MANAGERIAL DECISION MODELING AND SIMULATION USING SPREADSHEET PROGRAMS

NEGRUȚ CONSTANTIN VIOREL[1] , GIULVEZAN CORNEL[1]

[1]***West University from Timisoara, Romania; viorel.negrut@fea.uvt.ro***

Abstract. *Yhe paper presents some theoretical and practical issues related to decision-making in the field of economy.*
Using simulation and modeling techniques to assess the possible decision alternatives by What-If analysis.
The paper analyzes the variation of results starting from a single input variable (Goal Seek) and provides a sensitivity analysis (Data Table), by comparing the alternatives in order to make optimal decisions using Scenario Manager features. Restrictions are imposed on some of the input values or on the results (Solver).

Key words*: spreadsheet programs; decision-making process; Goal Seek; Data Table; Scenario Manager; Solver; Pivot Table.*

INTRODUCTION

Spreadsheet programs have some useful options in the decision-making process. Most of these programs offer a range of facilities to answer questions like “What if?”. For example, "What if you reduce costs by 10%”, “What products / projects within my business I have to sustain next?". To answer such questions, the values containing the original data of the problem can be changed. When these parameters change the results change also (Data Table, Scenario Manager). On the other hand we can solve the problem in reverse, that means to find the value / input values that leads to a particular outcome (Goal Seek / Solver). In addition to these facilities there are tools that allow data from a spreadsheet to be permuted in order to highlight new information. (Pivot Table, Pivot Chart).

MATERIALS AND METHODS

In our example we have information about the bills received by a particular firm from its customers. We want to present the facilities mentioned above, linked to decision optimization in Excel.

	A	B	C	D	E
1	Nr. document	Data	Nume client	Modalitate de plată	Valoare
2	505132	10.07.2009	Ionescu	Visa	253000
3	505133	12.12.2009	Zamfir	Cash	145000
4	505134	15.12.2009	Codrea	Mastercard	350000
5	505135	22.12.2009	Oprea	Mastercard	270000
6	505136	09.01.2010	Andrei	Mastercard	125000
7	505137	20.01.2010	Oana	Visa	234000
8	505138	22.01.2010	Dan	Visa	321456
9	505139	09.02.2010	Dorin	Cash	234567

Fig. 1 Unfiltered data

For the beginning, let's take the following example: client Ionescu has obtained a credit of 20000 lei, at an interest rate of 10 %, for a period of 10 months.
We can present the Excel facilities refered to decision analysis by answering the questions, as follow:

What is the monthly rate of payment?

