CORPORATE LOAN MANAGEMENT MODEL AS THE INSTRUMENT OF BANKS' PRODUCT OPTIMIZATION

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In terms of dynamic market circumstances in the Croatian banking market, the success of the banking business depends, among other things, on the selection of appropriate banking products and their optimal combination. Adequate planning and managing the supply of banking products is one of the most important preconditions for its success. In this sense, the need for performing the appropriate researches focused on the formation of new management methods that will, with already existing instruments, enable the adoption of more appropriate business decisions and, as a consequence, better managing of banking business is logically imposed.

Accounting information shows the movement in business operations in past periods and is the basis for further activities planning, as well as analysis of business objectives and results achieved. In this sense, models for managing the assortment of banking products should be based on that reliable information in order to assure that planning and management took place on realistic basis.

Supply of banks' loans to corporate sector is significant for the economic development of the country as a whole. Availability and acceptability of such loans by the users, affects a number of macroeconomic variables particularly including increase in production, employment and exports as the most important sub goals focused to the achievement of the main goal - increase in the welfare of Croatian population.

The aim of the conducted research is comprised in formation of the model that provides appropriate information to management for planning and conducting the corporate sector loans. Statistical and mathematical methods were employed on the accounting data as the main research methods focused toward the model estimation. The model derived can be used as a decision support tool that supplement the management information system database with information unavoidable in process of managing the loans inside the group of corporate sector loans. In addition, this model provides the information regarding the potential for further development of this very important segment of banks loans. Practical application of the research performed is shown in the operations of one big bank in the Republic of Croatia.

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1. INTRODUCTION

National banking markets in developing countries are increasingly internationalized by entry of multinational banking groups that are, by purchasing existing banks or establishing their subsidiaries, introducing new knowledge and experience as well as investing additional funds shaping in this way the modern trends of banking sector development. Modern banking market is mainly characterized by increasing competition and the impact of central bank with pronounced multiplication of banking products and services.

Increasing competition is forcing the banks to introduce and sell more competitive products and services. This leads to a multiplication of banking products and services and to the strengthening of competition, not only in the area of classical banking products and services, but also in the area of products and services supplied by other financial institutions involved in banking market. Along with the growing competition, the market is characterized with banks consolidation through mergers and acquisitions with other banks, but also by connection with the insurance companies and brokerage firms as well as the establishment of leasing companies, investment funds and factoring companies. In this way banks are actually incorporating a sale of wide range of banking and nonbanking products that is further improved by the implementation of new information and communication technologies that are directly impacting cost reduction and rising the potential of new products and services creation. Appropriate assessment of market requirements and supply of adequate, typically innovative, banking products and/or services are prerequisites of successful banking business. In this sense, the need for flexibility in introducing and managing the banking products is imposed; the shorter the time between recognition of the market needs or trends and the banking products creation as well as their acceptance by the bank as an organization, the greater are the possibilities for success. Aforementioned is particularly highlighted in the segment of managing the active banking products i.e. loans that directly affect the banks' revenue and profitability in general. Given the importance of corporate loans for profitability of individual banks, but also the overall economic development of the country, the researchers designed the model for corporate loan management whose structure and application is shown below.

The aim of the model is contained in the insurance of information base for decision making on the sale of certain banking loan or credit products for the corporate sector that will result in maximizing bank's revenues. Various scientific methods were used in the process of model formation. Description, analysis and synthesis methods were applied in determining the correlation of movement in revenues per loan product and sales volume as a starting point for the quantification of that relationship and optimization of loan assortment which is achieved by applying mathematical and statistical methods among which are emphasized the regression methods and nonlinear programming.

2. DESIGNINIG THE CORPORATE LOAN MANAGEMENT MODEL

Existing supply of credit banking products to corporate sector should be seen in terms of achieved financial results that enable their mutual comparison from a financial point of view, from the standpoint of the share of revenue from certain corporate loan products in the total revenues from sales of these credit products, and their movement through a certain period. Forecasting revenue growth for particular credit product in relation to the planned increase in volume of sales of the same credit product involves an analysis of historical revenues patterns in relation to the volume of sales of credit products, i.e. the amount of loans approved.

