EE-287 Engineering Economics

Lecture Title:

Interest Rate (IR), Rate of Return (RoR) and Minimum Attractive Rate of Return (MARR)

Instructor:

Dr. Muhammad Amir (DEE, UET, Peshawar)

Put on your headphones. Click Slideshow. Play the Speaker icon on each Slide and listen to the Lecture. Change Slide through Right/Left arrow keys or Page Down/Page Up keys

Interest Rate (IR) & Rate of Return (RoR)

Point to remember: Interest Rate & Rate of Return are one and the same thing

- **Interest is the manifestation (Accumulation) of the Time Value of Money (TVM) and it essentially represents "Rent" paid for the use of money**

- **Computationally, interest is the difference between an ending amount of money and the beginning amount**
  (If the above difference is zero, it means "No Interest")

Perspective 1: Interest Earned (Earned by person who invests or lends money)
e.g. If you invest Rs.100/- at an interest rate of 5% for a specific time unit of 1 year then after 1 year the manifestation of the TVM will be Rs.5/- (known as Interest) and your investment return will be Rs.105/-.

So, you started with the beginning amount of Rs.100/- and ended up with Rs.105/- earning you a difference of Rs.5/-.

If you would have invested at 0% interest rate then after one year you would have ended up with the same Rs.100 as the difference is zero meaning "No Interest".

Perspective 2: Interest Paid (Paid by a person who takes out a loan)
e.g. If you borrow Rs.100/- at an interest rate of 5% for a specific time unit of lets say 1 year then after 1 year the manifestation of the TVM will be Rs.5/- (known as Interest) and you will have to repay Rs.105/-.

So, you started with the beginning amount of Rs.100/- and ended up paying Rs.105/- with a difference of Rs.5/-.

If you would have borrowed at 0% interest rate then after one year you would have ended up with paying the same Rs.100 as the difference is zero meaning "No Interest".

Interest Rate: (Definition): When interest over a specific time unit (hour, week, month, year…..normally annual) is expressed as a percentage of the original amount (also known as Principal amount), the result is called "Interest Rate" or "Rate of Return".

Mathematically,

IR or RoR = (Interest accrued per time unit/Original amount) x 100

e.g. looking at both perspectives

IR or RoR = (5/100) x 100 = 5%

Example 1: (Interest Paid perspective)

Student A – Borrows Rs.10,000/- on 1st January 2021 and must repay Rs.10,700/- after 1 year.

Determine:

(1) The interest amount ?

(2) The interest rate paid ?

Solution:

(1) Interest amount = End amount – Original amount

= 10,700 – 10,000

= Rs.700/-

(2) Interest rate = (Interest accrued per time unit/Original amount) x 100

= (700/10,000) x 100

= 7% per year

Example 2: (Interest Earned perspective)

(1) Calculate the amount deposited 1 year ago to have Rs.1000/- now at an interest rate of 5% per year.
(2) Calculate the amount of interest earned during this time period.

Solution:
(1) Total amount accrued = Rs.1000/-

If X is the original amount deposited

Total amount accrued = Original amount + Original amount $*$ (Interest Rate)

$1000 = X + X * (0.05)$

$1000 = X(1 + 0.05)$

$X = (1000/1.05)$

$X = Rs.952.38/-$

(2) Interest = Ending amount – Beginning amount

$= 1000 – 952.38$

$= Rs.47.62$

Minimum Attractive Rate of Return (MARR)

