

Microsoft Office Excel 2010

Operational Research in Excel 2010

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Abstract—The paper presents applications in Excel 2010 that are implemented in economic activity in the modern society of today and tomorrow. If you have planned the distribution of goods from production to consumption we use transport problems. As we know linear programming represents a method of problem solving decision problems. It presented also an allocation problem that it can occur in various decision-making situations like: allocation works on machines, assignment of personnel in various regional centers, distributions agents to perform certain activities. Many real-life projects are complex and expensive and their production on time and within budget is not of any task. Typical certain activities cannot start before the other to finish. Decision problems containing uncertainty is not known when the likelihood of states of nature. These problems can be addressed in several ways, and accordingly there are several decision criteria. Because it by applying various criteria can get different advice is good decision agent to understand very well the existing criteria and to select the one that fits best, adverse to the best gain. In conclusion it presented application for: regret criterion, optimist criterion and pessimist criterion. It presented decisional analysis problems using solver. In Microsoft Excel 2010 are available a lot of categories of functions like: functions or type date and time, financial functions, logic functions, mathematical and trigonometric functions, statistical functions, database functions, external functions, engineering functions and user-defined functions. It also presented charts, applications with scenarios, goal seek, solver, pivot table and lists.

Keywords-component: solver, pivot tables, lists, charts, scenarios, allocation problem, project management, data and time functions, financial functions, logic functions, mathematical and trigonometric functions, statistical functions, database functions, engineering functions, user-defined functions

I. INTRODUCTION

There are a lot of problems from economic activity that I presented in this article. Microsoft Office Excel 2010 has a lot of new functions and new facilities like the others versions of Microsoft Office Excel and is easy to use to create charts, reports, statistical analysis, problems of operational researches and so on.

II. TROUBLESHOOTING TRANSPORTATION

Transport problems occur frequently in a position where you have planned the distribution of goods from production to consumption. Common objective of the problems is to minimize transportation costs. Transport models are a variation of linear programming problems involving the following:

1. The objective is to minimize transport problems in transport costs;
2. Transport costs are linear functions in relation to the number of units shipped;
3. Supply and demand are expressed in homogenous units;
4. Transport costs per unit do not vary with the transported quantity. To illustrate how you can solve transport problems we present the following example. A company has three factories and four distribution centers. The factories are located in Cluj, Bacau, and Craiova.

TABLE I. THE CAPACITY OF PRODUCTION (UNITS) OF THE FACTORIES

Factory	The capacity of production(units)
Cluj	5000
Bacau	6000
Craiova	2500
Total	13500

Distribution centers are located in Deva, Iasi, Bucharest and Brasov. Demand in this centers is:

TABLE II. DEMAND(UNITS) IN CENTERS OF DISTRIBUTIONS

Center of distribution	Demand(units)
Deva	6000
Iasi	4000

Bucharest	2000
Brasov	1500
Total	13500

The management would like to determine the amount that should be shipped from each plant to each distribution center so transport costs to a minimum.

The following figure shows the graph of 12 possible routes. Such a graph is called the graph of the network. Circles represent nodes. Lines joining nodes are called arcs.

Each point of departure and arrival is represented by a node and each possible route is represented by an arc. The right of each node is last bid amount (for production capacity) and demand (for distribution centers). Direction of travel is indicated by arrows. Transport unit costs for each route are presented in the following table, on each spring following figure:

TABLE III. UNITS TRANSPORT COSTS ON EACH ROUTE

Origin	Destination			
	1.Deva	2.Iasi	3.Bucharest	4.Brasov
1.Cluj	3	2	7	6
2.Bacau	7	5	2	3
3.Craiova	2	5	4	5

To solve the problem of transport I use the linear programming. I have two indices decision variables the first index indicates the origin node, the second node destination.

Thus x_{ij} denote the number of units shipped from the factory i and distribution center j .

The unit cost carried from Cluj is:

$$3 * x_{11} + 2 * x_{12} + 7 * x_{13} + 6 * x_{14} \quad (1)$$

The unit cost carried from Craiova is:

$$2 * x_{31} + 5 * x_{32} + 4 * x_{33} + 5 * x_{34} \quad (2)$$

The sum of these costs is the total cost of transportation, value to be minimized, so the objective function is:

$$\min(3 * x_{11} + 2 * x_{12} + 7 * x_{13} + 6 * x_{14} + 7 * x_{21} + 5 * x_{22} + 2 * x_{23} + 3 * x_{24} + 2 * x_{31} + 5 * x_{32} + 4 * x_{33} + 5 * x_{34}) \quad (3)$$

Restrictions on transport issues arise because each factory has a certain capacity of production. Cluj factory has a production capacity of 5000 units. The total number of the units shipped from the factory in Cluj is:

$x_{11} + x_{12} + x_{13} + x_{14}$, so that the factory has like associated restriction

$$x_{11} + x_{12} + x_{13} + x_{14} \leq 5000 \quad (4)$$

Similarly for the other factories we have:

$$x_{21} + x_{22} + x_{23} + x_{24} \leq 6000 \quad (5)$$

for the factory from Bacau

$$x_{31} + x_{32} + x_{33} + x_{34} \leq 2500 \quad (6)$$

for the factory from Craiova

In the other four distribution centers, the restriction will be on that request at the center must be equal to the amount transported there.

$$x_{11} + x_{21} + x_{31} + x_{41} = 6000 \quad (7)$$

Demand in Deva

$$x_{12} + x_{22} + x_{32} + x_{42} = 4000 \quad (8)$$

Demand in Iasi

$$x_{13} + x_{23} + x_{33} + x_{43} = 2000 \quad (9)$$

Demand in Bucharest

$$x_{14} + x_{24} + x_{34} + x_{44} = 1500 \quad (10)$$

Demand in Brasov

Combined objective function with the constraints we obtain the transport model:

$$\begin{aligned} \min(& 3 * x_{11} + 2 * x_{12} + 7 * x_{13} + 6 * x_{14} + 7 * x_{21} + \\ & 5 * x_{22} + 2 * x_{23} + 3 * x_{24} + 2 * x_{31} + \\ & 5 * x_{32} + 4 * x_{33} + 5 * x_{34}) \\ & x_{11} + x_{12} + x_{13} + x_{14} \leq 5000 \\ & x_{21} + x_{22} + x_{23} + x_{24} \leq 6000 \\ & x_{31} + x_{32} + x_{33} + x_{34} \leq 2500 \\ & x_{11} + x_{21} + x_{31} + x_{41} = 6000 \\ & x_{12} + x_{22} + x_{32} + x_{42} = 4000 \\ & x_{13} + x_{23} + x_{33} + x_{43} = 2000 \\ & x_{14} + x_{24} + x_{34} + x_{44} = 1500 \\ & x_{ij} \geq 0; i = 1, 2, 3; j = 1, 2, 3, 4; \end{aligned} \quad (11)$$

Solving problems in Excel-the spreadsheet used to solve the problem is shown in the following figure:

Origin	DEVA	IASI	Bucharest	BRASOV	Offer
CLUJ	3	2	7	6	5000
BACAU	7	5	2	3	6000
CRAIOVA	2	5	4	5	2500
Demand	6000	4000	2000	1500	

Origin	DEVA	IASI	Bucharest	BRASOV	TOTAL
CLUJ	3500	1500	0	0	5000 <= 5000
BACAU	0	2500	2000	1500	6000 <= 6000
CRAIOVA	2500	0	0	0	2500 <= 2500
Total	6000	4000	2000	1500	

Figure 1. Modelling transport problems

Data of the problem are introduced in the domain A1:F8. The transport costs are contained in the B5:E7, production capacity (supply) F5:F7, and demand distribution centers in cells B8:E8.

Key elements to be included in Excel are decision variables. Initially all decision variables have the value 0.

Objective function: To calculate the total cost in cell C13=SUMPRODUCT(B5:E7,B17:E19).

The left side restrictions F17:F19 cells contains formulas left –restrictions associated demand distribution centers, formulas used are: Cell F17=SUM(B17:E17). It copies itself to F18 and F19.

Cell B20=SUM(B17:B19). B20 is copied to C20:E20.0

Right side restrictions, cells H17:H19 contain restriction on the right side associated demand distribution centers.

These values are already introduced in the initial data of the problem, so it will use the formulas: Cell H17=F5. It copies itself to H17 in H18:H19.

Cell B22=B8. B22 is copied into C22 and E22. It solves the problem using the Solver. Dialog solver Parameters box is completed as in the following figure. Selected options are Assume Linear Model and Assume Non-Negative.

Solver Parameters

Set Objective: **\$C\$13**

To: ☐ Max ☒ Min ☐ Value Of: 0

By Changing Variable Cells: **\$B\$17:\$E\$19**

Subject to the Constraints:

- \$B\$20:\$E\$20 = \$B\$22:\$E\$22**
- \$F\$17:\$F\$19 <= \$H\$17:\$H\$19**

☒ Make Unconstrained Variables Non-Negative

Select a Solving Method: **Simplex LP**

Solving Method
Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Buttons: Add, Change, Delete, Reset All, Load/Save, Options, Help, Solve, Close

Figure 2. Solver Parameters of Modelling transport problems with SIMPLEX LP

The optimal solution shows that the minimum cost of transport is 39500 monetary units and in field B17:B19 are displayed quantities to be transported on each route. A value of 0 indicates that the route didn't carry anything

Variations of transport problems

Total supply is equal to the total demand. In many cases the total supply is equal to the total demand. Excess supply will appear as a deviation in the solution of the problem, and the deviations can be constructed to offer unused or quantities not transported. If total supply is less than total demand programming model linear transport problem has a feasible solution.

To solve the problem creates a fictional so that its offer to satisfy excess demand and transportation costs awarded in this 0. In this way the linear programming problem will have solutions.

Maximize the objective function

In some problems the goal is to find a solution that maximizes revenue or income, or profit. Using unitary income or profits in the objective function coefficients will solve a problem of minimization rather than a problem of maximization. The changes do not affect restrictions.

Unsupported routes

Establishing a route from every origin node to every destination node is not always possible.

Routed with limited capacities

Four routes with limited additional restrictions are introduced. For example, if transport route Craiova-Deva cannot carry more than 1000 units will be introduced the restriction $x_{13} \leq 1000$.

The general model of a linear programming transportation problem with m points of origin and destination n points is:

III. LINEAR PROGRAMMING

Linear programming represents a method of problem solving decision making. The following applications are specific to their resolution using linear programming:

1. A manager must establish a program for the next period production and inventory levels so as to be satisfied market demand and also wants to minimize the total cost of production and storage costs.
2. A financial analyst must select for a portfolio of investments the best combination of stocks and bounds. These investments should be selected so as to maximize investment efficiency.
3. Inner making manager must determine how to distribute the budget for advertising in different media: newspapers, television, radio and magazines so that the effect of advertising to be made up.
4. A company has warehouses in several cities in the country and receives orders from customers in various locations. The question of determine amounts to be sent from the warehouse so that the total transport costs to be minimized.

These are few examples where linear programming has been used successfully, but the list goes on. What these examples have in common is that they try to minimize or maximize something.

In the first example the manager wants to minimize investment efficiency. In the third example marketing manager must maximize advertising effectiveness. In the fourth example should be minimized transportation costs. In all linear programming problems the objective is to maximize or minimize some quantities.

All linear programming problems have a second property: restrictions that limit the degree to which the goal can be achieved. In the second example the analyst is limited to the amount and types of shares existing available.

In the third example the marketing director is constrained by fixed budget and availability of advertising media.

In the fourth example the quantities that can be transported are limited to availability in each store.

In conclusion, the restrictions are another general feature of each linear programming problem.

The ABC firm produces a variety of chemicals. In a production process to produce two products (additive and solvent) required three types of raw materials. The additive is sold to oil mills and it is used in the production of various types of fuel. The solvent is selling chemical plants and it is used in the manufacture of detergents. Additive and solvent to produce three materials are mixed in the proportion indicated in the table:

TABLE IV. MIXING BETWEEN ADDITIVE AND SOLVENT

Material	The first product	The second product
	additive	solvent
First material	0.4	0.5
Second material	0	0.2

Third material	0.6	0.3
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To get a tone of additive mix 2/5 tons of material 1 and 1/5 tons of materials two and 3/10 tons of materials 3.

The production is limited to the availability of the three materials. Currently the company has 20 tons of material 1, 1.5 tons of material 2 and 21 tons of material 3. The nature of production process, raw materials are used in the current production and are considered waste.

Each tone of additive brings a profit of \$40 per ton of solvent and makes a profit of \$30. ABC management, as market demand analysis, decided that the price set will determine the entire amount of product sales (additive and solvent).

Problem formulation and modeling is the process of transposing the problem into a mathematical model. Modeling is an art that can be mastered through practice and experience. Although each problem has unique characteristics, many problems has unique characteristics, many problems can have common features. Therefore, for beginners can be useful a set of rules, that can be applied to formulate a model of which may be illustrated in the development of a mathematical model for ABC company.

The first step is to identify the objective and constraints. In our case the objective is to maximize the total profit. Restrictions relate to the quantities of raw available materials, which limit the amount of additive and solvent that can be produced.

Restriction 1: the quantity of material 1 used must be less than or equal to the amount of material one available.

Restriction 2: the amount of material 2 used must be less than or equal to the amount of material available 2.

Restriction 3: The amount of material 3 used must be less than or equal to the amount of material available 3.

The next step is to define the decision variables. The two decision variables are: the number of tones of additive products and the number of tones of solvent products. We denote by:

-A=additive quantity produced (tons);

-S=solvent quantity produced (tons);

-A and S are decision variable

It is written using objective decision variables. The total profit comes from two sources: sales of solvent and sales of additive. If the profit made by selling a tone of additive is \$40, then profit by

Selling tons of A will be $40 * A$.

Similarly, if the profit made by selling a ton of solvent is \$ 30, then profit by selling tons of S will be $30 * S$.

$$\text{Total profit} = 40 * A + 30 * S \quad (12)$$

Mathematical expression of the objective function is called objective.

If our objective is to maximize the total profit, then the objective function will be:

$$\text{Max}(40 * A + 30 * S) \quad (13)$$

Restrictions are written using decision variables. Restriction 1: Because a ton of additive is produced from 2/5 tons of material 1, the amount of material needed to produce 1 ton of additive A is 2/5*A. For each ton of solvent using 1/2 tons of material 1, so that the amount of material needed to produce one tone of solvent S is 1/2*S.

Total objective and constraints were transformed into a set of mathematical relationships, set of relationships defined as the mathematical model. Complete mathematical model of the problem is:

$$\begin{cases} \text{Max}(40 * A + 30 * S) \\ 2 / 5 * A + 1 / 2 * S \leq 20 \\ 1 / 5 * S \leq 5 \\ 3 / 5 * A + 3 / 10 * S \leq 21 \\ A \geq 0 \\ S \geq 0 \end{cases} \quad (14)$$

-for solving optimal combination must be found(the A and S) that satisfy all constraints and also lead to an objective function value that is greater or equal than any value calculated with another possible solution.

If that the objective function and restrictions are linear functions with respect to the decision variables (decision variables appear only at the power one), then we have a linear programming problem.

Note that the spreadsheet is composed of two parts:

- the first part containing the problem;
- the other contains the model;

One advantage of separating data model is that can be studied effort to change the input measurements model using only changes in this area that contains data.

Another advantage is that the analyst can develop independently of available data model.

Step 1: Entering Data Problem

The problem appears at the top of the spreadsheet. Composition to obtain fractions representing one ton of solvent and additive were converted into decimal values and placed in the B5:C7.

The value 0.4 from cell B5 shows that every tone of additive product uses 0.4 tons of material 1, the value 0.5 from cell C5 shows that each tone of solvent produced using 0.5 tons of material 1, etc. Cells D5:D7 contains the available quantity of each material, and the cells B8 and C8 contain the profit made by selling or calculating the objective function one of additive (\$40) or solvent (\$30).

Step 2: Define cell which will contain the decision variables. B15 and C15 cells contain the number of tons of additive and solvent products.

Step 3: Define the objective function cell containing the formula.

Cell B17 contains the formula for calculating the objective function=B8*B15+C8*C15 (the unit profit per ton of additive

*production of additive +the unit profit per ton of solvent*production of solvent).

Step 4: Defining cells that contain formulas on the left of restrictions.

Cells B20:B22 contain formulas that show how to calculate the left side of restrictions. For the material 1, in cell B20 introduce the formula=B5*B15+C5*C15 (the quantity of additive produced*the quantity of material one to produce a ton of additive + the quantity of solvent produced *the quantity of material 1 to produce a ton of solvent).

Similarly we enter formulas in cells B21 and B22 for materials 2 and 3.

Step 5: Defining cells that contain the values from the right side of restrictions.

Spreadsheet used to solve the problem.

	A	B	C	D	E	F	G
4	Materials	Variable 1=Additive	Variable 2=Solvent	Amounts available			
5	Material 1	0.4	0.5	20			
6	Material 2	0	0.2	5			
7	Material 3	0.6	0.3	21			
8	Profit per tonne	40	30				
9							
10							
11	Model						
12							
13		Decision variables					
14		Variable 1=Additive	Variable 2=Solvent				
15	Tons produced	25	20				
16							
17	Profit maximization		1600				
18							
19	Restrictions	Amounts used		Amounts available			
20	Material 1	20		20			
21	Material 2	4		5			
22	Material 3	21		21			
23	Decision variable 1	25					
24	Decision variable 2	20					
25							

Figure 3. Linear Programming-Problem with additive and solvent

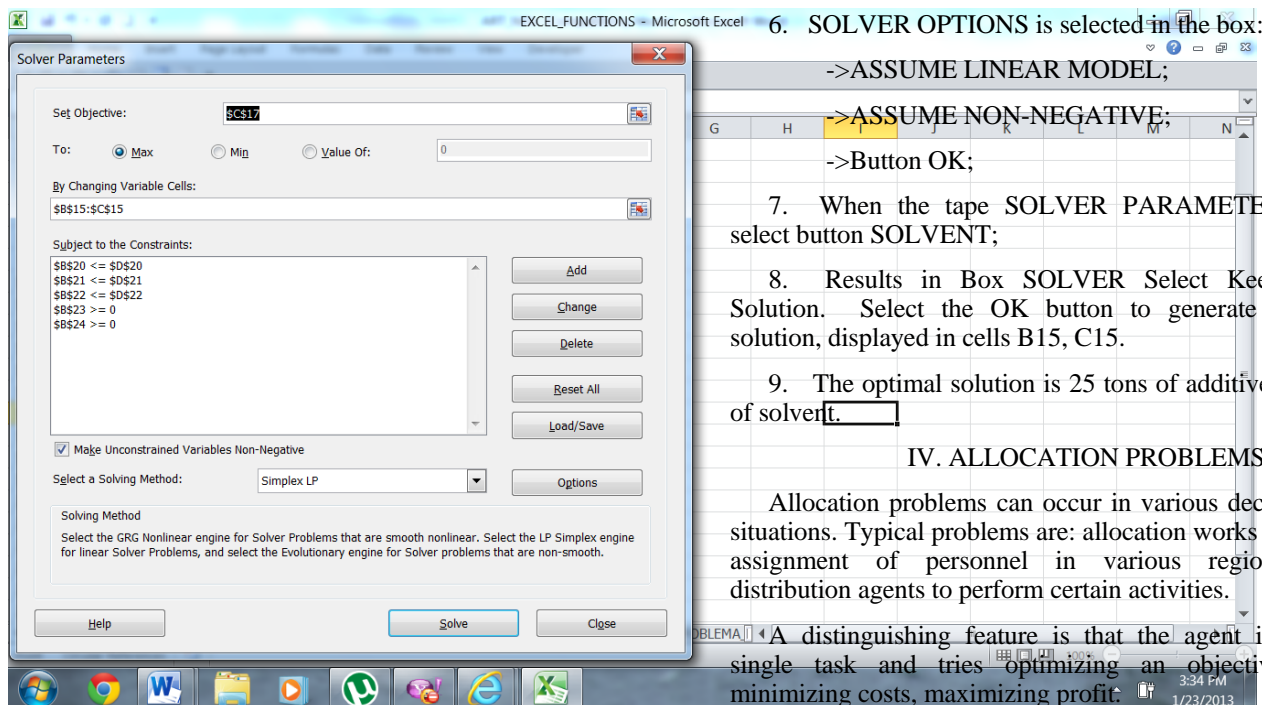


Figure 4. Solver for Linear Programming-Problem with Additive and Solvent

In the problem analyzed the values from the right of restrictions represents the amount of material available, values that are already placed in the D5:D7.

For material 1, in cell D20 enters the formula=D5 is for material 2 in cell D21 enter the formula=D6 themselves and for material 3 in cell D22 to enter the formula=D7.

