

# Time Value of Money

24 January 2020

# Session Contours

Concept of time value of money

Relationship between present value and future value

Interest Rate

Rule of 72

Calculations of present value and future value

# Concept of time value of money (TVOM)

Which would you prefer – INR 1,00,000 today  
Or  
INR 1,00,000 in ten years

**Obviously INR 1,00,000 today**

Money received sooner rather than later allows one to use the funds for investment or consumption purposes . The Time

frame that allows you the opportunity to postpone consumption

In the next slide we will understand the different ways of calculating TVOM and earn interest is referred as time value of money

# Relationship between present and future value

Present Value refers to the current value of future money payments discounted at an interest rate

**Whereas**

The Future Value of a sum of money invested today at an interest rate for a specific period is future value of money

In the next slide we will understand the different types of interest rates used

For calculating TVOM

# Interest Rate

Interest is the cost stated as a % of the amount borrowed per period of time.

## Compound interest

Compound interest is calculated each period on the original principal and all interest accumulated during past periods.

In simpler terms it is a series of back-to-back simple interest contracts

The interest earned in each period is added to the principal of the previous period to become the principal for the next period

Formula for calculating Compound interest

is where:

$$C = P(1 + r)^n$$

C = Compound Interest

P = Principal

r = rate of interest

n = number of years

# Rule of 72

Rule of 72 is a simplified way to determine approximately how long an investment will take to double given a fixed annual rate of interest. The annual rate of interest has to be divided by 72, the solution to it is the number of years that an investment will take to double.

Rate of Interest	No of years to double : Rule 72
6%	12 Years
8%	9 Years
10 %	7.2 Years
12 %	6 Years
15%	4.8 Years
18 %	4 Years

# TVOM in Financial Planning

Understand  
Investing pattern of  
customers

Check interest rate of  
current investments

Understand with help  
of TVOM time required  
and interest rate

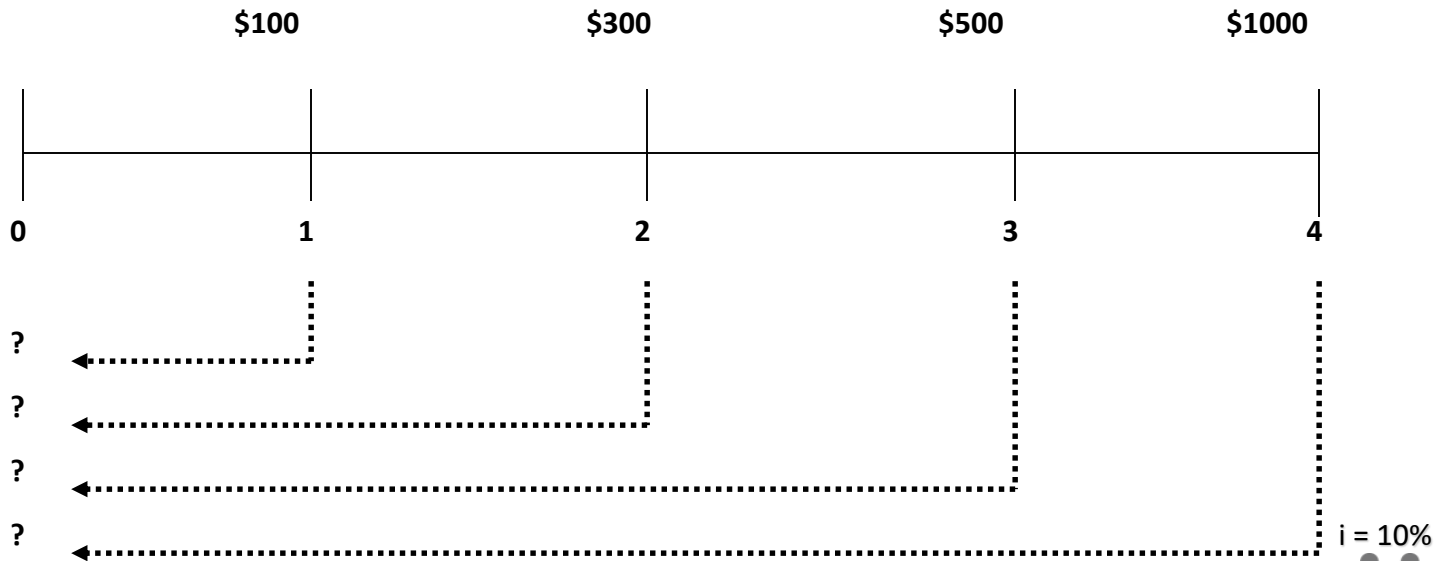
Inform client of gaps in  
existing plan and advice  
On alternate investment

Compare current  
Investment products with  
Other financial products

# Example of PV of a Cash Flow

You made an investment that will pay \$100 the first year, \$300 the second year, \$500 the third year and \$1000 the fourth year. If the interest rate is 10%, what is the present value of this cash flow stream?

