

## **Banking Techniques. A Didactical Application**

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**Abstract.** This work is a presentation of the Excel software containing 15 computing sheets and proposed problems in order to improve the students' abilities to perform calculus about banking specific area. Thus calculus related to bank deposits, taking a loan, refinancing a credit and leasing operations are provided.

**Keywords:** teaching software, banking, loans, interest, rates

### **INTRODUCTION**

In order to educate the students in the Banking discipline it was necessary to create a teaching software to get accustomed with the related specific items, and to offer a strong computing method for mainly operations like would be a bank deposit, a loan payment, bounds purchasing and more. The Romanian bank system received many accusations from the clients about many ambiguous contract clauses and the situation was partially regulated by a Governmental decision this year. This software could also be used by any potential bank client

### **MATERIALS AND METHODS**

The MS Office Excel version 2008 was used to perform the work, using the financial functions and facilities offered by the program. General formulas of calculating the interest, payments and other banking related items were also used.

### **RESULTS AND DISCUSSION**

The simplest banking operation is a bank deposit. In order to obtain a profit for such a bank deposit we have to calculate the final interest. Thus we will need the initial data as initial deposit, interest rate and regular deposit if any.

There are three types of possible deposits: 1 year, a number of months and a number of days. Having the number of capitalizations (the minimum term deposit multiplied by an integer number) we will obtain the final amount to be withdrawn. The second problem is returning the sum necessary to be deposited periodically in order to finally obtain a certain amount.

All this desired data are exposed in Tab 1 bellow as a spread sheet image.

Tab. 1

Excel sheet to calculate the final amount of a deposit in certain conditions and the necessary regular deposit in order to obtain a certain amount

Application	Parameter	Value
Application 1	Initial deposit	15000
	Number of years	7 YEARS
	Annual deposit	100
	Interest rate	4.00%
	Account amount	20,528.81
Application 2	Initial deposit	15000
	Deposit term	1 LUNI
	Capitalisation	86
	Term deposit	200
	Interest rate	4.00%
Account amount	39,850.90	
Application 4	Initial deposit	10000
	Number of years	5 ANI
	Interest rate	8.00%
	Account amount	25000
	Annual deposit	1,756.85
Application 5	Initial deposit	10000
	Term deposit	3 LUNI
	Capitalisations	40
	Interest rate	8.00%
	Account amount	36000
Term deposit	230.45	

In the Tab 2 is presented the representation of a days-term deposit (left side) and also the final account amount end of each cycle. On the right side is the corresponding problem to be solved by the student. Thus the student receive instantly the confirmation if his answer is correct or no. More than that the student can create his own problem by changing the initial data of the problem

Tab. 2

Excel sheet to calculate the final amount of a deposit in certain conditions and the amount after each cycle

Parameter	Value
Deposit amount	15000
Interest	8.00%
Deposit term (days)	77
Number of capitalisations	6
Year has	365 days
Final amount	16,584.45

  

Cycle	Amount to the beginning	Amount to the final cycle
1	15000	15253.15
2	15253.15	15510.57
3	15510.57	15772.34
4	15772.34	16038.53
5	16038.53	16309.20
6	16309.20	16584.45

In the sheet presented in Table 3 the annual interest rate is determined for a loan, knowing the loan value, the annuity and the number of periods the payment will be performed. Also this sheet is working in two variants: monthly payment and yearly payments.

Tab. 3

Excel sheet to calculate the annual interest rate for a loan

THE ANNUAL INTEREST RATE DETERMINATION FOR A LOAN	
Loan value	1000
ANNUITY (monthly)	50
Period	60 month
Monthly interest rate	4,68%
Annual interest rate	56,14%
ANNUAL INTEREST RATE FOR A LOAN	
Loan value	1000
Anuity	50
Period	5 ani
Annual yearly payment	-33,53%

One of the most important problems is to determine the actual value of a bond (or Net Present Value). Other ways, which is the real value of the bond knowing the nominal value the bond rate, the market interest rate, the period of payments and the expired periods (Tab 4)

Tab. 4

Excel sheet to calculate the actual value of a bond and the cash flow

Actual Value of a bond	
<i>It will be received periodically the interest and Nominal value at the end</i>	
Nominal value	8000
Interest rate	7,00%
Payment to be performed at	6 month
Interest rate on the market	12,00%
Number of periods	36
Present value	5075,80
Cash flow	
1	280
2	280
3	280
4	280

In Table 5 is presented a complex database the initial data being: the amount taken, the rate interest, the credit period, the promotional period with reduced interest rate and the Non payment period. This data can be easily introduced in the program. More than that a very large range of commissions could be inserted in data entry: Both fixed and variable commissions, in the three possibilities: initial, annual and monthly commissions. All of these possibilities can be specifically splinted in: included in credit or to be paid from the beginning, as percentage of sold or as percentage of credit. The different variants could be chosen by rolling lists.

