

# IMPACT OF KEY MARKETING TOOLS ON GLOBAL CAR MARKET DEVELOPMENT

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## Resume

The purpose of the proposed study was to identify the functional patterns of influence of the marketing tools on sales of cars on the global market, to be able to predict sales volumes in the future, taking into account certain marketing tools that the company may use in a particular international market. For the purpose of this research the method of correlation-regression analysis is used to construct the corresponding economic and mathematical models of impact on the sales volumes of various instruments of product, price, promotion policy, etc. Using the models offered in the article, the feasibility of introducing certain measures can be determined, when entering new markets in order to increase car sales. Each instrument to which potential buyers are sensitive determines the effect of its use. Considering this effect, budgets can be set up for appropriate action.

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## 1 Introduction

The modern global car market is characterized by a complex system of commercial relations, as well as the need to coordinate the activities and economic interests of a large number of businesses. Fluctuations in supply and demand in this market can provoke economic crises and can slow down the development of the world economy.

Entering any market is a great investment and risk, so businesses require the model for predicting success in specific markets using marketing parameters, which are relevant to this study.

In the process of studying the marketing activities of enterprises in the car market and the prospects for their effective operation, it is necessary to take into account the globalization processes [1-2], restrictions on access to natural resources and increase of their value [3-4], digitalization of society [5-6], intensification of competition [7-8] and government regulation [9-11], which are key factors influencing development of the automotive industry in the world. Besides that, since 2020 the world economy has largely been affected by the COVID-19 crisis [12] that has a great impact on the consumer's behavior worldwide; in general and on the global car market, in particular. In such circumstances, the way in which marketing can be used, has changed and

shows similarities with its usage during the economic downturns [13]. The specifics of the COVID-19 crisis impact on marketing usage on the global car market is presented in the discussion section of this paper.

## 2 Literature review

Literature review covers two stages:

1. Review of the researches dedicated to the automotive industry development in various countries.
2. Specifics of marketing factors.

One of the modern conceptual models, proposed in current researches of the automotive industry in India, is a conceptual model by Goswani and Kumar [14], which captures interdependency of agility enablers and develops its underlying attributes. Some components such as cost management, product service or customer resource adaption are researched in this conceptual model, but not in the marketing context.

The other research on developing the key performance indicators for agile manufacturing, based on the data of the Indian auto component manufacturer, was made by Kumar Potdar and Routroy [7]. In this research the following marketing performance indicators were studied: capturing market environment, management of market volatility,

improvement in market share, entering new market, response time for customer orders and queries, quick response to market changes. EL-Khalil [15] considered the market only as an element of strategic flexibility in the research dedicated to the mediating effect of lean management on the relationship between flexibility implementation and operational metrics in US automotive manufacturing plants.

Cech and Januska [16] evaluated risk management maturity in the Czech Automotive Industry, placing the emphasis on competition in complex business environment and its riskiness for the car producers. The force field analysis of Indian automotive strategic sourcing risk management enablers and barriers was performed by Kumar Sharma, Singh and Matai [8]. This research considered such an important marketing factor as sharing information among partners in the automobile supply chain with the purpose to make the communication process clearer. The factor of marketing communication policy is also partially considered in the research of Demirbas, Wilkinson and Bennett [17]. They studied supplier relations impact within the UK automotive industry.

Dmytriiev et al. [18] devoted their study to forming the competitive strategy of an enterprise based on typologization of regional markets one example of the Ukrainian automotive industry. The marketing factor of regional coverage is emphasized in this paper.

The research of Chen [19] is devoted to analysis of the strategies of European, American, Japanese, Korean and Chinese car producers on the Chinese automobile market. The focus was made on differences in development of domestic and foreign car producers with attention to such marketing factors as: regional coverage, low price, breadth of the range, consumer preference for car compactness, preference given to producers located in the region.

Cooper [20] considered the drivers of success in the new-product development, paying attention to such marketing factors as building in voice-of-customer (like the factor of brand loyalty to previously owned car), adopting a global orientation for the project, a compelling value proposition (like the value of possessing factor), ecology (represented as a climate factor) and culture.

The analytical report of Deloitte [21] proves that such marketing factors as safety, connectivity, ecology (represented by the alternative engine solutions) and value of possessing (represented by unwilling to pay more than...) are still very important for consumers around the world.

In general, in the world, the new generation, i.e. young people under 35, choose a car according to 6 main sources of information, which are sorted by impact rating [22]:

1. Recommendations from family and friends.
2. Reviews on independent sites
3. News and articles in the media

4. Manufacturers' websites
5. Sellers in car dealerships
6. Social networks.

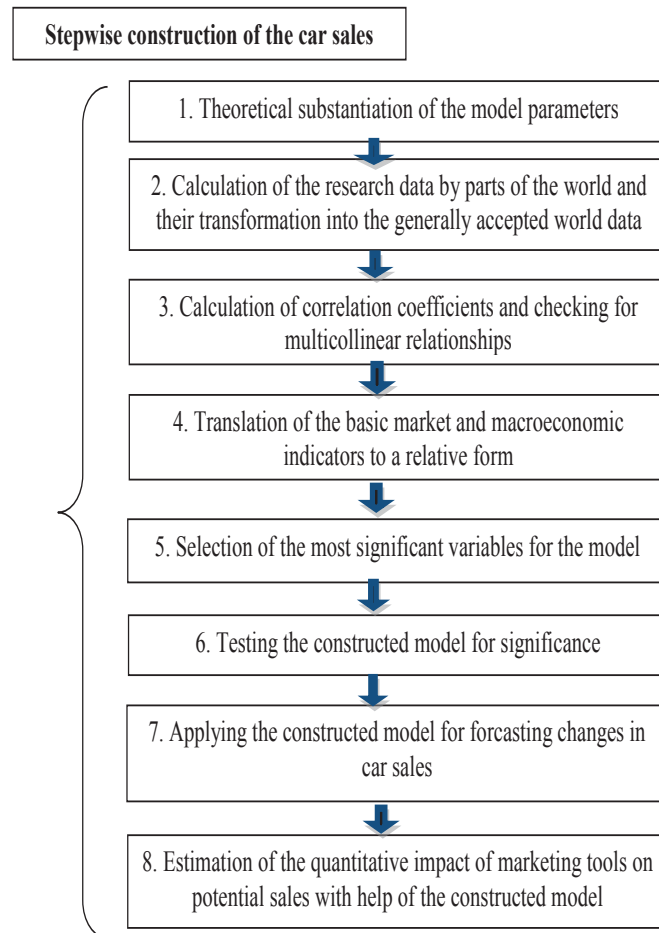
It is visible that in the top 6 information sources there is no advertising at all and trust in information of the car manufacturers (manufacturers' websites - 4th place and sellers in car dealerships - 5th place) is minimal. Therefore, automakers need to work harder to improve the brand loyalty, including improving the quality, reliability of the car and improving after-sales service to receive the final reward - the recommendations of people close to the consumer. In addition, it is necessary to actively work with independent sites and the media on effective PR activity.

The research dedicated to the concept of marketing efforts consolidation of car producers at the global car market [23] can be considered as the theoretical background of this paper. It includes the impact factors on strategic and tactical level. This research developed the concept in direction of the practical implication with the detailed analysis based on marketing factors important for the global car market. In addition, previous studies in this area [24] focused on modelling of global car market development under globalization impact, where the sales forecasting model is developed that can be useful for our research.

In order to identify the most effective marketing tools, the general list of explanatory variables proposed by Savych [25], the authors propose to supplement a set of features that characterize the needs and behavior of consumers in each part of the world, including product policy («Loyalty to the brand previously owned by the consumer», «Preference is given to manufacturers who are localized in the region», «The younger generation is the largest consumer in the share of all consumers», «Consumer advantage in the compactness of the car», «Safety», «Design», «Ecology/electric cars», «Breadth of assortment», «Brand premium», «Consumption level»), price policy («Cost of ownership», «Low price»), place policy («Personal sale», «Internet sales», «Region coverage»), promotion policy («Events», «Digital advertising», «Magazines», «Television», «Radio», «Recommendations from family and friends»), human resources policy («Motivation of sellers», «Qualification of sellers»).

Based on the analysis of literature sources, the authors proposed the following research hypotheses:

- $H_1$ : The model of forecasting car sales volume, considering marketing factors, can be used as a basis for conducting a study of various marketing tools impact on car sales volume.
- $H_2$ : The forecast volume of car sales in the world during 2007-2019 coincides with the actual figures.
- $H_3$ : The proposed set of marketing tools has a positive impact on the growth of car sales at the global market.



**Figure 1** Stepwise construction of the car sales forecasting model considering marketing parameters

### 3 Methodology

Based on the performed literature review and to achieve the purpose of study, the authors propose to build appropriate economic and mathematical models of impact of the above mentioned tools of product, price, advertising policy etc. on sales volume.

To make the appropriate calculations and build the model of forecasting car sales considering the marketing parameters, Microsoft Excel software (package "Analysis of data") was used. The proposed stepwise construction of the car sales forecasting model, considering marketing parameters is presented on Figure 1.

For each of these features, according to the OICA statistics presented in [26] its affiliation to a certain part of the world (European Union, CIS, North American Free Trade Area (NAFTA), South America, Asia, Africa) - if any feature inherent in the needs of consumers in the region, it is opposed to «1» and «0» - otherwise.

Since for all the parts of the world the communication tool "Television" is marked as important (in all the records the value "1" is specified), for this indicator it is impossible to calculate correlation coefficients and determine the impact on the resulting variable, because

in fact it becomes a constant. Accordingly, it will be excluded from the analysis.

For the rest of the indicators that characterize the needs and behavior of consumers in each part of the world, it is advisable to check for multicollinear relationships. Accordingly, in Table 1 and Table 2 their correlation matrix is presented.

As it can be seen from Table 1 and Table 2, a significant number of pairwise correlation coefficients are equal to one by modulo. This is due to the fact that such indicators in different parts of the world are either equally important or at the same time unimportant in determining the needs of residents in cars. Or, conversely, they have the opposite dependence, such as the characteristic "Cost of ownership" on the value of the correlation coefficient "-1" with many other factors.

Accordingly, in the case of including any of these factors in the model, all the variables that have a correlation relationship with it at the level of one by modulo, should be excluded from consideration. It is desirable to reject other variables that have a high level of pairwise correlation to avoid the manifestation of multicollinearity.

The fact that these features of the specifics of consumer behavior for each part of the world are constant tests of the study period 2006 - 2018, to a set of independent observations of these factors is 6 records - for several parts of the world (European Union, CIS, North American Free Trade Area (NAFTA), South America, Asia, Africa).

Therefore, in addition to these features that characterize the needs and specifics of consumer behavior

in each part of the world, the model for forecasting car sales, considering marketing factors, must include basic market and macroeconomic indicators. In this case, the entire data sample will increase 13 times (by the number of years of observations). Moreover, the signs of the specifics of consumer behavior will be repeated for each year of observations for the relevant part of the world.