The statistical method of regression analysis was used in establishing the relations between credit products revenues and their volumes of sales. The research included a double logarithmic regression model, which has a further standard form (Sosic, 2006, p. 427):

$$\hat{\mathbf{Y}} = \mathbf{a}\mathbf{x}^{\mathbf{b}} \tag{1}$$

Where,

- \hat{Y} represents revenues per corporate sector credit products (dependent variable),
- x represents the amount of loans approved to corporate sector (independent variable),
- a represents constant and
- b is regression coefficient.

In double logarithmic regression model independent variable x consist of the size of loans given to corporate sector, while the dependent variable y refers to the revenues per corporate sector credit products. Usage of regression analysis resulted in determination of corresponding relation which represents the starting point for the projection of trends in corporate credit product's revenues depending on the planned increases in the amount of this loans approved. Representative ability of the regression model is determined by the coefficient of determination, while the average deviation of empirical value of dependent variable from the regression value of dependent variable is determined by standard deviation or standard error.

The above calculations allow the prediction with which corporate sector credit products the bank can achieve the highest revenue and, accordingly, shape business strategy with corporate sector that will result in stronger sales of those credit products that generate the highest revenues. Assuming the constant expenditures on the basis of the funds involved, intensification of the sale of these products will ultimately result in increased profits.

Appropriate management of banking assets, particularly of loan or credit products, includes maximization of total revenues from their sales what appear as the result of maximization of revenues from individual credit product in the group concerned. Under conditions of scarce financial resources, satisfying the demand for corporate sector credit products includes making appropriate decisions on funds' allocation to those credit products which, along with given costs of raising funding sources, result in the highest revenues, and thereby indirectly in the highest profits.

The mathematical programming procedure was applied for this purpose. It is the procedure that deals with the optimization problem in which the optimizer is faced with certain restrictions. Restrictions in the banking business, in terms of corporate sector credit products, relates to market restrictions that include limited demand for loans as well as limited funds that are available for sale in form of the credit products.

Corporate loan management model, as the optimization model, consist of the double logarithmic regression models, which predict the movement of revenue from each credit product in the future depending on the planned sale of that credit product, and the results found in the process of non-linear programming.

Nonlinear programming is applied in the process of loan assortment optimization because the interrelationship of revenues and sales volume of corporate sector credit products is nonlinear what is shown by selected regression model too.

Nonlinear programming which maximizes the function has the following general form (Chiang, 1994, p. 716):

Maximize	$\pi = f(\mathbf{x}_1, \mathbf{x}_2, \dots, \mathbf{x}_p)$	
according to conditions	$g^{1}(x_{1}, x_{2}, \dots, x_{n}) \leq r_{1}$	
	$g^{2}(x_{1}^{}, x_{2}^{}, \ldots, x_{n}^{}) \leq r_{2}^{}$	(2)
	•••••	
	$g^{m}(x_{1}, x_{2},, x_{n}) \leq r_{m}$	
and	$X_{j} \ge 0$ (j= 1,2,, n)	
	,	

Maximize	$\pi = f(\mathbf{x})$	
according to conditions (3)	$g^{i}(x) \leq r_{m}$	(j= 1,2,, n)
and	$X \ge 0$	

Scientifically based optimization model provides very useful information base for making decision about intensifying the sale of certain corporate sector credit products that will result in maximizing the total revenues according to the following conditions:

- Maximum sale of credit products is estimated based on the market conditions and represents the upper limit constraints;
- Bank has total available funds, which are smaller than the market demand and they should be sold to the customer in the form of credit products that will maximize the revenues;
- Initial state of the loans portfolio is the lower limit constraint.

Or in abbreviated form

Among the prominent advantages of the model is the fact that it is applicable to small groups of credit products, and it will provide management with valuable information when planning and designing the various scenarios in managing the corporate sector credit products.

