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**Tetiana Zatonatska,**

*Dr.Sc., Professor, Taras Shevchenko National University of Kyiv, Ukraine*

 ORCID ID, 0000-0001-9197-0560

email: [tzatonat@ukr.net](mailto:tzatonat@ukr.net)

**Maryna Hubska,**

*Taras Shevchenko National University of Kyiv, Ukraine*

 ORCID ID, 0000-0002-7403-9106

email: [maryna.hubska@gmail.com](mailto:maryna.hubska@gmail.com)

**Viktor Shpyrko,**

*Ph.D., Taras Shevchenko National University of Kyiv, Ukraine*

 ORCID ID, 0000-0003-4955-2685

email: [viktor.shpyrko@gmail.com](mailto:viktor.shpyrko@gmail.com)

Correspondence author: [tzatonat@ukr.net](mailto:tzatonat@ukr.net)

## MARKETING STRATEGIES IN THE BANKING SERVICES SECTOR WITH THE HELP OF DATA SCIENCE

**Abstract.** Competition between marketing strategies of enterprises shifts to the use of artificial intelligence and begins to be considered in the context of competition between Data Science projects. Therefore, the issue of developing methodology and building a model in a particular area is relevant, which will make the project quite effective and ensure the achievement of goals for the company. The banking services market has a certain specificity of consumer behaviour, so forming marketing strategies is a somewhat complex process. Thus, banks face the task of maintaining the loyalty of their existing customers and attracting new ones. This article aims to build a marketing strategy to attract new customers in the banking sector using Data Science tools. The result of the study is the construction of two econometric models of the different bank's credit products: cash loans and credit cards, which determine the influence of various factors on this process and helps to distribute the advertising budget between different types of advertising. Using the built model, it was determined that advertising campaigns directly affect the increase in the number of new customers in the bank and the overall growth of brand knowledge about the banking institution in society. In addition, the determined weights of each influencing factor helped form an advertising budget, which increased customer inflows by 12%, with an average ROI of 3.18. Taking all into account, the model had shown its effectiveness in organising the bank's advertising campaign when decisions were made using Data Science technologies. The results obtained based on the models give a fairly clear understanding of the factors influencing the inflow of new customers in the bank, which will model the distribution of the budget for advertising campaigns in future periods and predict their effectiveness. Competition in the country's financial sector is forcing banking institutions to use data science in their marketing activities.

**Keywords:** bank, marketing activity, advertising, regression, involvement of new clients, Data Science.

**Introduction.** The modern economy of any country is impossible to imagine without financial institutions. People make payments daily, send money to each other, open deposits or issue credit cards. The leading players in this area are banks. On the other hand, banks are the same players in the market as any other company and conduct their business, including marketing. That is, along with the essential functions of the bank to support financial transactions in the economy, these institutions, like other industry representatives, conduct marketing campaigns, promoting their brands through various sources of communication.

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Thus, banks face the task of maintaining the loyalty of their existing customers and attracting new ones. To achieve this goal, it is necessary to analyse the factors that affect the involvement of new customers, including the marketing activity of the bank.

It is very important for ordinary commercial banks to always be in a prominent position in front of potential customers to get as many deposits as possible and provide more loans that will provide them with a profit.

Thus, the analysis of the banking institution in the context of its advertising activities to attract as many customers as possible is a fundamental issue.

**Literature review.** The issue of the development of banking services and increasing the number of customers is quite relevant in the financial sector because it directly affects the bank's profitability. According to the Financial Conduct Authority (2022), competition in banking services is constantly growing, so essential areas are analysing the bank's environment, using new technologies to offer customer-friendly service and cross-selling various bank products.

The study includes a survey of 4 central banks (LBG, Barclays, HSBC and NatWest), which confirms the importance of advertising to expand the bank's share of the financial market. Research gives a significant role to the innovation component in the retailing of banking services (Kuznyetsova et al., 2018).

Advertising campaigns stand out as one of the tools to promote banking services in the market. According to DePino (2021), the marketing strategies of banks cannot be the same as a few years ago because it was influenced by a number of factors: consumer change, technology change, and data science.

On the other hand, there are modelling of the effects of individual media on sales through regression analysis. Zhou et al. (2021) show the positive impact of YouTube advertising on sales. The investigation analysed the studies of the social networks' impact on sales and the degree of importance of such factors. Attention to social media as a platform for advertising is growing.

The scientific literature considers many approaches to marketing activities on social networks. In particular, Alalwan (2018) considers three factors from the extending Unified Theory of Acceptance and Use of Technology (UTAUT2) (performance expectancy, hedonic motivation, and habit) along with interactivity, informativeness, and perceived relevance.