An advantage of using spreadsheet is that if one of the values that contains the problem changes, the model values automatically change.

To determine the optimal solution of the problem we will use the SOLVER from Excel. The following steps show how SOLVER can be used to obtain the optimal solution for a linear programming problem.

1. Select the MENU TOOLS.
2. Apply the SOLVER Command.
3. SOLVER Parameters box is filled in the following manner:
->Set Target Cell: B17;
->Select the option MAX;
->By changing Cells: B15:C15;
->Select ADD button;
4. Add Constraint box is completed as follows:
->Cell Reference: B20:B22;
->Select Operator<^ ;
->Select the OK button ;

5. When the tape SOLVER PARAMETERS reappear SELECT the OPTIONS button.

6. SOLVER OPTIONS is selected in the box:
->ASSUME LINEAR MODEL;
->ASSUME NON-NEGATIVE;
->Button OK;
7. When the tape SOLVER PARAMETERS reappear select button SOLVENT;
8. Results in Box SOLVER Select Keep SOLVER Solution. Select the OK button to generate the optimal solution, displayed in cells B15, C15.
9. The optimal solution is 25 tons of additive and 20 tons of solvent.

IV. ALLOCATION PROBLEMS

Allocation problems can occur in various decision-making situations. Typical problems are: allocation works on machines, assignment of personnel in various regional centers, distribution agents to perform certain activities.

A distinguishing feature is that the agent is assigned a single task and tries optimizing an objective, such as minimizing costs, maximizing profit.

To illustrate how to solve allocation problems we consider the following example:

The company ABC specializing in market research has three new clients. Each project must be assigned then a project leader. The time required for the project depends on the experience and ability of project leader. Currently available only three projects have about the same priority and cannot be achieved simultaneously. The management company must establish the project leader will coordinate each trial so that three studies to finish in the shortest total time. A leader can be assigned to only one project. Three clients and three studies are alternatives. The estimated time to complete each project is presented in table 1:

TABLE V. ESTIMATED TIME FOR COMPLETION OF EACH PROJECT

Project Leader	Client 1	Client 2	Client 3
Ionescu	10	15	9
Popescu	9	18	5
Georgescu	6	14	3

Network graph for the problem analyzed

Nodes correspond project leaders and clients, and the springs are possible distribution of the client project leaders.

Network graph attached to problem

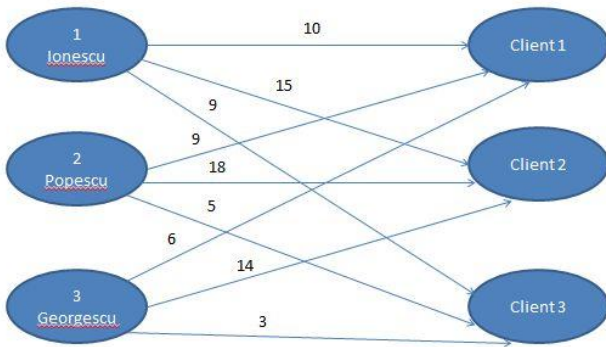


Figure 5. Network graph attached to allocation problem

Offer each origin node 1 and demand in each destination node is 1. Distribution cost of a customer project leader is the time required for the study. Note the similarity if the issues and the allocation of transport allocation problems is a special case of transportation problem where all packages and applications have value 1 and the amount carried on each arc is 0 or 1.

The problem can be solved using linear programming method. We need a variable for each arc and each node restriction. We use two indices decision variables x_{ij} -sharing and the project leader j .

In conclusion we will have nine variables of decisions.

$$x_{ij} = \begin{cases} 1, & \text{if the leader } i \text{ is distributed to client } j \\ 0, & \text{in the other cases} \end{cases}$$

where $i = 1, 2, 3$ and $j = 1, 2, 3$.

(15)

Using these notations:

The necessary time needed to complete projects by Ionescu is:

$$10 * x_{11} + 15 * x_{12} + 9 * x_{13} \quad (16)$$

-only one of decisions variables can take the value 0;

The necessary time needed to complete projects by Popescu is:

$$9 * x_{21} + 18 * x_{22} + 5 * x_{23} \quad (17)$$

-only one of decisions variables can take the value 0;

The necessary time needed to complete projects by Georgescu is:

$$6 * x_{31} + 14 * x_{32} + 3 * x_{33} \quad (18)$$

-only one of decisions variables can take the value 0;

The sum of these times gives the number of days to complete the three market studies. Thus the objective function is:

$$\text{Min}(10 * x_{11} + 15 * x_{12} + 9 * x_{13} + 9 * x_{21} + 18 * x_{22} + 5 * x_{23} + 6 * x_{31} + 14 * x_{32} + 3 * x_{33})$$

(19)

Restrictions reflect the fact that each leader can be assigned at most a client and each client must be assigned a leader. These restrictions are:

$$x_{11} + x_{12} + x_{13} \leq 1 \quad (20)$$

-ineq. (20) it represents distribution of Ionescu;

$$x_{21} + x_{22} + x_{23} \leq 1 \quad (21)$$

-ineq. (21) it represents distribution of Popescu;

$$x_{31} + x_{32} + x_{33} \leq 1 \quad (22)$$

-ineq. (22) distribution of Georgescu;

$$x_{11} + x_{21} + x_{31} = 1 \quad (23) \text{ -client 1}$$

$$x_{12} + x_{22} + x_{32} = 1 \quad (24) \text{ -client 2}$$

$$x_{13} + x_{23} + x_{33} = 1 \quad (25) \text{ -client 3}$$

Combining objective function with constraints we get:

$$\begin{aligned} &\text{Min}(10 * x_{11} + 15 * x_{12} + 9 * x_{13} + 9 * x_{21} \\ &+ 18 * x_{22} + 5 * x_{23} + 6 * x_{31} + 14 * x_{32} + 3 * x_{33}) \\ &x_{11} + x_{12} + x_{13} \leq 1 - \text{distribution of Ionescu} \\ &x_{21} + x_{22} + x_{23} \leq 1 - \text{distribution of Popescu} \\ &x_{31} + x_{32} + x_{33} \leq 1 - \text{distribution of Georgescu} \\ &x_{11} + x_{21} + x_{31} = 1 - \text{client 1} \\ &x_{12} + x_{22} + x_{32} = 1 - \text{client 2} \\ &x_{13} + x_{23} + x_{33} = 1 - \text{client 3} \\ &x_{ij} \geq 0 \text{ for } i = 1, 2, 3 \text{ and } j = 1, 2, 3 \end{aligned}$$

(25)

EXCEL_FUNCTIONS - Project Excel

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Figure 6. Worksheet attached to the problem

Data of the problems are introduced in the domain: A1:D7.

Decision variables cells D16:D18 are reserved decision variables. Initially all decision variables have the value 0.

Objective function-the formula SUMPRODUCT(B5:D7,B16:D18) were placed in cell C12 to calculate the number of days needed to complete all projects.

The left part of restrictions –

Cells E16:E18 containing restriction left on the number of clients that can be assigned a leader.

Cells B19-D19 contain restriction left by which a project must be assigned them a project leader.

The formulas used are:

-Cell E16=SUM(B16:D16). It copies itself into E17:E18.

-Cell B19=SUM(B16:B18). It copies itself into C19:D19.

Right side restrictions, cells G16:G18 contain restrictions on the right side of leaders and cells B21:D21 contain restrictions on the right of customers.

All values are equal to one.

The parameters are completed as shown next. Selected options are ASSUME NEGATIVE LINEAR MODEL and NON ASSUME.

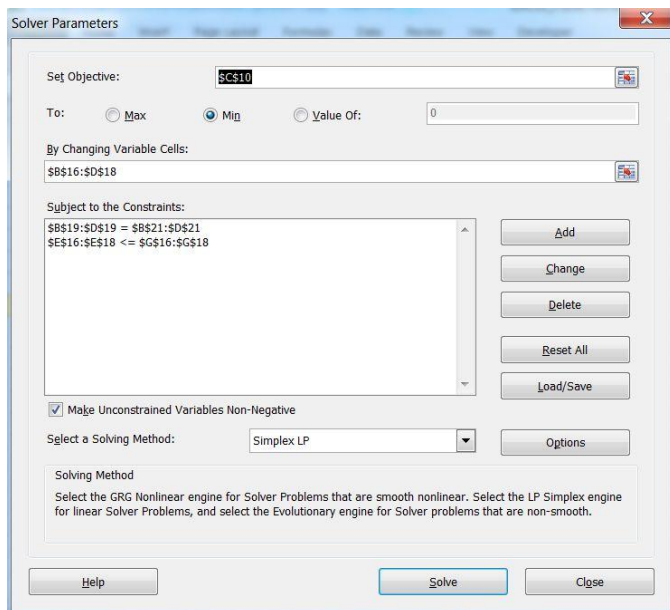


Figure 7. Box Solver Parameters

Optimal solution to the problem is : Ionescu is assigned to client 2, Popescu is assigned to client 3 and Georgescu is assigned to client 1. Time completion of the three projects is 26 days.

Variations of the problem

Because allocation problems can be treated as special cases for transport, variations that can occur in allocation problems are the same as in transport issues.

The total number of agents (offer) is different from the number of activities (application).

If the number the agents it exceeds the number of activities, additional agents will remain unallocated linear programming model.

If the number of activities is greater than the number of agents linear programming model will have a feasible solution.

In this case just add a sufficient number of agents to be equal to the number of activities. The objective function coefficients for fake agencies will be zero.

If allocation problems are evaluated in terms of revenue and profit we have to solve a problem of maximizing instead minimizing.

In addition, if one or more allocations will not be accepted decision variables will be removed from linear programming model.

For the example this may occur if an agent does not the necessary experience to work on a project.

Not make changes to the spreadsheet, the simplest solution is attaching high costs for the decision variables corresponding allocations that cannot be accepted.

The general model for the allocation problems is:

$$\begin{aligned} \text{Min} \sum_{i=1}^m \sum_{j=1}^n c_{ij} * x_{ij} \\ \sum_{j=1}^n x_{ij} \leq 1 \quad i = 1, 2, \dots, m \quad \text{Agents} \\ \sum_{i=1}^m x_{ij} = 1 \quad j = 1, 2, \dots, n \quad \text{Activities} \\ x_{ij} \geq 0 \quad \text{for all } i \text{ and } j \end{aligned} \quad (26)$$

V. PROJECT MANAGEMENT

Many real-life projects are very complex and expensive and their production on time and within budget is not an easy task. Typically certain activities cannot start before the other to finish.

And if a project there are hundreds of such dependent planning problems are too complex, and managers need special methods of analysis.

Some of the questions that I tried to answer here are:

1. What is the deadline for completion on the project?
2. What are the start and end times of each activity?
3. Which activities are critical in that they must and exactly as planned so as not to be exceeded deadline for completion of the project?
4. How long can noncritical activities be delayed so as not be exceeded deadline for implementation of the project?
5. How can resources be allocated so that the project activity to be performed quickly and with minimal costs?

The methods PERT and CPM, acronyms for Program Evaluation Technique and Critical Path Method, Gant charts are methods of analysis used for project management.

Regardless of the method, the first step is to define the project planning activities and establish precedence relations between them ok. This is the most important project and normally at this stage would have involved more people so that should not be forgotten any important activity.

ABC currently has offices in Bucharest and only wants new offices in Brasov. In this purpose some staff will move to Bucharest and Brasov will hire new staff. While economists have to deal with the financial side of the business, architects must deal with the interior design. Some parts of the project can not start until others are completed. For example, it can be arranged offices if they were not design, or many employ personnel necessary until it sets.

The following table shows the activities that make up the project:

TABLE VI. ACTIVITIES OF THE PROJECT

Activity	Description	Previous activities	Execution time(weeks)
A	Selecting offices	-	3
B	Establishing the plan of organization and financial	-	5
C	Determination of necessary staff	B	3
D	Interior design	A,C	4
E	Fitting offices	D	8
F	Selection of personnel moves	C	2
G	Hiring new staff	F	4
H	The actual move	F	2
I	Establishing relationships with new partners in Brasov	B	5
J	Staff training	H,E,G	3

Each activity is placed in a separate row and column last previous activities call activities to be performed before participation analyzed. For example, activity C cannot start until finish work in column B. Project duration is past the estimated time for implementation activities.

GANT GRAPHICS

One of the most popular methods used for project planning is to use GANT charts. Each activity is carried on the vertical axis. Horizontal is the time. The graph indicates the earliest

starting time of each activity. For example, activity C cannot begin before C begins. As an activity is performed, the bar association is shaded.

Thus, at any point of time is clearly what activities were carried out in time or not. The graph in the following figure below shows that in week 13 activities D, E and H are behind schedule and work ahead of G is the plan.

Since there are complete in week 13 they are behind schedule.

From GANT charts cannot determine immediate predecessors of an activity.

In the Figure 7 may seem like F and I are previous business activities G, since G may start in week 10, and F and I can finish it.

But from Table VI we know that only F “immediate predecessor” of G. A delay of I activity would not affect that start time of activity G.

Such information is important for the manager to determine what activities could be delayed without changing the deadline for the project. Gant charts may be used for such analysis, in this case the recommended method of representing the project in a graph.

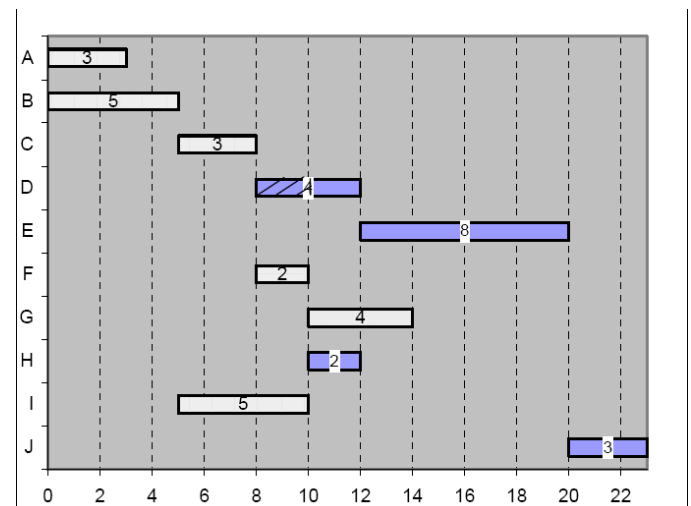


Figure 8.Gant Graphic

REPRESENTATION THROUGH GRAPHS PROJECTS

Each activity is representing in the graph by an arc. Beginning and end of each activity are indicated by a circle called node. Each node is assigned a number. The assignment of numbers is arbitrary.

As the graph nodes can build numbers, but must be kept properly precedence relationships between activities. Each activity should begin in the node preceding activity ends. For example, in Figure 9, activity C starts in node 3 because previous work B and there.

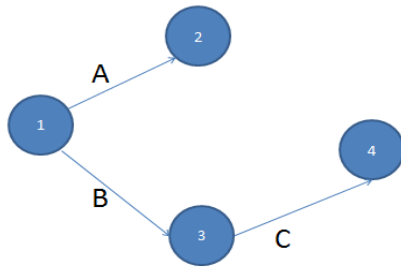


Figure 9. Graph for activities from A to C

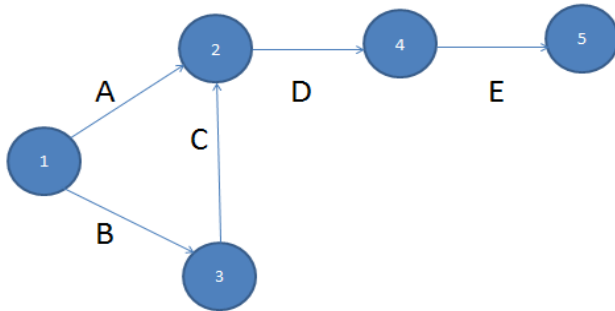
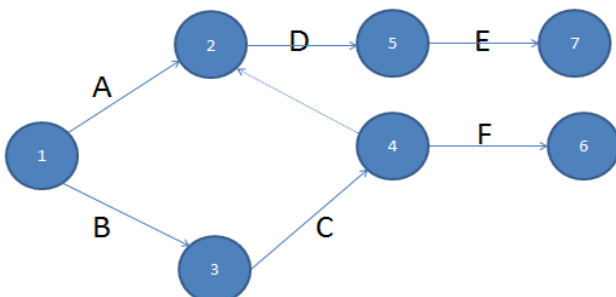


Figure 10. Partial Graph

The complications end when trying to add D activity graph. Both A and C are precedents for D activities, and how I want to graph D activity must occur only once to combine nodes 2 and 4 in figure 9 into one. This is shown in Figure 10. Node 2 (were renumbered nodes) is the event in which A and C activities were completed. Activity E, whose only previous activity D can be added without difficulties.

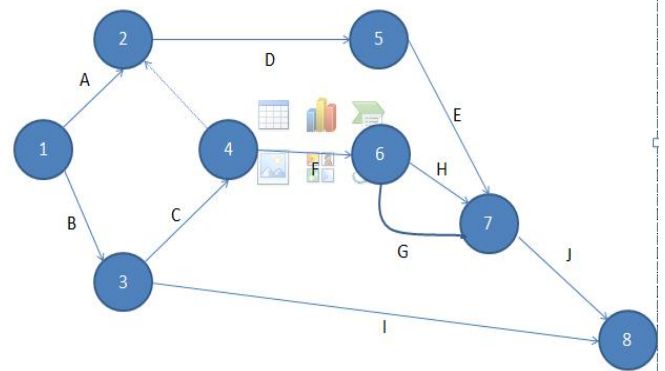
When trying to add new problems arising from business F. As F has previous work on C, should work to start in node F. But this would work to start in node F. But this would mean that the activity is engaged in previous F and A, which is incorrect. This dilemma can be solved by introducing fictitious activities, represented by the dotted line in Figure 11.



The Figure 11. Introducing a fictitious activity

This activity does not require any time or resources. Thus figure four shows that the activity can begin after D and C have been completed. Similarly, F can start after activity C to finish.

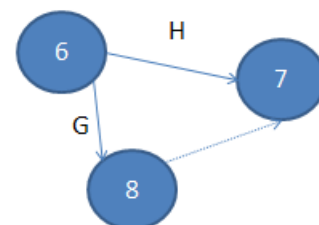
I introduce a generalized way fictional work in the following way: suppose we want to add an activity A in node start n, but not all activities ending in node N are the activities and previous activities. To do this, create a new node M, a fictional work from node M to node N. All activities ending in N are predecessors of activity A will end in node M. It now work can begin in node M.



The Figure 12. Network Graph

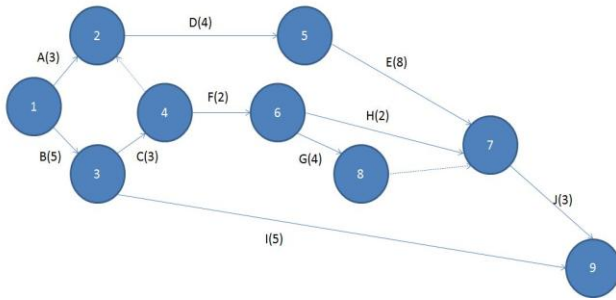
Figure 12 show the graph associated Table 1.

Each activity is identified by a start and one end node. The graph in Figure 12 may be confusion as G and H is the same activity. To avoid confusion insert a new fictitious activity (Figure 13).



The Figure 13. Introducing the second fictitious activities

Thus the final graph looks like in the Figure 14. From table VI it can be calculated (gathering times of realization of activities) that the total realization of the project is thirty nine weeks.



The Figure 14. The final graph

This term may be less because some activities can take place simultaneously (e.g. activities A and B).

To find the minimum implementation of the project must calculate the critic road. A road trip in a graph is a sequence of activities and the initial node (1) to the end node (9). For example $B-I$ sequence requires 10 weeks to be accomplished, the sequence $B-C-D-E-J$ 23 weeks. In a graph can be identified more roads from the initial to the final node with different durations. There exists the following situation: how we determine the longest path from the initial to the final node. This path, called critical path can be project development time, because no other way is longer. If activities on the critical path are delayed, the entire project will be delayed. For this reason activities on the critical path are called critical activities. The critical activities must be carried out “on time” node with different durations.

This path, called critical path will cause project development time, because no other way is longer.

If activities on the critical path are delayed, the entire project will be delayed. For this reason activities on the critical path are called critical activities.