Points to Remember

1. Engineering alternatives are evaluated upon the prognosis that a reasonable Rate of Return (RoR) can be realized.

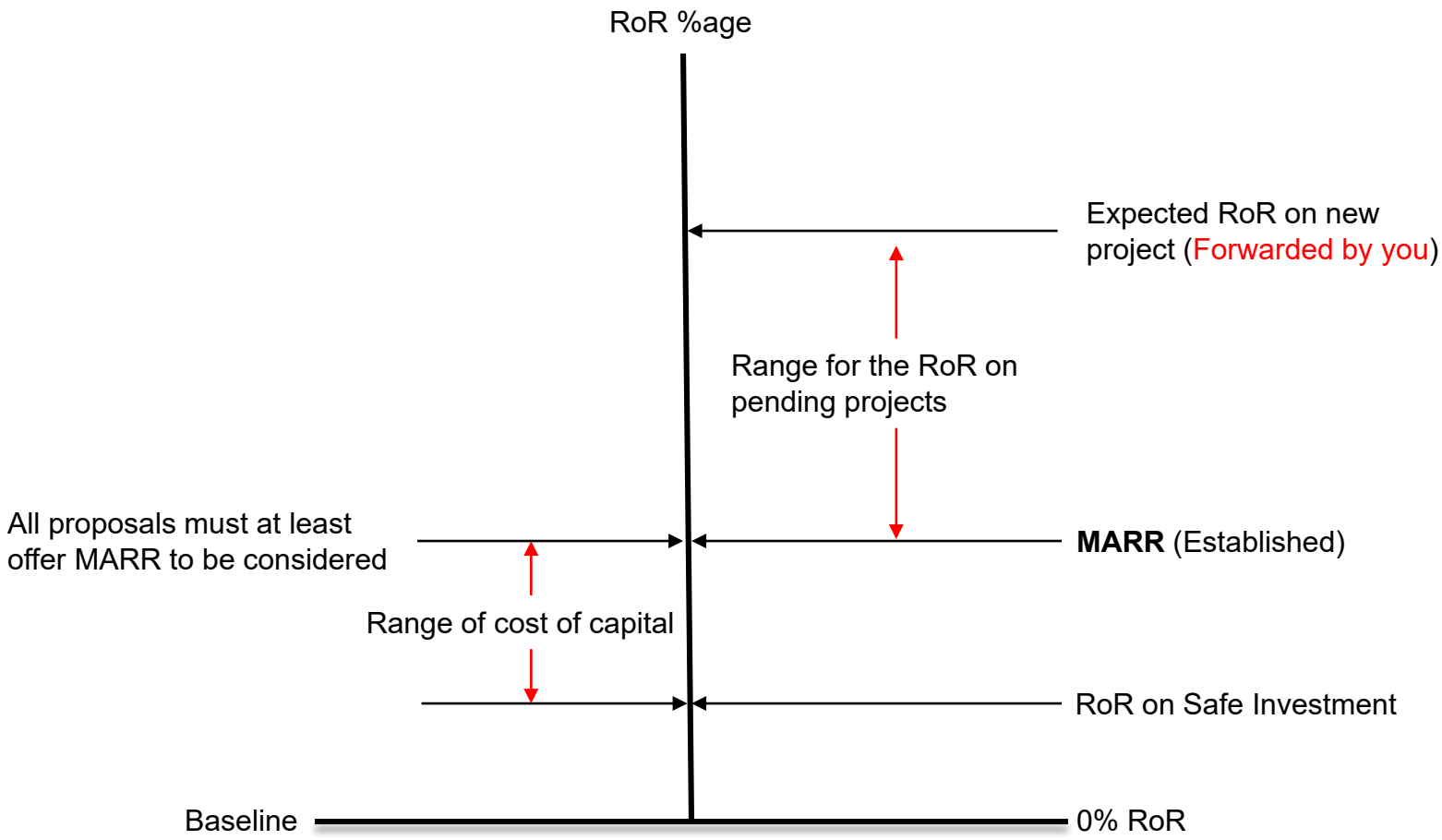
2. A reasonable RoR must be established so that the Accept/Reject decision can be made.

3. That reasonable rate is called MARR and it must be higher than the cost (i.e. rate) of money used to finance the alternative. As well as higher than the rate expected from a Bank or safe (i.e. minimal risk) investment.

Example: An Organization borrows funds at an average of 5% per year. It expects to clear 6% per year. What is going to be the MARR for them ?

Rule of thumb for MARR = Borrowing rate + Clearance rate
= 5% + 6% = 11% must be their established MARR

RoR ≥ MARR > Cost (i.e. Rate) of Borrowed Capital funds (Important!)



MARR relative to the Cost of Capital & other Rate of Return values

Thank You for listening