

# Seminar Series of lectures at Madurai School of Management

## Time Value of Money (TVM) & Money Value of Time (MVT)

*delivered by*

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*at Madurai on Sep 20, 2012*

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# Time Value of Money (TVM) & Money Value of Time (MVT)

## Agenda

- ❖ Four Factors of Production
- ❖ The two most precious resources
- ❖ TVM basic concept
- ❖ Interest is a return on investment
- ❖ Interest calculations
- ❖ Cash Flows
- ❖ Project Evaluation and Selection
- ❖ Discounted Cash flow (DCF) Analysis
- ❖ Net Present Value (NPV)
- ❖ Internal Rate of Return( IRR)
- ❖ Break Even Analysis (BEA)



# Time Value of Money (TVM) & Money Value of Time (MVT)

## Agenda

- ❖ Annuities and Equated Monthly Payments( EMP)
- ❖ Future Value
- ❖ Pricing of Bonds, Shares
- ❖ Splitting the EYP into Principal and interest
- ❖ MVT basic concept
- ❖ Time Management
- ❖ Skill Building
- ❖ Law of comparative Advantage
- ❖ Value Focus
- ❖ Summary



# Time Value of Money (TVM) & Money Value of Time (MVT)



## Factors of Production

- ❖ Money
- ❖ Machinery
- ❖ Materials
- ❖ Manpower



Money and Manpower play a significant role

# Time Value of Money (TVM) & Money Value of Time (MVT)

Money is borrowed to

Buy a house or car

Start a business

Conduct a wedding, family function

Buy fertilizer, pesticide or even a tractor

Money is saved to

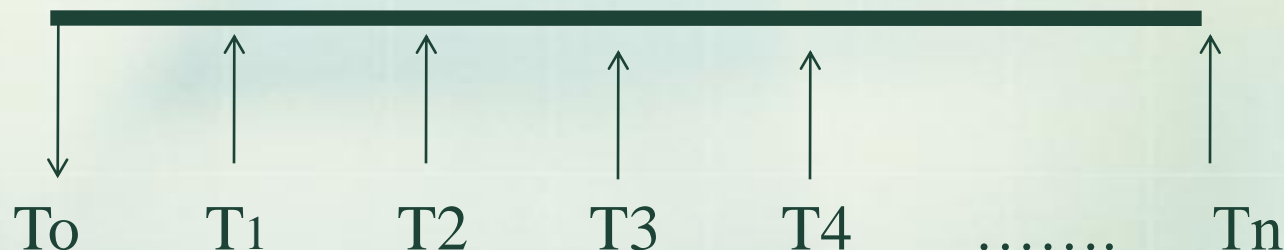
Get a lump sum amount on a future date

Get a steady income post retirement



How can we equate the current payment to future payments?

# Time Value of Money (TVM) & Money Value of Time (MVT)

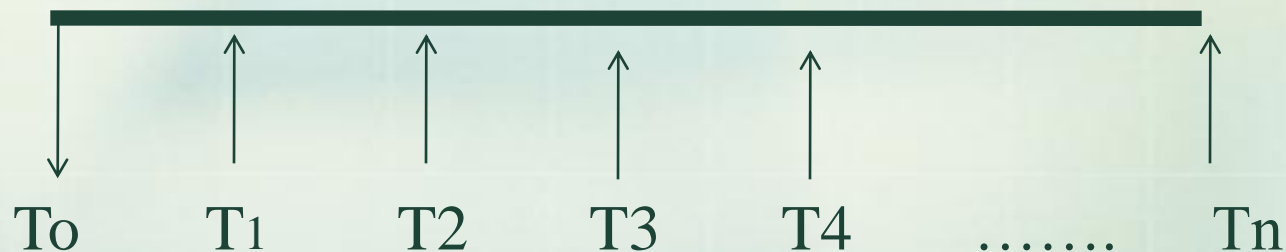


What is the worth of Rs 10000, given today, one year from now?

10000    11000    12100    13210.....

The borrower has to pay interest on interest as years go by.  
This is known as compound interest.

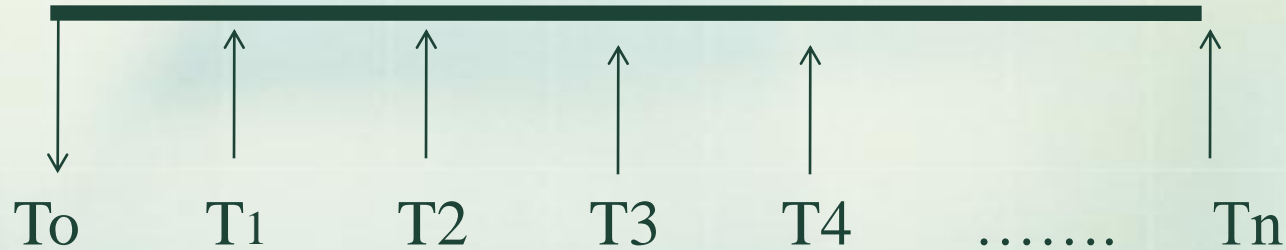
# Time Value of Money (TVM) & Money Value of Time (MVT)



10000    11000    12100    13210.....with compounding  
interest.....