However, when combining information from different parts of the world, it should be borne in

**Table 1** Pairwise correlation coefficients between indicators that characterize the needs and behavior of consumers in the world

Variables	Loyalty to the brand previously owned by the consumer	Preference is given to manufacturers who are localized in the region	The younger generation is the largest consumer	Consumer advantage in the compactness of the car	Safety	Design	Ecology/electric cars	Breadth of assortment	Brand premium	Consumption level	Cost of ownership
Loyalty to the brand previously owned by the consumer	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
Preference is given to manufacturers who are localized in the region	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
The younger generation is the largest consumer	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
Consumer advantage in the compactness of the car	0.707	0.707	0.707	1.000	0.707	0.000	0.707	0.500	0.250	0.500	-0.707
Safety	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
Design	0.333	0.333	0.333	0.000	0.333	1.000	0.333	0.707	0.707	-0.707	-0.333
Ecology/electric cars	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
Breadth of assortment	0.707	0.707	0.707	0.500	0.707	0.707	0.707	1.000	0.500	-0.500	-0.707
Brand premium	0.000	0.000	0.000	0.250	0.000	0.707	0.000	0.500	1.000	-0.250	0.000
Consumption level	0.000	0.000	0.000	0.500	0.000	-0.707	0.000	-0.500	-0.250	1.000	0.000
Costs of ownership	-1.000	-1.000	-1.000	-0.707	-1.000	-0.333	-1.000	-0.707	0.000	0.000	1.000
Low price	-0.707	-0.707	-0.707	-0.250	-0.707	0.000	-0.707	-0.500	0.500	0.250	0.707
Personal sale	-0.707	-0.707	-0.707	-1.000	-0.707	0.000	-0.707	-0.500	-0.250	-0.500	0.707
Internet sales	1.000	1.000	1.000	0.707	1.000	0.333	1.000	0.707	0.000	0.000	-1.000
Region coverage	0.707	0.707	0.707	0.500	0.707	0.707	0.707	1.000	0.500	-0.500	-0.707
Events	-0.447	-0.447	-0.447	-0.316	-0.447	0.447	-0.447	0.316	0.632	-0.632	0.447
Digital advertising	0.707	0.707	0.707	0.500	0.707	0.707	0.707	1.000	0.500	-0.500	-0.707
Magazines	-0.707	-0.707	-0.707	-1.000	-0.707	0.000	-0.707	-0.500	-0.250	-0.500	0.707
Radio	-0.707	-0.707	-0.707	-1.000	-0.707	0.000	-0.707	-0.500	-0.250	-0.500	0.707
Recommendations from family and friends	-0.333	-0.333	-0.333	0.000	-0.333	0.333	-0.333	0.000	0.707	0.000	0.333
Motivation of sellers	-0.333	-0.333	-0.333	-0.707	-0.333	0.333	-0.333	0.000	0.000	-0.707	0.333
Qualification of sellers	0.447	0.447	0.447	0.316	0.447	0.447	0.447	0.632	0.316	-0.316	-0.447

**Table 2** Pairwise correlation coefficients between indicators that characterize the needs and behavior of consumers in the world (continuation of Table 1)

Variables	Low price	Personal sale	Internet sales	Region coverage	Events	Digital advertising	Magazines	Radio	Recommendations from family and friends	Motivation of sellers	Qualification of sellers
Loyalty to the brand previously owned by the consumer	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
Preference is given to manufacturers who are localized in the region	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
The younger generation is the largest consumer	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
Consumer advantage in the compactness of the car	-0.250	-1.000	0.707	0.500	-0.316	0.500	-1.000	-1.000	0.000	-0.707	0.316
Safety	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
Design	0.000	0.000	0.333	0.707	0.447	0.707	0.000	0.000	0.333	0.333	0.447
Ecology/electric cars	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
Breadth of assortment	-0.500	-0.500	0.707	1.000	0.316	1.000	-0.500	-0.500	0.000	0.000	0.632
Brand premium	0.500	-0.250	0.000	0.500	0.632	0.500	-0.250	-0.250	0.707	0.000	0.316
Consumption level	0.250	-0.500	0.000	-0.500	-0.632	-0.500	-0.500	-0.500	0.000	-0.707	-0.316
Costs of ownership	0.707	0.707	-1.000	-0.707	0.447	-0.707	0.707	0.707	0.333	0.333	-0.447
Low price	1.000	0.250	-0.707	-0.500	0.316	-0.500	0.250	0.250	0.707	0.000	-0.316
Personal sale	0.250	1.000	-0.707	-0.500	0.316	-0.500	1.000	1.000	0.000	0.707	-0.316
Internet sales	-0.707	-0.707	1.000	0.707	-0.447	0.707	-0.707	-0.707	-0.333	-0.333	0.447
Region coverage	-0.500	-0.500	0.707	1.000	0.316	1.000	-0.500	-0.500	0.000	0.000	0.632
Events	0.316	0.316	-0.447	0.316	1.000	0.316	0.316	0.316	0.447	0.447	0.200
Digital advertising	-0.500	-0.500	0.707	1.000	0.316	1.000	-0.500	-0.500	0.000	0.000	0.632
Magazines	0.250	1.000	-0.707	-0.500	0.316	-0.500	1.000	1.000	0.000	0.707	-0.316
Radio	0.250	1.000	-0.707	-0.500	0.316	-0.500	1.000	1.000	0.000	0.707	-0.316
Recommendations from family and friends	0.707	0.000	-0.333	0.000	0.447	0.000	0.000	0.000	1.000	-0.333	-0.447
Motivation of sellers	0.000	0.707	-0.333	0.000	0.447	0.000	0.707	0.707	-0.333	1.000	0.447
Qualification of sellers	-0.316	-0.316	0.447	0.632	0.200	0.632	-0.316	-0.316	-0.447	0.447	1.000

mind that economic, infrastructural, demographic and other characteristics are too different (some indicators may differ very much). If to include all these factors in absolute form, it will be lost the ability to build a regression model, which is most convenient for analyzing the degree of influence of individual factors on the resulting indicator (to optimize the parameters of such a model all its variables should be distributed according to normal law).

