

ANOVA IN MARKETING RESEARCH OF CONSUMER BEHAVIOR OF DIFFERENT CATEGORIES IN GEORGIAN MARKET

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Abstract

Consumer behavior research was conducted on bank services and (non-alcohol) soft drinks. Based on four different currencies and ten services there are analyses made on bank clients' distribution by bank services and currencies, percentage distribution by bank services, percentage distribution of bank services by currencies.

Similar results are also received in case of ten soft drinks with their five characteristics: consumers quantities split by types of soft drinks and attributes; Attributes percentage split by types of soft drinks; Types of soft drinks percentage split by attributes.

With usage of ANOVA, based on the marketing research outcomes it is concluded that bank clients' total quantities i.e. populations' unknown mean scores do not differ from each other. In the soft drinks research case consumers' total quantities i.e. populations' unknown mean scores vary by characteristics.

Keywords: ANOVA, Bank Services and Currencies, Soft Drinks, hypothesis.

Classification JEL : M310

1. Introduction and context of the study

Marketing research plays important role in any contemporary business. Marketing information is used by firms, companies, banks, etc. for the planning, managing, controlling and forecasting purposes. Georgia started progressing in marketing by the end of XX century. Along with other topics, it has contributed to increase importance and usage of consumer behavior marketing research in Georgia.

Consumer behavior marketing research is still quite new in Georgia, although it should be noted, that in some aspects of Georgian market attitude of Georgian consumers towards services, products and purchase decision making motivations are well studied [1, p.11]. As a part of globalization process of marketing and current economic situation, Georgia is dependent on imports. Russia and Turkey (border countries with Georgia) are key sources for many goods and services. A separate study was done to determine Georgian consumers perception of products sourced from Turkey [2, pp.199-218].

Here we provide analyses of marketing research results for two studies: 1. to study consumer behavior towards bank services and currencies and 2 - to study consumer behavior towards soft drinks and their characteristics (attributes). The objectives of the research are to study consumer distribution by different services and by different currencies in terms of actual quantities and by percentage split. We also checked hypotheses about consumer populations' unknown mean scores equality; same analyses done for the 2nd study on the soft drinks. Along with research methodology we used variance analysis method – ANOVA [3, p.475], [4, p.725]. Novelty here is the usage of

ANOVA in such studies. Based on the research, outcomes are tested against the hypotheses: it is true that average number of consumers do not differ in different banks, also that average number of soft drink consumers differ from each other. Results can be used a) by banks in order to help them to better study the clients’ inflow, during the analyses of income and expenses; b) by manufacturers of soft drinks to estimate consumption and make changes in the characteristics of the product.

Initially ANOVA was used to study and make decisions related to agricultural statistics and specific biological experiments. Nowadays ANOVA along with other statistical methods is becoming universal in theoretical research as well as in practical activities in almost all fields.

Population is a complete set of elements (persons or objects) that possess some common characteristic defined by the sampling criteria. For instance, total number of consumers of any firm’s product (or for specific product) makes certain population. Each population has two numeric characteristics: mean score of the element– expected score and numeric measure of the deviation from the mean – variation. As usual, these characteristics are unknown. In order to estimate (to establish approximate meanings) these characteristics to study total population is either impossible or not recommended. E.g. it is not possible to study impact of tobacco usage on each smoker’s health or it is not suggested to check validity of each bulb ready for sales, etc. therefore, observation is made on the part of the population, data of which is called sampling. Quantity of sampling elements i.e. of conducted tests is sample size. In reality researcher has only this sampling, based on which she/he needs to solve different type of statistical problem based on the statistical conclusions. Key objective of statistics is to study population through the sampling.

One of the aspects of interest in our research is to study populations’ unknown mean scores homogeneity i.e. proximity points. For instance, a) there is a need to find out for similar type of products (populations) made by different firms, share of mean scores homogeneity of the rejected products – if they match or not; b) if the unknown mean score of consumers (populations) of specific service and products are matching or differ from each other.

Using ANOVA for creating and solving the general problem of hypothesis check about populations’ unknown mean score equality has its defined scheme [3, p.475].

For example, there is R quantity of population X_1, K, X_R , for which unknown mean scores are: a_1, K, a_R . Main hypothesis is that all mean scores match; whereas alternative hypothesis can state that at least one mean score is different from others. Objective is to decide on the parts of the populations based on the outcomes of the measurements (tests, tracking, interviewing) with some probability (significance level) out of two hypotheses which one is correct (true).

Let’s now review the results of the first research.

2. Consumer behavior towards bank services and currencies

Each bank’s total number of clients is considered as studied population. Our research conducted in 3 key banks of Georgia: a) Bank Republic, b) Bank of Georgia and c) TBC Bank. In each bank 100 respondents were interviewed.