The problem is solved in the following way:

1. It is calculated for each activity at the earliest starting time and earliest completion time:

I denote by:

DI = earliest start time for activity;

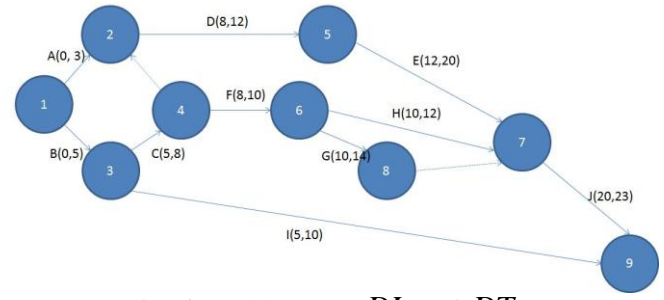
DT = early, the deadline for completion of activities;

t = the expected duration of activity;

For an activity, the relationship between these quantities is
 $DT = DI + t$ (27)

DI = term for an activity that departs from a node is the highest DT of activities ending in that node.

For each activity in the network are calculated DT and DI . The result is shown in the Figure 15. So, at the earliest project completion time is twenty three weeks.



The Figure 15. Terms DI and DT

1. It calculates the last start and finish time of an activity. To identify critical activities and timeframes that non-critical activities can be delayed without affecting the project completion deadline, the graph back through the final node to initially node.

The idea is that once we know the project implementation period (23 weeks), starting from this value we can calculate the latest time at which an activity can finish without delaying the entire project. Evaluation begins at the end node to initially node.

We denote by:

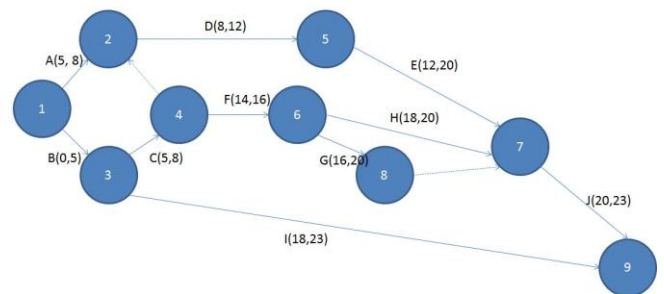
TI = at the latest starting time of an activity;

TT = term no later than the end of an activity;

The relationship between these quantities is:

$$TI = TT - t \quad (29)$$

TT = term for an activity that ends in a node is the lowest TI 's activities leaving from that node. The results are shown in Figure 16.



The Figure 16. Calculations of TI and TT

4. The Determination reserve time associated with each activity. Reserve time is the time that an activity can be delayed without affecting the project deadline. Reserve time (RT) is calculated using the formula:

$$RT = TI - DI = TT - DT \quad (30)$$

For example, activity G, reserve time is:

$$\begin{aligned} RT_G &= TI_G - DI_G = 16 - 10 = 6 \\ RT_G &= TT_G - DT_G = 20 - 14 = 6 \end{aligned} \quad (31)$$

This means that G can delay work six weeks after the earliest starting time without delaying the project activity.

The work C:

$$RT_C = TI_C - DI_C = 5 - 5 = 0 \quad (32)$$

So C activity is not the subject to time and must start in week 5. As the activity can be delayed without affecting the entire project, means that this activity is critical.

Activities the reserve for 0 are critical activities.

VI. TROUBLESHOOTING EXCEL

Troubleshooting Excel Project Management is performed using a graph-based approach spreadsheet containing the model is shown in the Figure 16. Data and the resulting formulas are introduced graphical development project attached.

For example, since the later –term termination activity F is the smallest value of the late start time of activities G, F and K, the formula in cell G7 will be=MIN(F8,F9,F12). Since the earliest start time for activity D is the highest value of the early termination terms of activities A and C, the formula in D5 is MAX(E2,E4).

The last column is the word YES critical activity for activities that deviation is zero.

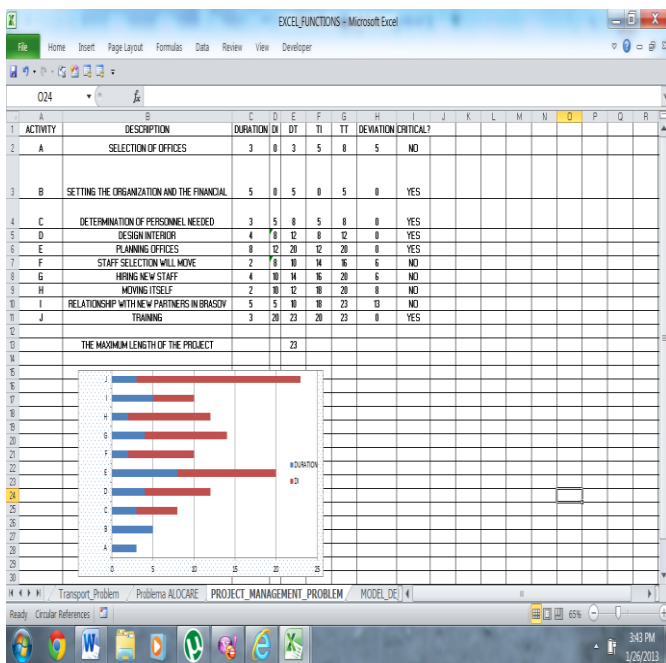


Figure 16. Worksheet in Excel

GRAPHIC REPRESENTATION OF GANTT CHARTS IN EXCEL

In Gantt chart activities are displayed on the vertical axis and the horizontal axis is the time. The graph indicates the earliest starting time of each activity and duration of activity.

GANTT CHARTS

1. Select data to be represented graphically: activities (A1:A11), duration activities (C1:C11) and the earliest starting time of activities (D1:D11).

2. It creates a chart type Stacked Bar;

3. Select the DI series. Press the right button of your mouse and select the FORMAT command SERIES. Select the SERIES button is set to display Order and DI series order duration. Select the Patterns button, and SECTION AREA BORDER and NONE is selected. So starting bars attached terms of activities will be transparent and bars representing activities will occur during extension.

Time series is selected, press the right button of your mouse and SELECT the Format COMMAND SERIES. Select the Scale button, options Categories in reverse order and value(Y) axis crosses at maximum category. Such activities will be displayed starting at the top of the Y axis.

THE CRITICAL PATH ANALYSIS /COST

To reduce development time of a project, the analyst can try reducing the time in which is carried out certain activities on the critical path by allocating additional resources.

For example, a task that usually takes two weeks if working eight hours in a day it can be completed faster if they work overtime and increases the number of workers. This, of course, is achieved at the cost of increased costs.

THE CRITICAL PATH ANALYSIS COST

To reduce development time of a project, the analyst can try reducing the time in which is carried out certain activities on the critical path by allocating additional resources.

For example, a task that usually takes two weeks if working eight hours in a day, it can be completed faster if they work overtime and it increases the number of workers. This, of course, is achieved at the cost of increased costs. The question is: "What activities should be expedited so that the final shortening the project implementation should be done with minimal cost?"

This model assumes that the cost is a linear function of time, decreasing, because and any effort to speed is accompanied by increased spending. For each activity I know the following information:

1. The normal-achieving the maximum activity;
2. Normal cost, the cost necessary to achieve during normal working activity;

Minimum-time is the minimum that can be work.

Minimum-cost is the cost necessary to achieve the work in the minimum time;

To present method I will use the following example:

A project associated with the graph shown in the Figure 13 consists of five activities. For each activity during normal known, the minimum average cost and the maximum cost. In the last column of the table was calculated for each activity cost per hour to speed equal to (maximum cost-normal cost)/(normal time, minimum time).

ACTIVITY	NORMAL TIME	NORMAL COST	MINIMUM TIME	MAXIMUM COST	DURATION SPEEDING	COST/TIME TO SPEED
A	32	640	20	800	12	19.33333333
B	40	480	30	720	10	24
C	50	1000	30	1200	20	10
D	24	288	15	360	9	8
E	120	4800	70	5600	50	16
TOTAL		7208				

Figure 17. Representation of activities, normal time, normal cost, minimum time, maximum cost, duration speeding, cost/time to speed

Using normal duration for each activity, the earliest time for completion of the project is 194 hours (on the critical path C-D-E).

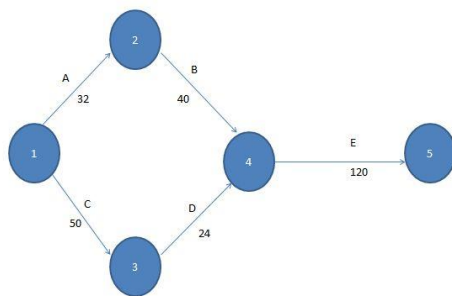


Figure 18. The graph associated to the problem

To reduce the project completion time of 193 hours activity on the critical past must urgently hour. How to speed up cost per hour for activity D is less than the costs to speed up the time for activities C and E ($8 < 10$ and $8 < 16$), it will speed D activity one hour. Thus, the project will end in 193 hours, C-D-E critical path and the total cost will be $7208 + 8 = 7216$.

If the deadline must be further reduced to 191 hours, the problem is complicated. The situations illustrated in Figure 4. Now there are two critical path A-B-E and C-D-E, both of 192 hours.

Graphical completion time must be further reduced to 191 hours, the problem is complicated. The situation is illustrated in Figure 4. Now there are two critical paths B-E and C-D-E, both 192 hours.

Graphical completion time must be reduced further to 191 hours, the problem is complicated. The situation is illustrated in Figure 18. Now there are two critical paths B-E and C-D-E, both 192 hours. Urging one of the activities A, B, C, D with an hour will reduce road an hour, but still remains the critical path of 192 hours. A critical path of 191 hours can be obtained if urgency to activities on both roads, or if you just work urgency to E. So, there are many alternatives, and of these have found the solution that has minimum cost. For solving graphs in this way would be very cumbersome. The problem can be solved using linear programming.

Figure 17 contains the model attached problem.

In the first part of the spreadsheet is introduced during normal, normal cost, minimum time and maximum cost of achieving each activity. Based on these data, we calculate the maximum that length of column expedite the maximum that can be expedited each activity (the difference between the normal and the minimum), are in the next column expedite cost per hour maximum difference between the cost and time cost related.

The second table of the spreadsheet contains the decision variables of the problems, which can be expedited times each activity in B9:B13. Initially all values will be 0. The column length is calculated during work activity where it will be urgent speeding duration column value (difference between the normal and expedite time).

Activation Duration Column is calculated during activity where it will be urgent speeding Duration Column Value (Difference between the normal and expedite time). The next columns are calculated the early and late periods of the start and end of each activity, following the sequence of activities (as in the example above). There for each is calculated deviations and enter formulas to determine the critical activities.

The objective function (cell C15) is to minimize the total cost to speed, calculated as the sum of durations competitive products that are cost expedite urgency to each activity and activity per unit time-min (C15). The Problem constraints are:

1. Duration within which the project which the project (contained in cell D14). For example, if the project should be completed in 184 hours, the restriction would be $D14 = 184$.

2. The duration of each activity can be expedited not exceed the maximum length of urgency, and these durations are positive numbers so: Solve the problem using SOLVERS's and the results show that for the project to finish with minimal costs in 184 hours, have accelerated 2-D work hours and is 8 hours. Expedite additional cost in this case would be \$ 144.

VII. TROUBLESHOOTING DECISIONAL ANALYSIS

The main elements of decision making are:

1. The agent decision-making;

2. The type of decision problem. If the problem parameters analyzed are known to say that we are dealing with decisions under conditions of certainty. In this case of events whose probabilities are known, it is said that decision-making takes place under conditions of risk. If the probability of occurrence of events are random (are not known), then the decision is adopted in conditions of uncertainty.

3. Possible alternatives of action, which makers have at their disposal.

4. Possible strategies of action managers. These strategies consist of various rules that allow the choice of variants of existing ones.

5. The objectives of the decision (goal pursued managers). These objectives are materialized either restricted or the function end.

Events that may occur, but the agent decision cannot control are referred to as states of nature.

The decisional analysis models are shown in the following example:

The company PDC bought the land logs to build a villa complex. Their construction prices range from 300000 \$ and 1200000 \$, depending on the number of rooms.

The key factor is selecting one of the three alternatives is the correct assessment of the company's management of the future demand. Although the market may be influenced by advertising rates that are relatively high demand depend on the variety of factors over which management has no control.

The company management believes that there are two possibilities:

- acceptance of the project by the market, so high demand;
- low demand;

So, in the example analyzed there are two states of the nature.

S_1 =high demand;

S_2 =reduced demand;

-also three alternatives:

d_1 =small sized project;

d_2 =medium sized project;

d_3 =large sized project;

Using the best available information, the agent must evaluate each decision and state of nature gain to be obtained. Depending on the analyzed problem, this gain can be a profit, cost, time, distance, or any other measure that reflects outflows studied problem.

In the table VI are presented the profits assessed for the problem analysis (in terms of millions of dollars):

TABLE VI. PROFIT OBTAINED FOR EACH ALTERNATIVE AND STATE OF THE NATURE

ALTERNATIVE	STATES OF NATURE HIGH DEMAND(S_1)	REDUCED DEMAND (S_2)
SMALL SIZED PROJECT	8	7
MEDIUM SIZED PROJECT	14	5
LARGE SIZED PROJECT	20	-9

$-V_{31} = 20$ shows that if anticipates a profit of 20 million \$ if the project of large size is selected and the demand will be high, $V_{32} = -9$ shows that if you select the project of large size and the demand is low, we obtain a loss of 9 million od dollars.

DECISION UNDER CONDITIONS OF UNCERTAINTY

Decision problems containing uncertainty is not known when the likelihood of states of nature. These problems can be addressed in several ways, and accordingly there are several

decision criteria. Because it by applying various criteria can get different advice is good decision agent to understand very well the existing criteria and to select the one that fits best, adverse to the best gain.

REGRET CRITERION (CRITERION MINI-MAX)

Alternative is chosen taking into account the difference between the best result that would have obtained a certain state and the value of other result. This difference is called regret:

$$R_{ij} = |V_j^* - V_{ij}| \quad (33)$$

Where:

R_{ij} =the regret associated alternative d_i and the state of nature S_j ;

V_j =the corresponding gain the best decision for the state of nature S_j . For maximization problems V_j^* is the largest state of nature S_j , for problems of minimization V_j^* is the smallest value.

V_{ij} =the gain corresponding to d_i alternative and to state of nature S_j .

The next step is to determine the maximum regret for each alternative. Ultimately will be selected alternative with the lowest "regret" maxim.

ANALYSIS PROBLEM SOLVING DECISION UNDER UNCERTAINTY IN EXCEL

OPTIMIST CRITERION

Figure 19 shows the spreadsheet to solve the problem with the CRITERIA OPTIMISTIC.

The domain A4:C8 contains data problems. In the domain D6:D8 it calculates "maximum gain for each alternative" in cell D10 it calculates the greatest of "maximum gains of each alternative". In the field E6:E8 it displayed the recommended alternative name. The formulas used are represented in the following table:

TABLE VII. FORMUAS FOR OPTIMIST CRITERIUM

Cell	Formula	It copies itself
D6	$\wedge \text{MAX}(\text{B6:C6})$	D7:D8
D10	$\wedge \text{MAX}(\text{D6:D8})$	-
E6	$\wedge \text{IF}(\text{D6} \wedge \text{D\$10}, \text{A6}, " ")$	E7:E8

1	A	B	C	D	E
2					
3					
4					
5	ALTERNATIVE	NATURE STATE	REDUCED DEMAND	MAXIMUM GAIN	RECOMMENDED DECISION
6	SMALL SIZED PROJECT	8	7	8	SMALL SIZED PROJECT
7	MEDIUM SIZE PROJECT	14	5	14	MEDIUM SIZE PROJECT
8	LARGED SIZE PROJECT	20	-9	20	LARGED SIZE PROJECT
9					
10	BEST WIN			20	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Figure 19. Optimist Criterion

PESSIMISTIC CRITERIUM

Figure 20 shows the spreadsheet to solve the problem with the CRITERIA PESSIMISTIC. The only difference between spreadsheets in Figures 19 and 20 is that the CRITERIA PESSIMISTIC determines winners minimum for each alternative. Thus, the cell D6 contains the formula $\text{MIN}(B6:C6)$, which is copied in cells D7 and D8.

1	A	B	C	D	E
2					
3					
4					
5	ALTERNATIVE	NATURE STATE	REDUCED DEMAND	MAXIMUM GAIN	RECOMMENDED DECISION
6	SMALL SIZED PROJECT	8	7	7	SMALL SIZED PROJECT
7	MEDIUM SIZE PROJECT	14	5	5	MEDIUM SIZE PROJECT
8	LARGED SIZE PROJECT	20	-9	-9	LARGED SIZE PROJECT
9					
10	BEST WIN			7	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

Figure 20. Pessimistic Criterion

REGRETS CRITERIUM

In Figure 21 is presented to solve spreadsheet with regret criterion. The domain A4:C8 contains the data of the problem.

This problem involves determine the regrets associated with each alternative and each state of nature. The formulas used are:

The Cell B14-calculates the “regret for the best value high demand state of nature” best value which demand state of nature. Wording is $\text{MAX}(\$B\$6:\$B\$8)-B6$. It copies B14 into B15 and B16.

The Cell C14-calculates the “regret” over the best value to the state of the nature $\text{MAX}(\$C\$6:\$C\$8)-C6$. It copies C14 into C15 and C16.

The Cell D18 calculates the minimum of “maximum regret”. The formula used is: $\text{MIN}(D14:D16)$.

The Cell E14-in the area E14:E16 it displays recommended alternative name. In E14 cell it enters the formula: $\text{IF}(D14\text{^} \$D\$18, A14, \text{” “})$. E14 it copies into E15:E16.

1	A	B	C	D	E
2					
3					
4					
5	ALTERNATIVE	NATURE STATE	REDUCED DEMAND		
6	SMALL SIZED PROJECT	8	7		
7	MEDIUM SIZE PROJECT	14	5		
8	LARGED SIZE PROJECT	20	-9		
9					
10					
11	MATRIX REGRETS				
12					
13	ALTERNATIVE	NATURE STATE	REDUCED DEMAND	MAXIMUM REGRET	RECOMMENDED DECISION
14	SMALL SIZED PROJECT	12	0	12	SMALL SIZED PROJECT
15	MEDIUM SIZE PROJECT	6	2	6	MEDIUM SIZE PROJECT
16	LARGED SIZE PROJECT	0	16	16	LARGED SIZE PROJECT
17					
18	MAXIMUM REGRET			6	
19					
20					
21					
22					

Figure 21. Criterion Regrets

VII. DECISION UNDER RISK

In many decision problems can estimate the probability arising state of nature. The main feature of decisions under risk is that the agent must choose a decision based alternative probability of state of nature.

We denote by:

N -the number of states of nature;

$P(S_j)$ -the probability of S_j conditions;

At time can appear only a state of nature, so a probability must satisfy the conditions:

$$P(S_j) \geq 0, \text{ for all states of nature}$$

$$\sum_{j=1}^N P(S_j) = P(S_1) + \dots + P(S_N) = 1 \quad (34)$$

The expected value VA of an alternative d_i is defined as follows:

$$VA(d_i) = \sum_{j=1}^N P(S_j) * V_{ij} \quad (35)$$

In other words, “expected value” of an alternative is the weighted sum of “earnings” alternative analysis. Share of a

win of state nature is the probability associated to the nature state j .

For the example analysis, if the probability of state of a nature are 0.8 for $S_1 = i$ 0.2 S_2 , we have:

$$\begin{aligned} &VA(d1) \wedge 0.8 * 8 + 0.2 * 7 \wedge 7.8 \\ &VA(d2) \wedge 0.8 * 14 + 0.2 * 5 \wedge 12.2 \quad (36) \\ &VA(d3) \wedge 0.8 * 20 + 0.2 * (-9) \wedge 14.2 \end{aligned}$$

Will eventually be selected “expected value” the best (highest value for MAXIMIZING CRITERIA, lowest criteria for OPTIMIZATION). In the example analyzed the profit maximization try so is the best alternative is (with $VA \wedge 14.2$).

SOLVE THE PROBLEM USING EXCEL

In the figure 4 it presents the spreadsheet used to make decisions under risk.

DECISIONS IN RISK CONDITIONS	NATURE STATE		EXPECTED VALUE	RECOMMENDED DECISION
ALTERNATIVE	HIGH DEMAND	REDUCED DEMAND		
SMALL SIZED PROJECT	8	7	7.8	SMALL SIZED PROJECT
MEDIUM SIZE PROJECT	14	5	12.2	MEDIUM SIZE PROJECT
LARGED SIZE PROJECT	20	-9	14.2	LARGED SIZE PROJECT
PROBABILITY	0.8	0.2		
MAXIMUM EXPECTED VALUE			14.2	

Figure 22. Taking decisions in conditions under risk

Areas A4:C9 contains data problems. The probability of the two states of nature is included in cells B9 and C9.