Accordingly, when building a model for forecasting car sales considering marketing factors, it is necessary to translate the basic market and macroeconomic indicators to a relative form. For this purpose, these variables are converted to relative increments for the year as a percentage of the ratio:

$$Z_i^t = \frac{X_i^t - X_i^{t-1}}{X_i^{t-1}} \cdot 100\%, \quad (1)$$

where  $X_i^t, X_i^{t-1}$  - the value of the  $i$ -th basic indicator in the  $t$ -th and previous years.

As it can be seen from Equation (1), a number of

relative values of indicators will begin in 2007 (2006 serves as a basis for calculating the annual relative change). Therefore, the training sample for building a model for forecasting car sales considering marketing factors is reduced to the period from 2007 to 2018 for explanatory variables and from 2008 to 2017, for the resulting variable. Data on sales in 2019 are left to compare the result of the model calculation to the real data that were not taken into account in its construction.

From the list of the basic market and macroeconomic indicators, two factors are left out - "Inflation" and "Population expenditures, consumption", because they are already presented in the original statistics in the form of annual relative percentage change (for them  $Z_i^t = X_i^t$ ).

#### 4 Results

To build a model for forecasting the car sales considering marketing factors, it was decided to add

**Table 3** Correlation of relative changes in car sales with the corresponding indicator

Indicator	Correlation
Car Park, thousands units	0.024
Motorization, Quantity of cars per 1000 of population	0.178
Population, number of people	-0.061
Urbanization, %	0.128
Major Roads Length, km	0.128
Real fuel costs (average for gasoline and diesel fuel), USD	-0.008
GDP, USD	0.690
Inflation, %	-0.133
Unemployment, %	-0.308
Population expenditures, consumption, % of change	-0.003
Annual Average Sold Car Price, USD	-0.015
Average Fuel Consumption of Car Sold, liters per 100km	-0.053
Average Costs of Sold Car Operation, USD	0.018
GDP per capita, USD	0.702
Car sales, units	0.197
Loyalty to the brand previously owned by the consumer	0.134
Preference is given to manufacturers who are localized in the region	0.134
The younger generation is the largest consumer	0.134
Consumer advantage in the compactness of the car	0.161
Safety	0.134
Design	0.075
Ecology/electric cars	0.134
Breadth of assortment	0.030
Brand premium	0.100
Consumption level	0.131
Costs of ownership	-0.134
Low price	0.069
Personal sale	-0.161
Internet sales	0.134
Region coverage	0.030
Events	-0.141
Digital advertising	0.030
Magazines	-0.161
Radio	-0.161
Recommendations from family and friends	0.062
Motivation of sellers	-0.120
Qualification of sellers	0.043

to analysis the indicator «GDP per capita» [27], which combines the two factors - «GDP» and «Population». In order to select the most significant explanatory variables for the model, their impact on the relative change in car sales next year (Table 3) was analyzed.

As it can be seen from Table 3, only two explanatory indicators have a significant impact on the dependent variable - “GDP” and “GDP per capita”. Since there

is a multicollinear relationship between them (direct dependence on each other and a correlation of 0.896), only one of them was left in the model - “GDP per capita”, because it has a greater impact on the resulting variable and combines the two factors.

Other indicators have low values of correlation with the original variable, as it can be seen from Table 3. Therefore, the selection of the most significant of

