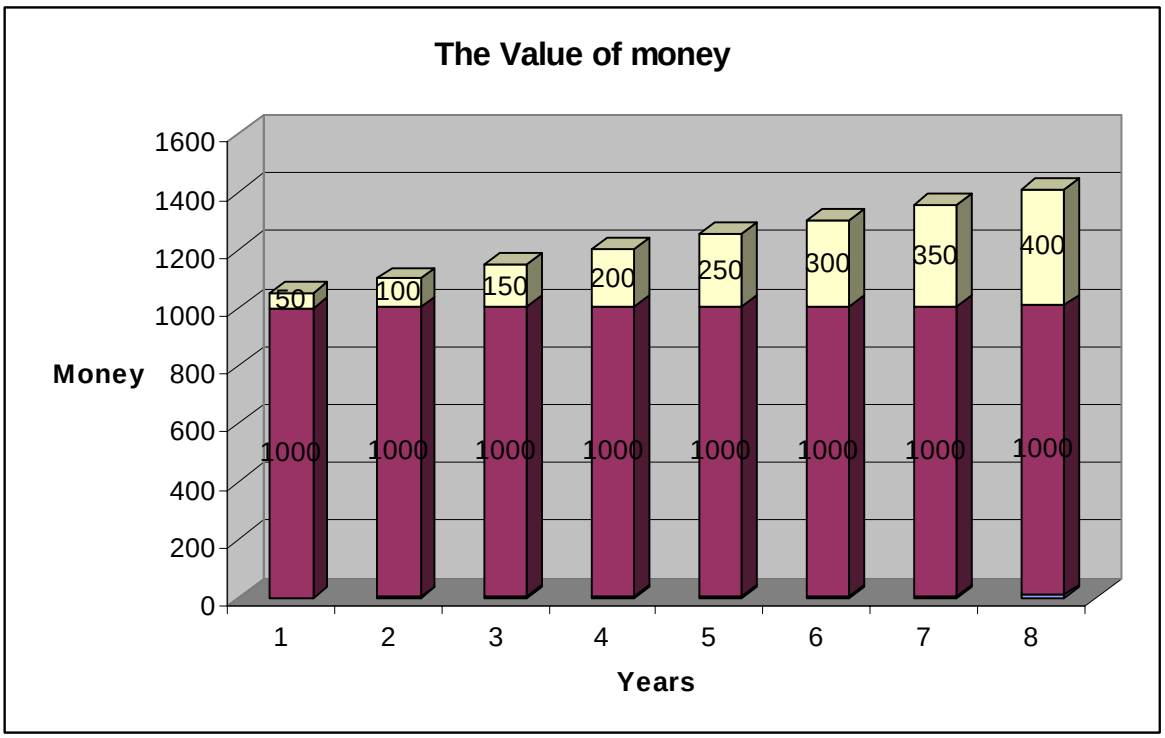
TIME VALUE OF MONEY



Time value of money is an important concept in financial management.
Money that you hold today is a worth more because you can invest it and earn interest.
For instance (see the diagram) you can invest your euro (1000€) for one year at a 5% annual interest rate and accumulate 1050€ at the end of the year.
You can say that the FUTURE VALUE of the 1000€ is 1050€ given at 5% INTEREST RATE and a one year PERIOD.

The PRESENT VALUE of the 1050€ you expect to receive in one year is only 1000€.

We need a formula to calculate the value a single sun of money will grow to of some future date.
For this calculus we need we called:

C = capital

i = interest rate

t = time and the number of the period

Simple interest	I=C*i*t	Is the charge for investing money. It's a percentage of the amount invested over a specific period of time.
Future value	FV=C+I	Is the amount of money that an investment with a fixed interest Rate will grow to buy come future date.

Since money has time value, we naturally expect the future value to be greater than the present value. The difference between the two depends on the number of the compounding periods involved and the going interest rate.
Example:

C = 1000 €
i = 4%
t = 4 years

FV = 1000+1000*0,04*4= 1000+160= 1160€

Simple the interest is calculated on the original capital only, accumulated interest from prior periods is not used in calculations for the following periods. Simple interest is normally used for a single period of less than a year, such as days or months.

