**INSTITUE OF AERONAUTICAL ENGINEERING COLLEGE**
**(AUTONOMUS)**

# POWERPOINT  PRESENTATION
# ON
# FINANCIAL MODELING

# SEMESTER -IV

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# UNIT-I

## UNDERSTANDING THE BASIC FEATURES OF EXCEL

# FINANCIAL MODELING

- Financial modeling is the construction of spreadsheet models that illustrate a company's likely financial results in quantitative terms. Financial models can simulate the effect of specific variables so that the company can plan a course of action should they occur.

- Financial modeling is the process by which a firm constructs a financial representation of some, or all, aspects of the firm or given security. The model is usually characterized by performing calculations and makes recommendations based on that information.

- The model may also summarize particular events for the end user such as investment management returns or the Sortino ratio, or it may help estimate market direction, such as the Fed model

# DEFINITION

- "The process by which a firm constructs a financial representation of some, or all, aspects of the firm or given security. The model is usually characterized by performing calculations, and makes recommendations based on that information.

- The model may also summarize particular events for the end user and provide direction regarding possible actions or alternatives."

# TYPES OF FINANCIAL MODEL

- There are various kinds of financial models that are used according to the purpose and need of doing it. Different financial models solve different problems.

- While majority of the financial models concentrate on valuation, some are created to calculate and predict risk, performance of portfolio, or economic trends within an industry or a region.

# DISCOUNTED CASH FLOW MODEL:

- Among different types of Financial model, DCF Model is the most important. It is based upon the theory that the value of a business is the sum of its expected future free cash flows discounted at an appropriate rate.

# COMPARATIVE COMPANY ANALYSIS MODEL:

- Also referred to as the "Comparable" or "Comps", it is the one of the major company valuation analyses that is used in the investment banking industry.

- In this method we undertake a peer group analysis under which we compare the financial metrics of a company against similar firms in industry. It is based on an assumption that similar companies would have similar valuations multiples, such as EV/EBITDA.

# SUM-OF-THE-PARTS MODEL:

- It is also referred to as the break-up analysis. This modeling involves valuation of a company by determining the value of its divisions if they were broken down and spun off or they were acquired by another company.

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# LEVERAGED BUY OUT (LBO) MODEL:

- It involves acquiring another company using a significant amount of borrowed funds to meet the acquisition cost.

- This kind of model is being used majorly in leveraged finance at bulge-bracket investment banks and sponsors like the Private Equity firms who want to acquire companies with an objective of selling them in the future at a profit.

# MERGER & ACQUISITION (M&A) MODEL:

- Merger & Acquisitions type of financial Model includes the accretion and dilution analysis. The entire objective of merger modeling is to show clients the impact of an acquisition to the acquirer's EPS and how the new EPS compares with the status quo.

- In simple words we could say that in the scenario of the new EPS being higher, the transaction will be called "accretive" while the opposite would be called "dilutive."

# OPTION PRICING MODEL:

- On, to buy or sell the underlying instrument at a specified price on or before a specified future date".

- Option traders tend to utilize different option price models to set a current theoretical value.

# CUSTOMIZATION MICROSOFT EXCEL ENVIRONMENT:

- Personally I like the black colour, so my excel theme looks blackish.  Your favourite colour could be blue, and you too can make your theme coulor look blue-like. If you are not a programmer, you may not want to include ribbon tabs i.e., developer.  All this is made possible via customizations. In this sub-section, we are going to look at

- Customization  the ribbon

- Setting the color theme

- Proofing settings

- Save settings

# CREATING CHARTS

- Charts are used to display series of numeric data in a graphical format to make it easier to understand large quantities of data and the relationship between different series of data.

# Dynamic formula method

- Using our earlier sheet, you'll need five dynamic ranges: one for each series and one for the labels.  Instructions for creating the dynamic range for the labels in column A follow. Then, use these instructions to create a dynamic label for columns B through E. To create the dynamic range for column A, do the following:

- Click the Formulas tab.

- Click the Define Names option in the Defined Names group.

- Enter a name for the dynamic range, MonthLabels.

- Choose the current sheet. In this case, that's DynamicChart1. You can use the worksheet, if you like. In general, it's best to limit ranges to the sheet, unless you intend to utilize them at the workbook level.