3. CORPORATE LOAN MANAGEMENT MODEL APPLICATION

In order to present the usefulness and wide possibilities of its use, the corporate loan management model was tested on the example of one large bank that is operating in the Croatian banking market. It is important to note that the corporate sector in the banking business is considered in a broader context and include, along with private sector, state authorities' units and nonprofit organizations. Bank's accounting information relates to the movements of volumes of sales and revenues per corporate sector credit products for the period from 2003 till 2007. Table 1 shows the total amount of credit products sold by individual type, while table 2 includes the sales revenues of the same products.

Tune of product	Total products sale in kunas					
Type of product	31.12.2003.	31.12.2004.	31.12.2005.	31.12.2006.	31.12.2007.	
PUBLIC COMPANIES	1.044.098.108	1.225.121.103	1.344.139.258	1.359.775.029	1.139.471.529	
Short term loans	20.410.073	42.312.439	46.423.011	47.481.048	54.586.234	
Long term loans	1.023.688.035	1.182.808.664	1.297.716.247	1.312.293.982	1.084.885.296	
OTHER COMPANIES	6.658.212.917	6.728.168.014	7.381.796.574	7.483.961.400	7.619.849.597	
Short term loans	1.487.800.923	1.280.336.395	1.404.718.609	1.422.151.161	1.343.661.011	
Long term loans	5.038.649.091	5.324.837.770	5.842.135.500	5.923.136.293	6.144.253.154	
Credit lines	131.762.903	122.993.849	134.942.465	138.673.946	131.935.432	
NONBANKING FINAN- CIAL INSTITUTIONS	181.501.168	246.670.350	270.633.900	298.391.228	115.306.007	
Short term loans	173.573.096	240.891.525	264.293.672	291.421.783	111.080.863	
Long term loans	7.318.605	4.988.745	5.473.392	5.462.585	4.200.728	
Credit lines	609.466	790.081	866.835	1.506.861	24.415	
STATE AUTHORITIES	892.117.295	1.421.862.022	1.559.993.178	1.815.981.906	1.819.865.840	
Short term loans	288.810.162	656.523.116	720.303.072	941.401.837	956.551.247	
Long term loans	603.307.133	765.338.906	839.690.106	874.580.068	863.314.593	
NONPROFIT ORGANIZATIONS	19.522.060	23.304.975	25.678.724	27.286.710	27.095.346	
Short term loans	3.141.799	2.444.302	2.681.761	2.644.779	967.862	
Long term loans	16.027.557	20.458.430	22.555.642	24.195.233	25.728.011	
Credit lines	352.704	402.243	441.320	446.697	399.472	

 Table 1. Total corporate sector credit products sold from 31.12.2003. until 31.12.2007.

Source: Bank's internal financial statements

Tuno of product	Revenues in kunas					
Type of product	2003.	2004.	2005.	2006.	2007.	
PUBLIC COMPANIES	61.617.681	68.947.350	74.178.005	76.348.440	64.062.377	
Short term loans	916.651	1.912.649	2.120.584	2.124.094	2.626.960	
Long term loans	60.701.030	67.034.701	72.057.421	74.224.346	61.435.417	
OTHER COMPANIES	407.320.496	428.267.311	462.705.189	470.280.995	478.526.242	
Short term loans	96.678.244	89.595.461	94.014.887	94.168.667	92.449.473	
Long term loans	300.500.974	329.322.305	358.467.912	365.729.182	375.982.587	
Credit lines	10.141.278	9.349.545	10.222.390	10.383.146	10.094.183	
NONBANKING FINANCIAL INSTITUTIONS	7.046.868	9.767.501	10.186.144	10.847.306	5.344.252	
Short term loans	6.519.554	9.340.324	9.750.290	10.372.906	5.031.621	
Long term loans	487.512	340.888	380.329	378.574	310.634	
Credit lines	39.803	86.288	55.525	95.827	1.998	
STATE AUTHORITIES	42.643.406	59.136.540	64.837.043	78.779.647	78.693.144	
Short term loans	16.253.341	27.560.515	29.750.713	41.712.864	41.991.869	
Long term loans	26.390.065	31.576.025	35.086.330	37.066.783	36.701.275	
NONPROFIT ORGANIZATIONS	1.333.577	1.437.233	1.603.185	1.696.396	1.731.420	
Short term loans	289.626	210.419	221.113	222.902	100.296	
Long term loans	1.010.376	1.190.628	1.342.584	1.433.309	1.594.561	
Credit lines	33.576	36.186	39.487	40.186	36.563	

 Table 2. Revenues from corporate sector credit products from 31.12.2003. until 31.12.2007.