In contrast, COMPOUND INTEREST is calculated each period on the original amount invested plus all unpaid interest accumulated during past periods. Although the interest may be stated as a yearly rate, the compounding periods can be yearly, semiannually, quarterly, or even continuously.

You can think of compound interest as a series of back-to-back simple interest contracts. The interest earned in each period is added to the capital of the previous period to become the capital for the next period. For example, you invest 100€ for 3 years a 5% annual interest compounded annually:

Interest year 1 = C*i*t = 100*0,05*1 = 5
Interest year 2 = ($C_2 = C_1+i_1$)*i*t = 105*0,05*1 = 5,25
Interest year 3 = ($C_3 = C_2+i_2$)*i*t = 110,25*0,05*1 = 5,5125

Total interest earned over the three years = 5+5,25+5,5125 = 15,7625
Compare this to 15 earned over the same number of years using simple interest
Future Value in compound interest can be expressed as:

$$FV = C(1+i)^n$$

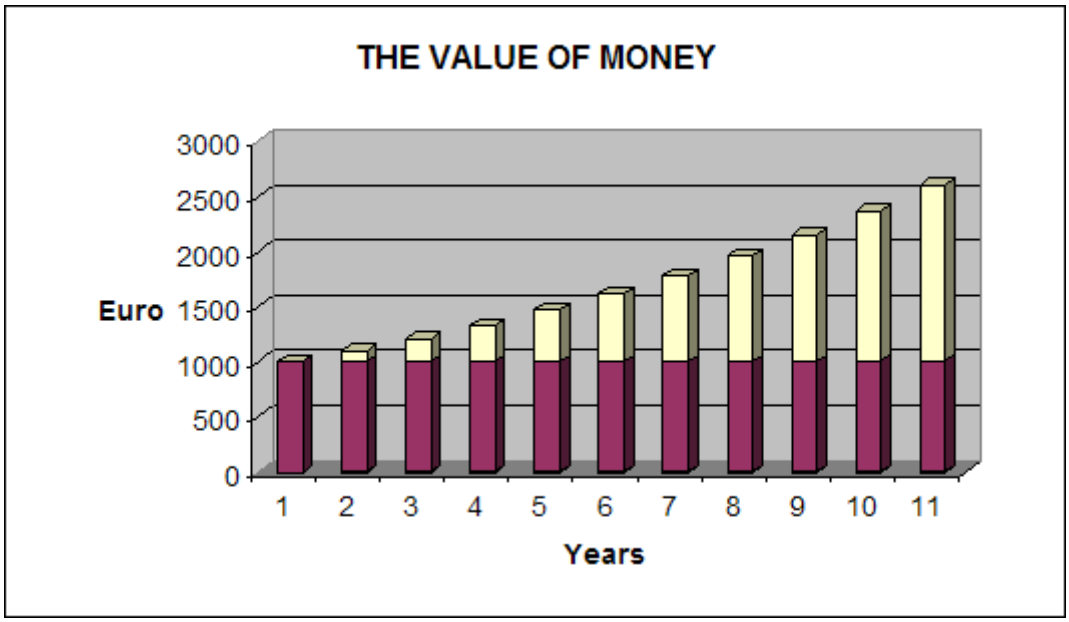
Where:

FV = future value
C = capital invested
i = interest rate per period
n = number of compounding periods

Example

C=	**1000**
i=	10%
n=	1

n	C	I
0	1000	0
1	1000	100
2	1000	210
3	1000	331
4	1000	464,1
5	1000	610,51
6	1000	771,56
7	1000	948,72
8	1000	1143,59
9	1000	1357,95
10	1000	1593,74



in compound interest the PRESENT VALUE is an amount today that is equivalent to a future payment that has been discounted by an appropriate interest rate. The relationship between the present value and future value can be expressed as:

$$PV = FV[1/(1+i)^n]$$

Where:

PV = present value
FV = future value
i = interest rate per period
n = number of compounding periods

Example: What amount will accumulate if we deposit 5000 € at the beginning of each Year for the next 5 years? Assume an interest of 6% compounded annually.

Some examples

1. *Calculate the simple interest and the future value on a capital of 8000€ for 5 months to the interest rate 6%.*

2. *Calculate the future value on a capital of 5000€ for 4 years to the interest rate 5%.*

3. *Calculate the present value on a capital of 16000€ available in 6 years to the interest rate 4%.*