- Enter the following formula:

- =OFFSET(DynamicChart1!$A$2,0,0,COUNTA(DynamicChart1!$A:$A))

- Click OK.

# UNIT-II

# SENSITIVITY ANALYSIS USING EXCEL

# SENSITIVITY ANALYSIS USING EXCEL

The main goal of sensitivity analysis is to gain insight into which assumptions are critical, i.e., which assumptions affect choice.

The process involves various ways of changing input values of the model to see the effect on the output value. In some decision situations you can use a single model to investigate several alternatives.

In other cases, you may use a separate spreadsheet model for each alternative.

# ONE-VARIABLE DATA

- For a model with numerical input and numerical output, use the One Input One Output feature of the SensIt sensitivity analysis add-in.

# LINE CHART OR XY (SCATTER) CHART:

The results of the Data table command may be displayed using either a Line chart type or an XY (Scatter) chart type; both types have a continuous numerical vertical axis.

However, the Line chart has a categorical horizontal axis, which means that the worksheet data is displayed as equally spaced text values. Only the XY (Scatter) chart has a numerical horizontal axis.

Since the input values to a data table are usually equally-spaced, you can use either chart type to display the results. When the data for the horizontal axis are not equally-spaced, it is important to use the XY (Scatter) chart type.
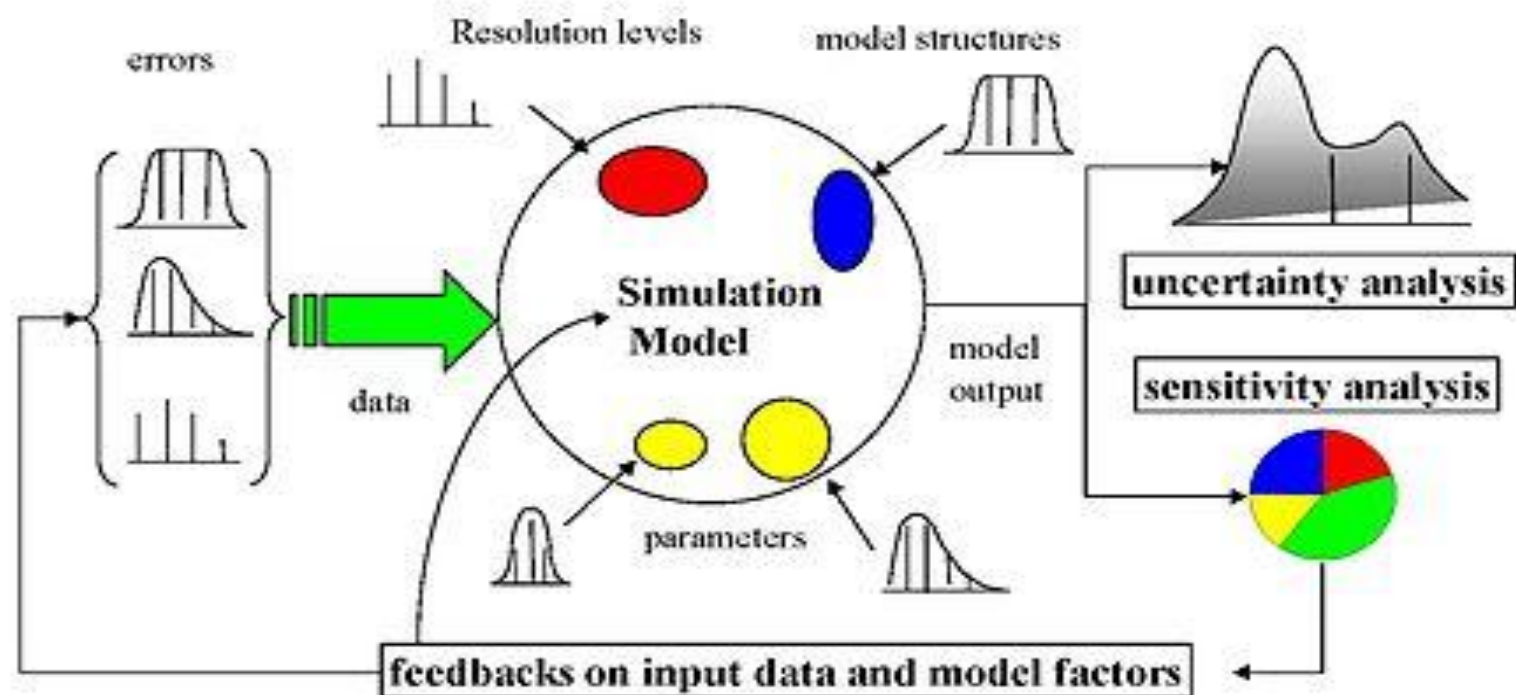
# SCENARIO MANAGER