In the field D6:D8 it calculates “expected value” for each alternative and in the field E6:E8 it posted the name of recommended alternative.

The formulas used are:

-Cell D6-calculates the expected value of alternative D1. The wording is: $\wedge \text{SUMPRODUCT}(\$B\$9:\$C\$9, B6:C6)$. It copies D6 into D7 and D8.

-Cell E6->it determines the alternative recommended. The wording is: $\wedge \text{IF}(D6 \wedge \$D\$11, A6, “”)$. It copies E6 in E7:E8.

For a minimization problem only modification would be changed spreadsheet formula in cell D11 in $\wedge \text{MIN}(D6:D8)$.

VIII. DECISIONAL ANALYSIS PROBLEMS USING SOLVER

A company has three factories in cities A, B and C. The products manufactured in these factories are distributed in localities S and P. The company is considering whether a new warehouse location in town R.

The analyses have established the following costs:

TABLE VIII. REPRESENTATION OF FACTORIES AND COST OF TRANSPORTATION IN DEPOSITS

FACTORIES	COST OF TRANSPORTATION IN DEPOSITS FROM		
	S	P	R
A	10	14	8
B	12	10	12
C	8	12	10

Production capacity at factories in cities A, B and C are 20, 30 and 40 units a week. R is estimated that the deposit will graduate 20 units per week, while the S and P, 40 and 30 units a week. To determine the distribution of products in warehouses so shipping costs to a minimum. The model will have 9 decision variables:

x_1 = the number of products transported from factory A to the warehouse R;

x_2 = the number of products transported from the factory A to deposit P;

x_3 = the number of products transported from the factory A to the warehouse R;

x_4 = the number of products transported from the factory B to the warehouse S;

x_5 = the number of products shipped from the factory B to the warehouse P;

x_6 = the number of products transported from the factory B to the warehouse R;

x_7 = the number of products transported from the factory C to the warehouse S;

x_8 = the number of products transported from the factory C to the warehouse P;

x_9 = the number of products transported from the factory C to the warehouse R;

The restrictions of the model are:

$$1. \quad x_1 + x_2 + x_3 \leq 20 \quad (37)$$

The production from the factory A does not exceed the production capacity:

$$2. \quad x_4 + x_5 + x_6 \leq 30 \quad (38)$$

The production from B factory does not exceed the production capacity:

$$3. \quad x_7 + x_8 + x_9 \leq 40 \quad (39)$$

The production from C factory does not exceed the production capacity:

$$4. \quad x_1 + x_4 + x_7 \geq 20 \quad (40)$$

The number of products carried in the store A has to be high than the storage request)

$$5. \quad x_2 + x_5 + x_8 \geq 40 \quad (41)$$

The number of products carried in the store B has to be higher than the storage request)

$$6. \quad x_5 + x_6 + x_9 \geq 30 \quad (42)$$

The number of products carried in the store C has to be higher than the storage request)

The objective function of the model is to minimize transportation costs. Transportation costs are equal to:

$$10 * x_1 + 14 * x_2 + 8 * x_3 + 12 * x_4 + 10 * x_5 + 12 * x_6 + 8 * x_7 + 12 * x_8 + 10 * x_9 \quad (43)$$

To solve this problem will be configured in the following manner spreadsheet with initial data input:

	A	B	C	D	E	F	G	H	I	J
1										
2	FACTORIES		S	P	R					
3	A		3	1	1	1				
4	B		3	1	1	1				
5	C		3	1	1	1				
6				3	3	3				
7										
8	TRANSPORT COST FROM THE FACTORY TO DEPOSITS									
9		CAPACITY FACTORY	S	P	R					
10	A		20	10	14	8				
11	B		30	12	10	12				
12	C		40	8	12	10	CAPACITY DEPOSITS			
13				20	40	30				
14										
15	TRANSPORT COSTS		96	30	36	30				
16										
17										
18										
19										
20										
21										
22										

Figure 23. Initial Data Solver

Menu cells C3:E5 will contain variables model. At first these cells will be filled with random data, assume that all variables are equal to 1. After solving the problem in these cells will get the result. In cells B3, B4, B5 I shall calculate the total production in each factory.

In cell B3 I shall enter the formula=SUM(C3:E3).It is copied the formula in B4 and B5 .

In cell C6, D6, E6 it is calculated the output stored in each warehouse. In cell C6 I shall enter the formula=SUM(C3:C5). This formula is copied in D6 and E6.

The cells B10, B11, B12 contain production cost factories A, B and C.

The cells C13, D13 and E13 I shall introduce transportation costs per unit of product from each factory to store.

In cells C15, D15, E15 I calculate shipping costs in each store. In cell C15 I enter the formula

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$$C_{15} = C_3 * C_{10} + C_4 * C_{11} + C_5 * C_{12} \quad (44)$$

(number of products transported from factory A to store S*transport costs + number of products transported from factory B to store S*transport costs + number of products transported from factory C to store S*transport costs). This formula it copies in cells D15 and E15. In cells B15 shall calculate transportation costs. In this cell I shall enter the formula = SUM(C15: E15) .

Restrictions for the problems designed for the spreadsheet will be:

$$B_3 \leq B_{10} \quad (45)$$

-the production from factory A doesn't exceed the capacity;

$$B_4 \leq B_{11} \quad (46)$$

-the production from B factory doesn't exceed the capacity;

$$B_5 \leq B_{12} \quad (47)$$

-the production from C factory doesn't exceed the capacity;

$$C_6 \geq C_{13} \quad (48)$$

-will not be breaking the stock at the warehouse S;

$$D_6 \geq D_{13} \quad (49)$$

- will not breaking the stock at the warehouse P;

$$E_6 \geq E_{13} \quad (50)$$

-will not breaking the stock at the warehouse R;

$$C_3 : E_5 \geq 0 \quad (51)$$

-all variables must be negative numbers;

After the spreadsheet was configured, from the Data Menu it applies SOLVER command.

The objective of the problem is to minimize the total transport costs. This value is calculated in cell B₁₅ , so in SET TARGET CELL is inserted B₁₅ .

The function must be minimized so that I will choose MIN function. The cells containing input variables are in the range C₃ : E₅ so in BY CHANGING CELLS introduces C₃ : E₅ .

In the box Subject to the CONSTRAINTS it shall introduce the restrictions of the problems:

1. Select the ADD button.
2. In the Cell Reference Box introduces B₃ .
3. From operators list selects ≤ .

Similarly the other restrictions are inserted.

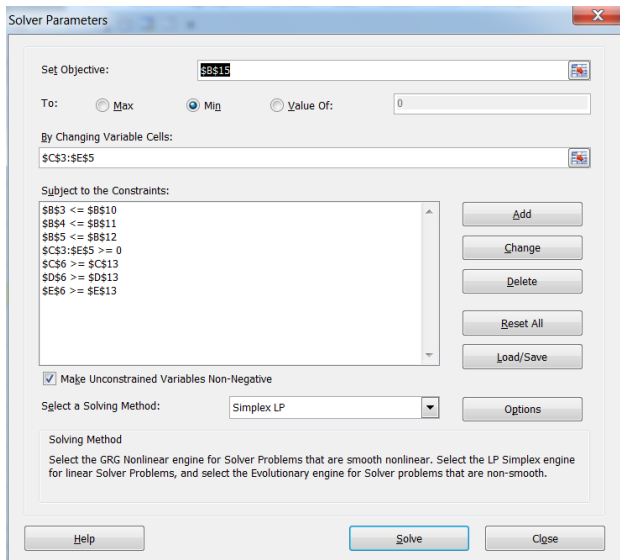


Figure 24. Solver Parameters

Finally box Solver will be completed as shown in Figure 24.

Select button OPTIONS. In the dialog box SOLVER OPTIONS is marked ASSUME LINEAR MODEL and ASSUME NON NEGATIVE. Select OK button SOLVER.

In the box SOLVER RESULTS select the option KEEP SOLVER SOLUTIONS and the three reports.

Solver solves the problem.

The obtained result is: it will transport 20 products from factory A to deposit R, 30 products from factory B to deposit P, 20 products from factory C to deposit S, 10 products from factory C to deposit P, 10 products from factory C to deposit R.

IX. MICROSOFT EXCEL-SPREADSHEET FORMAT, SIZING CELLS, FONT, SIZE, STYLE, FORMATTING NUMBERS, ALIGNMENT, BORDERS, COLORS AND CELLS, REFERENCE CELLS IN A SPREADSHEET, ABSOLUTE AND RELATIVE REFERENCES, REFERENCE 3D, CELL VALIDATION, CALCULATIONS USING FORMULAS

Microsoft Excel is currently the most common spreadsheet program. Excel can hold out a lot of information (text, numbers) and can produce a wealth of information about these numbers and offers all the facilities for presenting them in a professional format. Using Excel, the user benefits from several advantages including:

- work environment more efficiently by customizing this program;
- automating various tasks using macros, templates and formulas;

Working file (workbook) and spreadsheet (worksheet)

In Microsoft Excel a file can contain multiple spreadsheets, which allows organizing various types of information in a single file. Spreadsheets are used for printing and analysis. Data can be entered on multiple spreadsheets simultaneously, and can perform calculations with data from multiple spreadsheets. Charts created using data from a spreadsheet can

be placed on the same worksheet or can be placed in different worksheet.

To move a sheet into another it selects a specific sheet here. Name spreadsheet at one point (bold).

A spreadsheet consists of several distinct cells, where they can register different values.

SPREADSHEET FORMAT

Formatting a spreadsheet cells involves sizing, setting and style font, number format, alignment of the use of frames and colors, elements shown in the following figure:

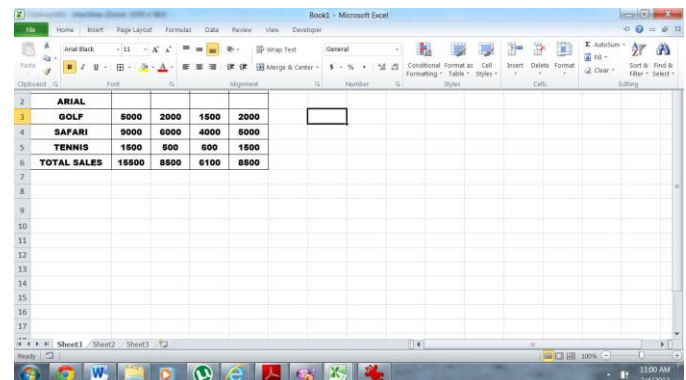


Figure 25. Spreadsheet Format

SIZING CELLS

Columns and rows can be resized if they move the line between two names of rows and columns. To match long data in the cell the columns and rows can be resized if it is double click on the head row or column. Because all data in the cell appear, not resize columns, using the alignment format MENU to decrease the text or CELLS to enter multiple lines in a cell.

FONT, SYZE, STYLE

The font, size, style or color of selected data cells can be modified using the options in the task bar formatting.

FORMATTING NUMBERS

You can use different formats for numbers by selecting buttons on the task bar formatting. Other numbers can be used if you select the MENU button NUMBER FORMAT/CELLS.

ALIGNMENT

To align data using taskbar buttons formatting. To place data in other directions ALIGNMENT menu button using FORMAT CELLS.

BORDERS, COLORS and CELLS

Application of cells frame for SELECT menu options borders, taskbar formatting. All of this bar can be select FILL COLOR button to apply different colors of cells.

REFERENCE CELLS IN A SPREADSHEET

References it identifies a cell or a range of cells in a file thing. References allow use of data from different worksheets in the same file work in various work files or data from other programs. Cell References in various work files are called external references. Reference data from other programs are called remote references. By default, Microsoft Excel uses the A1 reference type (marking columns) and lines with numbers (1 to 65536). Refer to a cell, designating specific column letter

followed by the number that specifies line. (For example cell D50 refers to the intersection of column D with line 50).

To reference a number of cells required cell reference in upper left corner and one in the lower right corner, separated by “.”

TABLE IX. EXAMPLE OF REFERENCES IN EXCEL

Refers to	Is used
Cell from column A and line 10	A10
Range of cells in column A, lines 10 and 20	A10:A20
Range of cells in column A, lines 10 and 20	B15:E15
All cells of line 5	5:5
All cells lines 5:10	5:10
All cells in column H	H:H
All cells in column H:J	H:J

It can also be used a reference model in which both lines and columns in a worksheet to be numbered. Style “R1C1” is useful when working with macros and highlight relative cell reference. Cell position is indicated as R followed by the line number and the column number C followed.

Remarks:

In more cells in a spreadsheet can be grouped into a single cell by selecting MERGE CELLS-DIALOG BOX FORMAT-CELLS-ALIGNMENT. In order to ungroup, go OPTION to CANCEL your selected ABOVE.

ABSOLUTE AND RELATIVE REFERENCE

When create a formula, cell reference or range of cells based on their relative position to the cell containing the formula. In the example in the following table cell B6 contains the formula=A5. Microsoft Excel will find the search value once cell above and once cell to the left of B6. This type of reference is known as relative reference.

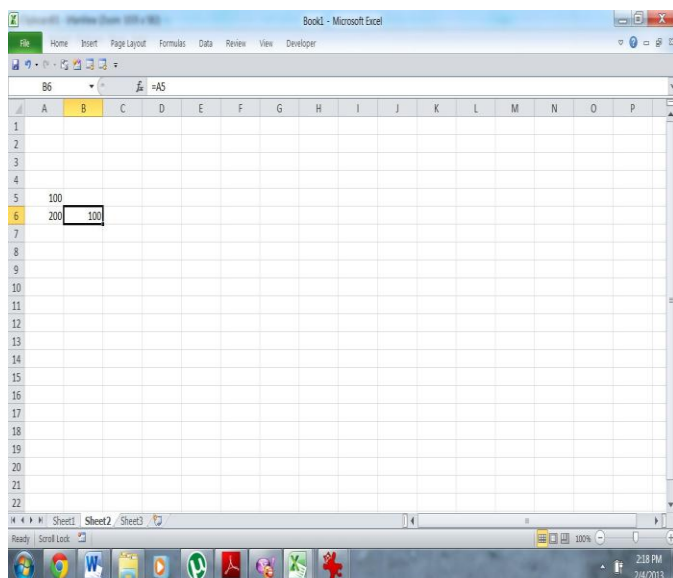


Figure 26. Relative Reference

When you copy a formula that uses relative references, references are updated and the new formula will refer to other cells depending on the position of the formula. In the above example, the formula in the cell B6 has been copied to cell B7. Formula in B7=A6 turned in, that relates cell one position and one position left to the B7.

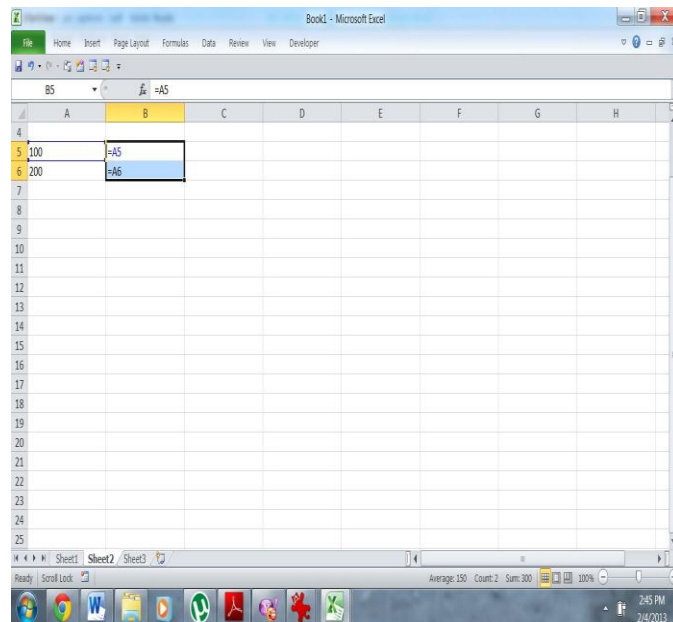


Figure 27. Formulas

For references remain unchanged by copying formulas. Absolute references are used by inserting the character “\$” in front references that we will not change. If the mean absolute cell A5, above formulas becomes: “=\$A\$5”.

LABELS AND NAMES IN FORMULAS

Often we have labels worksheets at the end of each column and the left of each live to describe the data in the spreadsheet. These tags can be used in formulas to reference the data from these columns or rows. Also, you can create descriptive names, different labels to represent cells, range of cells, formula or constant.

When writing a formula that refers to data in a worksheet can use the labels to represent cells, range of cells, formula or constant.

When writing a formula that refers to data in a worksheet can use the labels of columns and lines. For example, if a table contains quantities sold in a column labeled “Sales” and a line labeled “Computer”, we can determine how many computers were sold “with formula”= “Computer Sales”. The space between the labels is intersection operator, which specifies that the formula will return the value of the cell at the intersection line labeled “Computer” in a column labeled “Sales”.

If the data are not labeled or if you want to use the information in a spreadsheet and other spreadsheets in the same file work, you can use the name that describes the cell or range of cells.

These names are set as follows: first select the cells you want and enter the desired name in the Name Box on the left side of the bar with formulas.

For example, the formula “=SUM(First Quarter Sales)” is easier to understand than “=SUM(Sales!C20:C30)”, hence the name “First Quarter Sales” is given a range of cells (C20:C30).

Assigned names will be available in either a spreadsheet file. Note: By default, the name used absolute references.

REFERENCE 3-D

To analyze data from the same cell or range of cells from many spreadsheets of a file using 3-D references. A 3-D reference implies reference cell or series of cells preceded by exclamation mark (!) followed by worksheet name.

For example, the formula “=SUM(Sheet 2:Sheet 13!B5)” will gather values in cells B5 in all worksheets from the second to the 13th.

CELL VALIDATION

In Microsoft Excel it is possible to restrict the values that can be entered into cells in a spreadsheet. This is done using Validation Option in Data Menu.

Phases of restrictions:

1. Select the cell.
2. Choose Settings from the Menu Option Data->Validation;
3. From allow dialog box, choose the desired data type and ENTER the lower and upper limits for values;
4. To display the Error Message Explanatory or choose options Input Message and Error Alert;

TYPES OF RESTRICTIONS

Option dialog Box Data->Validation. Change depending on what was selected in the dialog box Allow and Data. In the following table it describes and explained the types of restrictions:

TABLE X. TYPES OF RESTRICTIONS

Type	Describe and options
Any Value	No restriction. It is used to display a message without checking its validity.
Custom	Allows use of formulas or expressions to determine values.
Date	Specific the necessity of introduction a date
List	Allows to user to specify a list of valid values
Time	Input Data must be of type long
Whole Numbers	Data must be integers

CALCULATIONS AND FORMULAS

CALCULATIONS USING FORMULAS

A formula is an equation with which to operate on data in a worksheet. Thus, you can make additions, multiplications, comparisons between values from different worksheets, also can combine different values.

Formulas can work with cells in the same spreadsheet, different worksheet cells, but the same file work or different work cells files.

Always Microsoft Excel formulas begin with the character “=” followed by various on the desired cell (+, -, *, /). In the table below are some examples of using the various types of formulas.

TABLE XI. TYPES OF FORMULAS

Types of Formulas	Result
Simple Formulas	
=128+345	Add numbers 128 and 345
=5^2	Picks 5 to the power 2
Formulas that contains references or name	
=C2	Take the value from the cell C2
=Sheet2!B2	Take the value from cell B2 from the spreadsheet Sheet2
=Gross Returns-Tax	Decrease a cell named Tax from a cell called Income Tax
Formulas that contain functions	
=SUM(A:A)	Adds the values in column A
=AVERAGE(A1:B4)	Calculates the average from the values in the field

The article “Nonstandard operator precedence in Excel” by Roger L. Berger tells that “Microsoft’s Excel spreadsheet program implements an unusual operator precedence in formulas. This can cause errors in statistical calculations, if it is not properly followed. For example, some errors by Excel in nonlinear regression reported by McCullough and Wilson(2002). On the accuracy of statistical procedures in Microsoft Excel 2000 and Excel XP. Comput. Statist. Data Anal. 40, 713-721) were probably due to programming by the users that did not follow the unusual operator precedence rules. In this note the operator precedence in Excel is explained, the previous nonlinear regression results are corrected, and a simple example of maximum likelihood estimation is given”. [1]

X. USING FUNCTIONS

Functions are predefined formulas that perform calculations on values, called arguments, in a certain order, called SINTAX. For example, the SUM function adds value or range of cells, and PMT function calculates rates of loans by interest rate, loan term and the amount borrowed.

Arguments can be numbers, text, logical values (true or false), massive error values (#N/A) or cell references. They can be also constants, formulas, or other functions. The syntax of a function begins with the function name followed by the arguments list, which are between parentheses and separated by commas.