Source: Bank's internal financial statements

The corporate loan management model formation involves two basic stages. In the first phase the double logarithmic regression models for each type of banking credit products are calculated along with appropriate parameters. Double logarithmic regression models are used to estimate the increase in revenues according to the increase in sales volume for each credit product.

Applying double logarithmic regression models to bank's corporate sector credit products resulted in calculation of the values shown in Table 3. The level of significance of regression model applied is 1%, which means that the obtained double

logarithmic regression models are statistically significant. The models' coefficients of determination range from 0.9306 to 0.9946, which means that from 93.06% to 99.46% of relations, are explained by a double logarithmic regression model.

Type of product	Regression models	r ²	Adjusted R square	р	Standard error
Short term loans to public companies	$y = 0,0232x^{1,0388}$	0,9960	0,99462073	0,00010	0,012884649
Long term loans to public companies	$y = 2,3076x^{0,8227}$	0,9734	0,96447263	0,00186	0,007438407
Short term loans to other companies	$y = 3454, 1x^{0,4848}$	0,9840	0,97861622	0,00086	0,001777381
Long term loans to other companies	$y = 0,0058x^{1,1046}$	0,9831	0,97752111	0,00093	0,005958762
Credit lines to other companies	$y = 0,5637x^{0,8928}$	0,9480	0,93069940	0,00510	0,004663742
Short term loans to nonbanking financial institutions	$y = 2,3682x^{0,785}$	0,9834	0,97789390	0,00091	0,020081689
Long term loans to nonbanking financial institutions	$y = 0,9342x^{0,8324}$	0,9878	0,98370744	0,00057	0,009345778
Credit lines to nonbanking finan- cial institutions	$y = 0,1195x^{0,9642}$	0,9798	0,97312803	0,00122	0,113857909
Short term loans to state authorities	$y = 3,6613x^{0,7836}$	0,9699	0,95986605	0,00223	0,033817472
Long term loans to state authorities	$y = 0,2538x^{0,9125}$	0,9851	0,98017438	0,00077	0,008670541
Short term loans to nonprofit organizations	$y = 0,9188x^{0,8405}$	0,9817	0,97554780	0,00105	0,027103737
Long term loans to nonprofit organizations	$y = 0,1846x^{0,9338}$	0,9687	0,95830749	0,00236	0,015583176
Credit lines to nonprofit organizations	$y = 2,1535x^{0,7552}$	0,9800	0,97338706	0,00120	0,00514197

 Table 3
 Double logarithmic regression models for corporate sector credit products in the analyzed bank

Source: Authors' calculations according to data from tables 1 and 2

In the second stage, according to the constraints of market demand for any corporate sector credit product, the nonlinear programming process is used in order to generate information about distribution of funds in form of credit products that maximize total revenue of the corporate loan group. The constraints mentioned earlier would be taken into account. The upper limit constraint includes the maximum sale for each credit product. This assessment on the maximum sale is made by bank's management according to the market conditions. The following restrictions apply to the fact that the bank has total funds that are less than the total market demand and that it should sell credit products to customers in a manner to achieve maximum revenue. The lower limit constraint in the process of optimization relates to the balance of the portfolio as at 31.12.2007. The above restrictions and associated regression models are shown in Table 4.