- The Scenario Manager is a great, but often overlooked What-If Analysis feature of Excel that will let you swap multiple sets of data in a worksheet and even compare them side-by-side. This technique can help you decide between multiple courses of action or what the implications are among several possibilities.
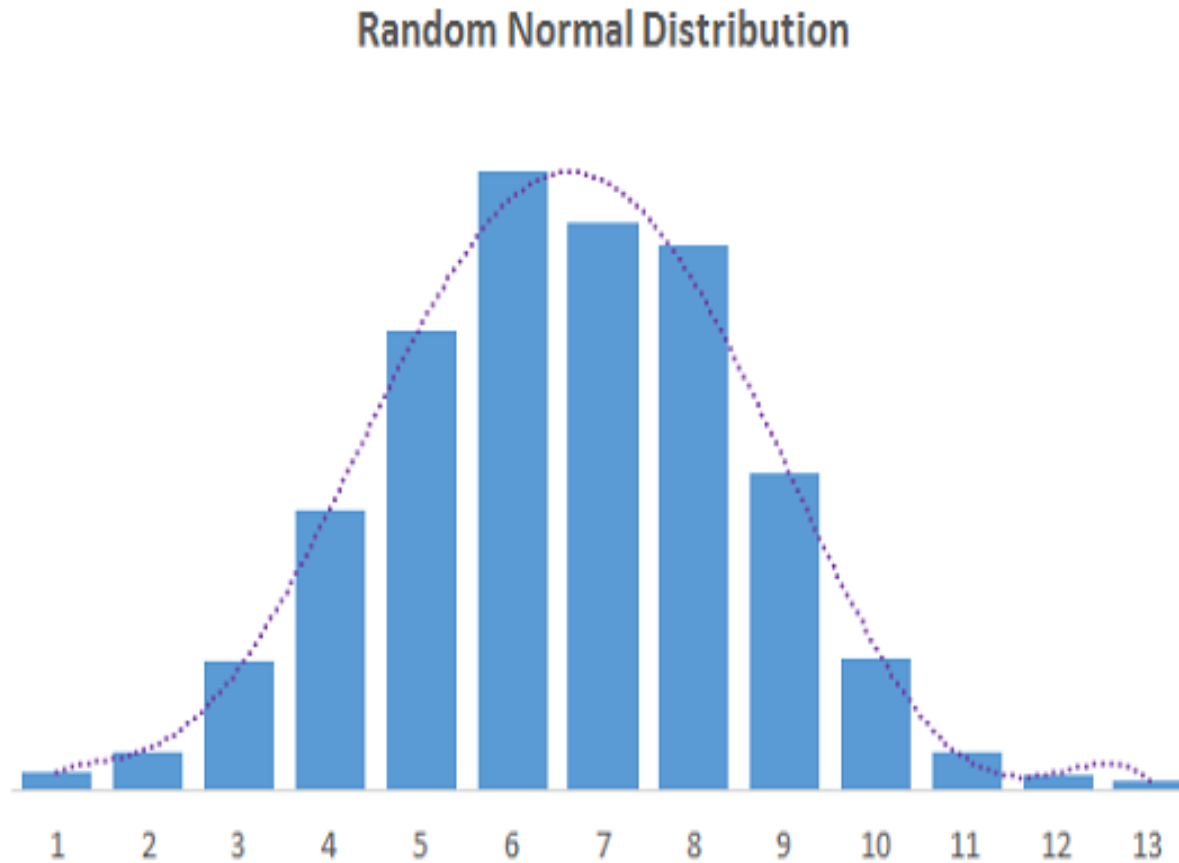
-

# SENSITIVITY ANALYSIS

- A sensitivity analysis is a technique used to determine how different values of an independent variable impact a particular dependent variable under a given set of assumptions.