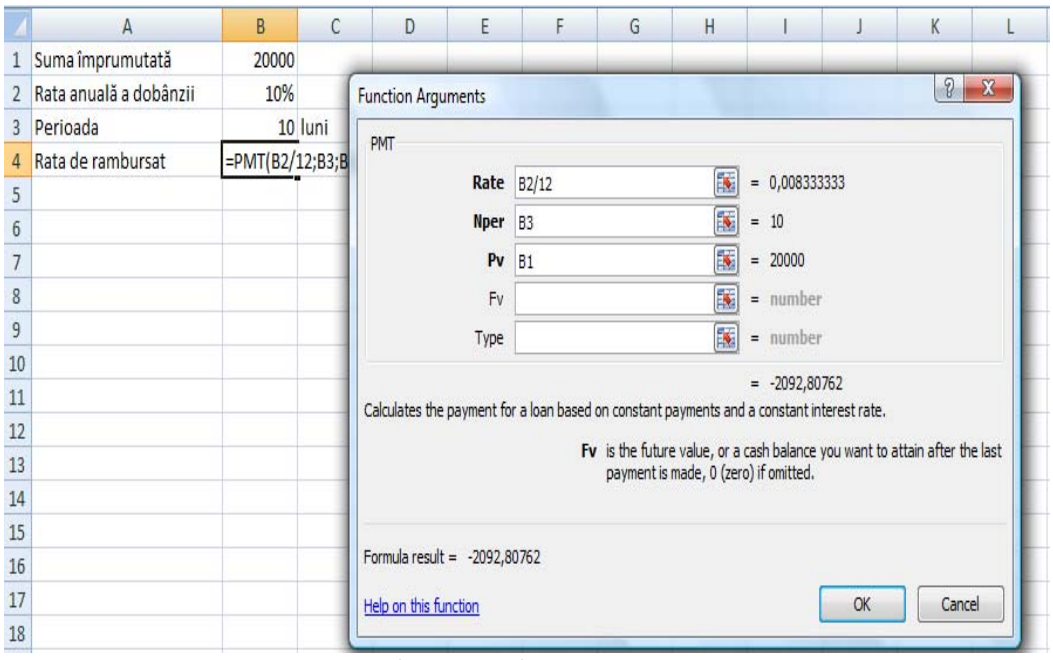


Fig.2 Function PMT

What is the value of the credit that client Ionescu can obtain if he can pay 280 lei monthly?

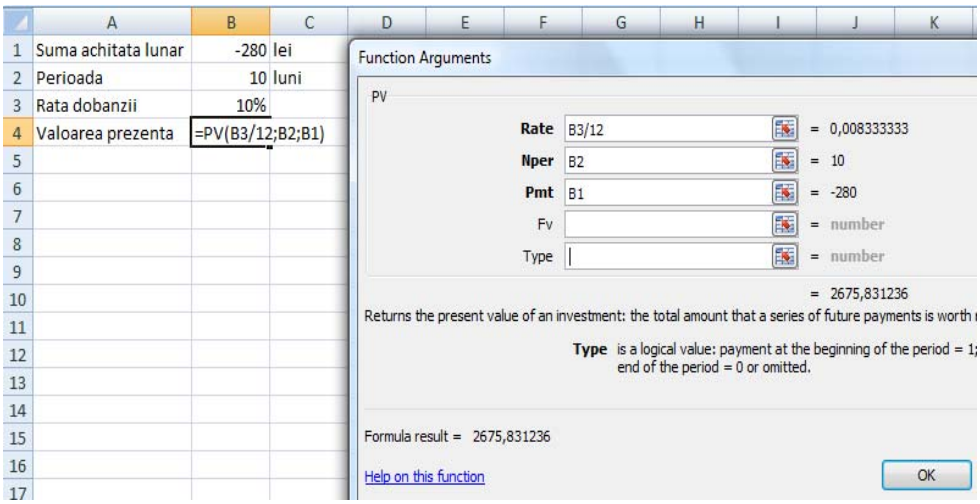


Fig. 3 Function PV

It is tested how the result (the amount of the monthly payment) affects a minimal change in the input variables, for the given example (the amount of credit and the interest rate).