Or the borrower keeps paying an interest of Rs 1000 every year and repays the amount Rs 11000 in the final year.

# Time Value of Money (TVM) & Money Value of Time (MVT)



What is the worth of Rs 10000, given today, one year from now?

Present Value = 10000 rupees

Future Value = 11000 rupees

$$PV = FV * PVF$$

PVF =  $(1/(1+r))$  where r is the interest rate



# Time Value of Money (TVM) & Money Value of Time (MVT)

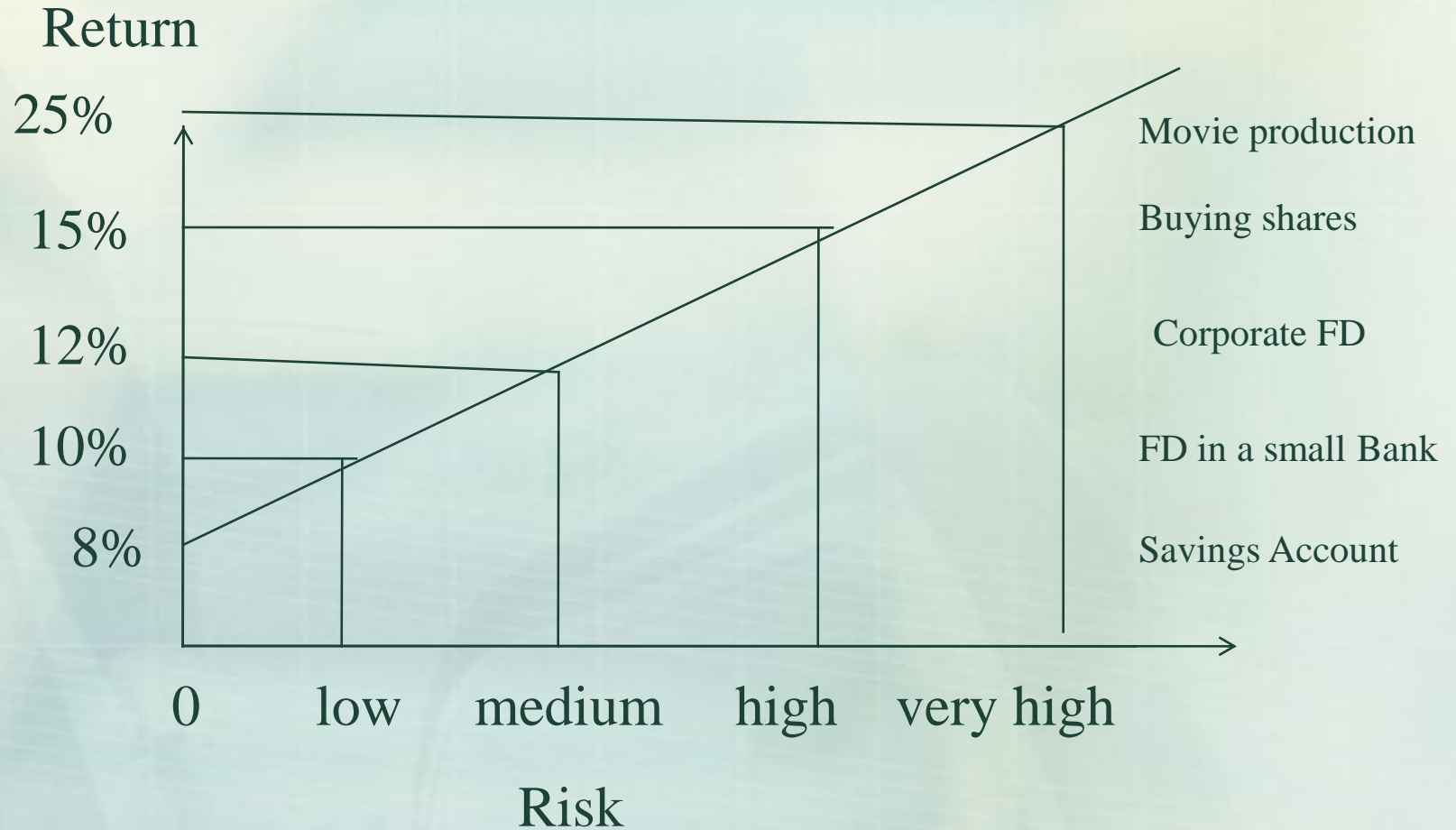
We have seen that the PVF depends on the interest rate. We also know that

$$FV = PV / PVF$$

When we have money to lend, what is the interest rate we can use?

Will it be 8% ( bank savings rate), 11% ( interest on Fixed Deposits or 24 % ( Pawn Broker rate) ?