Based on the raw data following information was captured: 1. Split of clients by bank services and currencies; 2. % split of currencies by services; 3. % split of services by currencies.

Here is an example based on the Bank Republic:

Table no. 1 Bank Clients Split by Services & Currencies

Bank Republic						
#	Bank Service Name	Currency				Total
		Georgian Lari	US Dollars	Euro	Ruble	
1	Business loan	5	3	1	1	10
2	Term deposit	4	2	3	0	9
3	Mortgage	2	2	1	0	5
4	Compound savings	2	1	1	0	4

5	Privilege savings	3	2	1	0	6
6	Child deposit	6	2	1	1	10
7	Debit Card	14	6	1	1	22
8	Flexible deposit	6	2	2	0	10
9	Consumer loan	11	3	1	1	16
10	Call deposit	4	2	2	0	8
Total		57	25	14	4	100

Table no. 2 % Split of Currencies by Services

Bank Republic						
#	Bank Service Name	Currency				Total
		Georgian Lari	US Dollars	Euro	Ruble	
1	Business loan	50	30	10	10	100
2	Term deposit	45	22	33	0	100
3	Mortgage	40	40	20	0	100
4	Compound savings	50	25	25	0	100
5	Privilege savings	50	33	17	0	100
6	Child deposit	60	20	10	10	100
7	Debit Card	64	26	5	5	100
8	Flexible deposit	60	20	20	0	100
9	Consumer loan	69	19	6	6	100
10	Call deposit	50	25	6	6	100

Table no. 3 % Split of Services by Currencies

#	Bank Service Name	Currency			
		Georgian Lari	US Dollars	Euro	Ruble
1	Business loan	9	12	7	25
2	Term deposit	7	8	21	0
3	Mortgage	3.4	8	7	0

4	Compound savings	3.4	4	7	0
5	Privilege savings	5.3	8	7	0
6	Child deposit	10.5	8	7	25
7	Debit Card	24.6	24	7	25
8	Flexible deposit	10.5	8	15	0
9	Consumer loan	19.3	12	7	25
10	Call deposit	7	8	15	0
Total		100	100	100	100

Let's now review in the mentioned three banks 7 service types split by clients as provided below:

Table no. 4 Clients by Services
(Bank Republic, Bank of Georgia, TBC Bank)

#	Bank Service Name	Number of Clients		
		Bank Republic	Bank of Georgia	TBC Bank
1	Business loan	10	8	6
2	Term deposit	9	12	8
3	Compound savings	4	10	5
4	Mortgage	5	10	6
5	Child deposit	10	4	5
6	Debit Card	22	15	24
7	Consumer loan	16	18	16

Using ANOVA we need to find out if unknown mean scores of the clients populations match or differ from each other in the mentioned banks for 7 services. In this case we have $R = 3$, $N = 21$ three unknown means: a_1 , a_2 da a_3 . Significance is $\alpha = 0.05$. We need to validate hypotheses: $H_0 : a_1 = a_2 = a_3$ and H_1 : at least one mean is different from others. Based on the calculations following result revealed:

$$\bar{x}_1 = 11, \bar{x}_2 = 11, \bar{x}_3 = 10 \quad (1)$$

$$\bar{S}_1^2 = 40, \bar{S}_2^2 = 21, \bar{S}_3^2 = 53 \quad (2)$$

$$\bar{x}_1 = 10.62 \quad (3)$$

$$S_B^2 = 2.36 \quad (4)$$

$$S_W^2 = 38 \quad (5)$$

$$f = 0.06 \quad (6)$$

Referring to Fisher's table of upper α - critical points of distribution [3, p.528], we calculated critical area which is:

$$\left[F_{R-1, N-R, \alpha}, +\infty \right) = \left[F_{2, 18, 0.05}, +\infty \right) = [3.55, +\infty) \quad (7)$$

So, critical meaning $f = 0.06$ does not fall in $[3.55, +\infty)$ critical area, therefore, there is no reason to reject main hypothesis H_0 . In other words, at 0.05 significance level i.e. with $1 - \alpha = 95\%$ confidence level (with 0.95 probability) we can conclude that in the mentioned three banks unknown mean scores of bank services of the populations (clients) do not differ.

Let's see the outcomes of another research.