- This technique is used within specific boundaries that depend on one or more input variables, such as the effect that changes in interest rates have on bond prices.

errors

Resolution levels

model structures

Simulation Model

data

parameters

model output

uncertainty analysis

sensitivity analysis

feedbacks on input data and model factors

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# Random Normal Distribution



Random Normal Distribution

# BUILDING MODELS IN FINANCE USING SIMULATION

- The projection model we will be developing is one that you might find as the starting point in many forms of analysis. The model will have these key features:

- u It will have historical and forecast numbers for modeling an industrial type of company or business. Forecast numbers can be entered as ''hard-coded'' numbers (e.g., sales will be 1053 this year and 1106 next year, etc.) or as assumptions (e.g., sales growth next year will be 5 percent, etc.).

- u The income statement, balance sheet, and a cash flow statement follow GAAP.

- u The balance sheet balances: the total assets must equal the total liabilities and net worth. This balancing is done through the use of ''plug'' numbers (see Chapter 7). With the accounting interrelationships correctly in place, the cash flow numbers will also ''foot'' (see Chapter 11), i.e., the changes in cash flow must equal the change in the  cash on the balance sheet.

# UNIT-III

# EXCEL IN ACCOUNTING

# EXCEL IN ACCOUNTING:

- Microsoft Office Excel was designed to support accounting functions such as budgeting, preparing financial statements and creating balance sheets.

- It comes with basic spreadsheet functionality and many functions for performing complex mathematical calculations.

- It also supports many add-ons for activities such as modeling and financial forecasting, and seamlessly integrates with external data to allow you to import and export banking information and financial data to and from other accounting software platforms.

# BALANCE SHEET ANALYSIS

- The common figure for a common-size balance sheet analysis is total assets. Based on the accounting equation, this also equals total liabilities and shareholders' equity, making either term interchangeable in the analysis.

- It is also possible to use total liabilities to indicate where a company's obligations lie and whether it is being conservative or risky in managing its debts.

- The common-size strategy from a balance sheet perspective lends insight into a firm's capital structure and how it compares to rivals.

- An investor can also look to determine an optimal capital structure for an industry and compare it to the firm being analyzed. Then he or she can conclude whether debt is too high, excess cash is being retained on the balance sheet, or inventories are growing too high.

# FORECASTING FINANCIAL STATEMENTS USING EXCEL:

- Good forecasts must be consistent with historical performance and the current industry outlook.

- Look at historical numbers in relationship to others and use these ratios, particularly the operating ratios, to make your projections.

- All forecasts are estimates and approximations. Spend the time thinking and developing your ideas about the big picture, not the third decimal place.

- If the forecast looks too good to be true, it probably is.

- Re-examine your assumptions.

# INCOME STATEMENT ACCOUNTS

- **Revenues**
- For industrial/manufacturing types of companies, revenues drive the other numbers in the model. Here are things to think about as you make your forecast:
- Revenues are the result of three main components: price, industry growth, and market share. Isolating the price growth from inflation will give you the measure for volume growth.
-  Understand that in the context of the economic cycle, and then concentrate on what the drivers for future industry growth and market share might be.

# ANALYZING FINANCIAL STATEMENTS BY USING SPREADSHEET MODEL:

- Spreadsheets provide a roadmap of analysis. The maps present the big picture and delineate the "territories," i.e., the major components of analysis. These maps help users keep the big picture in mind as they work through the details.

- The spreadsheets provide a template that can be filled in with real data for hands-on illustrations.

- The power of spreadsheets becomes apparent when one compares them to the traditional sequence of text narratives, algebraic derivations, numerical examples, and computations of metrics for real cases.

- Spreadsheets condense this teaching material by an order of magnitude and enable what-if analyses.

- In addition to condensing the material and presenting it using spreadsheets, our materials also clean up the terminology and provide a logical sequence of otherwise disparate topics. They show how valuation drives FSA.