Draw a timeline:





# Example of PV of a Cash Flow

Time (n)	Cash Flow (cf)	Discount Factor (r)	Formula	P.V
1	100	10%	$cf/(1+r)^n$	90.90
2	300	10%		247.93
3	500	10%		375.64
4	1000	10%		683.00
Total	1900			1397.51

**Present Value**

Today's value of an amount to be received at a future date

# Example – PV in MS-Excel

## Function PV in MS-Excel

Used to calculate Present Value of a future cash flow, given an interest rate and the number of periods

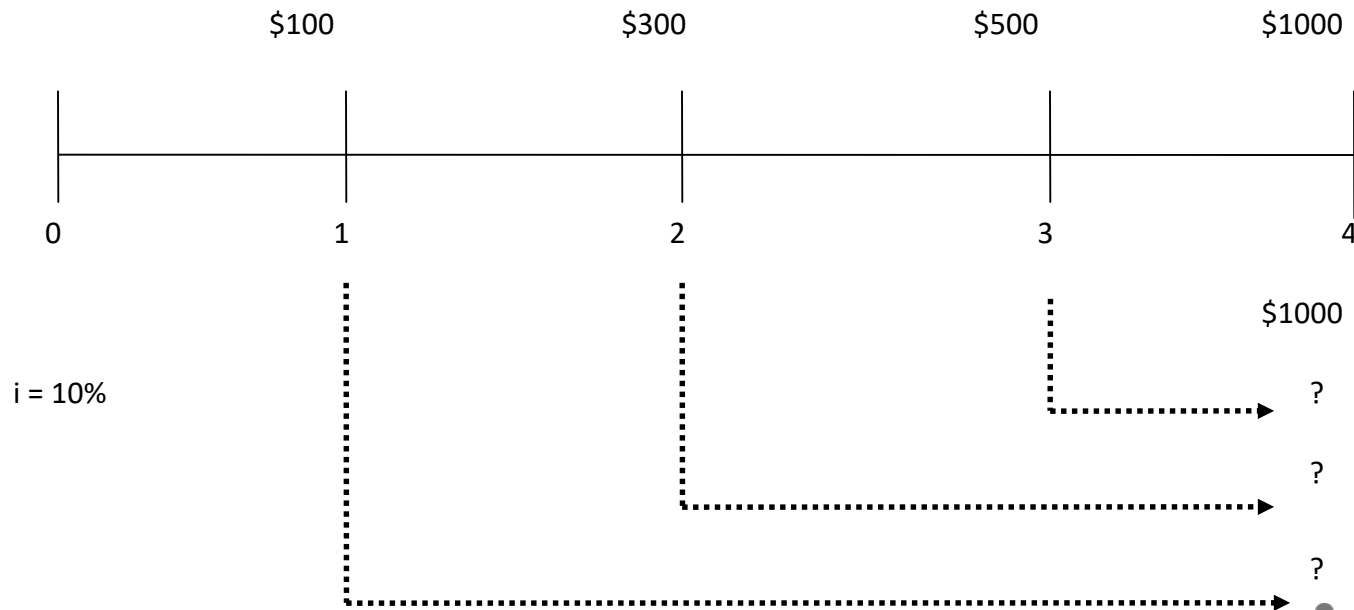
The screenshot shows the 'Function Arguments' dialog box for the PV function. The dialog has a blue title bar with a question mark and a close button. The main area is light beige and contains the following fields and values:

Argument	Value	Converted Value
Rate	6%	= 0.06
Nper	10	= 10
Pmt	0	= 0
Fv	100000	= 100000
Type	1	= 1

Below the fields, the result is shown as = -55839.47769. A descriptive text reads: 'Returns the present value of an investment: the total amount that a series of future payments is worth now.' A note explains: 'Type is a logical value: payment at the beginning of the period = 1; payment at the end of the period = 0 or omitted.' At the bottom, the 'Formula result =' is displayed as (\$55,839.48). There is a blue link 'Help on this function' and 'OK' and 'Cancel' buttons.