Available functions are grouped into several categories, including:

1. Functions or type date and time;
2. Financial functions;
3. Logic functions;
4. Mathematical and trigonometric functions;
5. Statistical functions;
6. Database functions;
7. External functions;
8. Engineering functions;
9. Information functions;
10. User-defined functions;

In conclusions of “Nonstandard operator precedence in Excel” are presented the following ideas “Microsoft’s Excel spreadsheet program implements an unusual order of operator precedence. Unary negation has a higher order of precedence than any other arithmetic operation. Care must be taken when using formulas in Excel to ensure their correct calculations, given this operator precedence. This can be easily achieved by the liberal use of parentheses to ensure that the correct order of evaluations is clearly spelled out. In some previously reported tests of Excel’s Solver tool on nonlinear least squares regression problems, it appears that formulas may have been entered incorrectly given Excel’s operator precedence. When the formulas defining the regression model are correctly entered, Excel’s Solver gives reasonable estimates.

However, Excel’s performance is not improved by considering operator precedence in many other nonlinear least squares regression problems nor in other types of problems. So, despite some improvements reported in this paper, Excel still cannot be recommended as a general purpose statistical package. Excel’s usage should still be limited to simple pedagogical examples.” [1]

FUNCTIONS OF TYPE DATE AND TIME

Functions of type and time (Date and Time) manipulates and operate calculation of numeric values representing dates and times;

1. NOW()-returns a decimal number meaningfully representing the current date time;
2. TODAY()-returns a number representing the current date;

3. DATEVALUE(“string”)-calculates the number corresponding to the string-date calendar date format(string should be enclosed in double quotes);
4. DATE(year, month, day)-calculated number „corresponding to the string-date calendar date format(string should be enclosed in double quotes);
5. YEAR(number, date)-returns the year corresponding to the date, a number between 0 (1900) and 199 (2099);
6. MONTH(number, date)-extracts month from a total-date in the form of values between 1 and 12;
7. DAY(total-time)-generates a corresponding number of day with values between 1 and 31;
8. WEEKDAY(x)-returns the number of the day of the week corresponding argument x, which can be a number text date or a calendar date format;
9. DA0YS360(start date, end date)-calculates the number of days between two days considering year as having 360 days;
10. TIME(hour, minute, second)-calculates a total for the corresponding hour, minutes and seconds;
11. TIMEVALUE(“string”)-returns the number corresponding to the string-time format specified in date/time(in quotation marks)
12. HOUR(NUMBER-TIME)-extracts the hour from a number-time(0.000000 for hour 24:00:00 and 9,99988426 for hour 23:55:39) as a number between 0 and 23;
13. MINUTES(total-time) minute extracts the minute from a number time, as an integer between 0 and 59;
14. SECOND(number, time)-extracts the second from a number time as an integer between 0 and 59;

FUNCTIONS OF TYPE DATE AND TIME

	A	B	C	D	E	F	G	H	I	J
1										
2										
3	2/6/2013 15:09		NOW()							
4	2/6/2013		TODAY()							
5	6/27/1998		DATE(98;6;27)							
6	2013		YEAR(TODAY())							
7	27		DAY(DATE(98;6;27))							
8	2:35 PM		TIME(14;35;0)							
9	0.607638889		TIMEVALUE(“2:35 PM”)							
10	14		HOUR(TIME(14;35;0))							
11	9		MINUTE(NOW())							
12	4		SECOND(TIMEVALUE(“23:26:04”))							
13										
14										
15										
16										
17										
18										
19										

Figure 28. Date and time functions

FINANCIAL FUNCTIONS

Financial functions are used to conducting to making of calculation specific to business domain, such as determining the value of an investment or future of value of shares and bonds.

Among the most common arguments of these functions may be specified:

1. Future value (FV)-the value of an investment or a loan after making all payments;
2. The number of periods(NPER)- the total number of installments or for an investment period;
3. Sum payment (PMT)-the amount of money paid periodically for an investment or a loan;
4. The present value (PV)-the value of an investment or a loan value earlier period; for example the present value of a loan is the amount of money that is borrowed;
5. Rate(RATE)-the interest rate for a loan of an investment;
6. Type(TYPE)-the interval in which payments are made within the payment period(beginning and end);

LOGIC FUNCTIONS (AND, IF, OR)

Logic functions are used to test the truth value of one or more conditions. For example, using the functions IF a certain value is returned IF it meets CONDITION and another for value false conditions:

1. Function AND(argument1, argumnet2,...) returns true if all arguments are true; returns false if one or more arguments are false;

The function can have up to 30 arguments, true or false.

NOTES: Be expressed by-arguments logical values;

-if references an argument contains text or is blank, then that argument will be ignored;

-if there is expressed in series logical values, and function returns the #value!

Examples:

1. AND(TRUE, TRUE)-returns TRUE;
2. AND(TRUE, FALSE)-returns FALSE;
3. AND(2+2=4, 2+3=5)-returns TRUE;
4. IF the cells B1:B3 contains the values TRUE, FALSE and TRUE AND(B1:B3) returns FALSE;
5. If the cells B1:B3 contain the values TRUE, FALSE and TRUE AND(B1:B3) returns FALSE;
6. In B4 assuming there is a number and that number IF WANT display is between 1 and 100 ERROR MESSAGE OR OTHERWISE.
7. IF B4 contains the number 104, then:
 - a). IF(AND(A<B4, B4<100),104,"THE VALUE EXCEEDED") returns the value exceeded;
 - b). IF contains 50, then IF(AND(1<B4, B4<100), B4, "VALUE EXCEEDED") returns 50.
2. Function IF(CONDITION, VALUE_IF_TRUE, VALUE_IF_FALSE)-returns a value IF specified

condition is evaluated as TRUE, and another when judged as FALSE;

-CONDITION is any value of expression can be evaluated logic if;

-VALUE_IF_TRUE is the value that will be returned if the conditions met, if the condition is true and the value VALUE_IF_TRUE is omitted, it returns true. VALUE_IF_TRUE can be and a certain formula.

-VALUE_IF_FALSE is returned in case of failure conditions. If the condition is false and VALUE_IF_FALSE is omitted, it returns FALSE. VALUE_IF_FALSE may also be another formula.

NOTES:

-can nest up to IF FUNCTION;

-when evaluating VALUE_IF_TRUE and VALUE_IF_FALSE, IF returns the value returned by this argument;

-IF ANY of the arguments are MASSIVE if function, each element of the massive evaluates to if function execution. If some arguments are functions, they will be executed individually;

Example:

Assume the following test: IF the value of cell A10 is 100, the condition it is true and calculate the total for the series B5:B15. Otherwise, the condition is false and the cell that contains the function if nothing is written.

IF(A10=100, SUM(B5:B15), "")

3. Function OR(ARGUMENT1, ARGUMENT2, ...) returns true if any of the arguments is true, return false if all arguments are false; The function can have up to 30 arguments.

1. OR(TRUE)->returns TRUE;
2. OR(1+1=1, 2+2=5) returns TRUE;
3. IF A1:A3 contain the value TRUE, FALSE and TRUE, THEN OR(A1:A3) returns TRUE;

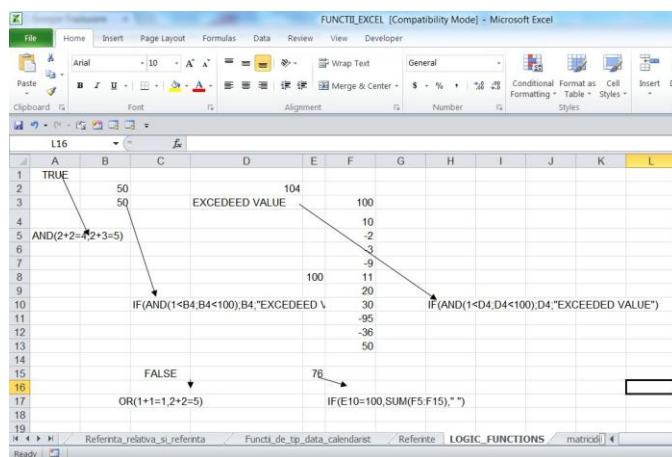


Figure 29.Mathematical and trigonometric functions

The mathematical and trigonometric functions (math & trig) to allow carrying out various calculations, from the simplest to the most complex, for applications that require solving mathematical tools and trigonometric current use. Category and

the mathematical functions are related to matrix computations. The main functions related to the calculation of matrix determinant calculation are related, matrix inverse and product of two and a transposed matrix.

1. FUNCTION MDETERM (MATRIX), this function returns the determinant of a matrix. Matrix is numeric and must have the number of rows equal to the number of columns. It can be given as a range of cells, for example A1: C3 as an array constant, such as {1,2,1 | 4,2,1 | 1,1,2}, or as a given name each.

If any cells in array are empty or contain text, MDETERM returns the # VALUE!;

MDETERM also returns # VALUE! if the matrix has the same number of rows and columns.

Remarks:

1.The determinant is a number derived from the values array. For a matrix with three rows and three columns, A1: C3, the determinant is defined as:

$$\begin{aligned} \text{MDETERM}(A1:C3) = & A1*(B2*C3-B3*C2) + \\ & A2*(B3*C1-B1*C3) + \\ & A3*(B1*C2-B2*C1) \end{aligned} \quad (51)$$

Determinants are generally used for solving systems of mathematical equations that include more variables.

Examples:

1.

$$\begin{aligned} \text{MDETERM}(\{1;3;8;5 | 1;3;6;1 | \\ 1;1;1;0 | 7;3;10;2\}) = 88 \end{aligned} \quad (52)$$

2.

$$\text{MDETERM}(\{1;3;8;5 | 1;3;6;1\}) = \#VALUE! \quad (53)$$

-because the matrix hasn't the number of rows equal with the number of columns;

2. FUNCTION MINVERSE (MATRIX) –returns for matrix the inverse matrix stored in a massive data. The matrix must be a matrix numbers with an equal number of rows and columns.

-The matrix can be given as a cell range such as A1:C3 as an array constant, such as {1;2;3|4;5;6|7;8;9} or a name for each of these;

-If any cells in array are empty or contain text, MINVERSE returns the #VALUE!

-MINVERSE also returns the #VALUE! If the matrix is not equal with to the number of rows of columns.

OBSERVATIONS:

1. Formulas that returns matrix must be introduced as matrix formulas;

2. The reverse matrix as determinants are geo 1 and generally used for solving systems of mathematical equations with multiple variables.

3. The inverse matrices, like determinants, are generally used for solving systems of mathematical equations with multiple variables. The product of a matrix and its inverse is the matrix square where unit-diagonal elements are equal to 1 and cell other elements are 0.

Like how the calculation is made for proper matrix with two rows and two columns, we assume that the range A1:B2 contains the letters a, b, c, d, which represents any four numbers. The following table presents the calculation of the elements of the inverse matrix A1:B2.

TABLE XII. MATRIX

	Column A	Column B
Row 1	$d / (a * d - b * c)$	$b / (b * c - a * d)$
Row 2	$c / (b * c - a * d)$	$a / (a * d - b * c)$

MINVERSE is calculated with a precision of about 16 decimal places, which can lead to a very small numerical error if the rounding is done.

Some square matrices cannot be inverted and will return the #NUM! through MINVERSE function.

Noninverting determinant of a matrix is 0.

Examples:

1.

$$\text{MINVERSE}(\{4;-1 | 2;0\}) \text{ equal } \{0;0,5 | -1;2\} \quad (54)$$

2.

$$\begin{aligned} \text{MINVERSE}(\{1;2;1 | 3;4;-1 | 0;2;0\}) \text{ equal} \\ \{0,25;0,25;-0,75 | 0;0;0,5 | 0,75;-0,25;-0,25\} \end{aligned} \quad (55)$$

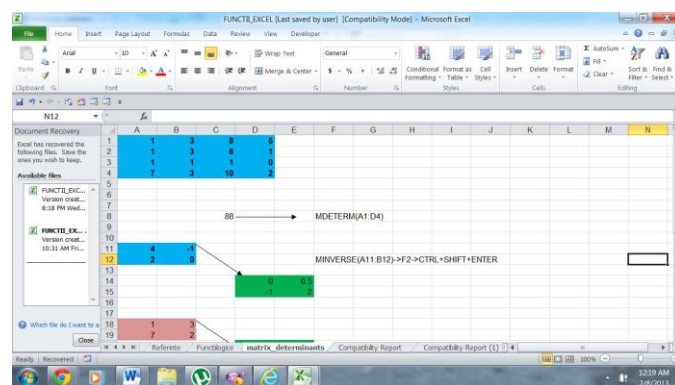


Figure 30. Minverse

1. FUNCTION MMULT(ARRAY 1; ARRAY 2)

- It returns matrix product of two arrays. The result is a matrix with number of rows with the same number of rows from matrix1 equals with the number of columns that has the matrix 2.
- ARRAY 1; ARRAY 2-are matrices to be multiplied. The number of columns from MATRIX1 must be equal to the number of rows from MATRIX2 and both array must only contain numbers.
- ARRAY1 and ARRAY2 can be given as areas of cells, constants, array or reference.
- Remarks: The matrix resulted from multiplication of matrix B and C is:

$$a_{ij} = \sum b_{ik} * c_{ik} \quad (56)$$

- where i -represents the number of rows;
- and j -represents the number of columns;
- The formulas that return arrays must be entered as matrix formulas.

$$\text{MMULT}(\{1;3|7;2\} ; \{2;0|0;2\}) \\ \text{equals} \{2;6|14;4\} \quad (57)$$

$$\text{MMULT}(\{3;0|2;0\} ; \{2;0|0;2\}) \\ \text{equals} \{6;0|4;0\} \quad (58)$$

$$\text{MMULT}(\{1;3;0|7;2;0|1;0;0\}; \\ \{2;0|0;2\}) \text{ EQUALS} \\ \# \text{VALUE!} \quad (59)$$

- because the first matrix has 3 columns and the second matrix has only two lines.

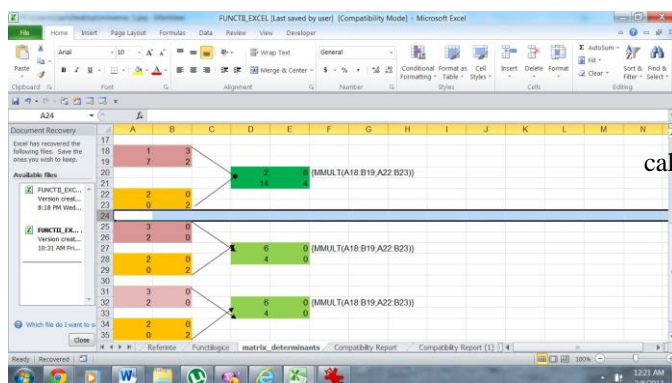


Figure 31. Mmult

2. OTHER COMMON MATHEMATICAL FUNCTIONS

FUNCTION SUM(LIST) –collects the values from a list specified as an argument. The list can contain certain continuous and discontinuous fields referenced by address or more fields. Select the set of cells to sum, including the area where they post the results of summation then is the sum.

1. FUNCTION PRODUCT(LIST)-multiply the values contained in a list. To calculate the value of the products we sold te unit price multiplied by quantity.
2. FUNCTION SUMPRODUCT(LIST)-multiplies corresponding values located in cells for a series of fields, and then add the results. With this feature we calculated total sales, for example the sum of products quantities (C2:C7) and prices (D2:D7).
3. FUNCTION SUMIF(FIELD ASSESSMENT; CRITERION; FIELD AMOUNTED)- collect cell contents according to given criterion.

Example: Let's calculate the amount of commissions from sales of products sold over 100000000 RON values for products in the following table. We use the SUMIF(), for which the field is evaluated values of cells(D2:D6) criterion is text, namely ">10.000.000" and the amounted filed is.

PRODUCT NAME	SOLD QUANTITY	UNIT PRICE	VALUE	COMMISSION(2%)
MICROMOTOR	120	3759654	451158480	9023169.6
ENGINE TORQUE	95	4589654	436017130	8720342.6
FUSES	90	659421	59347890	1186957.8
SPOTLIGHT	100	2156354	215635400	4312708
TACHOGENERATORS	110	1689457	185840270	3716805.4
TOTAL AMOUNT OF SALES			1347999170	23243178
FEE AMOUNT				

Figure 32.Sum and Sumif
STATISTICAL FUNCTIONS

Statistical functions (statistics) for making statistical calculations using sets of values:

1. FUNCTION MAX(LIST)-returns the largest value from the list. The list can be composed of: numbers, numerical formulas, addresses or names of field.
2. FUNCTION MIN(LIST)-returns the smallest value in the list.
3. FUNCTION AVERAGE(LIST)-calculates the arithmetic mean of the list.

4. FUNCTION MEDIAN(LIST)-calculates the median of the list.
5. FUNCTION GEOMEAN(LIST)-calculates the geometric mean of the list.

In the article “On the accuracy of statistical procedures in Microsoft Excel 2007” by B.D. McCullough and David A. Heiser “Excel 2007, like its predecessors, fails a standard set of intermediate-level accuracy tests in three areas: statistical distributions, random number generation and estimation. Additional errors in specific Excel procedures are discussed. No statistical procedure in Excel should be used until Microsoft documents that the procedure is correct; it is not safe to assume that Microsoft Excel’s statistical procedures give the correct answer. Persons who wish to conduct statistical analysis should use some other package”. [2]

In the following table using the functions described in order to calculate statistical indicators for sales activity. Value on outlets selling:

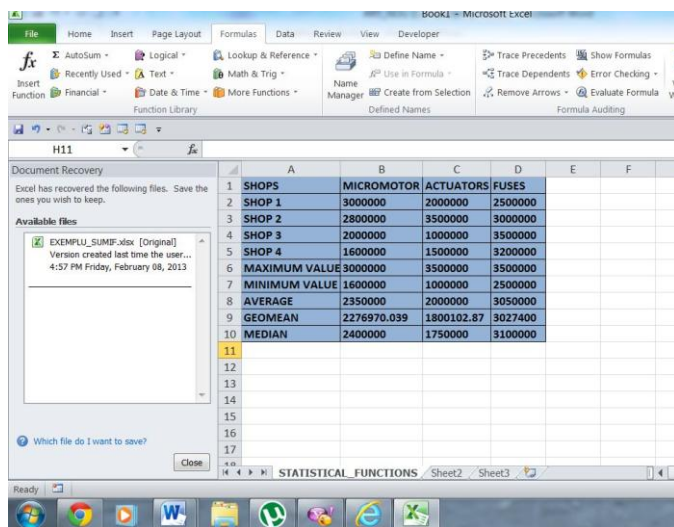


Figure 33. Statistical functions

So I applied statistical functions presented in the following figure:

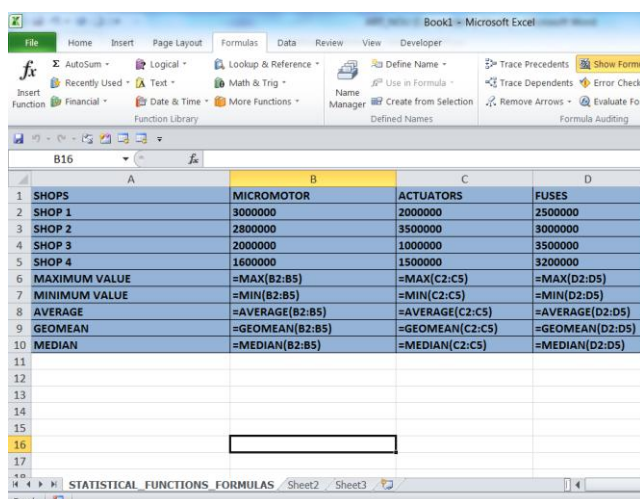


Figure 34. Statistical functions with formulas

Conclusions of article “On the accuracy of statistical procedures in Microsoft Excel 2007” by B.D. McCullough and David A. Heiser “ are “ The statistical literature has regularly identified flaws in Excel’s statistical procedures at list since Sawitzki(1994), and Microsoft has repeatedly proved itself incapable of providing reliable statistical functionality. It is little wonder that introductory texts on statistics warn students not to use Excel when the results matter (e. g. Keller(2001) and Levine et. al. (2002)). There is nothing inherently difficult about programming a spreadsheet that precludes reliable statistical programming. The open-source spreadsheet package Gnumeric was originally such a good Excel clone that it even reproduced many Excel errors. When informed that these were errors, the handful of part-time programmers who maintain least so far as consumers of statistics are concerned, is that Microsoft seems to take the approach that specialized domain knowledge is not necessary to the production of statistical code, i.e. , that the entire field of statistical computing has no merit. As but one case to illustrate this point, in KB 829215, Microsoft discusses the enhancements made to the ATP ANOVA function in Excel 2003. The KB describes pseudocode for the computations in previous versions of Excel; this pseudocode embodies an algorithm that would be implemented by no one who has read an introductory text on statistical computing, e. g. Kennedy and Gentle(1980) or Thised (1988). Microsoft then remarks, Again, for model 2 and model 3, sums of squares are calculated and a quantity is subtracted from the sum of squares as in calculator formula. Unfortunately, basic statistics text frequently suggest approaches for ANOVA such as the one that is shown earlier in this article.