# DETERMINING PROJECT VIABILITY

- Step 1: Research the Business Drivers
- Step 2: Confirm the Alternative Solutions
- Step 3: Determine the Feasibility
- Step 4: Choose a Preferred Solution
- Step 5: Reassess at a lower level

# types of feasibility

- Economic feasibility, which uses economic analysis or cost/benefit analysis wherein the benefits are compared with the cost.
- Legal feasibility, which deals with the legal requirements.
- Operational feasibility, which deals with how to solve problems and take advantage of opportunities.
- Schedule feasibility, which deals with the duration of the development and completion of the system  and if the schedule or deadline is desirable.
- Market and real estate feasibility, which involves testing of the geographical location of the project.
- Resource feasibility, which involves the amount of time  set for the project and the type and amount of resources needed.

# RISK ANALYSIS IN PROJECT APPRAISAL

- Analyzing the time to complete a project using project planning tools nearly always underestimates the time to completion. It is not the fault of the software or of the analysts, but of the use of 'best guess' values for task durations, etc. in the project plan. Risk analysis will allow you to avoid systematically underestimating project costs and durations.

- The project risk analysis course is designed to help those who wish to apply quantitative risk analysis modeling to project planning problems.

- A project is defined as any set of tasks involving resources (human, machine, time, financial) with well-defined goals. Project risk analysis aims at identifying the risks and uncertainties that threaten the achievement of those goals or the efficiency with which the project can be carried out.

# RISK SIMULATION

- Risk simulation is a risk analysis technique that came to prominence in the early 1960s (Hertz, 1964 ). It involves the use of a probability distribution and random numbers, hence the Monte Carlo element, to estimate net cashflow figures. When discounted these figures sum to an estimated net present value (NPV) for a project. Repeated many times one gets a distribution of project NPV.

# RESIDUAL INCOME MODEL (RIM)

- Along with the DDM, the residual income model (RIM) is another specialized version of a DCF used to value a firm. In its most basic form, the RIM has an equity charge that is equal to equity capital multiplied by the cost of equity.

- This is subtracted from net income to get to a residual income figure, which is used in lieu of cash flow or dividends, as calculated in the DCF and DDM models. Residual income figures can easily be modeled and calculated in Excel, but there are a number of steps to get to these calculations.

# DETERMINATION OF VALUE DRIVERS:

- A value driver is an activity or capability that adds worth to a product, service or brand. More specifically, a value driver refers to those activities or capabilities that add profitability, reduce risk, and promote growth in accordance with strategic goals. Such goals can include increasing shareholder value, competitive edge and customer appeal.

# DISCONTINUED CASH FLOW VALUATION:

- The discounted cash flow (DCF) formula is equal to the sum of the cash flow in each period divided by one plus the discount rate Weighted Average Cost of Capital (<u>WACC)</u> raised to the power of the period number.

Here is the DCF formula:

- **DCF = (CF/(1+r)^1) + (CF/(1+r)^2) + (CF/(1+r)^3) + … + (CF/(1+r)^n)**

 Where:

- CF = Cash Flow in the Period
- i = the interest rate or discount rate
- n = the period number

# Steps in the DCF Analysis

- The following steps are required to arrive at a DCF valuation:

- Project unlevered FCFs (UFCFs)

- Choose a discount rate

- Calculate the TV

- Calculate the enterprise value (EV) by discounting the projected UFCFs and TV to net present value

- Calculate the equity value by subtracting net debt from EV

- Review the results

# USING MODELS FOR RISK ANALYSIS

- **Model** *inputs* that are uncertain numbers -- we'll call these uncertain variables

- Intermediate calculations as required

- **Model** *outputs* that depend on the inputs -- we'll call these uncertain functions

# UNIT-IV

# EXCEL IN PORTFOLIO THEORY

# DETERMINING EFFICIENT PORTFOLIO

- As we know, an efficient frontier represents the set of efficient portfolios that will give the highest return at each level of risk or the lowest risk for each level of return. A portfolio is efficient if there is no alternative with:

- Higher expected return with same level of risk

- Same expected return with lower level of risk

- Higher expected return for lower level of risk

# FIXED INCOME PORTFOLIO MANAGEMENT USING EXCEL:

- There are income funds which have a mandate to keep the maturity profile of the fund limited to some number.  For E.g. Birla Dynamic normally keeps the duration near to 3.  So how does one keep constant watch on it?  How does one optimize return with respective duration? How should one allocate his funds to enjoy maximum convexity other things (i.e. duration, yield) remaining constant.