# Example of FV of a Cash Flow Stream

Assume you have the same cash flow stream from your investments but want to know what will it be worth at the end of the fourth year. Assume that the cash flow occurs at the beginning of the period. Draw a timeline:



# Example of FV of a Cash Flow Stream

Time (n)	Cash Flow (cf)	Discount Factor (r )	Formula	F.V
1	100	10%	$Cf * (1+r)^4$	146.41
2	300	10%	$Cf * (1+r)^3$	399.30
3	500	10%	$Cf * (1+r)^2$	605.00
4	1000	10%	$Cf * (1+r)^1$	1100.00
Total	1900			2250.71

**Future  
Value**

Value of an asset at the end of a particular time period

# Example – FV in MS-Excel

## Function FV in MS-Excel

Used to calculate Future Value of an investment, based on periodic, constant payments and a constant interest rate

The screenshot shows the 'Function Arguments' dialog box for the FV function. The dialog has a blue title bar with a question mark and a close button. The main area is light gray and contains the following fields and values:

Argument	Value	Converted Value
Rate	6%/12	= 0.005
Nper	12*10	= 120
Pmt	0	= 0
Pv	-3000	= -3000
Type	1	= 1

Below the fields, the result is shown as = 5458.190202. A descriptive text reads: 'Returns the future value of an investment based on periodic, constant payments and a constant interest rate.' A note explains the Type argument: 'Type is a value representing the timing of payment: payment at the beginning of the period = 1; payment at the end of the period = 0 or omitted.' At the bottom, the 'Formula result =' is displayed as '\$5,458.19'. There are 'OK' and 'Cancel' buttons at the bottom right, and a 'Help on this function' link at the bottom left.

# Internal Rate of Return

## Internal Rate of Return

- Discount rate that makes the net present value of all cash flows from a particular project equal to zero
- Discount rate which makes the NPV of all cash flows zero

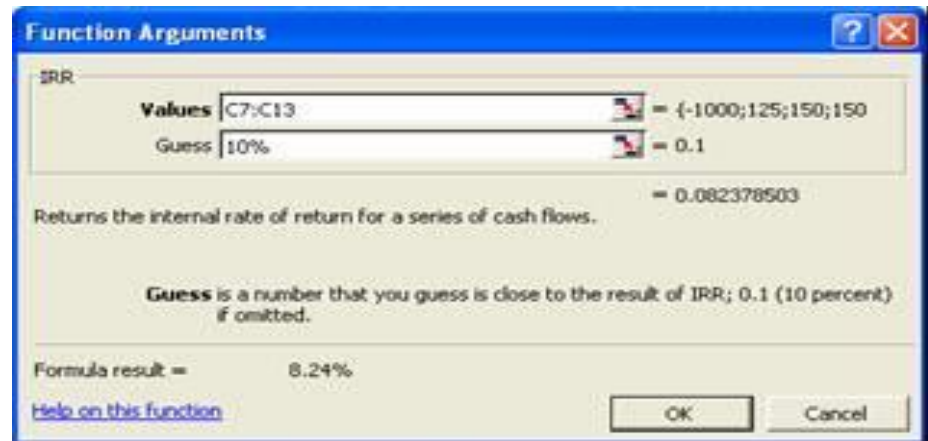
	Cash Flows	
	A	B
Required Rate of Return	15%	20%
Years		
0	-100000	-500000
1	500	25000
2	600	0
3	700	450000
4	105000	600000
NPV	(\$33,580.16)	58,834.88
IRR	2%	25%

Excel Function : IRR & XIRR

# Example – IRR in MS-Excel

**Function IRR in MS-Excel**  
Used to calculate the IRR for a series of uniform cashflows

Year	Cash Flow
0	-1000
1	125
2	150
3	150
4	300
5	300
6	350
IRR	8,24 %



# Application of IRR in Investments

IRR is commonly used for computing returns

“Yield” in fixed income securities (bonds)

Annualised return in mutual funds, portfolio schemes

Used for comparing relative performance of investments

Captures intermittent cash flows such as coupon receipts, dividends, partial redemptions, etc. – hence, a powerful tool for performance analysis



**Thank You**