Bellow the data entry section are calculated the following items for each month: the remaining credit, the interest to be paid, the principal, the annuity, the commissions, the total

amount to be paid. The results are presented as the reimbursement graphic. A synthesis of a certain month payment is available also with a month's balance presenting the total paid amount and the remaining amount to be paid. In order to report these situations a rolling list is provided thus having the possibility to choose between desired months. A rolling list is also available in order to choose between equal and decreasing credit annuity.

The indicator of "DAE" –the initial of annual effective interest including the bank interest rate and the total commissions is also provided. DAE is the proper indicator in order to assess the real interest rate of a loan and has to be calculating according with legislations.

Tab. 5

Excel sheet to calculate the reimbursement loan graphic in certain conditions

**CALCULATES THE REIMBURSEMENT LOAN GRAPHIC**

Credit Value	10000	EUR	INITIAL COMMISSIONS
Credit period	24	month	Fixed commissions 2,00 EUR
Interest	12,00%		Variable commissions 2,00%
Data of taking loan	20-feb.-11		ANNUAL COMMISSIONS
Promotional period (month)	6		Fixed commissions
Promotional interest	4,00%		Variable commissions
No payment period (month)	4		Commissions to be paid
Payment methods: Annuity	Equal		MONTHLY COMMISSIONS
			Fixed commissions
			Variable commissions 0,10%
To be paid in month	data	2011	mar
Initial credit	10202,00	Interest	34,01
		Principal	0,00
		Annuity	34,01
		Commissions	10,20
			44,21
			20-mar-2011
			Month's balance 1
			Total 44,21
			DAE 12,97%
			To be paid 10202,00
			1068,19
			234,65
			11504,84

**REIMBURSEMENT GRAPHIC**

Month	Credit	Interest	Principal	Annuity	Commissions	To be paid	Annual Commis	Data	Monthly commis
0	10202,00	1102,20	10202,00	11304,20	244,85	11549,05	0,00		244,85
1	10202,00	34,01	0,00	34,01	10,20	44,21	0,00	feb-11	10,20
2	10202,00	34,01	0,00	34,01	10,20	44,21	0,00	Mar-11	10,20
3	10202,00	34,01	0,00	34,01	10,20	44,21	0,00	Apr-11	10,20
4	10202,00	34,01	0,00	34,01	10,20	44,21	0,00	May-11	10,20
5	10202,00	34,01	494,13	528,14	10,20	538,34	0,00	Jun-11	10,20
6	9707,87	32,36	495,78	528,14	10,20	538,34	0,00	Jul-11	10,20
7	9212,08	30,12	468,65	561,77	10,20	571,97	0,00	Aug-11	10,20
8	8742,43	27,82	474,35	561,77	10,20	571,97	0,00	Sep-11	10,20
9	8268,08	25,58	479,09	561,77	10,20	571,97	0,00	Oct-11	10,20
10	7788,99	23,33	483,68	561,77	10,20	571,97	0,00	Nov-11	10,20
11	7305,11	21,05	488,72	561,77	10,20	571,97	0,00	Dec-11	10,20
12	6816,39	18,76	493,61	561,77	10,20	571,97	0,00	Jan-12	10,20
13	6322,78	16,43	498,54	561,77	10,20	571,97	0,00	Feb-12	10,20

About the same explanations are available for the sheet presented in Tab 6 related to refinancing a credit. The main difference consists in the possibility to refinance the credit from the previous sheet (Tab. 5) starting with a certain amount. Thus the amount to be refinanced is automatically taken following the options from a rolling list.