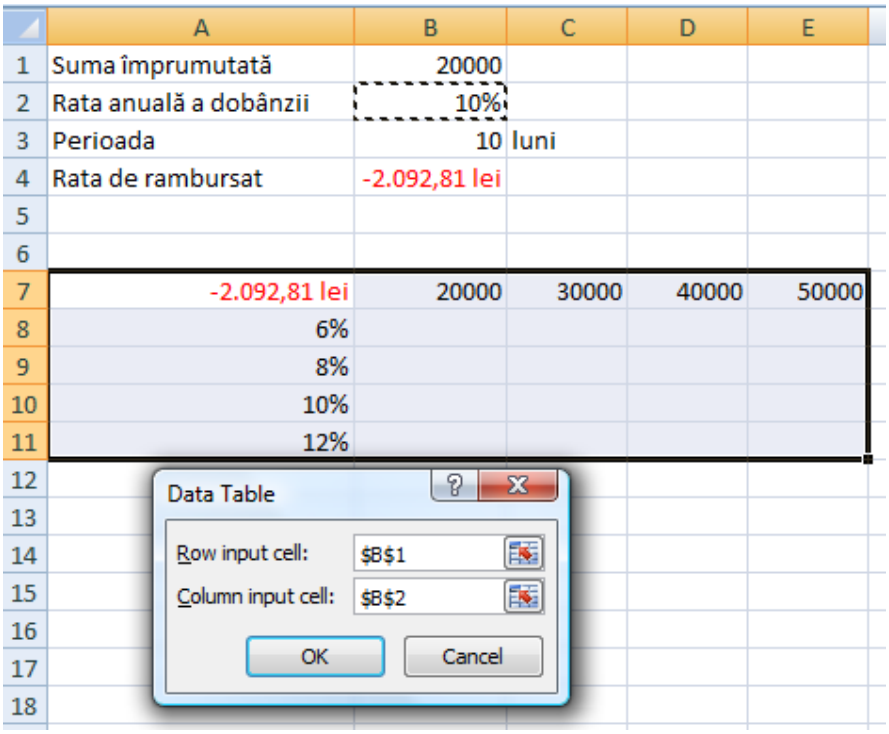


Fig. 4 A sensitivity analysis Data-What-If Analysis-Data Table

	A	B	C	D	E
1	Suma împrumutată	20000			
2	Rata anuală a dobânzii	10%			
3	Perioada	10	luni		
4	Rata de rambursat	-2.092,81 lei			
5					
6					
7	-2.092,81 lei	20000	30000	40000	50000
8	6%	-2055,41145	-3083,12	-4110,82	-5138,53
9	8%	-2074,06418	-3111,1	-4148,13	-5185,16
10	10%	-2092,80762	-3139,21	-4185,62	-5232,02
11	12%	-2111,64153	-3167,46	-4223,28	-5279,1

Fig. 5 Data Table

The Pivot Table is the tool that allows the flexible association of some fields in an interactive way, this fact leading to the re-grouping of data and presenting them in a sinthetic manner.