# EXCEL IN DERIVATIVES  BLACK SCHOLES IN EXCEL:

- The <u>Black-Scholes</u> formula (also called Black-Scholes-Merton) was the first widely used model for option pricing. It's used to calculate the theoretical value of European-style options using current stock prices, expected dividends, the option's strike price, expected interest rates, time to expiration and expected volatility.

- The formula, developed by three economists – Fischer Black, Myron Scholes and Robert Merton – is perhaps the world's most well-known options pricing model. It was introduced in their 1973 paper, "The Pricing of Options and Corporate Liabilities," published in the *Journal of Political Economy*. Black passed away two years before Scholes and Merton were awarded the 1997 Nobel Prize in Economics for their work in finding a new method to determine the value of derivatives (the Nobel Prize is not given posthumously; however, the Nobel committee acknowledged Black's role in the Black-Scholes model).

# The Black-Scholes model makes certain assumptions:

- The option is European and can only be exercised at expiration.
- No dividends are paid out during the life of the option.
- Markets are efficient (i.e., market movements cannot be predicted).
- There are no transaction costs in buying the option.
- The risk-free rate and volatility of the underlying are known and constant.
- The returns on the underlying are normally distributed.

# Black-Scholes Formula

$$C = SN(d_1) - N(d_2)Ke^{-rt}$$

$$d_1 = \frac{\ln\left(S/K\right) + \left(r + s^2/2\right)t}{s \cdot \sqrt{t}}$$

$$d_2 = d_1 - s \cdot \sqrt{t}$$

$C$ = Call premium
$S$ = Current stock price
$t$ = Time until option exercise
$K$ = Option striking price
$r$ = Risk-free interest rate
$N$ = Cumulative standard normal distribution
$e$ = Exponential term

$s$ = St. Deviation
$\ln$ = Natural Log

# REAL OPTIONS VALUATION

- The Real Options Valuation model encompasses a suite of option pricing tools to quantify the embedded strategic value for a range of financial analysis and investment scenarios.

- Traditional discounted cash flow investment analysis will only accept an investment if the returns on the project exceed the hurdle rate. While this is a worthwhile exercise, it fails to consider the myriad of strategic options that are associated with many investments.

- This model provides the ability to identify what options might exist in your proposal and the tools to estimate the quantification of them.

# KEY FEATURES OF THIS MODEL

- Ease and flexibility of input, with embedded help prompts.
- Informative 'Quick Start' menu for choosing the correct tool for the situation.
- Modified Black Scholes options model to value the options to delay, expand, or abandon investments.
- Automatic binomial 'tree' builder model to evaluate complex strategic options with multiple stages.
- Nash equilibrium Game Theory model to evaluate market entry strategies in a competitive environment.
- Ability to predefine historical investment and/or industry risk profiles to utilize across real options models.
- Compatible with all versions of Excel for Windows as well as Excel for Mac as a cross platform analytical business solution.

# UNIT-V

## UNDERSTANDING SUBROUTINES AND FUNCTIONS AND BUILDING SIMPLE FINANCIAL MODELS USING SUBROUTINES AND FUNCTION

# CHECK THE RECORDED CODE

- The Excel Macro Recorder created some code, while we performed the steps in our process. In my example, these were the steps:

- Open the orders file, named StationeryShort2007.xlsx

- Filter the list on the Data sheet, to show only the Binder orders

- Copy the Binder orders

- Create a new workbook

- Paste the Binder orders into the new workbook.

# SUBROUTINES AND FUNCTIONS:

- Functions and subroutines are FORTRAN's subprograms. Most problems that require a computer program to solve them are too complex to sit down and work all the way through them in one go. Using subprograms allows you to tackle bite size pieces of a problem individually.

- Once each piece is working correctly you then put the pieces together to create the whole solution. To implement functions and subroutines, first write a main program that references all of the subprograms in the desired order and then start writing the subprograms.