The obvious implication is that Microsoft programmed its statistical functions by using statistics texts, rather than statistical computing texts. Of course, this approach to programming –eschewing specialized domain knowledge–explains much of Microsoft’s inability to program functions correctly.

The improvements in Excel 2003 gave hope that Microsoft might finally be committed to providing reliable statistical functionality in Excel. That Microsoft once again decided to allow errors to remain unfixed, or fixed incorrectly, in the Excel 2007 release dashes those hopes. Regardless of the reasons for Microsoft’s inability to program Excel correctly, Microsoft has had years to fix these errors, and has proven itself unable to do so. It is clear that when Microsoft claims to have “fixed “ a procedure that is known to be in error, Microsoft’s claim cannot be safely believed. It is also clear that there are procedures in Excel that are in error, and Microsoft either does not know of the error or does not know of the error or does not choose to warn users that the procedure is in error. Since it is generally impossible for the average user to distinguish between the accurate and inaccurate Excel functions, the only safe course for Excel users is to rely on no statistical procedure in Excel unless Microsoft provides tangible evidence of its accuracy consisting of:

1. test data with known input and output;
2. description of the algorithm sufficient to permit a third party to use the test data to reproduce Excel’s output; and;
3. a bona fide reference for the algorithm;

If Microsoft does not perform these actions for each statistical procedure in Excel, then there are only two safe

alternatives for the user who is concerned about the accuracy of his statistical results: the user can perform all these actions himself, or simply not use Excel.”[2]

In the article “On the accuracy of statistical distributions in Microsoft Excel 2003” by Leo Knusel “Some of previously indicated errors in Microsoft Excel 97 and Excel XP have been eliminated in Excel 2003. But some others have not been corrected in Excel 2003 and new ones have been found as is shown by numerical examples.”[3]

To perform complex calculations requiring multiple IF formula or existing formulas are not enough, users can define their own functions VISUAL BASIC EDITOR USING proceed as follows:

1. Choose order TOOLS->MACRO->VISUAL BASIC EDITOR then INSERT->MODULE. In the workbook activity is insert a piece whose default name is MODULE. It is a worksheet VISUAL BASIC spreadsheets and varies both by structure and by commands from the menu bar.

7.Slides nurse-use program to make a visual presentation on the computer screen;Graphs are more appealing than numbers. Making graphs is easy because there is a type facilitated Wizard in Excel which fulfills this. Simply enter text and you are ready for a presentation on your computer suggestive.

SELECTING DATA FROM ACHIEVING GRAPHICS

The facility ChartWizard in Excel, transpose data from a spreadsheet into a graph is reduced to making clicks. Competency test for you is selecting data. You must understand and correctly formulate the message content translated into graphic data. Noted that despite the large amount of information embedded ChartWizard Facility is unable to determine which of the data in the spreadsheet will be significant in a graph. This is where your solution. Usually, entering all data in a single chart will cause confusion among those who will see it as it may contain too much information.

Instead, you have to select several rows or columns that contain significant milestones, report basic and fundamental relationships.

Called the data series or data set a row or a column containing numbers required to realize a graph. Purpose of tracing a graph using data sets consists usually in out of a particular developments or trends data, such as sales growth and increased market value of the shares.

In the jargon of statisticians, it is to achieve a schedule for data reduction. In other words, a well-designed graphic will synthesize visual data.

In order to reduce the idea, here's a simple suggestion for those who made graphic: Graphic conceive as simple!

Simplicity can be achieved by a graph represents to a businessman, a powerful tool. In presenting a business goal is to convince its profitability. If you are unsure of the outcome, better postpone is to convince its profitability. If you are unsure of the outcome, better postpone the presentation. The idea should be to guide you is to use graphs to illustrate your findings to apply for a initiating a debate. So if you choose the spreadsheet that data will illustrate most clearly conclusions can leave ChartWizard can facilitates to portray them as attractive.

Plotting a graph with facility ChartWizard. Here is an overview of the process of creating a chart in Excel:

1. Select your spreadsheet for presentation to which you wish to draw the graph. Include columns or rows that contain numeric values as those titles and text columns or rows.’

1.Click the button ChartWizard which is found in the Standard Toolbar (above).

2.The pointer will turn into a fine result. Mark rectangular area that will contain the chart.

3.ChartWizard will present different options in a series of dialog boxes. Answer questions from Wizard (usually this is done clicking on a thumbnail sketch of the desired options). After the selection in each dialog box, click the NEXT button. To create a default schedule, click the FINISH button in the dialog box and skip these steps Step1.

4. After the selections last dialog box, click Finish.

In Excel you can create charts and graphs for visual display of data. Although many types of charts can be created by small

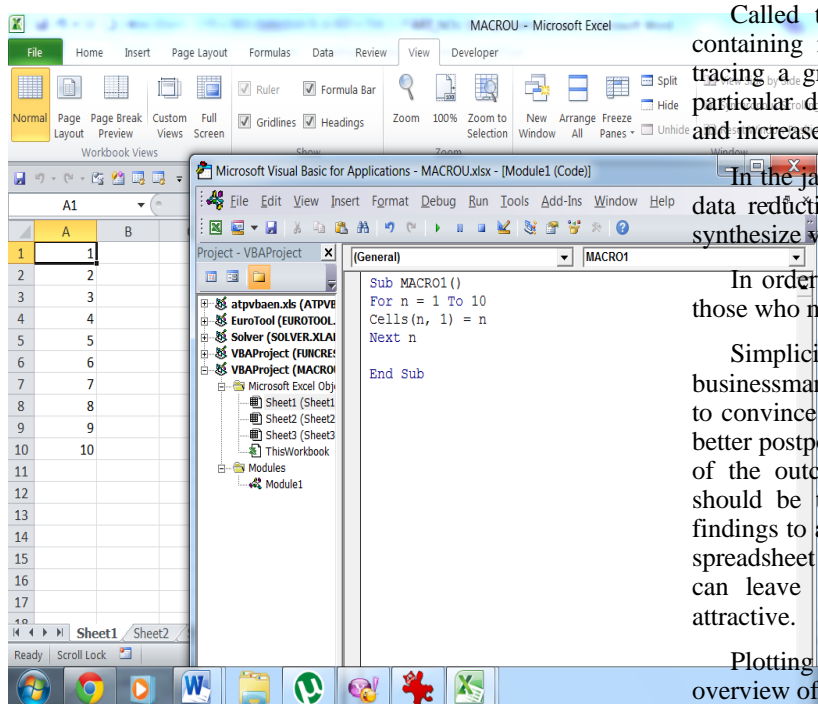


Figure 35. MACRO 1

XI. CREATING GRAPHS, DRAWING AND SUGGESTIVE PRESENTATIONS

By creating graphs, drawings and presentations suggestive we can achieve the following goals:

1. ChartWizard use facility to plot the data in a spreadsheet;
2. Edit and Change the appearance of graphs;
3. Understanding of related references for the data series;
4. Auto-Formats-Application facility to achieve Charts;
5. Creating a new default chart;
- 6.Use drawing tools;

data sets, diagrams are especially useful for presenting and summarizing large amounts of data.

A diagram is a floating object. Thus, you can move anywhere you want in the worksheet or change its size by dragging a corner. It can customize almost any part of a chart, such as title, axis, labels, legend, of the chart background.

You may also choose and which optional elements are displayed and which are hidden, such as data labels, grids, even the data itself.

Finally if you are not satisfied with the current style of the chart have all the freedom to replace it with another version or a completely different charts.

Excel chart tools are used for creating graphics in Power Point and Word. Graphs in Word or Power Point documents can be integrated (stable objects that are not related to the data in the worksheet) or related (items that are related to data and automatically reflect changes made to them).

ELEMENTS OF THE DIAGRAM

A diagram elements can be added or removed easily can move new positions. Charts can be resized, it can alter the shape and format. (It can also accept default formatting and used items present in a newly created chart, but it might not happen two often that). Because you spend so much time working on the diagram elements it is important for you to identify each item. Note that many items listed are optional.

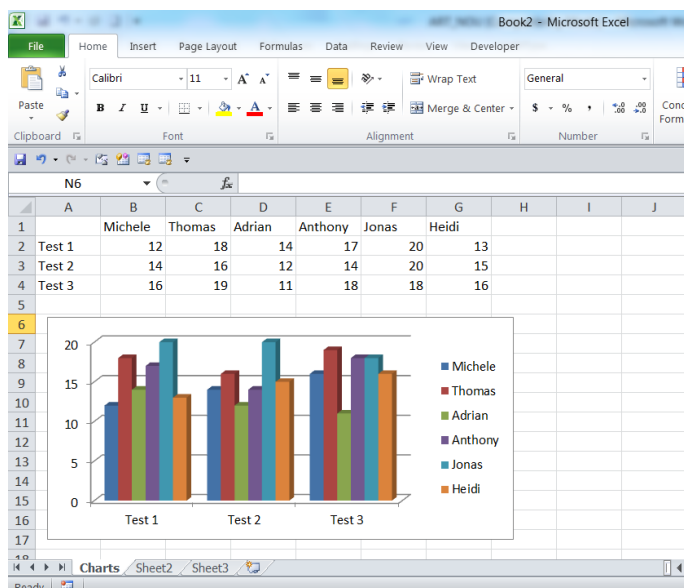


Figure 36. Diagram
CREATE A CHART

In many cases creating a diagram is a simple, selecting data labels and worksheet, and then choose a type of diagram. Chart data can be arranged in rows or columns. However, for certain types of diagrams, columns and rows must be in a certain order.

1.If necessary, rearrange the data to match the demands diagram. For example, to create a stock chart, your data must have order, High, Low, Close. For other requests of the Chart, see Create a Chart in Excel Help.

2.Optional: Arrange the data to ensure that it will appear in the desired order when placed in the diagram.

3.On the worksheet, select labels and data to be created chart. Note that labels and data should not be related.

4.On the Insert tab, choose a chart type from the Charts Menu Group symbol. The new chart will appear on the worksheet.

Advices: If you choose the making area of the chart, labels and data used to create the chart are highlighted on the worksheet. You can also SELECT data by switching the DESIGN TAB by clicking on the icon and select the data from the group date.

To change the type or style of the chart, select the chart, click the Design TAB and then Change Chart Type Group.

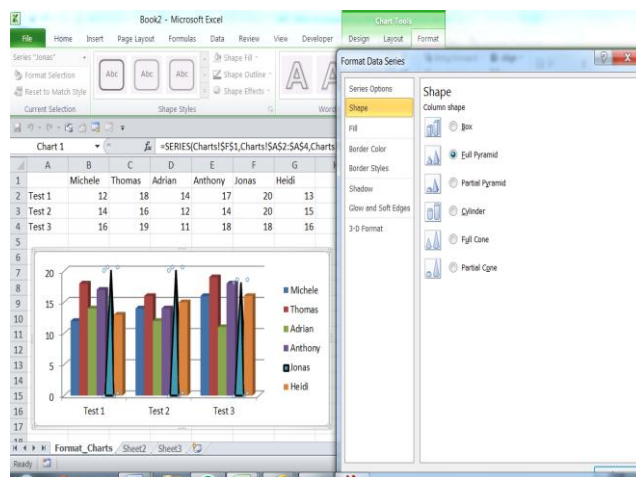


Figure 37. Format Chart

In the article “Polynomial Trendline function flaws in Microsoft Excel” by Bruce Hargreaves and Thomas McWilliams “Numerous statistical and graphical problems have been reported for different versions of Microsoft Excel, including the newest version(Excel 2007). We report newly discovered problems with Excel 2007 when generating polynomial trend line equations, having a user specified (forced) intercept, from graphed data. We also remind users of Excel’s Trendline function of problems with Excel 2003that have not been corrected in Excel 2007. Excel will “fit” nonsense trend lines to data presented on column and line charts, and can report an inadequate number of significant digits for polynomial trend lines. We provide suggestions for avoiding these continuing problems, but are unable to identify an Excel 2007 workaround solution for the forced-intercept polynomial trend lines errors.” [4]

ADDING AND FORMATTING TEXT

Although primarily visual in nature, charts can contain a significant amount of text. Text can be included in a diagram contains the title, legend, scale divisions labels, axis labels data labels and text boxes.

To add text to a diagram:

1. Select chart.
2. Select one of the following options:

Adding a chart title. Switch to the Layout tab, click Chart Title (title diagram), the group labels and choose an option from the top-down menu.

Adding an axis title. Switch to the Layout Tab, click Axis Titles in the Labels Group and choose an option from the submenu Horizontal Axis Title (Horizontal or vertical axis Title).

Labeling data-switch to the Layout Tab, click the Data Table, the group Labels and Choose show from the MENU appearing. Labeling options vary depending on the chart type.

Data display chart-Switch to the Layout tab, click the Data Table Labels group and choose Show from the menu appearing.

Through these chart data will be displayed in a grid in the drawing area.

Adding another text Switch to the Layout tab, click Axis Titles in the Labels group and choose an option from the submenu Horizontal Axis Title (horizontal or vertical axis Title) or vertical Axis Title (vertical axis title).

Labeling title-switch to Layout Tab, click the Data Table, the group Labels and Choose Show from the menu appearing. Labeling options vary depending on the chart type.

Data display Switch to the Layout Tab, click the Data Table Labels group and choose Show from the menu appearing. Through these chart data will be displayed in a grid in the drawing area.

Adding another text. Switch to the Layout tab and click the Text Box from the Insert group. Click and drag to create a text box in the diagram and then write or add text in the text box.

TO FORMAT THE TEXT DIAGRAM

1. Select the text object, such as title, legend, axis labels, axis labels vertical or horizontal data. (Select an object you want to apply the same formatting to the entire text of the object). In the text object, select specific text to be formatted. (Only certain items of chart permit, such as title, axis label or text box).

1. Do one of the following:

-home tab, choose the formatting options in the Font group;

-right-click on the selected object or text, choose FONT instant menu, select FORMAT FONT dialog box and click OK;

-the selected text, move the cursor up and choose formatting options minibar instruments;

-format tab, choose WordArt Style Group Advice;

To remove must objects, select it and press Del. You can switch to the Layout tab, click the appropriate icon and choose None Labels group;

ROWS VERSUS COLUMNS:

Regardless of how the data is organized in the worksheet, you can order the rows and columns. In many types of diagrams, layout data in the both forms can offer a new perspective on them.

Switching between rows and columns;

1. Select chart;
2. Design tab, click the icon Switch Row/Column, the group data;

Diagram is replaced to reflect the changes.

CHANGE THE DISPLAY AND STYLE

One of the easiest ways to change a chart is to provide a new presentation or style. Displaying refers to items that appear on the diagram and their position. Style is color chart elements, including data objects, backgrounds and background areas surrounding plotting. To specify a new view:

1. Selecting a table.
2. Design tab, click a symbol of gallery Chart Layouts group. Diagram is modified to match the new display.
3. If the diagram previously undefined text elements appear (such as title or axis title), delete them or replace them text.

To change the Chart Style:

1. Select chart.
2. Design tab, select a new style from the Chart Styles group gallery.

Diagram is modified to fit her style.

Advice:

If you have already added an item (such as a chart title), but have chosen a display without that element is not deleted. If you later choose a display type that includes the item, it will reappear.

Choosing a new style diagram is a destructive process. Items you have formatted like certain colors or background grids are replaced with characteristic style.

DISPLAY DATA SET:

If a chart is based on a small set data may be information to present the data table in the diagram.

To display data in chart:

1. Select chart.
2. Fact one: On the Layout tab, select the data display, the group data. Design tab, select a display mode from the Chart Layouts group that includes data table.

Data table is positioned in the diagram.

Advice:

USING GRIDS

Easier to estimate the size of data points, you can display vertical lines and / or horizontal, called grids, multiple chart types.

You can modify grids by removing their scales in order to display large, small or both types for any of the axes and specify a color and a new type grids lines.

ADDING, REMOVING OR CHANGING SCHEDULES:

1. Select the table.
2. Layout tab, click Gridlines symbol (grid) Axes group and choose one of these options, the submenus Primary Horizontal Gridlines, Primary Vertical Gridlines or Depth None.

Eliminate all grid lines of the selected type. Broadly grid. Displaying data on a large divisions chosen axis,

such as 1-5 or set of numbers divided by 5, 10 or 25 (depending on the size and scope of data).

Small grid lines:

Displaying large scale subdivisions of the lines (whether large grid lines are visible or not).

Grid lines large and small:

Display both the grid lines large and small for the chosen axis.

More primary options for grid lines:

Open the Format dialog box, where you can set the line color, style or shade. Select the new setting and click Close. The option chosen is applied to the chart.

Advices:

Depth Gridlines submenu (deep lines) appears only when the selected recipes dimensional diagram.

Lines can be deleted by right clicking on them and selecting Delete from the menu appearing

USING LEGEND:

If you select a row or a column label to create a chart, it is added, most times, a legend. You can add or remove legend, to clarify its position according to the diagram, let's change the properties (such as fill color and border style) and edit tags.

FOR ADDING, REMOVING OR CHANGING CAPTIONS:

1.Select chart.

2.Choose one of the following:

To add, delete or change the position of a legend, click the Layout tab and choose an option from the Legend Labels group.To manually change the size or position of the legend, drag an edge or center.

To format a legend, right-click it, choose Format Legend (formatting legend) appeared menu and make the desired changes in the Format Legend dialog box.

To change the characteristics of a data series only, select that item from the legend, right-click it, choose Format Data Series or Format Legend Entry and make the desired changes in the related dialog boxes.

To change the text used for data entered into legend, make edits in the cells you have used that tag.

ADVICE:

You do not have to immediately close the Format dialog box. To format an element of the chart, select the item in the diagram. Formats dialog box to modify the selected item.

ESTIMATION ADD A LINE

If data is added over time, you can add a line diagram (called estimation) to encompass data and predict future values. Depending on the dataset, different lines may corresponds better data estimates.

TO ADD ESTIMATED LINES:

Select chart.

2. Layout tab click on the symbol Trendline, Analysis group and choose an option from the drop-down menu. If the chart contains multiple data series, you will see a dialog box Add Trendline (add line estimated). Select a range of data to be applied on line and click OK. Estimated line will appear on the diagram.

3. Optional.

To change characteristics or model of a line, select it by pressing on one of the ends. Open the Format Trendline dialog box by one of the following methods:

-Right click and choose Format Trendline estimated line.

-Select More Options from the menu Trendline Trendline place. Make the desired changes and click Close. The new changes will be seen in the diagram.

ADVICES:

Adding lines estimate is cumulative, i.e. you can draw multiple lines on the same chart.

To remove all lines in the diagram prediction, choose None (none), Trendline menu. To remove a line (when multiple lines are displayed), select the line in the diagram prediction and press Del.

Discover the rest of the options in the Analysis group:

-Lines: display high-low markers (useful used for stock charts) and / or drop lines that extend to the X axis of each data point.

Error-bars: Frame with bar each data point representing a confidence interval based on a fixed amount, percentage, standard deviation, standard error, or a custom formula.

In the summary and conclusions of article “Polynomial Trendline function flaws in Microsoft Excel” by Bruce R. Hargreaves, Thomas P. McWilliams are presented “a variety of problems with Excel’s Trendline function. When working with scatterplots and fitting forced-intercept polynomial trend lines of degree three to six, the primary problem is that the displayed equation is invariably incorrect. Other problems include missing terms in the displayed equation and erratic behavior when changing the order of the polynomial or when closing and re-opening the Excel file. For scatterplot Trendline

function fits, regardless of whether the value of the intercept is fixed, the equation may be displayed with an insufficient number of significant digits. We also show that the use of Trendline function when working with column or line charts yields results that are clearly meaningless or possibly results that appear meaningful but are in fact incorrect. Consistent with the results reported by McCullough et al. (2008) , it is apparent that Microsoft's tradition of providing customers with software that is clearly flawed continues with Excel 2007. Postscript

During the second review cycle of this article, a referee was unable to replicate the problems we observed with the forced-intercept polynomial regression fits. We investigated and learned that the installation of The 2007 Microsoft Office Suite Service Pack 2(SP2), which was originally published by Microsoft on April 24, 2009, corrects the problems associated with the highest order regression coefficient. The R^2 calculation inconsistency between the Trendline function and other Excel regression-based functions is still present.