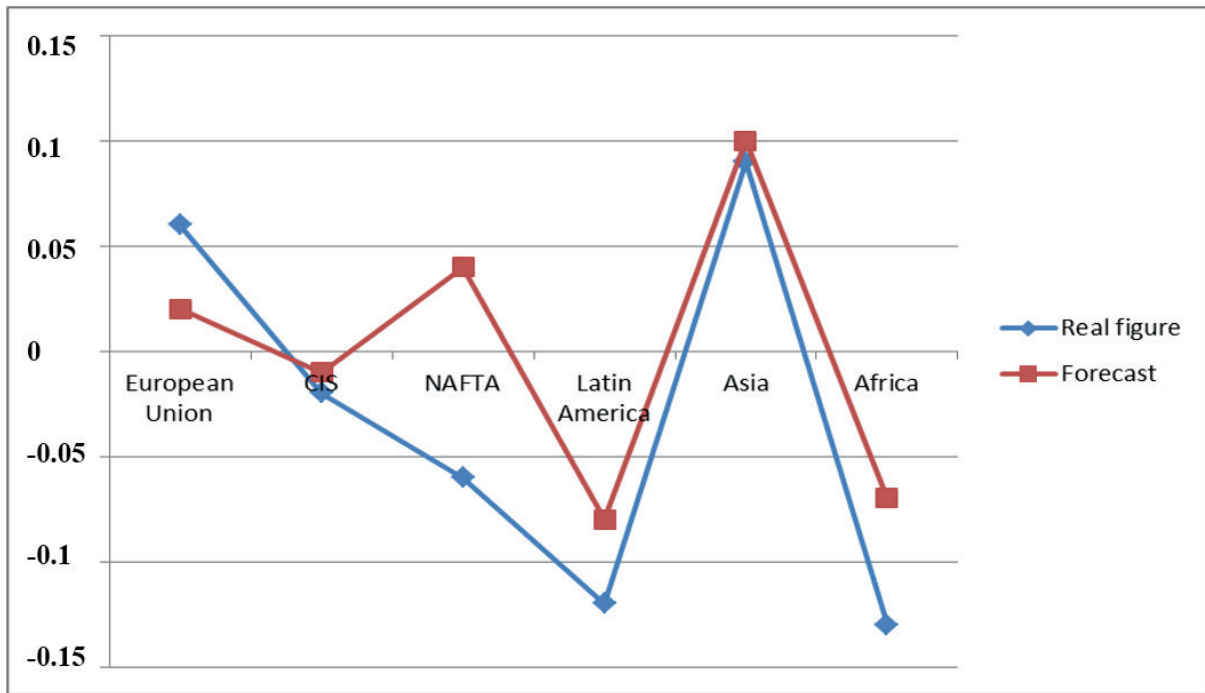


Figure 2 Forecasting annual growth in car sales by parts of the world in 2018 according to Equation (2)

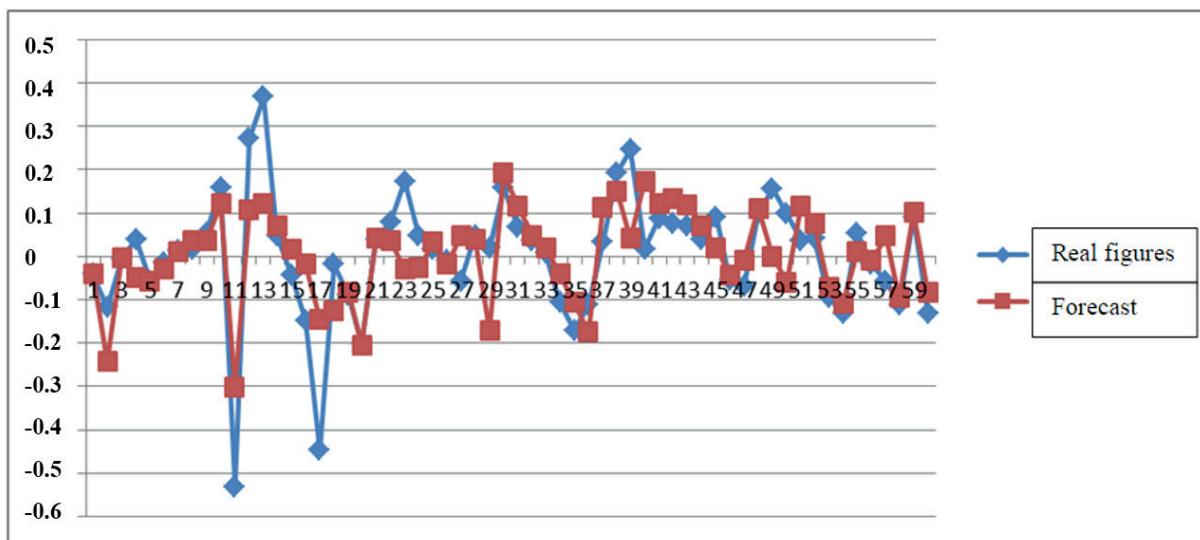


Figure 3 Forecasting annual changes (in %) of car sales by parts of the world in the period from 2008 to 2019 according to Equation (2)

them was made in the modelling process - the set of explanatory factors of the model was left, for which it would show the greatest accuracy in training and test data. Moreover, the coefficients of pairwise correlation between all the other relative variables (which are not presented in Table 3) were insignificant, so their combinations in the model could be anything. As a result of numerous experiments, with different composition of explanatory variables to the model of forecasting car sales considering marketing factors, it was decided to add such factors as «Inflation» and «Population expenditures, consumption» [27] to the indicator «GDP per capita». Finally, the model took the following form:

$$Y = 3.547 \cdot Z_1 - 0.459 \cdot Z_2 - 0.308 \cdot Z_3, \tag{2}$$

where

- Y - annual growth in car sales, %;
- Z<sub>1</sub> - annual change of GDP per capita, %;
- Z<sub>2</sub> - inflation, %;
- Z<sub>3</sub> - population expenditures, consumption, %.

Equation (2) proved to be the most effective of all the constructed with a coefficient of determination of 0.523 and an F-criterion of 18.6 at 51 degrees of freedom, that is the model is significant.

The forecast of changes in the car sales by parts of the world in 2018 relative to 2017 according to Equation (2) is shown in Figure 2.