Another study shows a directly proportional relationship between advertising campaigns on social networks, including Facebook and YouTube, and online stores' volume of orders and sales (Dolega et al., 2021). At the same time, it is worth emphasising the important conclusion of the article that the effectiveness of advertising also depends on the creativity and level of brand awareness.

The impact of television advertising was analysed by (Shapiro et al., 2020). Research shows how television affects the sales of different types of products. Through linear regression, the authors show the importance of the study and analyse the importance of various factors. In addition, the analysis of return on investment allowed us to conclude that it is important to consider the upper limit of spending on the advertising budget.

Also, a separate area of investment to attract customers is CRM. LinkedIn, Facebook, and other blogs are being explored as possible tools for interacting with customers and developing relationships with them. In this case, Data Science, namely cloud computing and web technology, is beginning to be actively used (Rodrigues et al., 2015).

At the same time, other possible media for advertising goods or services are analysed in addition to social media and television. Lin et al. (2021) compare the impact of YouTube and print media advertising (newspapers). Due to linear regression, it is shown that online advertising is well ahead of traditional print advertising nowadays.

The efficiency of media investments for a banking institution is analysed in the paper of Chernyak and Fareniuk (2020). The article proposes a model of call centre load depending on the bank's advertising

activity. The prediction error was within 10%. The study also suggests ways to increase the effectiveness of the advertising campaign by 8% by increasing conversion rates to 58% (the quality of the bank's call centre) compared to the standard market value.

However, current research does not address the economic and mathematical modelling of the influx of new clients of banks, emphasising this study's relevance.

**Methodology and research methods.** This study aims to build econometric models to determine the relationships between the cash loans and the opening of new credit cards and the factors of the internal and external environment of the bank, including marketing activities.

The research was carried out based on an actual bank that has been operating in the Ukrainian market for about 30 years and is among the TOP 5 most prominent banks, according to «50 leading banks of Ukraine», it is profitable and not at risk (credit rating according to the Credit Rating Agency was uaAAA). Today, the institution serves more than 1.5 million clients and is a permanent financial assistant for individuals and legal entities. The bank is constantly working to consider customers' needs and expectations, offering them practical solutions. The research bank uses outdoor advertising and digital marketing, including targeted Internet search, SSM mailings and television advertising campaigns as sources of communication. As any advertising requires investment, as well as every enterprise in the real sector of the economy, the bank needs to conduct market research to solve the problem of proper distribution of marketing budget to maximise the effect of advertising and increase its ratings, brand knowledge and customer growth in the future.

The subject of the study is defined as modelling the involvement of new customers of two types of banking products: cash loans and credit cards - due to various factors. The basis for the analysis was the weekly data from 2018 to the 4th quarter of 2021. To achieve the purpose of the article, there was concluded that the performance of the bank as part of the country's financial sector depends on the influence of various factors: both external and internal factors. The effectiveness of advertising campaigns has a special impact. To determine the factors on which the involvement of new customers depends, as well as to assess their impact, an econometric model - multiple linear regression - was built as a method, where the indicator of the number of executed transactions will be analysed as the target value, and the input parameters are indicators that characterise the banking internal and external environment (Chernyak and Farenjuk, 2020).

Variable Y in the model determines the number of transactions for the product (cash loans - GP\_Funded, credit cards - CC\_Funded). The following parameters were selected as variable X using correlation analysis (was built correlation table between all variables to measure the strength of the linear relationship between them (Zubair et al., 2021). Variables with strong correlation were not taken to the model):

- advertising campaign on television in a total of direct advertising and sponsorship (the banking institution sponsors individual projects, i.e. the logo periodically appears on television) (tv\_GP, tv\_CC, in the number of contacts (TV impressions));
- digital advertising campaign (digit\_GP, digit\_CC, in the number of impressions);
- advertising campaign on Facebook and other sources (other\_GP, other\_CC, in the number of impressions);
- CRM mailings (crm\_GP, crm\_CC).

Outdoor advertising (on billboards) was not included in the model because it is impossible to accurately estimate the number of customers who come and see information about the banking institution on billboards. Such an advertising campaign mainly attracts attention and increases brand awareness. It is worth noting that a number of factors are used with the lag, which is directly taken into account in the model. Macro factors in the model include: the current position index (IPC), index of economic expectations (IEO), and brand knowledge indicator (MMI\_know).

In addition, the model included the seasonality indicator for the year (season\_GP, season\_CC), which was calculated through the multiplicative decomposition of the Y series. The trend was also set as the year of the study (year\_code). In addition, fictitious binary variables are the period after the New Year (after\_NY), a period of quarantine restrictions due to the coronavirus infection (quar).