Microsoft is hardly forthcoming with the information that the forced-intercept Trendline function yielded incorrect results prior to installation of the service pack, and that this problem has been corrected. An overview of "improvements", which is apparently a Microsoft pseudonym for "corrected bugs", contained in the service pack was obtained at <http://support.microsoft.com/kb/953195> and contains no reference to the Trendline function. In a more detailed list of improvements or corrections, which can be downloaded from that website, the trendline-related problems addressed by the service pack are described as "For charts with a trendline that has specific data, the first argument of the trendline is sometimes calculated incorrectly" and "For charts with polynomial trendlines, the first coefficient of the polynomial trendline equation is not being considered." These too-brief descriptions of the problems give no information to a user of the Trendline function regarding what results that may have been generated in the past can be relied upon, versus what results were incorrect and should be recalculated.

The Microsoft list includes 256 other Excel problems that have ostensibly been corrected by this service pack. Examples include:

The Moving Average Trendlines are not being drawn correctly for charts when they are based on data that contains #N/A or blank values.

In Excel, elbow or curved connectors can be printed as a straight line.

In certain workbooks, formulas would not recalculate despite the workbook being in automatic calculation mode.

Bar and Column charts that have some very small positive values relative to other values may appear as very small negative values.

This all serves to underscore the concerns raised by McCullough (2000) regarding commercial computational software in general, and by Yalta and Jenal (2008) regarding XLSTAT, a set of non-Microsoft commercial add-in programs for Excel that commercial regarding Microsoft's apparent lack of commitment to quality assurance in business software: "It is difficult not to think that if Microsoft's apparent lack of commitment to quality assurance in business software:" It is difficult not to think that if Microsoft tested business software the way it tested game software, then the statistical functions

in Excel would be as accurate as those found in any other major software package." We can only speculate regarding how many undetected or detected but unfixed errors remain in Excel 2007, or how many new errors have been created by Microsoft Office Suite Service Pack 2." [4]

MODIFICATION AXES:

Most charts have a horizontal axis (x) and vertical (Y). You can change any of these to change the label or format.

TO CHANGE THE AXES:

1. Select chart.

2. Select one:

To remove an axis, Y axis positive stability or precision digital units to be used for X axis, click the Layout tab and select a menu option held Axes (Axis) Axes group.

If you want to change the formatting for axis, right-click the chart axis label and select Format Axis option or More (axis name) Axis Options (several options for axis).

Make the desired changes in the Format Axis dialog box and click Close.

To change an axis label, edit the label text in the box to the worksheet. You can also change the label in the Select Data Source dialog box (select data source). Click on the Design tab and click the Select Data icon (select dates) group Data.

CHANGING CHART DATA

Even if you have created a chart and format it carefully, just as you sometimes can cause problems. You can change the data that is based diagram! A column or row in the data source requires deletion, data from one or more cells to be modified or want to add additional rows or columns.

To change the data in the chart:

1. Select chart.

2. Select an option below:

If you edit the data in the cells is based on the chart, it automatically renews to play the edited data.

Deleting rows or columns

If you delete rows or columns within the zone used to create the chart, the data is automatically removed from the chart.

ADDING ROWS OR NEW COLUMNS:

Adding new columns, rows or even in the area of chart-original data will not trigger a renewal of diagram. For adding new data in the chart, switch to the Design tab and click the Select Data icon in the group data. It will appear Select Data Source dialog box (select data source). Edit or areas in the dialog box select areas new worksheet. Click OK to close the dialog box.

To change the formatting for axis, right-click the chart axis label and select Format Axis option or More (axis name) Axis Options (several options for axis).

Make the desired changes in the Format Axis dialog box and click Close.

To change an axis label, edit the label text in the box to the worksheet. You can also change the label in the Select Data Source dialog box (select data source). Click on the Design tab and click the Select Date icon (select dates) group Data.

XII. OTHER FEATURES OFFERED BY MICROSOFT EXCEL

1. GROUP DATA BY GENERATING TOTALS:

In Excel is possible by organizing and synthesizing information on levels of grouping them, then you can operate various calculations on these levels or centralized information such as totals and subtotals generation.

To group data that need to be aggregated is necessary sorting headings. Sorting is done using other features offered by Microsoft Excel:

1. GROUP DATA BY GENERATING TOTALS

In Excel is possible by organizing and synthesizing information on levels of grouping them, then you can operate various calculations on these levels or centralized information such as totals and subtotals generation.

To group data that need to be aggregated is necessary sorting grouping headings. Sorting is done using the SORT command from the Data menu. In the dialog box specifies offered keys to sort by SORT BY option (Then By) and sort order: ASCENDING or DESCENDING.

After the data has been sorted by the sort key selected, they can be aggregated in cluster fields.

Subtotal is done by positioning the first cell in that table (or selected) and the activation dialog box DATA->Subtotal, they specify:

1. Rubric for which the group or where there is "breaking the sequence" at Each Change dropdown list;

1. The type of surgery that will apply grouped data (SUM, MAX, MIN, AVERAGE, COUNT, PRODUCT) of the box USE Function;
2. Calculated column by selecting it from the Add Subtotal to;
3. After specifying these elements are validated with OK;

The total result of the group and will be displayed, resulting in changes in meaning spreadsheet occurrence of

elements (-) signifying the degree of clustering of the data. This makes the ranking table.

Hierarchy allows selecting data items grouped for viewing or for further processing such as graphical representations of the structure of the required information so that the user needs to be emphasized.

Display hierarchy level:

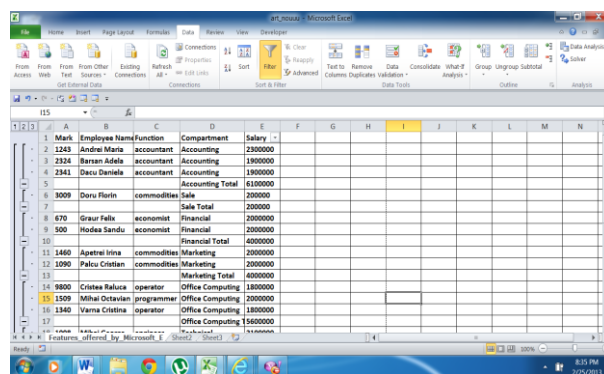
-Only totals (Grand Totals);

-Subtotals (Intermediate tools) and overall total;

-Items totaling, Subtotals and grand total;

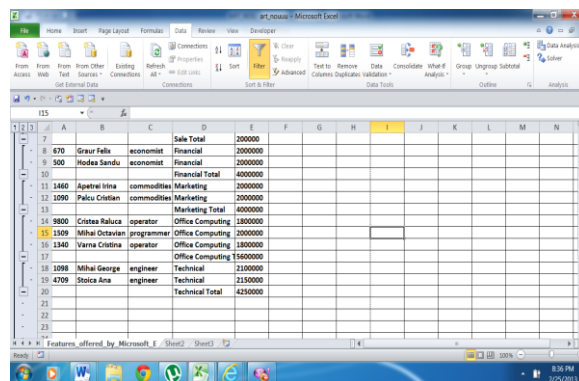
Return hierarchical display of form is done by selecting the table or by positioning the first cell and activate command DATA-SUBTOTALS and SUBTOTAL dialog box, select the REMOVE ALL button.

I have the following example:



Employee Name	Function	Compartment	Salary
Mark			
1249 Andrei Maria	accountant	Accounting	290000
2344 Baran Adela	accountant	Accounting	190000
2341 Dacu Daniela	accountant	Accounting	190000
		Accounting Total	670000
3009 Doru Florin	commodities	Sale	200000
		Sale Total	200000
670 Graur Felix	economist	Financial	200000
500 Hodas Sandu	economist	Financial	200000
		Financial Total	400000
1460 Apetrel Irina	commodities	Marketing	200000
1090 Palcu Cristian	commodities	Marketing	200000
		Marketing Total	400000
9800 Cristea Raluca	operator	Office Computing	180000
1509 Mihai Octavian	programmer	Office Computing	200000
1340 Varma Cristina	operator	Office Computing	180000
		Office Computing	560000

Figure 38. Marks, Employee, Name, Compartment and Salary



Employee Name	Function	Compartment	Salary
Mark			
1249 Andrei Maria	accountant	Accounting	290000
2344 Baran Adela	accountant	Accounting	190000
2341 Dacu Daniela	accountant	Accounting	190000
		Accounting Total	670000
3009 Doru Florin	commodities	Sale	200000
		Sale Total	200000
670 Graur Felix	economist	Financial	200000
500 Hodas Sandu	economist	Financial	200000
		Financial Total	400000
1460 Apetrel Irina	commodities	Marketing	200000
1090 Palcu Cristian	commodities	Marketing	200000
		Marketing Total	400000
9800 Cristea Raluca	operator	Office Computing	180000
1509 Mihai Octavian	programmer	Office Computing	200000
1340 Varma Cristina	operator	Office Computing	180000
		Office Computing	560000

Figure 39. Grouping data

XIII. FORMS

A form is a dialog box where you can enter rows of information called records in list with these records be various operations, location, delete, change. A list is a group of rows that contain data are in a relationship. Lists can be used as a database in which rows are records and columns fields.

ADD A RECORD IN A LIST USING A FORM

A form is a dialog box where you can enter rows of information called records in list. With these records can be various operations, location, delete, change. A list is a group of rows that contain data that are in a relationship. Lists can be used as a database in which rows are records and columns fields.

ADD A RECORD IN A LIST USING A FORM

To add a new record in a list of the following steps:

1. Select the cell in the list that follows to enter data.
2. Select the menu Data->Form, click new record.
3. Insert new record.
4. To add entry in the list, press the ENTER key.
5. After all records have been entered, close the form using the Close button.

From the same menu, Data-Form can delete, modify on locate records in the list.

RETRIEVE DATA FROM A LIST

Data from a list can be so arranged as to highlight the rows/ records that meet certain conditions, possible with AutoFilter or AdvancedFilter orders.

USING FILTERS

Filters can not be applied at a time than a single list, as follows:

1. Select a cell in the list to be filtered.
2. Select the menu Data->Filter->Auto Filter.
3. To display only those records that contain a certain value, select the appropriate arrow spine that contains The desired data.
4. Select the value.
5. To include a new condition, based on a value in another column, repeat step 3 and 4 in the desired column.
6. To filter a list by 2 values in the same column or to use other comparison operators besides equality in the arrow in the column and then select CUSTOM button.

CREATE A FORM

A spreadsheet can be converted into a form if I add buttons, labels and other controls available in the task bar Forms. While there are some predefined layouts? (Spreadsheet Solutions), which are based on common accounting applications.

The steps to create a form:

1. Select the New option from the File menu.
2. The spreadsheet formats as needed .
3. The calculation sheet formats as needed .
4. To add controls using Forms taskbar.
5. Can validate form fields, in the same way that validates the spreadsheet cells(option Data->Validation).
6. Unused spreadsheet file does fade.

7. Save the form using the SAVE AS from the FILE menu.

In terms of formatting the worksheet

You can have the following options:

-to restrict the access to fields:- can limit user access to certain fields in a form. This is achieved by disabling the Locked option in the Format –Cells-Protection for fields.

Then select the submenu Tools->Protection-Protection Sheet. Inclusion of formats may be included in the formulation and formula of totals or other values.

This use macros, the macros can assign to buttons on a form, that lead to the automatic filling of fields according to others or to process the data in some way.

XIII. WHAT IF ANALYSIS SCENARIOS

What If-Analysis can be done using three facilities offered by Microsoft Excel data tables, scenarios and Solver.

Scenarios are used to compare some values that generate different results. This can model various strategies to analyze the advantages and disadvantages of different approaches to data problems. Scenarios are simulations of several variants of the project, which by hypothesis proposed by different values of some parameters lead to different results. With this tool you can view and analyze assumptions considered. Generating scenarios is possible via the menu Data-> What if Analysis.

To effectively build a scenario to select certain cells that contain values change (Changing Cells). Participating in the formation of the final result and admit that during the simulation generates different types of results. Preferably before building scenarios cells modifiable called. Changing cells should not contain formulas, only constants leading to the simulated results. Management scenarios is achieved through "scenario manager". (Scenario Manager)

Steps:

1) previously stated changing cells that participate in the simulation (command Insert-> Name-> Define);

2) is selected by changing cells that contained values lead to results in simulation scenarios manager activates the command Data-> What-if Analysis> Scenario Manager;

3) Enter the simulation variants (by example: Optimist Budget and pessimistic budget) box by clicking Add Scenario Manager;

4) In the Add Scenario insert name box in box scenario Scenario name box;

5) addresses the changing cells box Changing cells box or you can insert comments relating to various studies, then validate with OK button option;

6) Enter the appropriate values Scenario Values box optimistic scenario;

7) Press the Add button to enter another scenario (pessimistic) or press OK and you are returned to the manager of scenarios;

8) Place the second scenario (pessimistic) by typing its name in the box and completing the Add Scenario values changing cells in Scenario Values box.

9) Return the scenario manager is via the OK button and adding new variants operating budget through the Add button.

10) The Scenario Manager can view the possible alternatives scenario simulated by selecting from the list of options that the entry scenarios and show activation button (action illustrated). Also on this level are subject to change or delete scenarios, selecting that option and pressing the Edit ... or Delete as appropriate.

If you want to make a summary of budget alternatives simulated, one can generate a report of scenarios. In the Scenario Manager dialog box by Merge button ... Merge Scenarios dialog box to identify several scenarios in Excel documents (Box Book) and multiple spreadsheets, the Sheet list box.

After being constructed a scenario, it can be operated and updated by the command Tools-> script.

To develop a budget incomes are not known precisely. It will then consider various values for revenues and will be developed for each.

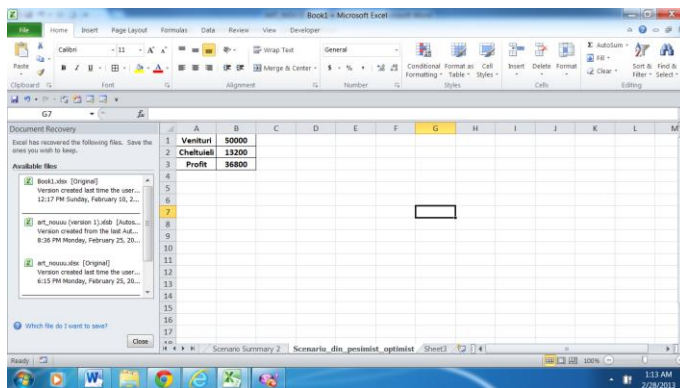


Figure 40. Initial data for incomes, spendings and profits

1.The simulation scenario is possible situations that are reflected through several values that can take a cell. Through this tool the user testing and verifying hypothesis reading various results that have values in a crowd. Number of the set determines the number of the cases that are assigned scripts.

To check the outcome of a hypothesis, the user must go through the following steps:

1. Selecting an existing scenario;
2. Changing an existing script by defining/removing variables considered or by changing its value;
3. Adding a new scenario;
4. Setting script name, allows rapid identification thereof;

5. Define the list of variables that will take new values as working hypothesis, you can select multiple cells using the Ctrl key and mouse;
6. Scenario description for use at an earlier date;
7. Defining hypothesis tested by setting new values for selected variables;
8. Running script, variables selected in step 5 will get new values and initial situation is thus replaced with this hypothesis;
10. Defining hypothesis tested by setting new values for selected variables;
11. Running script, variables selected in step 5 will get new values and initial situation so replaced with this hypothesis;
12. Generate a summary of the scenario, visualize new results without affecting the current situation; If the new hypothesis Optimistic Scenario is based on total ticket sales, the sales tabulation is given by generating abstract scenario:

Item Number	Cinema Hall Name	Number of Tickets Sold	Ticket Price	Total Ticket
1	A	60	35	2100
2	B	77	37	2849
3	C	32	38	1216
4	D	54	40	2160
5	E	123	42	5166

Figure 41. Scenarios with Item number, Cinema Hall Name, Number of Tickets Sold, /ticket Price and Total Ticket

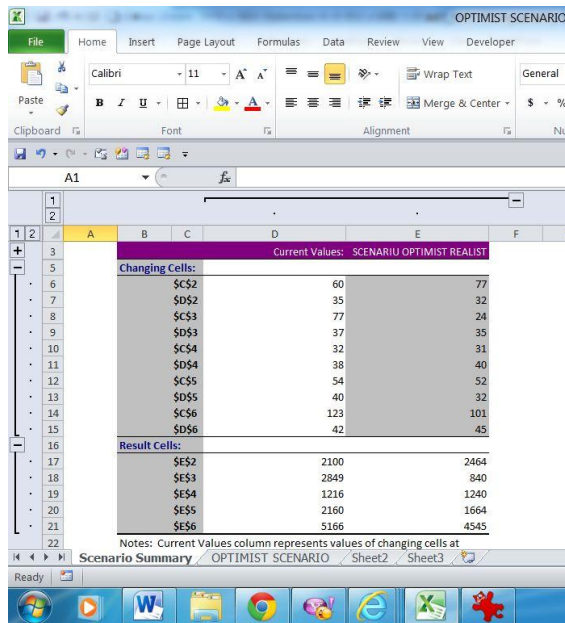


Figure 42. The optimist resulted scenario

XIV. WHAT IF ANALYSIS GOAL SEEK

When I know the result of a formula, but not the initial value of a variable it is uses the facility Goal Seek, from menu Data->What If Analysis:

Steps:

1. Select the option Data->What If Analysis->Goal Seek.
2. The box Set Cell it contains the reference of a cell that contains the formula.
3. In the box To Value it introduces the desired value for formula.
4. In the box By Changing Cells it introduces the references of cells that contain the adjusted values.

In the next example I search the rate of interest for that the month rate of profitability of a loan is 900\$.

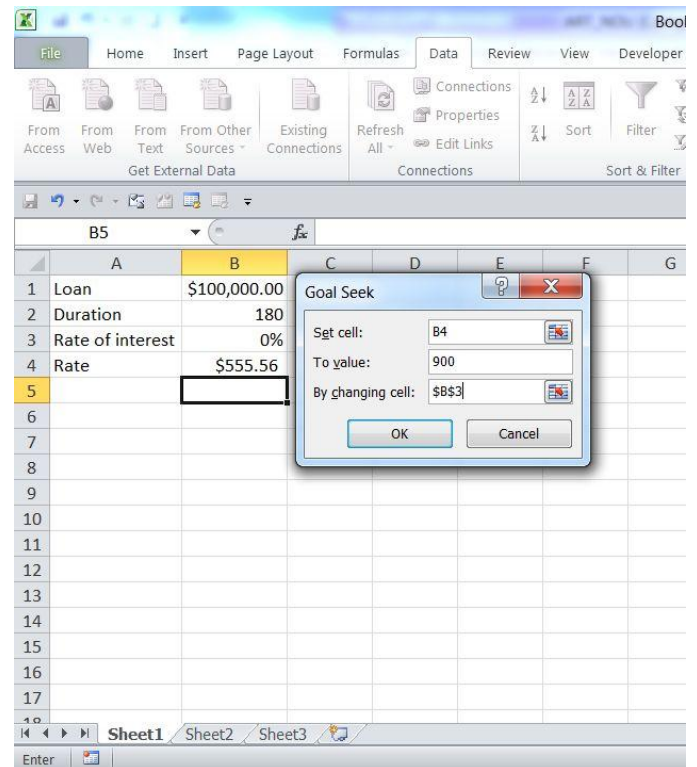


Figure 43. Initial data for Goal Seek

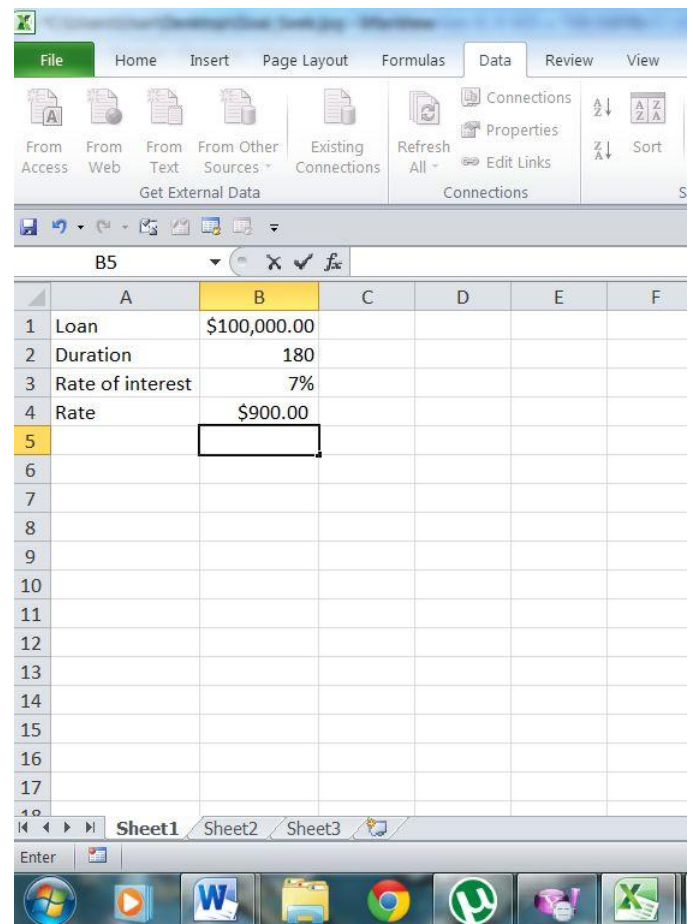


Figure 44. The results of Goal Seek

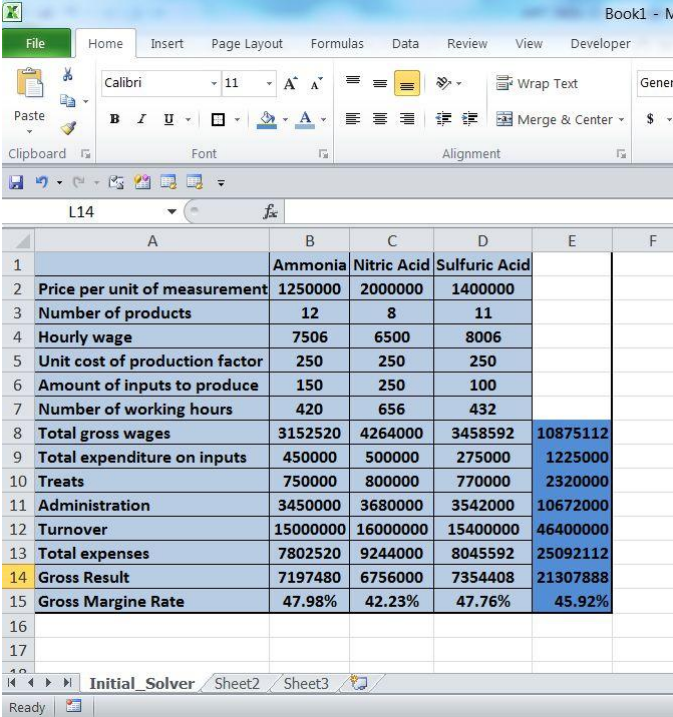
XIV. WHAT IF ANALYSIS -SOLVER

In the case that the result of a formula depends of a lot of variables it utilizes the facility Solver from menu Data->What If Analysis, that will adjust the values from the selected cells until will obtain the specified result.

