The definition of interest

Version 1

By

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In the Name of Allah, the Extremely Gracious, the Very Merciful.

All praise and thanks are due to Allah, and peace and blessings be upon His Messenger.

The definition of interest

The amount of money charged[1] after a specified term on the principal amount that is given as a loan is referred to as interest.

Sometimes, a sum of money is charged on the principal amount that is given as a loan without a clearly stating the period after which the loan becomes due.

e.g.

Where A lends B a $1000 in return for a 20% interest per annum, then any $200 paid by B to A in addition to the capital loan would be an interest payment.

Even if B had earned his money on a totally Islamically acceptable basis, then also the provision of the additional $200 to the lender would be an interest amount.

Borrowing or lending on an interest-based manner is the process that allows for the creation of interest and interest-debt.

The definition of compound interest

AF Ebrahim definition

When the amount of money charged[2] on the principal amount, which is given as a loan, after a specified term, is re-loaned together with the principal (or the principal + any previously accrued interest) in order to continue the cycle of the loan to a specific date, then the aggregate interest charged over the term of loan is referred to as compound interest.

Notes

1. This definition is appropriate because interest has not only been charged on the original principal amount but also on every interest amount, except the last interest payment, which was periodically paid upon the principal and all other interest earnings.

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[1] Interest is very often classified in financial writings and statements as “Interest Earned”. Islamically, earning is different from charging, and since the lender has not toiled for the interest-return, it would be better to classify the interest as “Interest charged”. Thus, a person who has deposited his money into a banking account that pays interest is actually forwarding a loan on which he demands interest.

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2. The principal loan could be a deposit into a banking account in which it has to be left for a fixed term in order to qualify for the specified interest-return. In this case, the money is considered as a loan that is forwarded to the bank. The bank then either invests the money or lends it to others and charges them an interest amount relative to the term of usage.

More simply

The difference between the total interest gain on the principal including any interest gains on other accumulated interest gains and the original principal is called compound interest.

Another definition: A compound interest contract is like a series of simple-interest contracts that are connected. The length of each simple-interest contract is equal to one compounding period. At the end of each period, the interest earned on each simple-interest contract is added to the principal.[3]

e.g. $100 invested at a rate of 10 % compounded annually:

Year	Principal	Interest	Year End Total
1st	100	10	110
2nd	110 (Principal + interest of year one)	11 (110 x 10%) Interest on principal + interest on the interest of the first year	121
3rd	121	12,10	133,10

In the above example, the original principal (100) + interest accrued at the end of year one (10), is also be regarded in conventional finance as the new principal for the next period of the loan.

Equation for compound interest

Equation 1[4]: $\mathbf{S= P (1+r)^n}$

S = Compound amount or principal + accumulated interest on principal and interest.

P = Principal amount of the loan

r = rate of interest

n = number of years or number of periods over which the compound interest is forwarded.

1 = the integer one and not the alphabet **l**.

The same formula is represented in the many manuals of financial calculators as

[3] HP 10bll Financial calculator's User's guide.
[4] Introductory Mathematical Analysis – For Business, Economics, and the Life and Social Sciences. Ernest F. Haeussler, Jr. /Richard S. Paul. Prentice Hall. USA. 1990. 6th Edition, p159. ISBN 0-13-501438-7

$FV = PV\ (1+r)^n$

where

FV = **Future Value** = **S** (as specified here above)
PV = **Present Value** = **P** (as specified here above)

Example 1

Suppose $1000 is invested for 10 years at 6% compounded annually.

Using Equation 1, the calculation of S or FV would be
When P = 1000, r = 0,06 and n = 10

$FV = 1000\ (1+0{,}06)^{10} = 1000\ (1{,}06)^{10}$

In the early years, the values of $(1{,}06)^{10}$ was taken from compound interest tables in which (n) was shown progressively in a vertical column in the table that gave the specific exponential values for 0.06 or 6% (or any other respective percentage) as the compound interest rate.

However, this exponential value is very easily obtained via scientific and financial calculators using the y^x function which is often activated through the 2^{nd} Function 2^{nd} F key.