Analysis of the quality of the model will be based on the following parameters:  $R^2$ , t-statistics, and p-values. The Durbin-Watson test tested autocorrelation between factors. Of course, problems of autocorrelation, heteroskedasticity and multicollinearity are avoided. In addition, all coefficients were primarily logically tested (for example, the advertising impact of factors could not have negative coefficients, and quarantine restrictions (closed bank branches) or weekends after the New Year could not bring additional customers).

Python programming language was used for the practical processing of bank data and building models.

In accordance with the identified issues, weekly regression models were built on the number of credit card (CC) and cash (GP) loans.

In general, there were received the following models:

$$GP_{funded} = a_0 + a_1 \cdot year_{code} + a_2 \cdot seasonGP + a_3 \cdot after_{NY} + a_4 \cdot quar + a_5 \cdot IEC + a_6 \cdot MMI_{know} + a_7 \cdot tv_{GP} + a_8 \cdot digit_{GP} + a_9 \cdot crm_{GP} + a_{10} \cdot av_{wage} \quad (1)$$

$$CC_{funded} = a_0 + a_1 \cdot year_{code} + a_2 \cdot seasonCC + a_3 \cdot after_{NY} + a_4 \cdot quar + a_5 \cdot IPC + a_6 \cdot MMI_{know} + a_7 \cdot tv_{CC} + a_8 \cdot digit_{CC} + a_9 \cdot crm_{CC} + a_{10} \cdot other_C \quad (2)$$

**Results.** With the help of regression analysis, the effectiveness of advertising by different sources of communication was determined, which allowed making possible options for the distribution of the advertising budget. As a result of the modelling, the coefficients of influence of each factor on the involvement of new customers of product types were received.

To assess the effectiveness of the advertising campaign, the analysed indicator was ROI, which shows the payback of one monetary unit of funds used. ROI is calculated as the division of the average check size by the SAC (Sales Acquisition Cost, cost for attracting one customer).

As a result of the simulation, the following models and figures were obtained. Firstly, consider the modelling of new credit card agreements (CC). The R-square and the adjusted R-square are 0.892 and 0.873, respectively. The model is adequate, as the database is large - weekly data for several years. There are unjustified emissions in the number of issued cards. So, this value is acceptable and can use in the model for further forecasting.

Table 1 shows the statistical characteristics of the coefficients of the model.

**Table 1. Table of credit card model (SS) ratios**

	Coefficient	Standard error	t-statistic	p-value
Constant	1843.379	856.784	2.152	0.033
year_code	1230.265	88.699	13.870	0.000
seasonCC	549.132	287.996	1.903	0.059
IPC	-18.224	5.313	-3.430	0.001
quar	-1056.672	281.768	-3.750	0.000
after_NY	-1358.413	282.561	-4.807	0.000
CC_digit	8.757E-5	0.000	1.206	0.230
CC_tv	2.850E-5	0.000	1.764	0.080
CC_crm	0.0004	0.000	1.459	0.147

**Continued Table 1**

	<b>Coefficient</b>	<b>Standard error</b>	<b>t-statistic</b>	<b>p-value</b>
CC_other	6.108E-5	0.000	2.300	0.023
rejected	-2831.205	351.405	-8.057	0.000
MMI_know	41.794	24.708	1.692	0.093

Sources: developed by the authors.

The analysis of the dynamics of cash loans was another regression model. R-square and adjusted R-square have values of 0.897 and 0.879, respectively, which also determines the model as adequate for further use. Statistical characteristics of the coefficients of the model are given in table 2.

**Table 2. Table of cash loans model (GP) ratios**

	<b>Coefficient</b>	<b>Standard error</b>	<b>t-statistic</b>	<b>p-value</b>
Constant	-510.899	926.182	-0.552	0.058
year_code	579.102	120.337	4.812	0.000
seasonGP	1359.794	295.848	4.596	0.000
IEO	-24.450	4.500	-5.433	0.000
quar	-1373.713	261.682	-5.250	0.000
after_NY	-1317.605	377.842	-3.487	0.001
GP_digit	8.024E-5	0.000	1.418	0.159
GP_tv	4.136E-5	0.000	3.943	0.000
GP_crm	0.0002E-4	0.000	1.275	0.205
rejected	-3560.035	321.441	-11.075	0.000
MMI_know	48.643	23.767	2.047	0.043
av_wage	0.432	0.059	7.333	0.000

Sources: developed by the authors.

The obtained findings allowed analysis of the effectiveness of the advertising campaign. In the next stage, the study analysed the contribution of communication factors for the period of the last advertising campaign (September-December 2021). Advertising with a TV commercial and the bank's sponsorship of one of the TV programs, digital banners and CRM mailings brought the bank an additional 20,688 customers, which is 12% of all customers during this period.