# Time Value of Money (TVM) & Money Value of Time (MVT)



The Interest rate is a function of your risk appetite.

# Time Value of Money (TVM) & Money Value of Time (MVT)

PVF =  $(1/(1+r))$  where  $r$  is the interest rate.

This formula is correct only when the future payment is away by one year ( or one time period).

If it is away by two years then

$$PVF = (1/(1+r)^2)$$

If it is away by  $n$  years then

$$PVF = (1/(1+r)^n)$$

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Fortunately we don't have to be calculating this all the time.

It is available from PVF Tables.

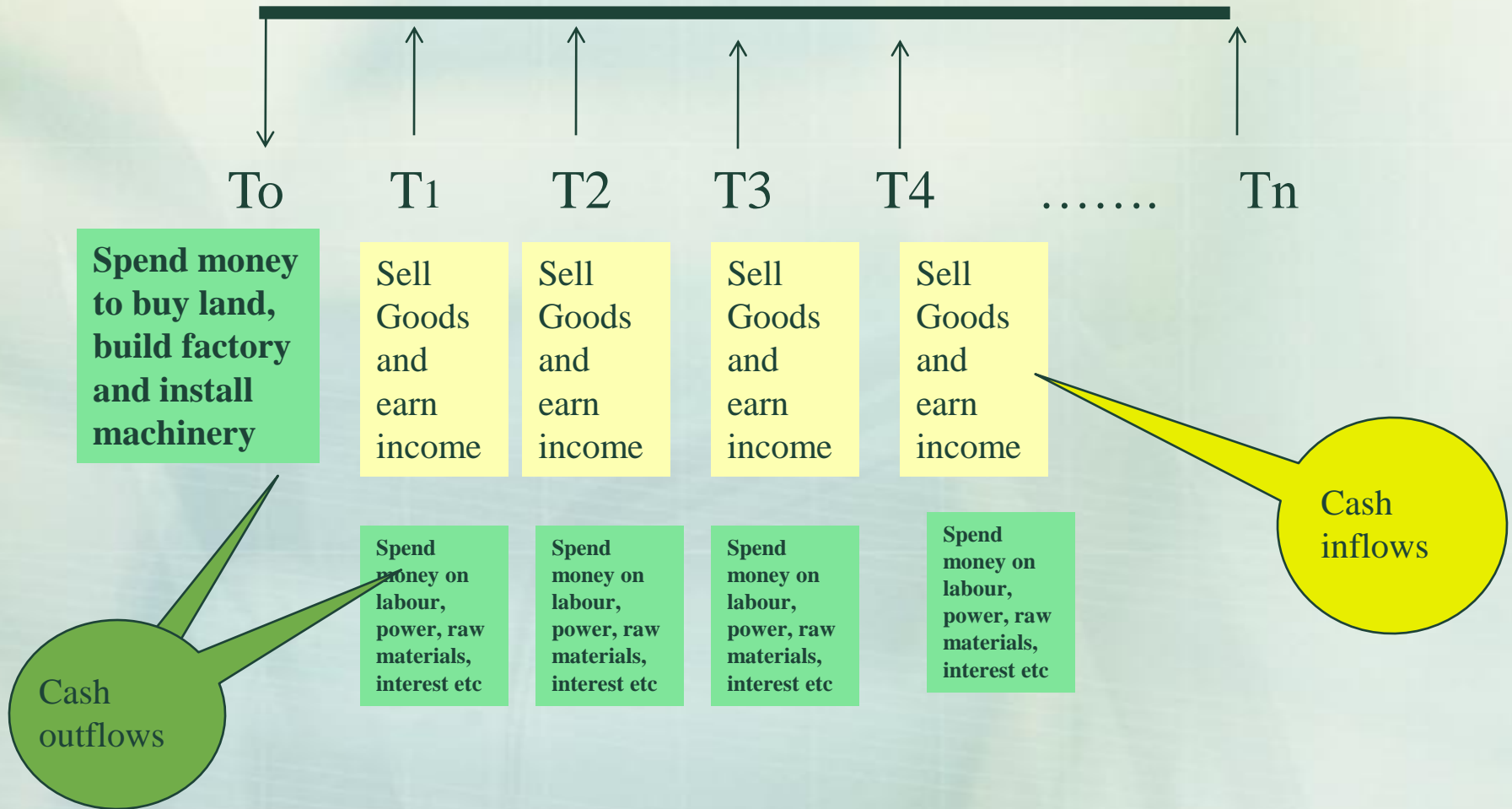
These PVF are also same as the Discounting Factors.