3. Consumer behavior towards soft drinks and their characteristics (attributes)

Table no. 5 Quantities of Consumers Split by Types of Soft Drinks and Attributes

#	Soft Drinks Names	Attributes					Total
		Taste	Color	Sweetness	Sparkle	Design	
1	Coca Cola	6	2	6	1	2	17
2	Pepsi	8	1	6	1	2	18
3	Fanta	8	3	6	2	2	21
4	Sprite	5	1	7	1	1	15
5	Natakhtari	7	2	6	1	2	18
6	Zedazeni	6	2	5	2	1	16
7	Zandukeli	8	1	6	2	1	18
8	Kazbegi	7	2	6	1	1	17
9	Laghidze	5	2	7	1	1	16
10	Lemonade (others)	6	1	10	2	2	21
Total		66	17	65	14	15	177

Table no. 6 Attributes % Split by Types of Soft Drinks

#	Soft Drinks Names	Attributes					Total
		Taste	Color	Sweetnes	Sparkle	Design	

				s			
1	Coca Cola	35.3	11.8	35.3	5.8	11.8	100
2	Pepsi	44.4	5.6	33.3	5.6	11.1	100
3	Fanta	38.1	14.3	28.6	9.5	9.5	100
4	Sprite	33.3	6.7	46.6	6.7	6.7	100
5	Natakhtari	38.9	11.1	33.3	5.6	11.1	100
6	Zedazeni	37.5	12.5	31.2	12.5	6.3	100
7	Zandukeli	44.4	5.6	33.3	11.1	5.6	100
8	Kazbegi	41.3	11.8	35.3	5.8	5.8	100
9	Laghidze	31.2	12.5	43.7	6.3	6.3	100
10	Lemonade (others)	28.6	4.8	47.6	9.5	9.5	100

Table no. 7 Types of Soft Drinks % Split by Attributes

#	Soft Drinks Names	Attributes				
		Taste	Color	Sweetness	Sparkle	Design
1	Coca Cola	9.1	11.8	9.2	7.1	13.3
2	Pepsi	12.1	5.9	9.2	7.1	13.3
3	Fanta	12.1	17.6	9.2	14.3	13.3
4	Sprite	7.6	5.9	10.8	7.1	6.7
5	Natakhtari	10.6	11.8	9.2	7.1	13.3
6	Zedazeni	9.1	11.8	7.7	14.3	6.7
7	Zandukeli	12.1	5.8	9.2	14.3	6.7
8	Kazbegi	10.6	11.8	9.2	7.1	6.7
9	Laghidze	7.6	11.8	10.8	7.1	6.7
10	Lemonade (others)	9.1	5.8	15.5	14.2	13.3
Total		100	100	100	100	100

Let's review Table no. 5 data and consumers by five attributes which unknown mean scores are a_1, a_2, a_3, a_4 and a_5 . We have $H_0: a_1 = L = a_5$, H_1 : at least one mean differs from others. Using ANOVA in this case there are $R = 5, R - 1 = 4, N = 40, N - R = 35$. Significance is $\alpha = 0.05$. Based on the calculations following result revealed:

$$\bar{x}_1 = 6.6, \bar{x}_2 = 1.7, \bar{x}_3 = 6.5, \bar{x}_4 = 1.4, \bar{x}_5 = 1.5 \quad (8)$$

$$\bar{S}_1^2 = 0.25, \bar{S}_2^2 = 0.25, \bar{S}_3^2 = 1, \bar{S}_4^2 = 0.625, \bar{S}_5^2 = 0.625 \quad (9)$$

$$\bar{x}_1 = 4.425 \quad (10)$$

$$S_B^2 = 86 \quad (11)$$

$$S_W^2 = 6.19 \quad (12)$$

$$f = 14.33 \quad (13)$$

Referring to Fisher's table of upper α - critical points of distribution [3, p.528], we calculated critical area which is:

$$\left[F_{R-1, N-R, \alpha}, +\infty \right) = \left[F_{4, 35, 0.05}, +\infty \right) = \left[2.64, +\infty \right) \quad (14)$$

So, critical meaning $f = 14.33$ falls in $\left[2.64, +\infty \right)$ critical area, therefore, we can conclude that for given ten soft drinks unknown mean scores of consumer populations are different by attributes.

4. Conclusions

Two marketing research outcomes are analysed: 1. consumer behavior towards bank services and currencies and 2. Consumer behavior towards soft drinks and their characteristics (attributes).

In both studies there is used variance analysis method – ANOVA with 95% confidence level in order to check hypotheses about consumer populations' unknown mean scores equality;

In first case main hypothesis H_0 reveals to be true i.e. given three banks unknown mean scores of bank services of the populations (clients) do not differ.

In another case main hypothesis H_0 reveals to be false i.e. given ten soft drinks unknown mean scores of consumer populations are different by attributes.

Results can be used a) by banks in order to help them to better study the clients' inflow, during the analyses of income and expenses; b) by manufacturers of soft drinks to estimate consumption and make changes in the characteristics of the product.

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