- This is similar to composing an outline for an essay before writing the essay and will help keep you on track

# TYPES OF FUNCTIONS AND SUBPROGRAMS

- Functions and subprograms can be grouped into several categories;
- Intrinsic or "built-in" functions
- Statement or "one-line" functions (Note: This link is optional)
- Function subprograms
- Subroutines

# INTRINSIC FUNCTIONS

- The intrinsic functions are the set of "built-in" or library functions that all versions of FORTRAN provide. These are such things as SIN, COS, EXP,...

- The user of these functions "passes" one or more arguments to the function.

- e.g.,

  Y = COS(0.0)   ABMX = MAX (A,B)
  0.0, A and B are called "arguments"

# FUNCTION SUBPROGRAMS

- A FUNCTION subprogram is a "mini-program", that is, a collection of program statements which make it look like a program.

- Functions, being separate entities, perform separate, specific tasks.

# PASSING ARGUMENTS

- Actual arguments are "passed" to the subprograms and used in place of the formal arguments. As previously stated, the actual arguments may have different names than the formal arguments BUT they must agree in NUMBER and TYPE.

# DECISION RULES:

- A decision rule is a set of conditions that classify records. The rule predicts an outcome in the target field.

- Viewing the decision rules helps you determine which conditions are likely to result in a specific outcome. For example, consider some hypothetical decision rules that could predict churn.

- These rules might identify classifications based on the ranges for customer age and number of previous claims. From these rules, you might observe that customer who have no or 1 claim and are older than 50 are more likely to churn. The decision rule corresponds to a branch in a decision tree.
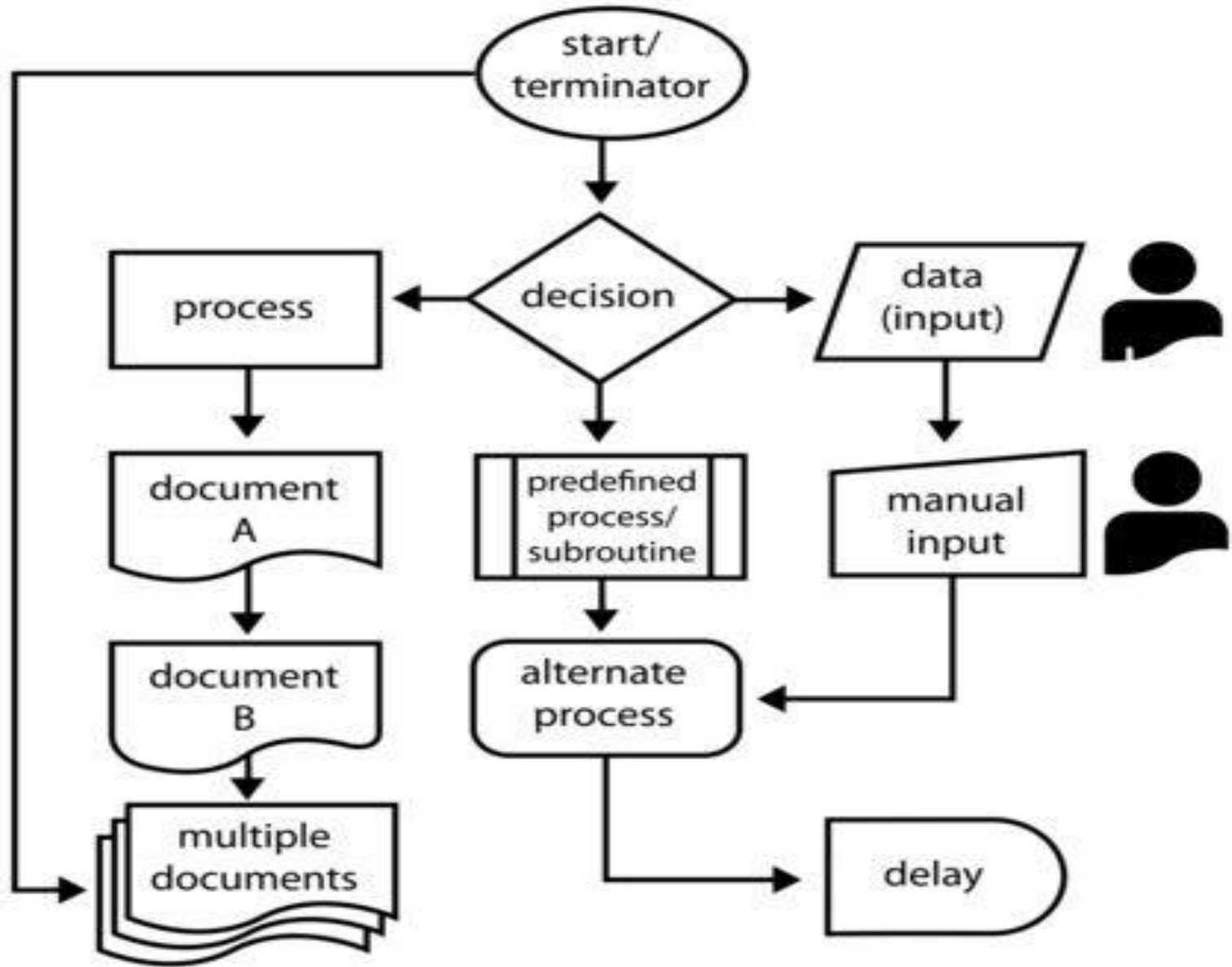
# DEBUGGING