Multiply any future payment with the PVF ( or the DF) to calculate its PV.

interest rate	0.10	0.15	0.20	0.25
year				
1	0.91	0.87	0.83	0.80
2	0.83	0.76	0.69	0.64
3	0.75	0.69	0.63	0.58
4	0.68	0.62	0.57	0.53
5	0.62	0.57	0.52	0.48
6	0.56	0.52	0.47	0.44
7	0.51	0.47	0.43	0.40
8	0.47	0.43	0.39	0.36
9	0.42	0.39	0.36	0.33
10	0.39	0.35	0.32	0.30

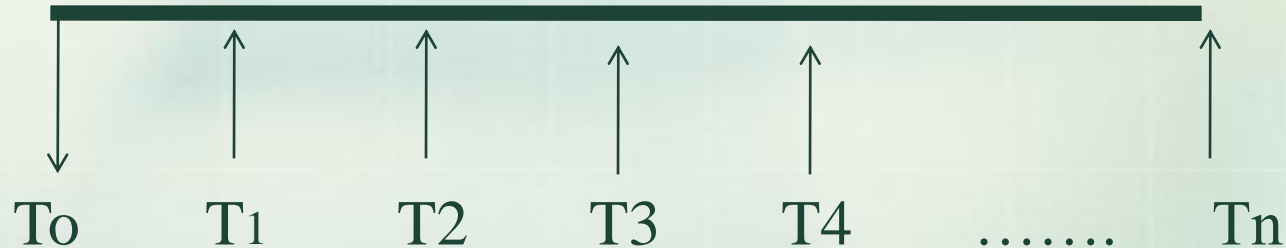
# Time Value of Money (TVM) & Money Value of Time (MVT)

Every Project calls for spending money upfront and earning returns over many years in future.



# Time Value of Money (TVM) & Money Value of Time (MVT)

## DCF Method

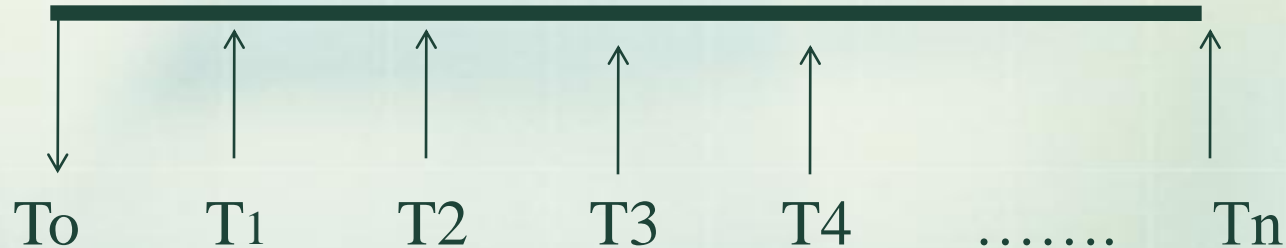


- ✓ Calculate the net inflows in periods  $T_1$  to  $T_n$
- ✓ Calculate the PV of all future inflows and add.  
 $T_1 * PVF_1 + T_2 * PVF_2 + \dots + T_n * PVF_n$
- ✓ If the above sum is greater than  $T_0$  then the project is profitable. Else unprofitable.

**This is known as Discounted Cash Flow (DCF) Method. It is used in all project evaluations. The Discounting rate used is known as Opportunity Cost of Capital.**

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Net Present Value (NPV)



- ✓ Calculate the net inflows in periods  $T_1$  to  $T_n$
- ✓ Calculate the PV of all future inflows and add.  
 $T_1 * PVF_1 + T_2 * PVF_2 + \dots + T_n * PVF_n$
- ✓ Subtract  $T_0$  from the above expression.
- ✓ The remaining amount is called the NPV of the project.

**Higher the NPV more attractive is the project. Hence this method is used to select among competing projects.**

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Net Present Value (NPV)

### Example

Total amount available for investment is Rs 800 lakhs

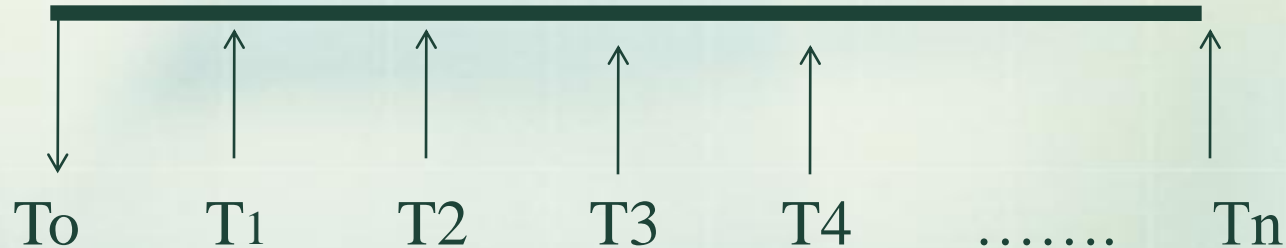
Project	NPV in lakhs	Investment in Lakh rupees
A	35	200
B	45	300
C	10	30
D	70	500
E	5	10

Which projects to choose?