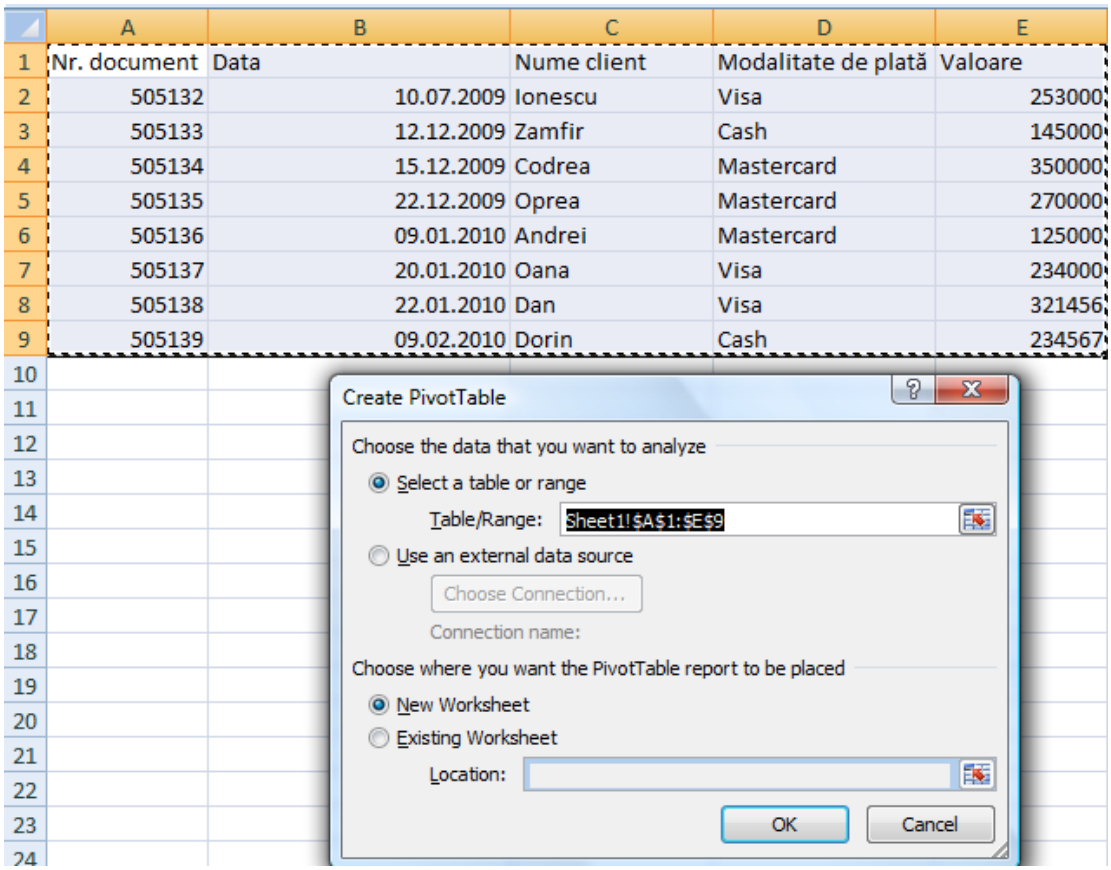
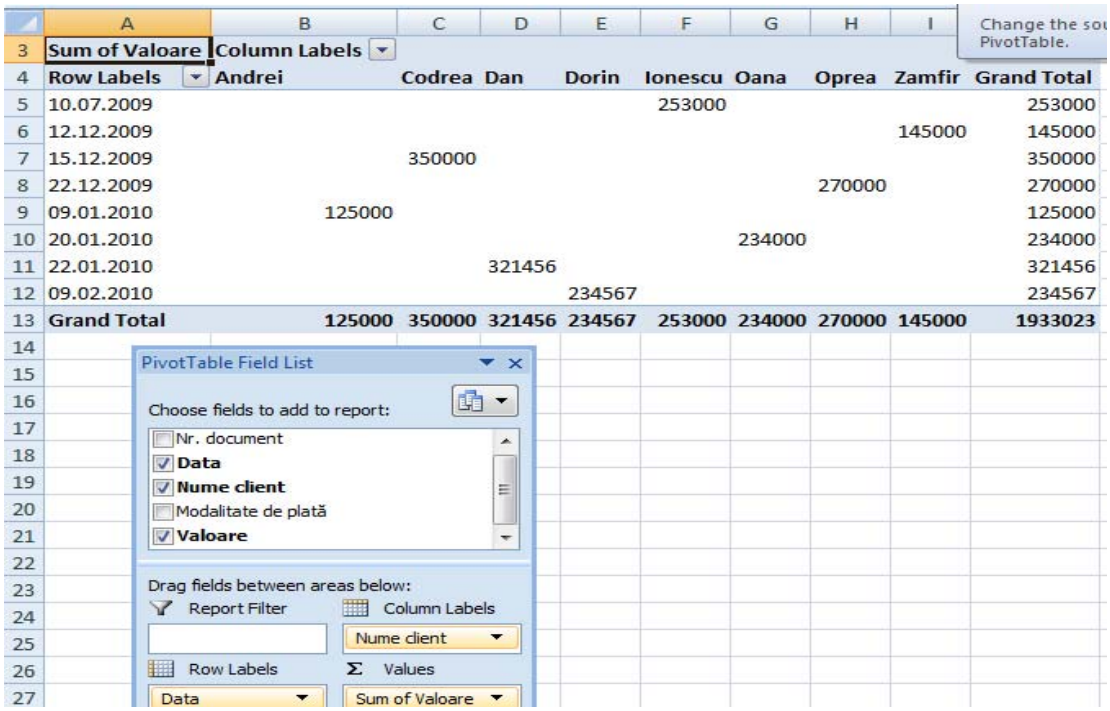
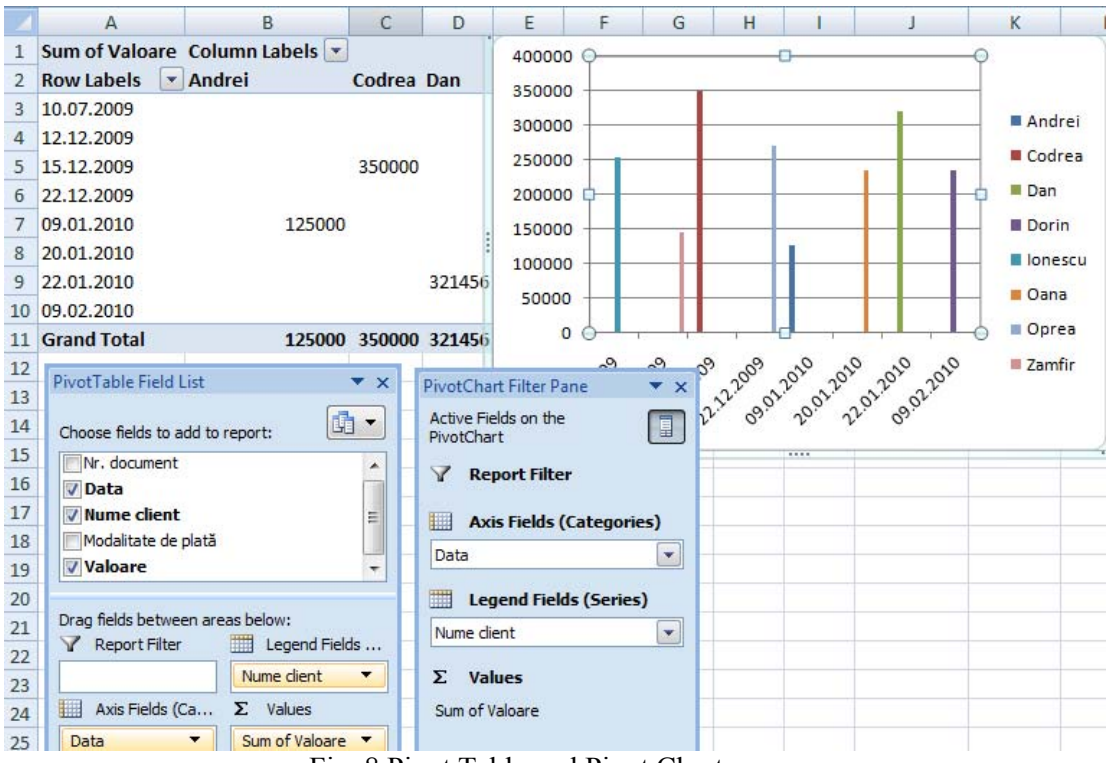