Thus 1,06 \ 2^{nd} F key\ then the y^x followed by the positive integer 10 = 1,79

Therefore **S** or **FV** = 1000 x 1,79085
= 1790,85

See Calculators:

1. Sharp EL-738 Business /Financial Calculator
2. Casio FC-100 manual p38 + calculator
3. Texas Instruments BA II Plus – p28 of manual + calculator

Therefore, the compound interest in the above case is

S (or **FV**) **-** P (or **PV**) **= Compound Interest**
1790,85 - 1000
= 790,85

Example 2

1. A principal of $2000 is invested for 10 years.
2. Compounding takes place every 3 months (i.e., quarterly) at a rate of 1½ % per quarter. Thus, there are 4 interest periods or conversion periods per year. In ten years there are 10 x 4 = 40 interest periods.

$FV= PV\ (1+r)^n$ **and** 1½ % is equal to 0,015

$= 2000\ (1 + 0{,}015)^{40}$
$= 3628{,}03$

FV- PV = Compound Interest

3628,03 - 2000 = 1628, 03

Calculator usage

We can do the above more simply with Financial Calculators.

Calculator 1. Here we use the FN Aurora Financial Manager[5]:

After correctly setting the calculator		
40 N		
1.5 *i*		Note: The interest key *i* is not shown as I/Y. This is similar to the same key on the Sharp EL-733 calculator.
-2000 PV		
COM key	3628,04	Answer appears after few seconds due to the level of the calculators processor

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Notes

1. Usually, the interest rate per conversion period is stated as an annual rate. [6]

2. In example two, we would say that the annual rate of 6% is compounded quarterly. Thus**, the rate per interest period**, or the **periodic rate** is 6 % ÷ 4 = 1,5 %. The quoted annual rate of 6% is called the **nominal rate** or the **annual percentage rate (A.P.R.)**.

3. Unless otherwise stated, all interest rates will be assumed to be annual (nominal) rates.

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[5] This was the best priced budget Financial calculator but lacks processing speed and certain functions of higher end financial calculators.

[6] [for footnotes 1-4] Introductory Mathematical Analysis – For Business, Economics, and the Life and Social Sciences. Ernest F. Haeussler, Jr. /Richard S. Paul. Prentice Hall. USA. 1990. 6th Edition, p159. ISBN 0-13-501438-7

4. Thus a rate of 15% compounded monthly corresponds to a periodic rate of 15%/12 = 1,25%.

5. The convention in FV calculations is to regard the PV as a negative quantity. Payments to the bank or to a supplier will appear as negative in the display.[7]

6. Generally, for a given nominal rate of interest, the compound interest amount increases due to an increase in the frequency of the compounding. However, this increase becomes less meaningful when the number of interest periods become closer to each other.[8]

Calculator 2: Sharp **EL-738** Business Financial Calculator

Note: The I/Y "Interest per year" key is functional as *i*/p "interest per period" as well. Thus it would have been better if the key had *i* printed on it instead of I/Y. The *i* is found to be printed on the Sharp **EL-733** Financial Calculator

After correctly setting the calculator and entering the appropriate mode		
	ON/C 40 N	
The down pointing cursor is to be used to insert all subsequent or other variables	-2000 PV	
Quarterly interest rate	1.5 (or key in 6 ÷4) I/Y	
Skip the (PMT) variable		
COMP = (compute answer)	COMP FV	Answer: 3628,04

Calculator 3. BA II Texas Instruments Business Analyst Calc.

See p 28 of the manual. In this calculator, the CPT key is used to for COMP = (compute answer).

Calculator 4. HP 10bll

See the manual p60 for doing the FV calculation. Follow the example but do not insert the FV value. Rather enter a value for N . Then , finally press the FV key.

Calculator 5. Sharp El-733

See manual which provides clear details on the FV calculation.

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[7] Sharp EL-733 Financial Calculator Manual p15.

[8] Introductory Mathematical Analysis – For Business, Economics, and the Life and Social Sciences. Ernest F. Haeussler, Jr. /Richard S. Paul. Prentice Hall. USA. 1990. 6th Edition, p159. ISBN 0-13-501438-7