# Time Value of Money (TVM) & Money Value of Time (MVT)

## Internal Rate of Return (IRR)

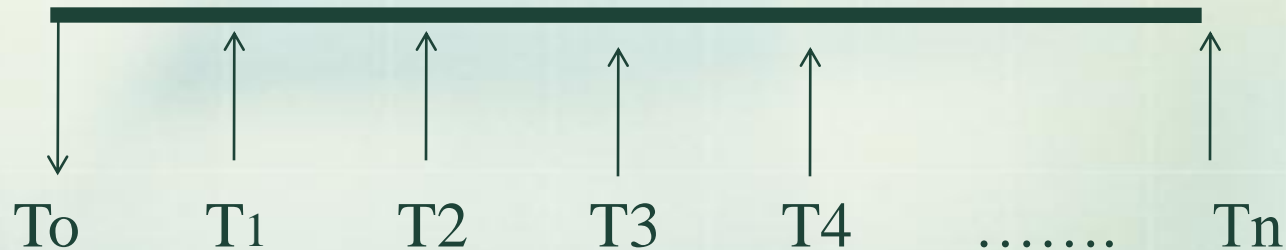


- ✓ Instead of assuming a Discounting Rate we can also use tables and computers and find out a specific rate at which  $T_0$  will be equal to the sum of present value of all future net flows.
- ✓ This rate is known as the Internal rate of Return of the project.
- ✓ IRR should be above the Cost of Capital for a project to be considered for selection.

We can use IRR as an alternative to NPV in project selection among competing projects. But NPV method is superior. Can you find out why?

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Break Even Analysis (BEA)

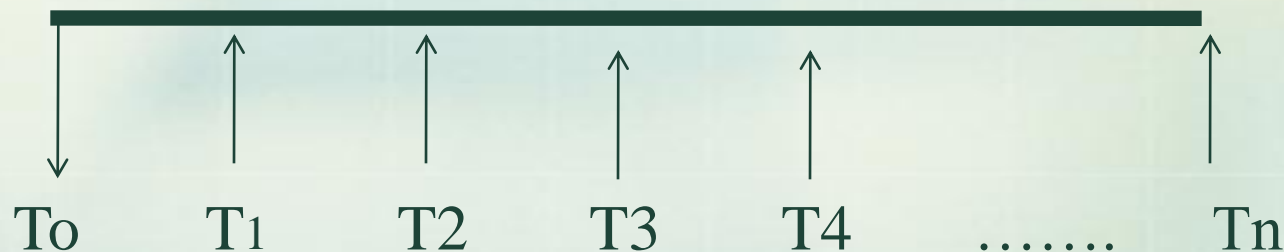


- ✓ One more method to evaluate a project is BEA.
- ✓ Using the DCF analysis we find out how long does it take for the project to recover the investment. Say it is six years.
- ✓ Then we use this information along with the NPV in project selection.

**Projects with shorter Break Even time periods are preferable.  
Can you say why?**

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Buying annuities

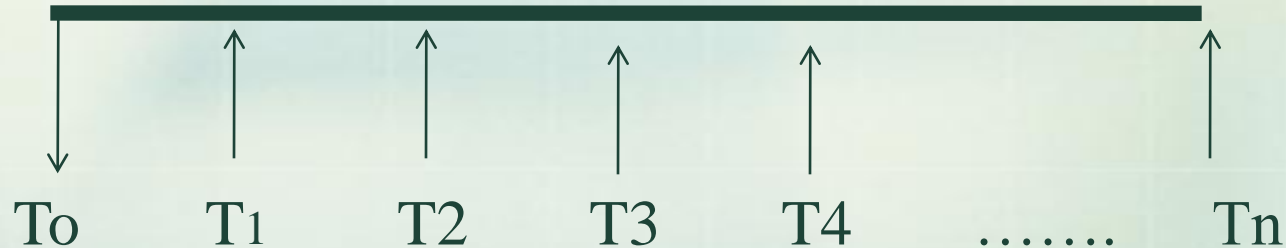


You can go to a Bank with your savings and buy an annuity for next 10 years. The bank takes your money, invests it wisely and earns 10 % return per annum. Then gives you an equated payment every year for next 10 years. How does the Bank determine the yearly payment amount?

Hint: use the PVF tables.

# Time Value of Money (TVM) & Money Value of Time (MVT)

Future value

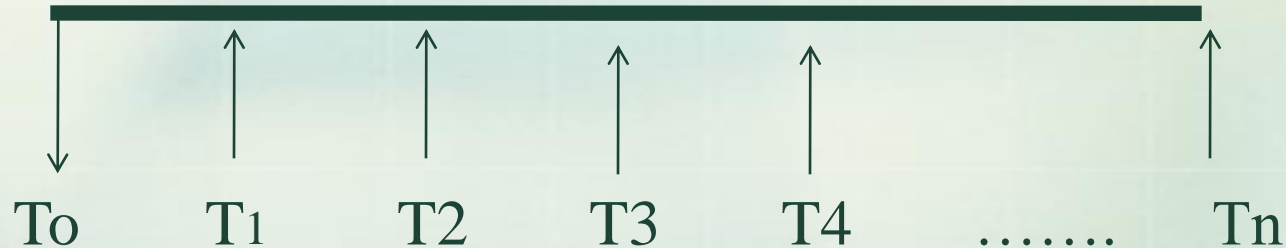


In the previous example, suppose the bank decides to invest part of your money in Share market. Then it is not assured of its earnings. Bank expects to earn an average of 14% per annum in the long run. Future value of current investment is uncertain.

