Model of Analysis of Electronical Instruments Services in Romania

Mădălina Gabriela ANGHEL
"Artifex" University of Bucharest, Romania
madalinagabriela_anghel@yahoo.com

Abstract. *The objective of this article consists of an analysis of Internet Banking services in Romania, especially of Internet Banking web based services, Home Banking and Mobile Banking services, form the point of view of number of users, number of transactions in RON and value of transactions in RON, in 2009-2014 period. Although an intense development of the Romanian market of Internet Banking services has been observed in the recent years, Romania is still at the beginning of this process, comparing to other states, yet with a potential of considerable progress. The more people will use internet services, the more likely this category of services is to develop. As Internet Banking web based indicator is one of the most important, its analysis goes further by studying the correlation between the value of transactions and number of users of this service by using the model of simple linear regression which stressed out a powerful and direct relation between these two indicators.*

Keywords: Internet Banking web based, Home Banking, Mobile Banking, simple linear regression, parameters estimation.

JEL Classification: L86, C10, G21.

Introduction

There is no current perfect Internet Banking application (known as Online Banking, Electronic Banking, E-Banking or Virtual Banking), yet credit institutions offer their clients a wide range of electronic services, so as the most demanding client may chose the most convenient one. Clients are attracted by reduced taxes on these type of electronic services in comparison to the old classical ones, on paper, which are more expensive. All credit institutions operating in the Romanian Bank System have websites to promote their services and products by using E-Banking.

These may be divided in three categories: Internet Banking web based (it involves access from the distance and it is based on Internet world wide web technology and institution information systems), Home Banking (access from the distance and it is based on a software application of the institution installed at the clients' residence on an individual working station or in a network) and Mobile Banking (access from the distance and it is based on using mobile equipment and services offered by telecommunication operators).

Literature review

The increasingly more intense growth in recent years of electronical instruments services in Romania has prompted the concern of the specialists in order to achieve a series of studies on the evolution of this field (Buhociu et al., 2009; Căpraru, 2009; Anghel, 2014, 2015) as well as the degree of technological development recorded in Romania (Alecu, 2006). The complexity of economic phenomena specific to the contemporary world caused a fundamental change in the typology of analysis performed on this field of activity (Anghelache and Anghel, 2015).

The regression econometric model is successfully used in economic analysis at micro or macroeconomic level (Anghelache, 2013). There are already studies where macroeconomic models are used in European Union countries, but also in Romania (Voineagu et al., 2007). There are also applicable, successfully, a number of econometric models in the study of financial markets.

Research methodology and data

Study of Internet Banking Services in Romania in 2009-2014 period

The article presents the results of the analysis of these three types of instruments, according to data form the Ministry of Information Society, data which, given their temporary characteristic, were estimated by author.

Table 1. *Values of main indicators which characterize Internet Banking web based services 2009-2014 period*

year	Number of Romanian users		Number of transactions in RON		Value of transactions in RON	
	Absolute value	%	Absolute value	%	Absolute value	%
2009	3320138	-	17871195	-	152320288192	-
2010	9019592	171.66	37200327	108.16	376416919398	147.12
2011	14881011	64.99	50008904	34.43	933827392073	148.08
2012	11838687	-20.44	56939434	13.86	871549148104	-6.67
2013	14212734	20.05	69089572	21.34	1161218648285	33.24
2014	15954734	12.26	79457033	15.01	1622867301088	39.76

In the analysed period, the maximum variation of the Internet Banking web number of users indicator is 171.66% in 2010. The main cause of this significant increase in the number of users is the massive development of communication network, they being increasingly interested in the service and. The increase in the number of users registers a slower rate in 2011 comparing to 2010.