Solver or the “resolver of the problems” represents an information result of optimization that generalizes the technique of the value like objective, offering a lot of possibilities of simulation of the parameters that generates of optimal situations.

Like principle, a problem of optimization treated under Excel has like target the automation of an application of linear programming (SIMPLEX algorithm) having like target an optimal solution in the sense of maximization of efforts or setting a target of a value-objective considered by the user.

Setting the optimal situation is made through the automated update of parameters that lead to the objective proposed, in conditions of saying the restrictions imposed by the model, so that the optimal situation will take into account these restrictions.



	A	B	C	D	E	F
1		Ammonia	Nitric Acid	Sulfuric Acid		
2	Price per unit of measurement	1250000	2000000	1400000		
3	Number of products	12	8	11		
4	Hourly wage	7506	6500	8006		
5	Unit cost of production factor	250	250	250		
6	Amount of inputs to produce	150	250	100		
7	Number of working hours	420	656	432		
8	Total gross wages	3152520	4264000	3458592	10875112	
9	Total expenditure on inputs	4500000	500000	275000	12250000	
10	Treats	750000	800000	770000	2320000	
11	Administration	3450000	3680000	3542000	10672000	
12	Turnover	15000000	16000000	15400000	46400000	
13	Total expenses	7802520	9244000	8045592	25092112	
14	Gross Result	7197480	6756000	7354408	21307888	
15	Gross Margine Rate	47.98%	42.23%	47.76%	45.92%	
16						
17						

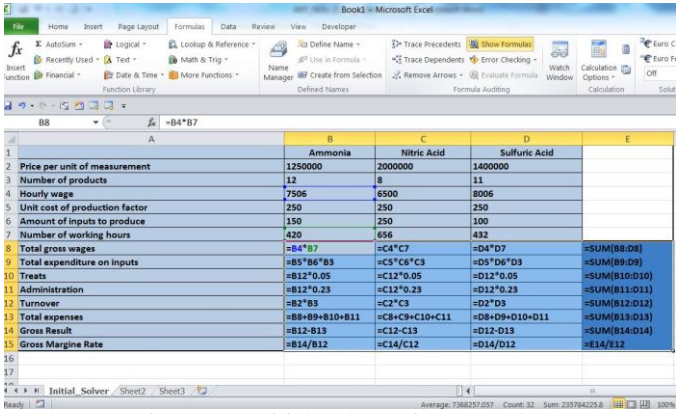
Figure 45 The initial Solver

Example:

The commercial society IMPEX S.A. wants to optimize the global profitability in the sense of maximization of this.

IMPEX SA Trade company wants to optimize their overall profitability in terms of maximizing it. The company manages the budgets of three sections, namely: ammonia, nitric acid and sulfuric acid.

Each department has its own budget forecast, estimating revenues, expenses, profit and gross margin eventual outcome of the result. Parallel, prospective data are centralized at the corporate level, calculating total cost. Economic model to be optimized by maximizing shown in the following figure:



	A	B	C	D	E
1		Ammonia	Nitric Acid	Sulfuric Acid	
2	Price per unit of measurement	1250000	2000000	1400000	
3	Number of products	12	8	11	
4	Hourly wage	7506	6500	8006	
5	Unit cost of production factor	250	250	250	
6	Amount of inputs to produce	150	250	100	
7	Number of working hours	420	656	432	
8	Total gross wages	=B4*B7	=C4*C7	=D4*D7	=SUM(B8:D8)
9	Total expenditure on inputs	=B5*B8*B9	=C5*C8*C9	=D5*D8*D9	=SUM(B9:D9)
10	Treats	=B12*B.05	=C12*C.05	=D12*D.05	=SUM(B10:D10)
11	Administration	=B12*B.23	=C12*C.23	=D12*D.23	=SUM(B11:D11)
12	Turnover	=B2*B3	=C2*C3	=D2*D3	=SUM(B12:D12)
13	Total expenses	=B8+B9+B10+B11	=C8+C9+C10+C11	=D8+D9+D10+D11	=SUM(B13:D13)
14	Gross Result	=B12-B13	=C12-C13	=D12-D13	=SUM(B14:D14)
15	Gross Margine Rate	=B14/B12	=C14/C12	=D14/D12	=E14/E12
16					
17					

Figure 46. Initial Solver with Formulas

Modifying certain parameters (product number salary per hour, unit cost of production factor, the quantity of inputs to product) via the formulas presented can generate different results for both the cost of each product and the overall profitability of the company.

Optimization model involves the first of its purpose, if it's overall profitability cell containing the formula (Target Cell), namely E15 (= Return on total global gross margin rate / turnover).

To solve the optimization problem in terms of maximizing profitability (gross margin rate) positions the cursor on the cell containing the target (E15) and activates command Data-> Solver and Solver Parameters in the dialog box, shown in the following figure are set: target cell, optimization purposes, or adjustable changing cells (shown in the previous figure: B3: D6) and restrictions on the model.

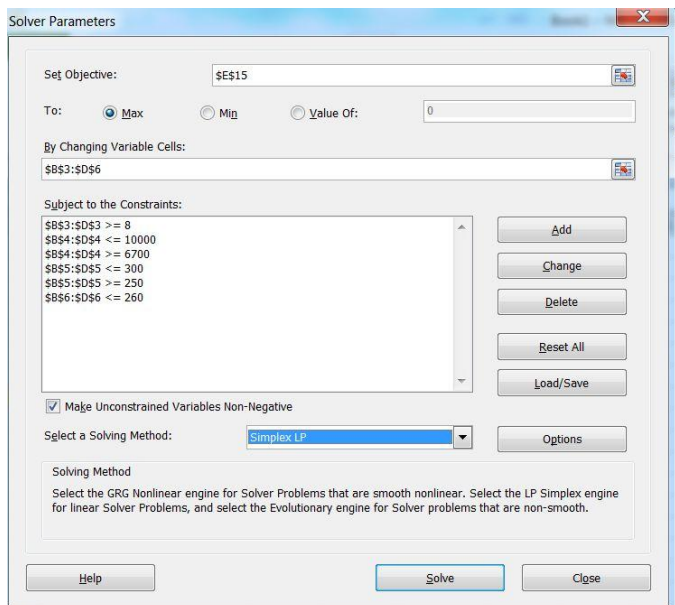


Figure 47. Solver Parameters

Significance Solver Parameters dialog boxes is as follows:

Set Target Cell: specify the address of the cell that contains the purpose or objective optimization:

Equal To: Make sense optimization as intended, as follows: maximize (Max), minimization (Min) or to reach a value (Value of);

By Changing Cells, suggests that not all cells contain formulas and are related to optimization. It automatically selects all cells that contain numerical parameters that formula field that defines the target (Target Cell) refers;

Subject to the Constraints: contains all restrictions optimization model;

Add button allows you to add restrictions;

Change button allows you to modify restrictions;

Delete button allows removing restrictions;

Solve button launches the process of solving the problem-solving;

Options button displays a dialog box in which you can control advanced solving characteristics and recording changes or specifications for a particular problem, Reset All cancels and restores the default parameters assigned.

After completing elements Solver Parameters dialog box and clicking Solve button, it triggers iterative optimization procedure, is generated when the problem was finally found (or solution) dialog box optimization results (Solver Results).

The result of optimization parameters assume or replace old with new, found in the optimization process, thus transforming existing solution into a new (Keep Solver Solution), or restore the original parameters and keeping the old result (Restore Original Values). Solution found can be saved in a script (with existing ones) by pressing the Save Scenario ...

Optimization results are shown in the following figure:

	A	B	C	D	E
1					
2					
3	Pret pe unitate de produs	1250000.00	2000000.00	1400000.00	
4	Numar de produse	3748252819.83	2665424069.44	2929078381.18	
5	Salariu pe ora	6700.00	6700.00	6700.00	
6	Cost unitar de factor de productie	250.00	250.00	250.00	
7	Cantitate factori de productie la produs	0.00	0.00	0.00	
8	Nr. Ore de munca	420.00	656.00	432.00	
9	Total Salarii Brute (7*4)	2814000.00	4395200.00	2894400.00	10103600.00
10	Total Cheltuieli cu Factori de Productie(6*5*3)	0.00	0.00	0.00	0.00
11	Tratati (5% din CA) (12*5/100)	234265801239293.00	266542406944104.00	205035486682406.00	705843694865803.00
12	Regie(23% din CA) (12*23/100)	1077622685700750.00	1226095071942880.00	943163238739067.00	3246880996382700.00
13	Cifra de Afacere (2*3)	468516024785870.00	533084813882080.00	4100709733648120.00	1411687887916100.00
14	Total Cheltuieli (9+9+10+11)	131188489754040.00	149263748328180.00	1148198728315870.00	3952724701352100.00
15	Rezultat brut (12-13)	3373427535031830.00	383821065599900.00	2952511005332240.00	10164149195964000.00
16	Rata marja bruta (14/12)	72.00%	72.00%	72.00%	72.00%
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99					
100					

Figure 48. Optimization results

XVI. PIVOT TABLES

Pivot Table, like instrument of decision assistance represents a facility through which data from worksheet can be permuted to put into evidence new information.

Pivot Table is an instrument that permits a very elastic association of new records into an interactive manner, fact that conduces at regrouping of data and present that facts into synthetically mod.

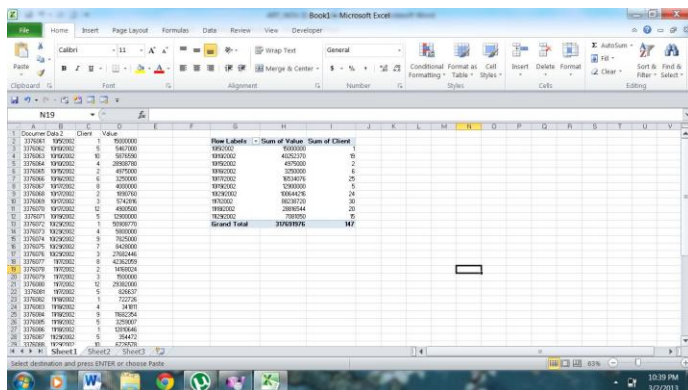
Pivot Table it creates by selecting the source of data of synthesis and making the following operations: Insert->Pivot Table, after that an assistant Pivot Table Wizard coordinates the user to follow 4 steps:

Step 1: It chooses the source of data for Synthesizing of information. From this you can select Microsoft Excel List or Database (Excel Table or database). The source of data can be selected or we position the cursor in the first cell (A1).

Step 2: It validates the source table on the base that it will consolidate the pivot table or if the source data was not selected previous, this can be selected in this phase by Step completion in the option Range (Range:\$A\$1:\$G\$14).

Step 3: It selects data through which it precises which choice will be placed on a row and which on a column.

Step 4: It stabilizes the address of the pivot table, if this will be placed in a new worksheet, or in the existent worksheet, at some address. In this phase, it selects the button Options and through the dialog box Pivot Table Options it chooses the name of pivot table, making some calculations of total general on the columns and rows and saving data with the page of the pivot table.



company distributed of electronics products at companies from different cities from countries, we proceed like this:

I go into File Menu, click Options and in the Left Panel we click Customize Ribbon. In the right Panel we select All Commands from Choose Commands from the Drop-Down Options and look for Form Command. Now, from Left Panel, select HOME and hit NEW GROUP, new group will be added to HOME tab, change its name to FORM and then CLICK ADD-> button to ADD FORM COMMAND to newly created group. Click OK to close Excel Options Dialog.

EXCEL OPTIONS RIBBON ->ALL COMMANDS ->FORM->ADD->FORM (CUSTOM) ->OK.

You will see the FORMAT COMMAND at the end of the HOME RIBBON.

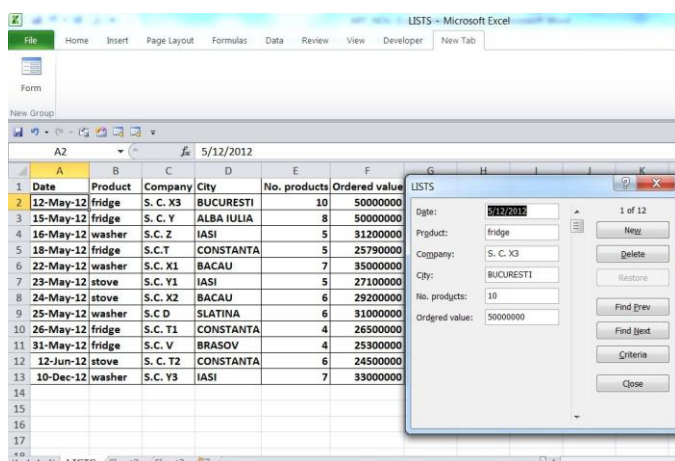


Figure 50 Form Picture

If I want to add a new record in my list I follow the next steps:

1. I go into menu New Tab.
2. I click Form button to open its dialog.
3. I will populate the form with a new record.
4. I will start to introduce the following data: Date->15 Dec 2012; Product->computers; Company: S. C. V3; City :Bucharest; No. products: 25; Ordered value: 375000000.

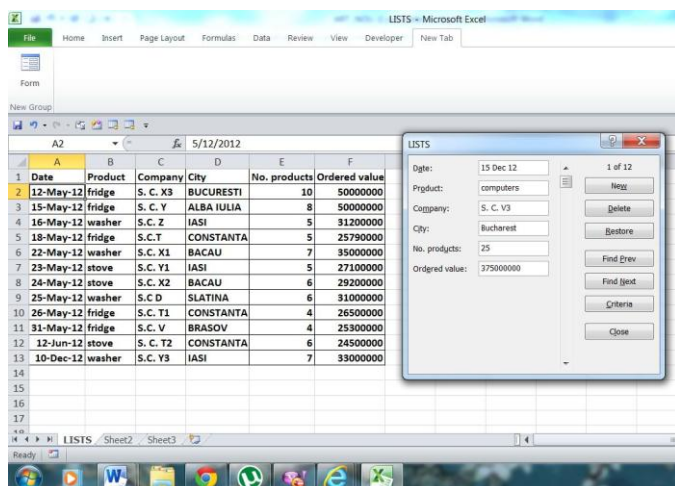


Figure 51. Introduce data in list

Once Form is filled, you can enter records for the other products, Click Find Next.

Records of all products are populated in a quite simple way, as seen in the screenshot below.

Date	Product	Company	City	No. products	Ordered value
12-May-12	fridge	S. C. X3	BUCURESTI	10	50000000
15-May-12	fridge	S. C. Y	ALBA IULIA	8	50000000
16-May-12	washer	S. C. Z	IASI	5	31200000
18-May-12	fridge	S.C.T	CONSTANTA	5	25790000
22-May-12	washer	S.C. X1	BACAU	7	35000000
23-May-12	stove	S.C. Y1	IASI	5	27100000
24-May-12	stove	S.C. X2	BACAU	6	29200000
25-May-12	washer	S.C D	SLATINA	6	31000000
26-May-12	fridge	S.C. T1	CONSTANTA	4	26500000
31-May-12	fridge	S.C. V	BRASOV	4	25300000
12-Jun-12	stove	S. C. T2	CONSTANTA	6	24500000
10-Dec-12	washer	S.C. Y3	IASI	7	33000000

Figure 52. Populated list

The article “Validation of lattice code “EXCEL” with TIC experiments on uniform and regularly perturbed lattices” tells as that “Temporary International Collective(TIC) was established in 1972 by an agreement among seven countries, namely, Bulgaria, Czechoslovakia, Germany, Hungary, Poland, Romania and Union Soviet Socialist Republics. The main objective of TIC was to provide the experimental data for the reactor physics analysis of water cooled and water moderated power reactors (WWER). Extensive experimental work for different core configurations was carried out by TIC countries to investigate the physics behavior of WWER lattices and the results were published in TIC volumes.

Two VVER-1000 MWe reactors are currently in an advanced stage of construction and due for commissioning in Kudankulam, Tamil Nadu, India. Indigenous development of in-core fuel management computer codes for the analysis of hexagonal lattice cores is also in an advanced stage to address various design, operation and safety issues of VVER type cores. The validation of the above TIC lattice experiments will help in the identification of deficiencies in reactor physics design computational codes and the associated nuclear data libraries. In this paper, TIC experiments on uniform and regularly perturbed lattices have been analyzed as part of the validation of indigenous computer codes, EXCEL, TRIHEX-FA and HEXPIN developed at Light Water Reactors Physics Section, B.A.R.C. Neutron-nuclear multi-group cross-section libraries in WIMS/D format in 69/172 energy groups have been released by IAEA at the conclusion of WIMS library update project (WLUP). In the present study we have used libraries based on ENDF/B-6, ENF/B-7, JEFF3.1 and JENDL3.2 evaluated nuclear datasets. The results of theoretical analyses bring out the performance of the code system and various cross-section libraries. “[6]

The conclusions of article “Validation of lattice code “EXCEL” with TIC experiments on uniform and regularly perturbed lattices” are: “ The TIC uniform and regularly perturbed lattice experiments were analyzed using the hexagonal lattice burnup code EXCEL. Four 172 group libraries, based on ENDF/B-6, ENDF/B-7, JEFFE3.1 and JENDL3.2 datasets were used. In Excel modeling a transport-diffusion correction was implemented. For this the cross-sections of the strong absorber cell were modified using a diffusion iterative technique (DIT). It is noted that the results of the new libraries are improved over that of ENDF/B-6. The DIT method also improves the calculated k_{eff} by 6mk. There is large the underprediction is due to higher fast neutron leakage for lattices having 11 mm pitch in comparison to the lattices having 12.7 mm pitch.

Hence, there is a need for 3-D computations for the leakage calculations, which are expected to improve the results. The relative worth of soluble boron, enrichment and change in pitch is predicted to be similar by all libraries. The relative worth of various absorbers is predicted well by all libraries after using the DIT correction. The comparison with experimental data is found to be satisfactory.”[6]

XVIII. CONCLUSIONS

In conclusion in this article I presented all the facilities of Microsoft Excel 2010 that are utilized all over the world in the all economic activities.

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