But the concept of FV is important from savings perspective. We contribute to pension funds in younger years.

# Time Value of Money (TVM) & Money Value of Time (MVT)

Future value : Pension funds

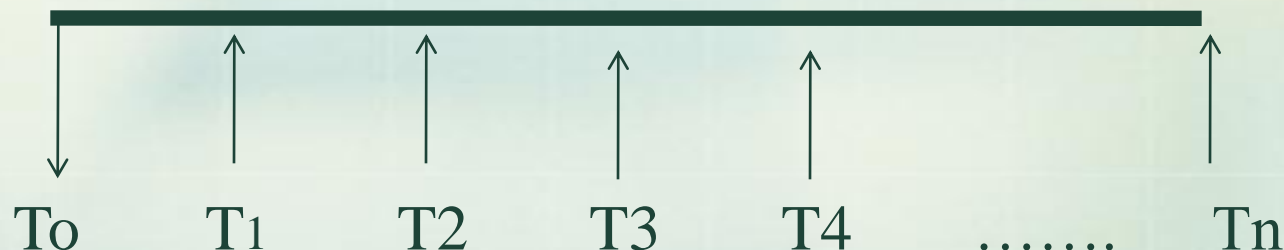


From the age of 25 till 60 a part of our salary is deducted and invested in pension funds so that , after retirement , we can get a monthly pension. Calculating the pension amount is very difficult due to uncertainty about future earnings and about our longevity.

Life Insurance companies and Pension Administrators use Mortality Tables to figure out how long we would live after retirement.

# Time Value of Money (TVM) & Money Value of Time (MVT)

Future value : buying Bonds and Shares

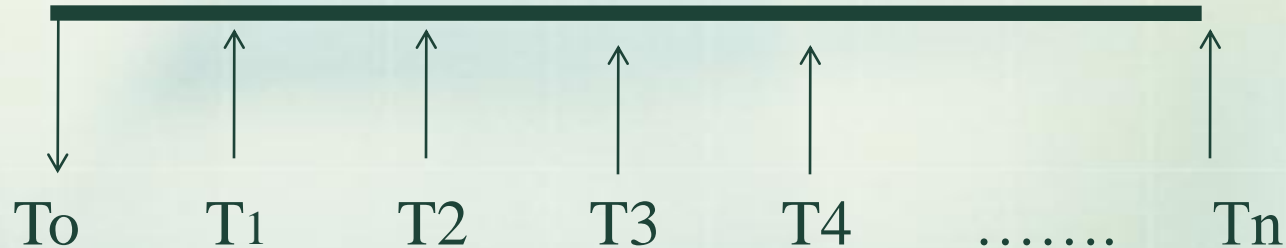


To start with at time  $T_0$  a bond is priced based on prevailing interest rate and its longevity. But at  $T_1$ ,  $T_2$  etc its market price will change depending on changes in interest rate. Hence it is not easy to determine how long you should hold a bond that has been bought in the secondary market.

Analysts who predict changes in interest rates are in great demand in the industry.