The year of 2012 brings a dramatic fall (-20.44%), yet recovered in the following years. The biggest increase in the number of transactions (year of 2010) and in the value of these transactions (year of 2011) is due to motivation, infrastructure development, consequently of communication network.
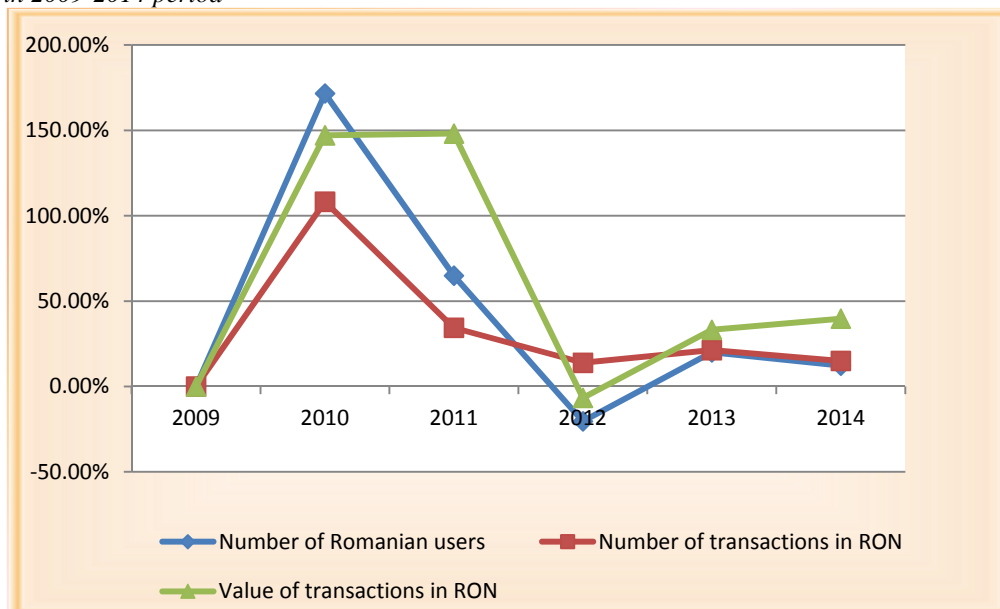
Graphic 1. *Evolution of indicators specific to Internet Banking web based service in 2009-2014 period*

Table 2. *Values of main indicators specific to Home Banking Service in 2009-2014 period*

Year	Number of Romanian users		Number of transactions in RON		Value of transactions in RON	
	Absolute value	%	Absolute value	%	Absolute value	%
2009	37067	-	3923048	-	88186364024	-
2010	152110	310.37	10172569	160.14	343854898803	289.92
2011	174681	14.84	12356798	21.08	456129894079	32.65
2012	114595	-34.40	11501216	-6.92	483891124009	6.09
2013	118459	3.37	11830969	2.87	458756836062	-5.19
2014	116773	-1.42	12214512	3.24	319430001088	-30.37

According to the above presented data, we may observe a similar evolution to the one of the previous service, so that the number of Home Banking Romanian users has had a varying evolution, with an extremely powerful increase +310.37% in 2010 due to the development of communication network and a significant in 2012. The same trend was registered in the transaction number. The decrease registered in 2014 in the number of users and in the value of transactions (a significant decrease of -30.37%) is caused by the increase of Internet Banking web based.
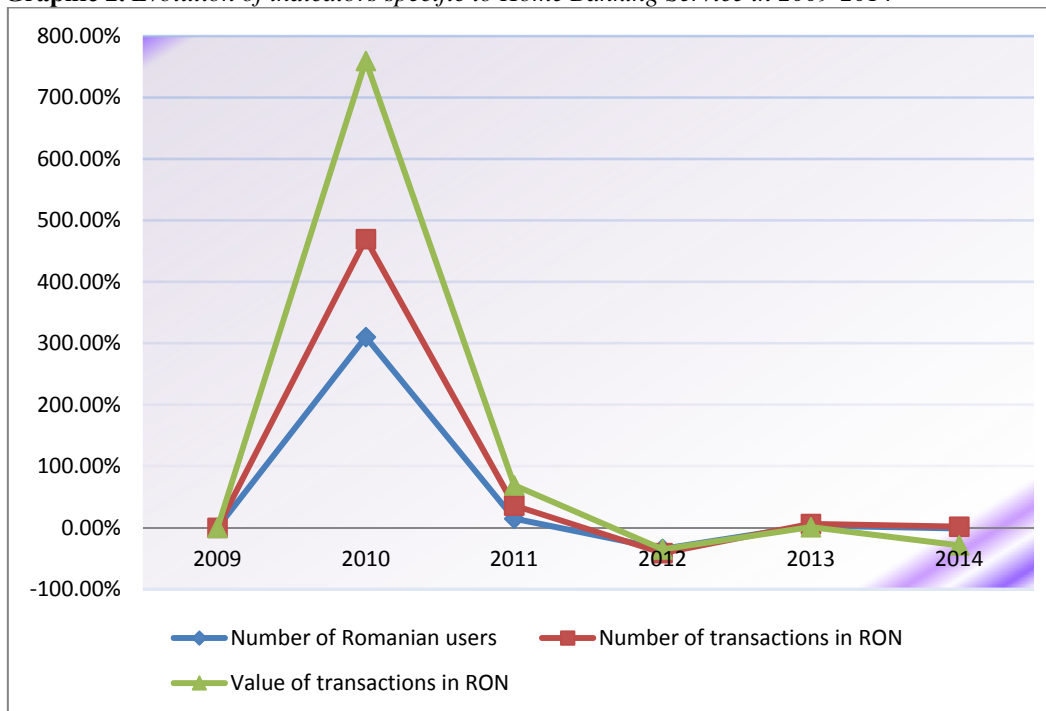
Graphic 2. *Evolution of indicators specific to Home Banking Service in 2009-2014*