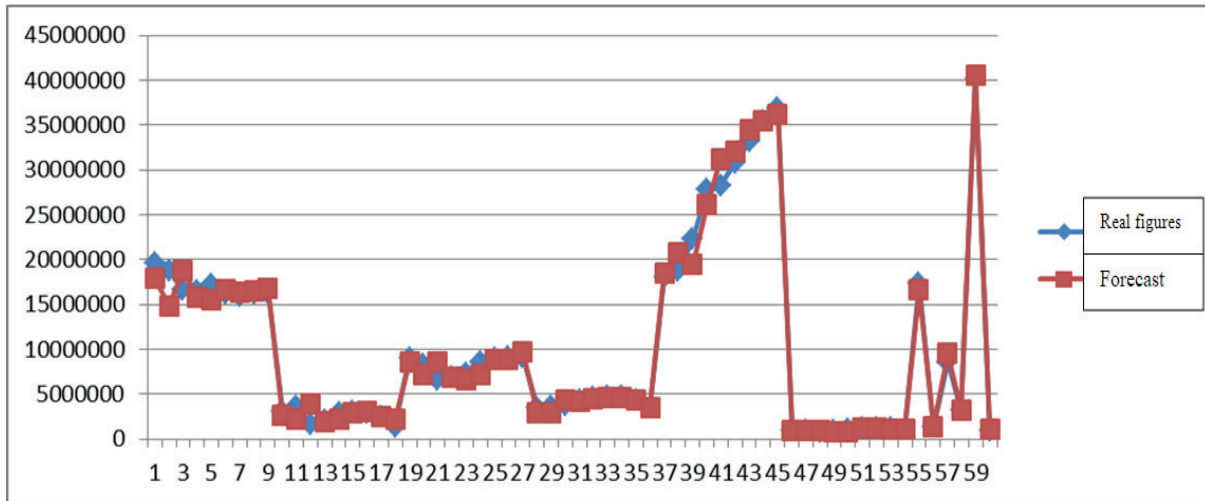


Figure 4 Forecasting car sales by parts of the world in the period from 2008 to 2019 based on e Equation (2)

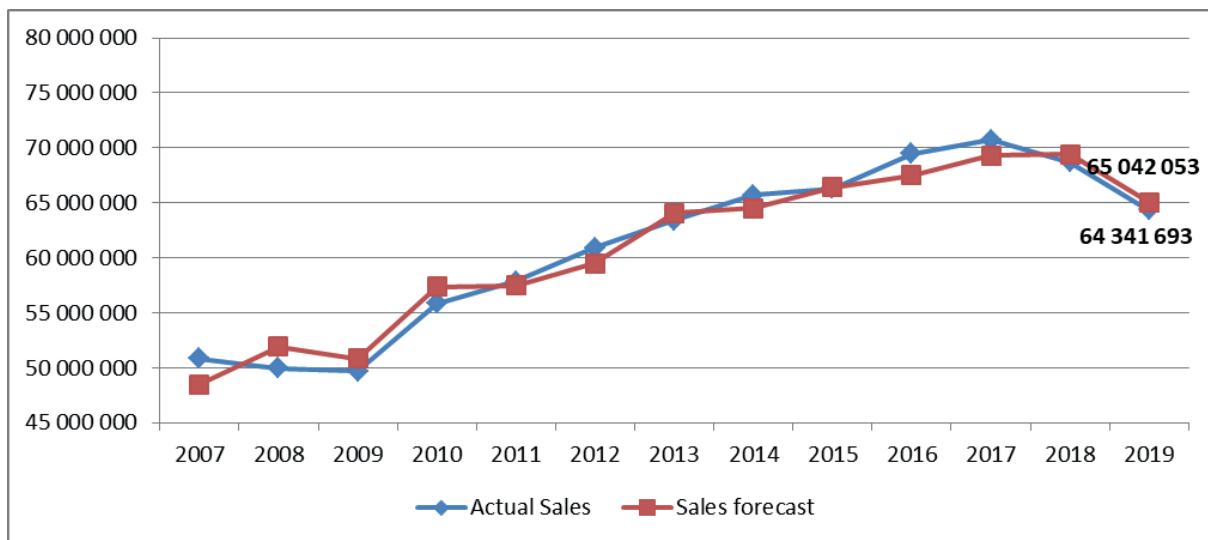


Figure 5 Forecast and actual data on car sales in the world, 2007-2019 years

It should be noted that Figure 2 shows the forecast on the test data of 2018, which were not used in selection of factors and optimization of Equation (2) parameters. As it can be seen from Figure 2, the model accurately predicts annual growth in car sales in almost all the parts of the world. Only for the countries of the North American Free Trade Area (NAFTA) a mistake was made in forecasting the dynamics of sales changes (in 2016 there was a decline [26], while the model predicted growth).

The forecast of changes in cars sales, according to Equation (2), for all parts of the world in the full studied time interval from 2008 to 2019 on the data of explanatory variables from 2007 to 2018, respectively, is shown in Figure 3.

When translating the relative changes in car sales projected by Equation (2). to the absolute values of sales in the period from 2008 to 2019, the graphical illustration in Figure 4 is obtained to compare the forecast to the real data.

As it can be seen from the obtained results, Equation (2) can be used as a basis for conducting

a study of impact The hypothesis  $H_1$  of this study is confirmed.

Therefore, the forecast data for the results of actual car sales in the world are presented in Figure 5. As it can be seen, the model is quite accurate, as it is possible to compare the actual data on car sales in the world in 2019 to the data of this model. The difference is only 1.01%, because according to our model, the projected sales are 65 042 053 cars, while the actual data [26] was 64 341 693 cars in 2019. So, the hypothesis  $H_2$  of our study is also confirmed.

Firstly, the importance of «Loyalty to the brand previously owned by the consumer» should be analyzed to ensure the higher sales of cars. For this purpose, it was included in the list of explanatory variables of the model, resulting in the following dependence:

$$Y = 3.522 \cdot Z_1 - 0.419 \cdot Z_2 - 0.738 \cdot Z_3 + 0.021 \cdot Z_4, \tag{3}$$

where  $Z_4$  - binary variable «Loyalty to the brand previously owned by the consumer».

It should be noted that the indicators  $Y$ ,  $Z_1$ ,  $Z_2$  and  $Z_3$  in Equation (3) are the same as in Equation (2). This provides an opportunity to study the individual impact of the additionally added factor  $Z_4$ .