# Time Value of Money (TVM) & Money Value of Time (MVT)

Future value : buying Bonds and Shares

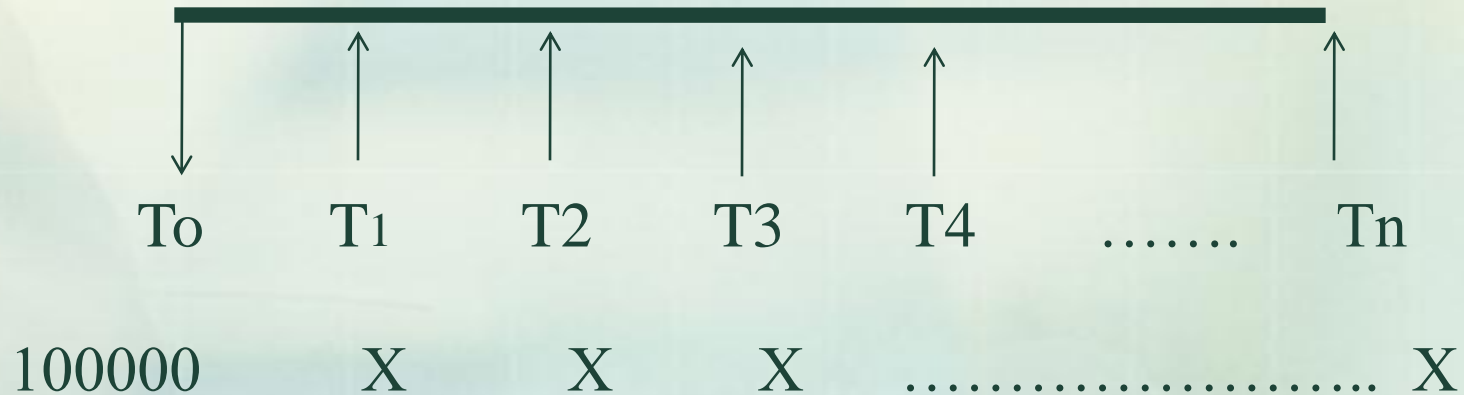


Shares carry even higher risks. We do not know what the dividend income would be in future years or its price. We know its current price alone.

Analysts who predict future share prices are in even great demand in the industry.

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Splitting EYP into Principal and Interest



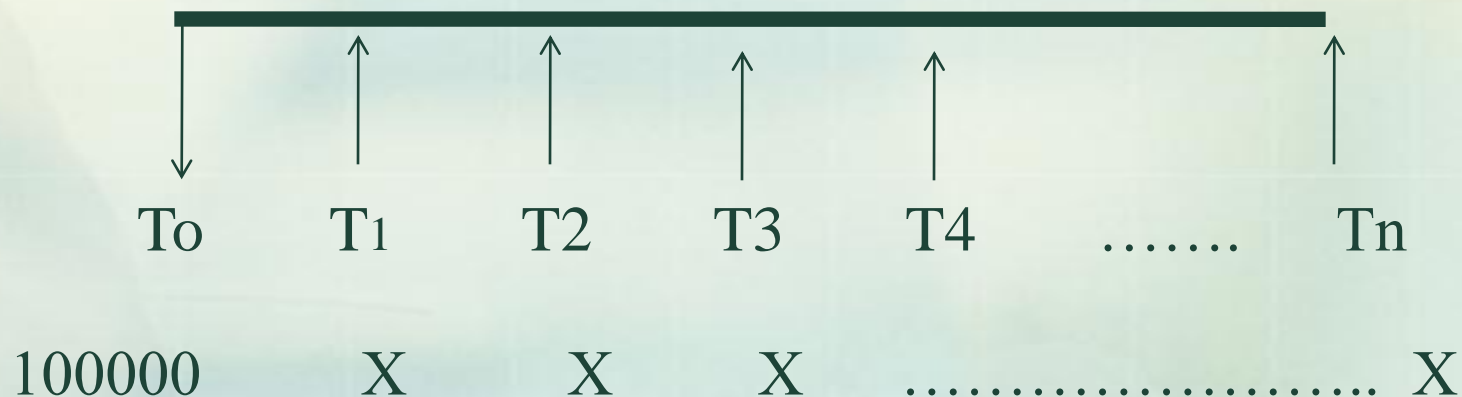
Say we borrow Rs 100000 to renovate the house at 10 % interest and to be repaid in EYP over next 10 years

What would be the EYP amount? Can you show that it will be Rs 16290?



# Time Value of Money (TVM) & Money Value of Time (MVT)

## Splitting EYP into Principal and Interest

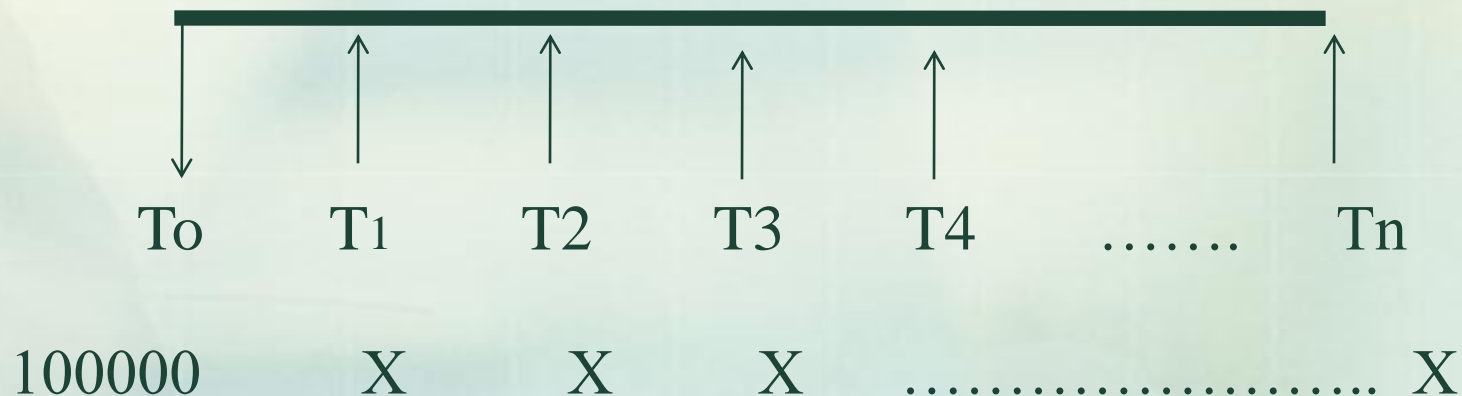


At  $T_1$  we pay Rs 16290. Rs 10000 goes towards interest and Rs 6290 towards Principal Repayment. Hence the loan outstanding at this time is Rs  $(100000 - 6290) = 93710$

At  $T_2$  we pay again Rs 16290; Out of which Rs. 9370 goes to pay interest and the remaining Rs. 6920 towards Principal repayment.