No.	Type of product	State of the loans portfolio on 31.12.2007. in kunas	Revenues in 2007 in kunas	Regression models	Maximum increase in the volume of sale – loans amount (market limita- tion) in kunas
		Х	Y		Z
1.	Short term loans to public companies	54.586.234	2.626.960	$y = 0,0232x^{1,0388}$	65.044.857
2.	Long term loans to public companies	1.084.885.296	61.435.417	$y = 2,3076x^{0,8227}$	1.250.350.885
3.	Short term loans to other companies	1.343.661.011	92.449.473	$y = 3454, 1x^{0,4848}$	1.779.576.264
4.	Long term loans to other companies	6.144.253.154	375.982.587	$y = 0,0058x^{1,1046}$	6.574.350.874
5.	Credit lines to other companies	131.935.432	10.094.183	$y = 0,5637x^{0,8928}$	197.903.148
6.	Short term loans to non- banking financial institutions	111.080.863	5.031.621	$y = 2,3682x^{0,785}$	172.183.505
7.	Long term loans to nonbank- ing financial institutions	4.200.728	310.634	$y = 0,9342x^{0,8324}$	4.578.794
8.	Credit lines to nonbanking financial institutions	24.415	1.998	$y = 0,1195x^{0,9642}$	43.948
9.	Short term loans to state authorities	956.551.247	41.991.869	$y = 3,6613x^{0,7836}$	1.386.999.308
10.	Long term loans to state authorities	863.314.593	36.701.275	$y = 0,2538x^{0,9125}$	1.093.314.593
11.	Short term loans to nonprofit organizations	967.862	100.296	$y = 0,9188x^{0,8405}$	1.016.256
12.	Long term loans to nonprofit organizations	25.728.011	1.594.561	$y = 0,1846x^{0,9338}$	28.300.812
13.	Credit lines to nonprofit organizations	399.472	36.563	$y = 2,1535x^{0,7552}$	479.102
14.	Total	10.721.588.319	628.357.436		12.554.142.346

 Table 4
 State of loan products, revenues and corresponding double logarithmic regression models of corporate sector credit portfolio for the bank analyzed and upper limit market constraint

Source: Tables 1, 2 and 3

The model application is shown in the example of one large bank that plans to invest available funds of 778,411,681.00 kunas. The funds will be invested in the form of corporate sector credit products. In this case, the total credit products portfolio of the bank would increase to 11.5 million kunas. Terms of nonlinear programming are as follows:

Maximize:	total revenues (Y14)
According to constraints: Upper limit constraint:	X1:X13 ≤ Z1:Z13
(4)	
Lower limit constraint:	X1:X13 ≥ initial balance of credit prod- ucts portfolio as at 31.12.2007.
and	
	X14 (total balance of credit products port- folio) = 11.500.000 kn.

Where:

X – balance of the portfolio by type of corporate sector credit products;

Z – market constraint by type of corporate sector credit products.

Type of product	State of the loans portfolio on 31.12.2007. in kunas	Planned portfolio in kunas	Revenues in 2007 in kunas	Planned revenues in kunas
Short term loans to public companies	54.586.234	65.044.857	2.626.960	3.032.869
Long term loans to public companies	1.084.885.296	1.250.350.885	61.435.417	70.353.981
Short term loans to other companies	1.343.661.011	1.343.661.011	92.449.473	92.449.473
Long term loans to other companies	6.144.253.154	6.574.350.874	375.982.587	405.721.744
Credit lines to other companies	131.935.432	197.903.148	10.094.183	14.391.995
Short term loans to nonbanking financial institutions	111.080.863	111.080.863	5.031.621	5.031.621
Long term loans to nonbanking financial institutions	4.200.728	4.578.794	310.634	327.227
Credit lines to nonbanking financial institutions	24.415	43.948	1.998	3.582
Short term loans to state authorities	956.551.247	956.551.247	41.991.869	41.991.869
Long term loans to state authorities	863.314.593	966.638.202	36.701.275	40.137.006
Short term loans to nonprofit organizations	967.862	1.016.256	100.296	102.827
Long term loans to nonprofit organizations	25.728.011	28.300.812	1.594.561	1.677.728
Credit lines to nonprofit organizations	399.472	479.102	36.563	41.976
Total	10.721.588.319	11.500.000.000	628.357.436	675.263.898

Table 5Planned portfolios and planned revenues values for corporate sector credit products according to the
model applied

Source: Authors' calculations according to data from table 4

Obtained values shown in the planned portfolio indicate the planned values that should be achieved in the sale of credit products in order to earn maximum revenues from the total corporate sector credit products portfolio. Table 5 shows that three credit banking products remain unchanged, which means that management does not emphasize their placement, while the sale of other products would be intensified by taking appropriate management activities in order to reach the planned values outlined in the planned portfolio. Furthermore, the table 5 shows planned revenues for each type of credit product, which allows consideration and comparison of the status of previous revenues and the planned revenues in relation to the state of so far realized values by the type of loan and planned balances of portfolio by type of loan.

