05	+0.07
2	–0.02	–0.04
3	+0.12	+0.18

May be entered as decimals or whole numbers

Covariance and Correlation

Steps	Display
[2nd][7]	X01 = 0.000000
[2nd][CE/C]	X01 = 0.000000(Clear previous works)
[5][ENTER]	X01 = 5.000000
[↓][7][ENTER]	Y01 = 7.000000
[↓][2][+/-][ENTER]	X02 = -2.000000
[↓][4][+/-][ENTER]	Y02 = -4.000000
[↓][12][ENTER]	X03 = 12.000000
[↓][18][ENTER]	Y03 = 18.000000
[2nd][8]	1-V
[2nd][ENTER]-**Repeatedly**	Lin
[↓]	n= 3(number of paired observations)
[↓]	$\bar{x}$= 5(mean value of variable X)

Covariance and Correlation

Steps	Display
[↓]	S_x = 7.000000 (sample standard deviation of x)
[↓]	σ_x = 5.715476(population standard deviation of x)
[↓]	$\bar{y}$ = 7.000000 (mean value of variable y)
[↓]	S_y = 11.000000 (sample standard deviation of y)
[↓]	σ_y = 8.981462(population standard deviation of y)
[↓]	a = -0.857143 (intercept of regression line)
[↓]	b = 1.571429 (slope of regression line)
[↓]	r = 1.000000 (sample correlation coefficient)

Cov (x,y)=$r_{x,y}$ S_x S_y = 1x7x11=77 (or as decimal 0.0077)

CONTENTS

Factorial

n factorial = n! = n(n - 1)(n - 2)(n - 3) 1

Example:

You want to assign four security analysts to cover four different industries. In how many ways can the assignments be made?

Steps	Display
4[2nd][X]	24.000000

Combination

$$ {}_nC_r = \frac{n!}{(n-r)!r!} $$

Example:

You have 5 stocks and want to place orders to sell 3 of them. How many different combinations of 3 stocks are there?

Steps	Display
5[2nd][+][3][=]	10.000000

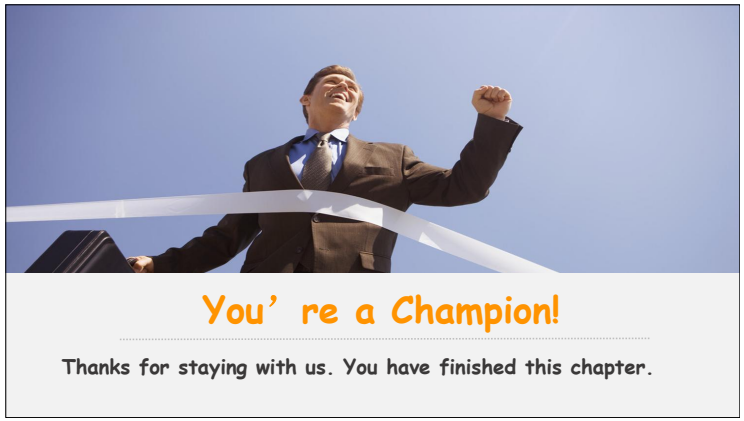
Permutation

$$_nP_r = \frac{n!}{(n-r)!}$$

Example:

You have 5 stocks and want to sell 3, one at a time. The order of the stock sales matters. How many ways are there to choose the 3 stocks to sell in order?

Steps	Display
5[2nd][-][3][=]	60.000000



You're a Champion!

Thanks for staying with us. You have finished this chapter.