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Splitting EYP into Principal and Interest



At  $T_{10}$  we pay Rs 16290.

Can you show how the loan is fully paid at that time?

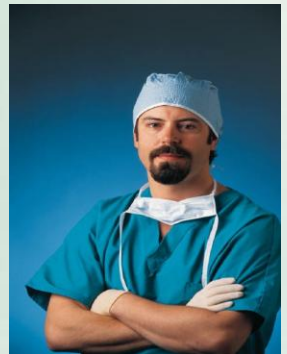
*Why do we have to do this calculation? Because the interest we pay on housing loans can be reduced from our annual income tax burden.*

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Concept of MVT

What is the difference between

- (a) a butcher and a surgeon ?
- (b) a bus driver and a pilot ?
- (c) a music teacher and playback singer ?
- (d) a fire fighter and an oil well blow capper ?



*Why do we pay highly skilled people by the hour in general?*

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Concept of MVT

Everybody's time is precious and valuable. How valuable depends on many factors.

- ❖ First differentiator is the skill level or knowledge required to perform the job. Higher the skills or knowledge required , higher is the MVT.
- ❖ Second factor is demand and supply gap at your place.
- ❖ Higher the gap, better would be the rate.
- ❖ Third and most critical factor is the impact created.
- ❖ Higher impact yields higher MVT.

# Time Value of Money (TVM) & Money Value of Time (MVT)

## Skill/ Knowledge Development

More powerful is the engine,  
more are the wagons it can haul.

Higher the knowledge level  
higher is the starting base.  
Fewer steps to climb.

Blend theory and practice.

Soft skills are equally important  
for managerial positions.



# Time Value of Money (TVM) & Money Value of Time (MVT)

## Time Management

Split time between Delivery, Client Facing and Knowledge Acquisition activities.

Deploy skilled resources where the leverage is maximum.

Intellectual Property Development is of more value than one off service engagement.



# Time Value of Money (TVM) & Money Value of Time (MVT)

## High Impact Management

Revenue Earning tasks are more critical than Cost Saving activities.

Focus resources on high value preventive maintenance tasks.

Differentiate the “Vital Few” from the “Trivial Many”



# Time Value of Money (TVM) & Money Value of Time (MVT)

## Law of comparative Advantage

David Ricardo, in 1807, enunciated this principle.

Consider two countries A and B, whose citizens need both food and clothing.

Country A people are smarter than Country B. They are more productive than B in producing food and clothing. The productivity difference is higher in food compared to clothing. But they have enough resources to produce only one of them.

Then Ricardo showed that people of both countries are better off if Country A produces food and Country B, clothing and they trade with each other.



*Cooperation leads to Win Win for both.*



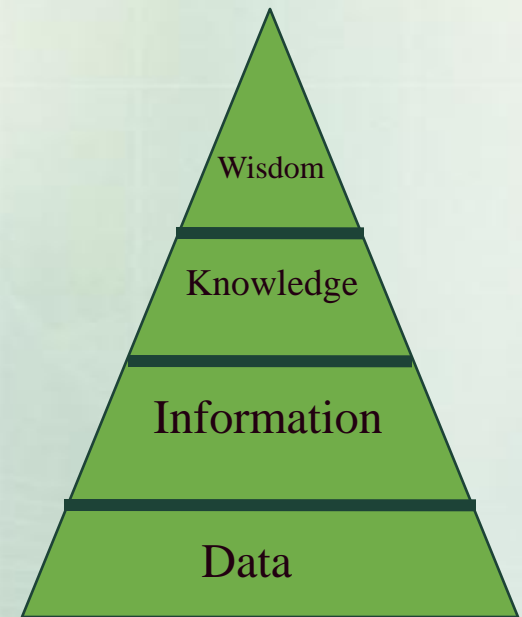
# Time Value of Money (TVM) & Money Value of Time (MVT)

## Value Focus

So far we were focusing on deriving the best value for two major resources, namely, Money and Time.

This session is incomplete without focusing on Values for life.

- ✓ Knowledge is not supreme but Wisdom is.
- ✓ Honouring commitment is superior to maximizing current opportunities.
- ✓ Aspire to structure Win Win solutions with all stakeholders on all occasions



**Mission of Education is Character Building**

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*Best Wishes !*