Comparing the relative share of loans by type and realized revenues analyst can get the information on the proportion of each type of loan in the total portfolio and the share of revenue by types of loan, what, in further step, allows comparison with the proportions of the planned size of the loans and revenues.

By calculating percentage increase in the planned value of loans in relation to the realized values of the loans and the planned percentage increase in revenues in relation to the realized values of revenues, one can analyze the planned increase in revenues compared to the planned increase in the loans. On the basis of all mentioned, the bank's management receives a series of new information that enable him to successfully manage and control the assortment of corporate sector credit products.

3. CONCLUSION

Corporate loan management model represents the scientifically based developed managerial instrument that can create high quality basis for planning and managing the assortment of corporate sector credit products in order to optimize the supply of banking products. In order to plan the placement of funds in form of credit products for corporate sector, presented model provides information for disposing the planned funds on credit products that are expected to achieve the greatest revenues up to the upper limit of market constraint. In further steps the funds could be allocated to those products that achieve lower expected revenues and so on until the whole amount available is not disposed.

By using this model decision maker could get insight into the need to increase the portfolio of each credit product in order to achieve the maximum total revenues from the corporate sector credit products. The obtained information allows a comparison between the planned increase in credit products' sales and expected revenues from credit products.

According to this, the analysis of the planned income and planned funds engaged in credit products can be made in order to group the products according to their performance and to improve and optimize the assortment of banking products to corporate sector.

Future research of presented model can be focused on the analysis of bank's credit products by currency, as well as a detailed elaboration within each group of banking credit products for the corporate sector.

REFERENCES:

- 1. Ahmed, A. S., Takedab, C., Shawn, T., (1999) Bank loan loss provisions: a reexamination of capital management, earnings management and signalling effects, Journal of Accounting and Economics, 28, 1., 1-25.
- 2. Chiang, A. C., (1994) Osnovne metode matematičke ekonomije, treće izdanje, Mate, Zagreb.
- 3. Chorafas, N. D., (1991) Obiettivo profitto-dal controllo dei costi al pricing nell'impresa banca, Edibank-Iceb srl., Milano.
- 4. Cobb, I., Helliar, C., Innes, J., (1995) Management accounting change in a bank Management Accounting Research, 6,2., 155-175.
- 5. Cox, D., Cox, M., (2006) The Mathematic of Banking and Finance, John Wiley & Sons Ltd, Chichester.
- 6. Hefernan, S., (2005) Modern banking, John Wiley & Sons Ltd, Chichester.
- 7. Helliar, C., Cobb, I., Innes, J., (2002) A longitudinal case study of profitability reporting in a bank, The British Accounting Review, 34, 1., 27-53.
- 8. Lapin, L. L., (1987) Statistic for Modern Business Decision, Fourth Edition, HBJ, Orlando.
- 9. Matthews, K., Thomposon, J., (2005) The Economics of Banking, John Wiley & Sons Ltd, Chichester.
- 10. Naughton, T., Chan, L.S., (1998) Strategic dimensions of correspondent banking, International Journal of Bank Marketing, 16, 4., 153-160.
- Nellis, J. G., McCaffery, K. M., Hutchinson, R.W., (2000) Strategic challenges for the European banking industry in the new millennium, International Journal of Bank Marketing, 18, 2., 53-64.

- 12. Ramesh, K., Revsine, L., (2000) The effects of regulatory and contracting costs on banks' choice of accounting method for other postretirement employee benefits, Journal of Accounting and Economics, 30, 2., 159-186.
- 13. Sinkey, J. F., (2001) Commercial Bank Financial Management in The Financial-services Industry, Sixth Edition, Prentice-Hall, New Jersey.
- 14. Šošić, I., (2006) Primjenjena statistika, drugo izmjenjeno izdanje, Školska knjiga, Zagreb.