The coefficient of determination of Equation (3) remained almost unchanged at 0.529 and the F-criterion decreased slightly to 14.0, due to the decrease in the number of degrees of freedom to 50. However, the model remains significant. The addition of a new factor  $Z_4$  did not change the effectiveness of the model on the training data, although the test prediction was a little more accurate, which can be concluded by comparing Figure 2 to Figure 5.

As it can be seen from the modelling results, the indicator "Loyalty to the brand previously owned by the consumer" was insignificant, which can be concluded, including the value of the coefficient 0.021 for the variable  $Z_4$  in regression in Equation (3), as well as large, relative to this, the coefficient of the value of its standard error, which is equal to 0.026. However, the parameter 0.021 of Equation (3) of the factor  $Z_4$  indicates that, on average, the manifestation of brand loyalty, which was previously owned by the consumer, increases the growth of car sales by 2.1%, which is quite a significant impact.

Therefore, in order to increase sales volume of its products to automotive concerns and their representative offices, it is advisable to implement a policy of maintaining loyalty to the brand, which was previously owned by the consumer.

Absolutely similar conclusions can be made about the characteristics "Preference is given to manufacturers who are localized in the region", "The younger generation is the largest consumer in the share of all consumers", "Safety", "Ecology/electric cars" and "Internet sales", after all, they repeat the value of the indicator "Loyalty to the brand previously owned by the consumer" (the coefficient of pair correlation with it is equal to +1, which can be seen from Table 3). That is, the intensification of marketing policy in the promotion of cars in each of these areas will increase sales by an average of 2.1%.

Instead, the price policy tool "Costs of ownership", associated with brand loyalty with a negative correlation of -1, while important for residents of the region reduces the demand for cars by an average of 1.9%, as it can be seen from the regression equation:

$$Y = 3.539 \cdot Z_1 - 0.279 \cdot Z_2 - 0.336 \cdot Z_3 - 0.019 \cdot Z_4, \quad (4)$$

where  $Z_4$  - binary variable of the price policy tool "Costs of ownership".

Accordingly, in order to increase car sales, it is necessary to seek or reduce the costs of ownership, or work towards levelling the perception of this factor in the region.

Consumer advantage in the compactness of the car increases their sales by 1.1%, which can be seen from the function:

$$Y = 3.517 \cdot Z_1 - 0.445 \cdot Z_2 - 0.454 \cdot Z_3 + 0.011 \cdot Z_4, \quad (5)$$

where  $Z_4$  - the product policy tool "Consumer advantage in the compactness of the car".

The product policy tool "Design" on average is able to reduce car sales by 0.5%, as it can be seen from the regression equation:

$$Y = 3.562 \cdot Z_1 - 0.449 \cdot Z_2 - 0.247 \cdot Z_3 - 0.005 \cdot Z_4, \quad (6)$$

where  $Z_4$  - the tool of product policy "Design".

Most likely, the negative impact of consumer commitment to the design appearance of cars on their sales is associated with a corresponding increase in their price, which reduces the possibility of buying them.

Breadth of assortment, region coverage and digital advertising, on average, have the same positive impact on car sales at 0.8%, as can be seen from the model:

$$Y = 3.541 \cdot Z_1 - 0.473 \cdot Z_2 - 0.448 \cdot Z_3 + 0.008 \cdot Z_4, \quad (7)$$

where  $Z_4$  - tools of product policy "Breadth of assortment", place policy "Region coverage" or promotion policy "Digital advertising".

Brand premium has a very significant negative impact on the level of car sales, which averages 2.6%, as can be seen from the equation of the forecast model:

$$Y = 3.666 \cdot Z_1 - 0.392 \cdot Z_2 - 0.175 \cdot Z_3 - 0.026 \cdot Z_4, \quad (8)$$

where  $Z_4$  - the product policy tool "Brand premium".

From Equation (8) it can be concluded that the desire to buy premium cars significantly reduces their sales in the region as a whole, because such cars are usually more expensive and, accordingly, are bought less often and in smaller quantities. Thus, to increase car sales, it is possible to pursue a product policy aimed at reducing public perception of the benefits of brand premiums. Such research result satisfies the findings of Davvetas and Halkias [28], relationships of consumers with brands perceived as worldwide available are based on passionate feelings generated by brand competence.

Consumers' perception of the efficiency of cars has a positive effect on their sales. Thus, implementation of the product policy to accustom customers to economic cars can increase their sales by an average of 1.6%, which can be concluded from the value of the regression parameter at  $Z_4$ :

$$Y = 3.501 \cdot Z_1 - 0.526 \cdot Z_2 - 0.539 \cdot Z_3 + 0.016 \cdot Z_4, \quad (9)$$

where  $Z_4$  - the product policy tool "Consumption level".

Regions with high sensitivity to the tool of price policy "Low price" are characterized by the low solvency of the population, due to which this factor shows a significant negative impact on car sales (at 3.6% of total sales decrease), as evidenced by the function:

$$Y = 3.715 \cdot Z_1 - 0.167 \cdot Z_2 - 0.091 \cdot Z_3 - 0.036 \cdot Z_4, \quad (10)$$

where  $Z_4$  - the price policy tool "Low price".

That is, in those regions where the price is important, there are insignificant sales in quantity.

Introduction of such a place tool as "Personal sale", or the perception of media by population through "Radio" or "Magazines" can increase car sales by 1.2%, which can be concluded from the functional ratio:

$$Y = 3.571 \cdot Z_1 - 0.565 \cdot Z_2 - 0.377 \cdot Z_3 + 0.012 \cdot Z_4, \quad (11)$$

where  $Z_4$  - binary variable of place tools "Personal sale", promotion tools "Radio" or "Magazines".