It is worth noting that the most significant source of new agreements for the bank was advertising on television (44% of all bank customers from marketing activities, 9% - sponsorship on television). 34% fell on digital advertising clients. The remaining factors accounted for only 13%.

The effectiveness of the advertising message is confirmed by the ROI analysis of the split of advertising channels, which is given in Table 3.

**Table 3. Analysis of the effectiveness of the bank's advertising campaign in September-December 2021**

Budget of the split, UAH	27 639 168
New Clients	20 688
SAC of the split, UAH	1 336
ROI of the split	3.18
ROI GP	4.49
ROI CC	2.69

Sources: the authors' calculations are based on the model's results and actual bank data.

The results obtained based on the models give a fairly clear understanding of the factors influencing the inflow of new customers in the bank, which will model the distribution of the budget for advertising campaigns in future periods and predict their effectiveness.

The obtained results correspond to the general practices that take place in the market. In particular, the strong influence of advertising on television, as well as digital advertising, compared to other traditional media (Chernyak and Fareniuk, 2020; Yushan et al., 2021). It is worth noting that the model allows you to predict the influx of new customers not only from marketing activities but in general, regardless of the period of advertising campaigns, because it takes into account a number of other factors influencing the analysed series. In contrast to the study of Zubair (2021), the article considers the impact of different types of digital advertising, not just videos on YouTube. In addition, the obtained results of the model are important for the banking institution in the financial sector analysis because they take into account the specificity of products sold on the market.

The following stages of the study will be an analysis of the impact of creativity on the effectiveness of the advertising campaign, as well as including a countdown timer on the advertising message.

**Conclusions.** Competition in the country's financial sector is forcing banking institutions to use data science in their marketing activities.

Analysis of the relationships between the factors of macro and microenvironment of the bank and the number of cash loans and credit cards showed that the inflow of new customers to the bank is influenced by various factors, ranging from consumer behaviour to marketing activities of the bank and its competitors. The advertising campaigns conducted by the institution are an important source of inflow of new customers and increase the level of brand awareness and trust in the bank in society, which increases the base of potential customers. The most effective source of advertising is television.

The correct distribution of funds for different types of advertising, which was justified by the model results, increased the inflow of new customers by 12%.

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**Тетяна Затонацька**, д.е.н., професор, Київський національний університет імені Тараса Шевченка, Україна

**Марина Губська**, Київський національний університет імені Тараса Шевченка, Україна

**Віктор Шпирко**, к.е.н., доцент, Київський національний університет імені Тараса Шевченка, Україна

#### **Маркетингові стратегії в секторі банківських послуг з допомогою інструментів Data Science**

Конкуренція між маркетинговими стратегіями підприємств переходить у площину використання штучного інтелекту та починає розглядатися в контексті конкуренції між проектами Data Science. Тому актуальним є питання розробки методології та побудови моделі в тій чи іншій сфері економіки, що допоможе забезпечити ефективну роботу та досягнення цілей компанії. Ринок банківських послуг має певну специфіку поведінки споживачів, тому формування маркетингових стратегій є досить складним процесом. Таким чином, перед банками стоїть важливе завдання зберегти лояльність своїх існуючих клієнтів і залучити нових. Метою статті є побудова маркетингової стратегії для залучення нових клієнтів у банківський сектор за допомогою інструментів Data Science. Результатом дослідження є побудова двох економетричних моделей кредитних продуктів банку: кредитів готівкою та кредитних карток, – які визначають важливість впливу різних факторів на притік нових клієнтів та допомагають розподілити рекламний бюджет між різними видами реклами для досягнення високої ефективності. Використовуючи побудовану модель, було визначено, що рекламні кампанії безпосередньо впливають на збільшення кількості нових клієнтів у банку, а також на загальне зростання обізнаності про бренд банківської установи в суспільстві. Крім того, визначені ваги кожного з факторів впливу допомогли сформувати рекламний бюджет, що збільшило приплив клієнтів на 12% із середньою рентабельністю інвестицій (ROI) 3,18. Враховуючи все вище сказане, модель показала свою ефективність в організації рекламної кампанії банку, коли рішення приймалися з використанням технологій Data Science. Отримані на основі моделей результати дають досить чітке уявлення про фактори, що впливають на приплив нових клієнтів до банку, що дозволить моделювати розподіл бюджету рекламних кампаній у майбутні періоди та прогнозувати їх ефективність. Конкуренція у фінансовому секторі країни змушує банківські установи використовувати інструменти Data Science у своїй маркетинговій діяльності.

**Ключові слова:** банк, маркетингова активність, реклама, регресія, притік нових клієнтів, Data Science.