USING A FINANCIAL CALCULATOR
- SOME GENERIC TOPICS -
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USING A FINANCIAL CALCULATOR – some generic topics

The main purpose of this document is to give some generic indications on the use of a financial calculator, no matter the model. In my website you can obtain additional material, more specific and detailed according to the usual models.

As a previous note, we must refer to three generic aspects to pay attention to when we are using a financial calculator:

1. The financial calculator, itself, can not solve problems. It is only a way of saving some hard work and time when solving, totally or partially, some problems. But it requires the correct human intervention.

2. The financial calculator is, in its essence, a *stupid* machine – it only does what we ask it to do, even if we ask it do stupid things.

3. In what it does, the financial calculator assumes hypothesis. In fact, the financial calculator works with formulae which, in turn, lye on hypothesis. This is the reason why the use of a financial calculator requires solid knowledge of the theory of Business Mathematics.

The main variables used on financial calculators are N, I%, PV, PMT and FV[1]. The same variable may have different meanings, depending on the type of problem we are solving. The variables PV, PMT and FV are "money variables", as they represent money. In any problem, at least two of these three variables must be present and their signs have to be different – if one of them is positive, the other one must be negative. One represents an *inflow* and the other one an *outflow*. If in a given problem the three variables have values (different from zero), then one of them must have opposite sign relative to the others. It is recommended that, when entering the values, one puts him or herself in the position of one of the parts (borrower or lender) and put the signs on the variables accordingly.

Two other important variables are P/Y and C/Y. They represent, respectively, the number of payments per year and the number of compounding periods per year[2].

Finally, when working on annuities, it is necessary to specify if it is an *ordinary annuity* or an *annuity due*. This is done by indicating END ou BEGIN, respectively.

There are four usual mistakes when using a financial calculator:

1. **No respect of the *signs rule*. We must remember that we can not give the same sign, positive or negative, to PV, PMT and FV on the same problem.**

    It is an easily detected mistake, because the calculator returns an error message.

2. **Incorrect attribution of signs to PV, PMT and/or FV, ie, positive instead of negative or vice-versa, according to the problem being solved.**

    It is often a hard to detect mistake, so it is a potentially serious one. In fact, when this happens, it is perfectly possible that the calculator returns a plausible, but erroneous, result.

3. **Incorrect indication of P/Y and/or C/Y.**

    It is often a hard to detect mistake, so it is a potentially serious one. We must carefully pay attention to the values of these variables, especially when using entry-level models, as they do not, usually, show them on the screen.

4. **Incorrect indication of END or BEGIN.**

    It is often a hard to detect mistake, so it is a potentially serious one. We must carefully pay attention to the type of annuity being solved.


[1] PV: Present Value; PMT: Payment; FV: Future Value
[2] If we admit that the interest rate, I%, is annual. As a matter of fact, P/Y and C/Y must be seen, respectively, as the number of payments and the number of compounding periods *per period at which the interest rate indicated in i% is referred to* (which can be other than annual).

Thus, we must pay attention to the following:

1. I tis a good practice to clear the values of the variables before entering the values of a new problem. In fact, it may happen that the value of one variable in the new problem must be zero, but that value was different from zero on the previous problem. If we do nothing, that value will remain, affecting the new calculations.

2. Carefully pay attention to the signs that must be given to PV, PMT and FV, especially when they all exist at the same time in the same problem.

3. Carefully pay attention to the values of P/Y and C/Y.

4. In the problems of annuities and loan amortization, carefully pay attention to the type of annuity, correctly indicating it with END or BEGIN.
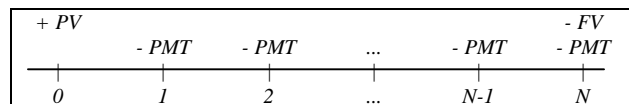
Finally, we must always have in mind that, accordingly to the theory, financial calculators assume that PV, PMT and FV flows occur like this:
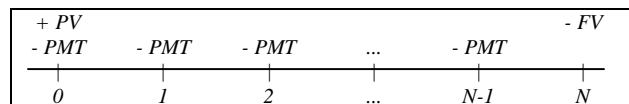
Single capital problems

```
 - PV                                                    + FV

    +-------+-------+-------+-------+-------+
    0       1       2       ...     N-1     N
```
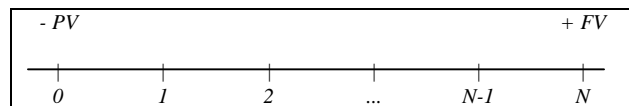
Multiple capital problems (annuities and loan amortizations)

END Mode (Ordinary annuities)

```
 + PV                                              - FV
           - PMT    - PMT    ...     - PMT    - PMT
    +-------+-------+-------+-------+-------+
    0       1       2       ...     N-1     N
```

BEGIN Mode (Annuities due)

```
 + PV                                              - FV
 - PMT    - PMT    - PMT    ...     - PMT
    +-------+-------+-------+-------+-------+
    0       1       2       ...     N-1     N
```

(The signs of PV, PMT and FV above are merely exemplificative. They do not have to be exactly those indicated. The main thing is that they can not be all positive or all negative and, especially, we must put the signs correctly, according to the problem being solved).

Type of problem	Variable	Meaning
Single capital	N	Number of compounding or discounting periods
	PV	Present Value
	FV	Future Value
	I%	Annual interest rate
	P/Y	
	C/Y	
Interest conversion	N	Number of compounding periods per year
	I%	
	EFF	Effective annual interest rate
	APR (ou NOM)	Annual Percentage Rate
Annuities	N	Number of payments
	PV	Present value
	FV	Future value
	I%	Annual interest rate
	PMT	(Ammount of the) Payment
	P/Y	(Number of) Payments per year
	C/Y	Number of compounding periods per year
	END	Ordinary annuities
	BEGIN (ou BGN)	Annuities due
Loan amortization	N	Number of payments
	PV	Present value
	FV	Future value
	I%	Annual interest rate
	PMT	(Ammount of the) Payment
	P/Y	(Number of) Payments per year
	C/Y	Number of compounding periods per year
	END	Ordinary annuities
	BEGIN (ou BGN)	Annuities due
	PM1 (ou P1)	First payment on the interval (in order to obtain total interest and total amortized capital in that interval) *(Payment 1)*
	PM2 (ou P2)	Last payment on the interval (in order to obtain total interest and total amortized capital in that interval) *(Payment 2)*
	BAL	Remaining balance after the payment of PM2 (ou P2)
	INT	Interest contained in the payment PM1 (ou P1)
	PRN	Principal (amortized capital) contained in the payment PM1 (ou P1)
	Σ INT	Total interest contained in the payments PM1 to PM2 (inclusive)
	Σ PRN	Total capital amortized in the payments PM1 to PM2 (inclusive)
Cash-Flow	CFj	"Cash-Flow" relative to period **j**
	I%	Discount rate in order to obtain NPV
	NPV	Net Present Value
	IRR	Internal Rate of Return