Fig. 6 Create Pivot Table



Sum of Valoare	Column Labels								
Row Labels	Andrei	Codrea	Dan	Dorin	Ionescu	Oana	Oprea	Zamfir	Grand Total
10.07.2009					253000				253000
12.12.2009								145000	145000
15.12.2009		350000							350000
22.12.2009							270000		270000
09.01.2010	125000								125000
20.01.2010						234000			234000
22.01.2010			321456						321456
09.02.2010				234567					234567
Grand Total	125000	350000	321456	234567	253000	234000	270000	145000	1933023

Fig. 7 Pivot Table



Sum of Valoare	Column Labels		
Row Labels	Andrei	Codrea	Dan
10.07.2009			
12.12.2009			
15.12.2009		350000	
22.12.2009			
09.01.2010	125000		
20.01.2010			
22.01.2010			321456
09.02.2010			
Grand Total	125000	350000	321456

Fig. 8 Pivot Table and Pivot Chart

CONCLUSIONS

The analysis of the variance on the results of a decision problem based on one or two inputs can be performed using tools like Goal Seek or Data Table.

Some issues may require multiple input variables or may be imposed restrictions on some of the input variables or on the outcome.

The analysis of a result by modifying the values from one or more input cells and by imposing restrictions on some input variables, or on the result from an Excel worksheet can be done using Solver tool.

REFERENCES

1. **COLESCA S., 2000,** Foi de calcul tabelar – Microsoft Excel**,** Editura ASE București;
2. **MIHALCA R**., Utilizarea produselor software - Word, Excel, PMT, WinQSB, Systat, Editura ASE București;
3. Excel 2010, Primii pași în business intelligence, Chip Kompakt.