Table 3. *Values of main indicators characteristic of Mobile Banking Service in 2009-2014 period*

Year	Number of Romanian users		Number of transactions in RON		Value of transaction in RON	
	Absolute value	%	Absolute value	%	Absolute value	%
2009	456353	-	150005	-	182505384	-
2010	759678	66.47	197987	31.99	780785753	327.82
2011	936412	23.26	228707	15.52	821218674	5.18
2012	819478	-12.49	201610	-11.85	773627732	-5.80
2013	1356001	65.47	397146	96.99	708169161	-8.46
2014	2389121	76.19	1132597	185.18	1395122801	97.00

For Mobile Banking Service, maximum values both in absolute value and in percentual variation, for all three analysed indicators, are registered in 2014, except for percentual variation of the value of transaction which reached its maximum in 2010, with the record growth 327.82%. It must be stated that the development of this type of service is closely linked to the technological progress, it being dependent on smart phones performances. The decreases in 2012 are caused by the increased effects of economic-financial crisis in Romania.

Graphic 3. *Evolution of indicators specific of Mobile Banking service in 2009-2014 period*
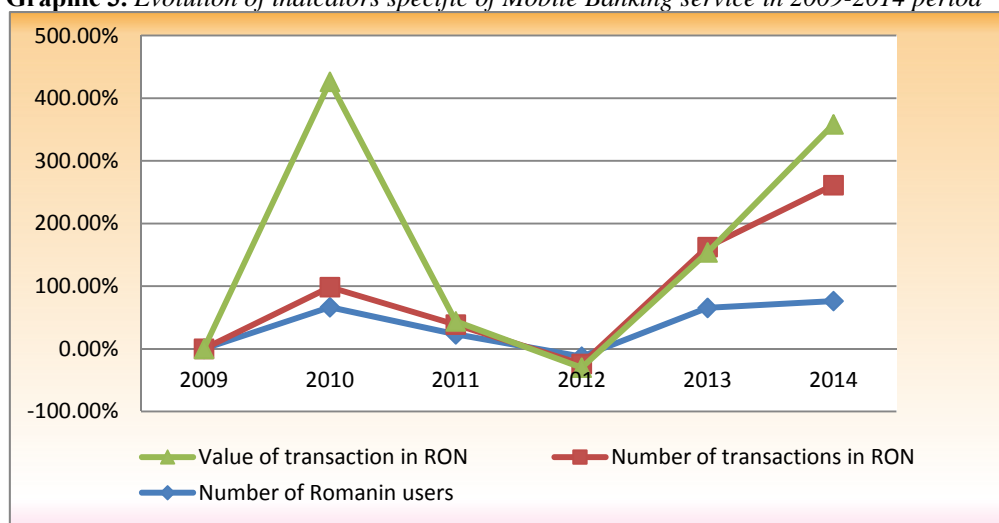
Analysis of correlation between transaction value and number of users with the help of the model of simple regression

Previous analysis goes further by assessing the relation between the value of transactions (dependent variable) and number of users (independent variable). In order to determine the regression model to be used, the series of data corresponding to the two considered were represented as a dotted cloud, the regression line was drawn, and there has been noted a direct linear relation between them.

Graphic 4. *Correlogram Value of Transactions_Number of Users*

Evolution of transaction value depending on the number of users

$y = 102491x - 3E+11$
$R^2 = 0.8314$
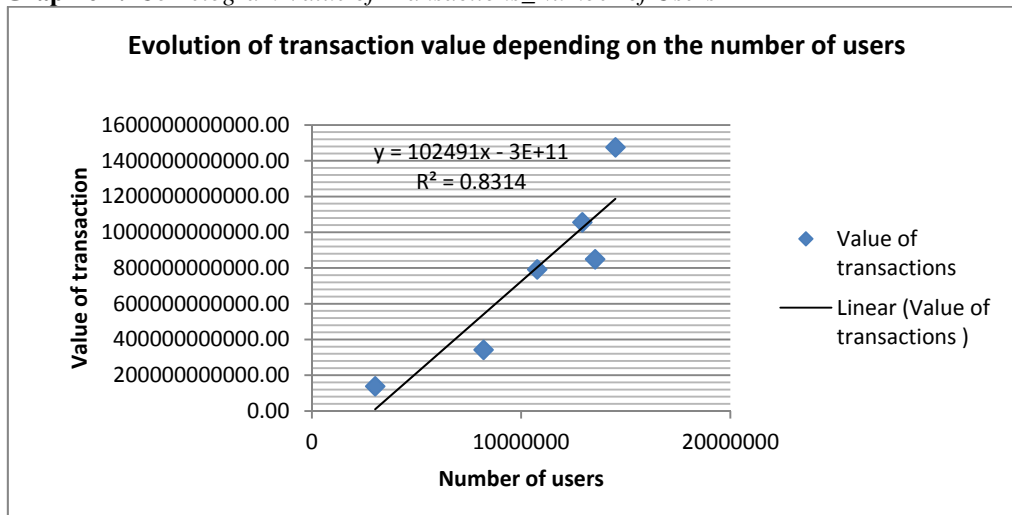
The model of linear simple regression has the following form:

Value of transactions = α + β * Number of users + ε
where:
α, β – parameters of linear regression model;
ε – residual value of the regression model.

The estimation of parameters of econometric regression model is made by using the least square method whose result are presented in Table 4.

Table 4. *Estimation of regression model Value of transactions _Number of users*

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.91178742							
R Square	0.8313563							
Adjusted R Square	0.789195375							
Standard Error	2.21861E+11							
Observations	6							
ANOVA								
	df	*SS*	*MS*	*F*	*gnificance F*			
Regression	1	9.71E+23	9.71E+23	19.71864	0.011329			
Residual	4	1.97E+23	4.92E+22					
Total	5	1.17E+24						
	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	-2.9953E+11	2.58E+11	-1.15882	0.310997	-1E+12	4.18E+11	-1E+12	4.18E+11
NrTranz	102490.5719	23080.51	4.440568	0.011329	38408.81	166572.3	38408.81	166572.3

The values of the two parameters of the regression model are:

$$\alpha = -2.9953 \cdot 10^{+11}$$

$$\beta = 102490.5719.$$

The registered value of multiple correlation coefficient (91.17%) indicates a strong relation between them two. The registered values of determination coefficient and corrected determination coefficient show to what extent the dependant variable is explained by the independent variable, so in a percentage of over 80% of Internet Banking web based transaction value is explained by the number of registered users.

The registered values of freedom degrees *df* s explained like following: *k* represents the number of explicative variables, k=1; fr residuals: *n–k–1*= 6–1–1 = 4 freedom degrees; (n represents the number of observations, n = 6 for total variation: *n–1*= 6–1= 5 freedom degrees; df Regression + df Residual = df Total (1 + 4 = 5).

The validity of analysed regression model is searched based on the registered values by F-statistic test (it exceeds the reference level in the table) and by Significance F test (almost zero), proving therefore that the considered model which describes the relation between the value of transactions of Internet Banking web based and the number of users is a correct model and the variable is significant from statistical point of view.

Conclusions

The analysis of the activity of Romanian banking system in the last years prove a significant interest of credit institutions in diversifying promoting channels and distribution of banking products and services. Under the circumstances, electronics, banking services are a true alternative to traditional way of accessing banking products and services.

The genuine tendency of clients' preference of electronically make their transactions is proved by the results registered in 213 by the value of transactions in Ron of Internet Banking web based service which reached billion and continued to grow in 2014 (unlike Home Banking) and the value of Mobile Banking.

All these increases are sustained by increases in number of users and registered transactions due to the development of necessary infrastructure, especially of electronic networks.

References

Alecu, F., 2006. Internet Banking. *Economic Informatics Review.* No. 4. pp. 104-106.
Anghel, M.G., 2014. Study on the banking system in Romania in 2009-2013. ART ECO. *Review of Economic Studies and Research.* Vol. 5. No. 4. pp. 69-78.

Anghel, M.G., 2015. *Analysis of the activity of credit institutions. Banking products and services offered.* Artifex Publishing House. Bucharest.

Anghelache, C., 2013. *Elements of theoretical econometrics.* Artifex Publishing House. Bucharest.

Anghelache, C. and Anghel, M.G., 2015. *Statistics. Theory, concepts, indicators and case studies.* Artifex Publishing House. Bucharest.

Buhociu, M.F., Virlanuta, F. and Moga, M.L., 2009. The role and efficiency of Internet Banking in Romania. The annals of "Dunărea de Jos" University of Galaţi. Fascicle I. *Economics and applied informatics.* pp. 21-28

Căpraru, B., 2009. *Retail banking.* C.H. Beck Publishing House. Bucharest.

Dănilă, N., Anghel, L.C. and Sincă, F.E., 2012. *Retail banking. Retail Banking products and services.* Economica Publishing House. Bucharest.

Voineagu, V., Ţiţan, E., Şerban, R., Ghiţă, S., Todose, D., Boboc, C. and Pele, D., 2007. *Econometric Theory and Practice.* Meteor Press Publishing House. Bucharest.

http://www.mcsi.ro – official site of Ministry of the Information Society