Tab. 6

Excel sheet to calculate the refinancing credit graphic

**CALCULATES THE REFINANCING CREDIT**

The value of refinancing credit	Preluare foale	EUR	Takes the credit from "Calculator rate" Sheet
Refinancing			
Refinancing starting with month no:	12	6681,43	INITIAL COMMISSIONS
Period of refinancing	24	month	Fixed commissions
Interest	8,00%		Variable commissions
Refinance data	20-feb.-11		ANNUAL COMMISSIONS
Promotional period (month)	6		Fixed commissions
Promotional interest	4,00%		Variable commissions
No payment period (month)	3		Commissions to be paid
Payment methods: Annuity	Equal		MONTHLY COMMISSIONS
			Fixed commissions
			Variable commissions 0,10%
PAYMENT MONTH	data	2013	ian
Initial credit	673,99	Interest	4,49
		Principal	335,88
		Annuity	340,37
		Commissions	0,67
			341,04
			20-ian-2013
			Month's balance 23
			Total 341,04
			DAE 7,77%
			Platit 6343,31
			Ramas 338,12
			2,25
			0,34
			340,71

**REIMBURSEMENT GRAPHIC**

Month	Credit	Interest	Principal	Annuity	Commissions	To be paid	Annual Commis	Data	Monthly commis
0	6681,43	501,91	6681,43	7183,34	94,87	7278,21	0,00		94,87
1	6681,43	22,27	0,00	22,27	6,68	28,95	0,00	feb-11	6,68
2	6681,43	22,27	0,00	22,27	6,68	28,95	0,00	Mar-11	6,68
3	6681,43	22,27	0,00	22,27	6,68	28,95	0,00	Apr-11	6,68
4	6681,43	22,27	307,69	329,96	6,68	336,64	0,00	May-11	6,68
5	6137,74	21,25	308,71	329,96	6,37	336,33	0,00	Jun-11	6,37
6	6065,03	20,22	309,74	329,96	6,07	336,02	0,00	Jul-11	6,07
7	5765,29	18,37	302,00	340,37	5,76	346,12	0,00	Aug-11	5,76
8	5453,28	16,36	304,01	340,37	5,45	345,82	0,00	Sep-11	5,45
9	5149,27	14,33	306,04	340,37	5,15	345,52	0,00	Oct-11	5,15



The leasing procedure is reflected in table 7 which introduces some new items: the residual value and the two type of leasing: operational and functional. The residual value is the remaining value not being paid by the leasing taker after the restitution of the leasing taken good (operational leasing).

In case of functional leasing the residual value is paid in the last month of the leasing. The program offers the possibility of switching through the two types of leasing using a rolling list.

Overall the application offers about 15 spreadsheets. More than the presented sheets, the program offers the possibility to calculate the annuity of a loan, the maximum possible value of a loan considering a monthly payment, the number of month determination for a certain amount to be granted, the interest rate for certain month and conditions and others all presented gradually in order to allow students to get accustomed with the topic. Each computing spreadsheet has a related problem to be solved and the end about 20 complex problem are proposed to be solved (the number can be easily increase). Some problems are interactive meaning that the student can change the entry data. After each answer a confirmation of correct/wrong answer is provided and to some problems is calculated even the degree evaluation.

Tab. 7

Excel sheet to calculate the reimbursement leasing graphic

Month	Credit	Interest	Principal	Annuity	Commissions	To be paid	Annual	Data	Monthly
0	9500,00	955,63	8000,00	8955,63	247,68	9203,61	90,29		157,69
1	9500,00	31,67	0,00	31,67	9,50	41,17	0,00	feb.-11	9,50
2	9500,00	31,67	0,00	31,67	9,50	41,17	0,00	mar.-11	9,50
3	9500,00	31,67	0,00	31,67	9,50	41,17	0,00	apr.-11	9,50
4	9500,00	63,33	0,00	63,33	9,50	72,83	0,00	may.-11	9,50
5	9500,00	63,33	0,00	63,33	9,50	72,83	0,00	jun.-11	9,50
6	9500,00	63,33	0,00	63,33	9,50	72,83	0,00	jul.-11	9,50
7	9103,65	60,69	396,35	396,99	9,10	466,79	0,00	aug.-11	9,10
8	8704,66	58,03	401,65	459,68	8,70	466,79	0,00	sep.-11	8,70
9	8303,01	55,35	404,33	459,68	8,30	467,99	0,00	oct.-11	8,30
10	7998,68	52,66	407,02	459,68	7,90	467,99	0,00	nov.-11	7,90

## CONCLUSIONS

The author of this software application hopes to offer a useful instrument for students in order to get accustomed with the necessary term and notions in order to perform a broad range of banking operations. As the author knows this is the strongest instrument of calculus nowadays on Romanian market.