- To debug a program, user has to start with a problem, isolate the source code of the problem, and then fix it. A user of a program must know how to fix the problem as knowledge about problem analysis is expected. When the bug is fixed, then the software is ready to use. Debugging tools (called debuggers) are used to identify coding errors at various development stages.

- They are used to reproduce the conditions in which error has occurred, then examine the program state at that time and locate the cause.

- Programmers can trace the program execution step-by-step by evaluating the value of variables and stop the execution wherever required to get the value of variables or reset the program variables.

- Some programming language packages provide a debugger for checking the code for errors while it is being written at run time.

# DEBUGGING PROCESS:

- 1.Reproduce the problem.
- 2.   Describe the bug. Try to get as much input from the user to get the exact reason.
- 3.   Capture the program snapshot when the bug appears. Try to get all the variable values and  states of the program at that time.
- 4.   Analyse the snapshot based on the state and action. Based on that try to find the cause of the bug.
- 5.   Fix the existing bug, but also check that any new bug does not occur.

# DESIGNING ADVANCED FINANCIAL MODELS USING VISUAL BASIC APPLICATION USER FORMS

- Automation is the buzz word in today's corporate world. Whether it is manufacturing industry or the service industry, all businesses are aiming to reduce the human element for critical processes and tasks to improve efficiency and output.

- As a finance aspirant, you will see this trend in finance companies as well. Calculators are replaced by laptops, ledgers are replaced by spreadsheets and hard bound documented financial models are replaced by dashboards.

- If you want to pursue a career in finance, it is of utmost important for you to know the latest trends in your domain, and more importantly how to use automation in your day to day activities as a finance professional.

# Advantages of Financial Modeling using VBA

- 1. Excellent output with minimum input
- 2. Speedy operations
- 3. Accuracy
- 4. Ease of comprehension

# How to Create a Financial Model Using Excel and VBA?

- 1. Define the problem
- 2. Structure the logic
- 3. Identify the input variables
- 4. Define the output
- 5. Pilot run
- 6. Record/document the model
- 7. Monitor and update

# ACTUAL MODEL BUILDING

- Step 1: Build Output Tabs Shell – Understand Your Requirements

- Step 2: Build Calculations on Paper – Determine Inputs Required

- Step 3: Build Input Tabs and Gather the Required Values

- Step 4: Load Data Tables
- Step 5: Build Calculations off of Inputs, Drivers, and

**Data Tables**

- Step 6: Link Calculated values to Output Tabs and Finalize Formatting of Output Tabs
- Step 7: Build Your Index Tab

- Step 8: Link Key Output Values to Drivers Tab to Perform Scenario and Sensitivity Analysis

- Step 9: Create Documentation and Finish Index Tab
- Step 10: Add Cell & Workbook Protection Where Appropriate

# THE END