The importance of events highlighted by statistical data and expert assessments only for the countries of the former CIS cluster showed a negative impact of this promotion tool on car sales (- 3.1 %), which is due to the predominant decline in sales in the region during the study period, i.e. investment in the events are ineffective. The forecast model taking into account the binary variable of the promotion tool "Events" takes the following form:

$$Y = 3.532 \cdot Z_1 - 0.345 \cdot Z_2 - 0.379 \cdot Z_3 - 0.031 \cdot Z_4, \quad (12)$$

where  $Z_4$  - the promotion tool "Events".

The importance of family and friends' recommendations reduces car sales by an average of 2%, as it can be seen from the equation:

$$Y = 3.631 \cdot Z_1 - 0.374 \cdot Z_2 - 0.145 \cdot Z_3 - 0.020 \cdot Z_4, \quad (13)$$

where  $Z_4$  - the promotion tool "Recommendations from family and friends".

That is, the tastes of different consumers are different and recommendations from family and friends, in the authors' opinion, increase the time to make decisions about buying a car and reduce sales in a particular period of time, as the consumer hesitates and delays the purchase decision.

Increasing motivation of sellers contributes to the growth of car sales by an average of 0.8%, as it can be seen from the parameters of the model:

$$Y = 3.559 \cdot Z_1 - 0.515 \cdot Z_2 - 0.330 \cdot Z_3 + 0.008 \cdot Z_4, \quad (14)$$

where  $Z_4$  - the human resources tool "Motivation of sellers".

Improving the qualification of sellers contributes to intensification of car sales by 1.6%, as can be seen from the equation:

$$Y = 3.527 \cdot Z_1 - 0.549 \cdot Z_2 - 0.563 \cdot Z_3 + 0.016 \cdot Z_4, \quad (15)$$

where  $Z_4$  - the human resources tool "Qualification of sellers".

## 5 Discussions

The research limitations are in the studied period, which covers the 2007-2019 years period before the COVID-19 crisis and doesn't include the analysis of its impact on the global car market development. It is not recommended to include 2020 data on car sales into the constructed model of forecasting car sales, considering the marketing factors, because the situation in the car sales sector was considerably changed in 2020 because of the COVID-19 and the 2020 data will differ very much in comparison to the previous years. For example, in 2020 in comparison to 2019, the world car sales decreased -16.9% [26]. That is why the authors consider the possibility to expand this research in future taking into account some additional marketing factors arisen at the beginning of the pandemic period and construct the appropriate model that will include marketing factors typical for this period.

The Coronavirus crisis has dramatically changed the life priorities of consumers and accelerated shift from offline to online consumption [13]. Changes are also admitted by Donthu and Gustafsson study [29]: in the approach to work, business organization, business models and consumption. Some scientists [30] even consider the change of consumer behavior paradigm from consumer materialism to consumer spiritualism.

According to the McKinsey [31], the COVID-19 crisis has compelled about 95% of all German automotive-related companies to make their employees being temporarily laid off and receiving a substantial payment amount through the government. Globally, many auto-retail stores have remained closed for more than a month.

The leaders of the global automotive industry had profits decline by approximately \$ 100 billion in 2020, which is equal to a roughly six-percentage-point decrease in comparison to 2018. It may take some years to recover. Based on this McKinsey research [31], the authors believe that such marketing factors as positive consumer preferences to digital sales interactions and on-demand mobility should be considered in the further studies of the marketing instruments impact on sales at the global car market.

Internet sales are one of the key marketing tools used by the car producers in their marketing policy to attract more consumers in pre-pandemic period, for which the car sales forecasting model, considering marketing factors, was created in this article. So, the authors should admit that in the post-pandemic period the impact of such marketing factor as Internet sales will increase as there is a great increase of online consumption under the influence of Coronavirus.

The other possible marketing factor for studying its impact on the global car market are the CSR (Corporate Social Responsibility) activities as the researchers got scientific findings [32] that the negative influence of

**Table 4** *The impact level of marketing tools on car sales*

Tools	The impact level, %
Loyalty to the brand previously owned by the consumer	2.1
The younger generation is the largest consumer	2.1
Ecology/electric cars	2.1
Internet sales	2.1
Safety	2.1
Qualification of sellers	1.6
Consumption level	1.6
Personal sale	1.2
Radio	1.2
Magazines	1.2
Consumer advantage in the compactness of the car	1.1
Motivation of sellers	0.8
Breadth of assortment	0.8
Digital advertising	0.8
Region coverage	0.8
Design	-0.5
Costs of ownership	-1.9
Recommendations from family and friends	-2.0
Brand premium	-2.6
Low price	-3.6

recessions on the brand value can be limited by engaging in the CSR activities. That's why such marketing factors as the CSR activities is also recommended for including into further studies as one of the key modelling parameters.

## 6 Conclusions

The car sales forecasting model, created by the authors and estimation of the quantitative impact of marketing tools on potential sales can be used in the real marketing activities of car producers, as the model statistical error according to actual sales data in 2019 is only 1.01%. Therefore, the car producers, entering specific markets, can choose certain marketing tools in order to effectively use investments and marketing budgets according to Table 4. That is, the most effective actions can be: formation of consumer loyalty, focusing on the younger generation, production of eco- and electric cars, use of internet sales, production of safe cars, personnel qualifications and efficiency of the car, its low cost of operation. However, it should be borne in mind that these indicators may have different effects in different clusters of the world.

As it can be seen from the results, the basic model of forecasting car sales considering marketing factors in Equation (2) provides an effective instrument for studying the impact on sales of various marketing policy tools, which also confirms the hypothesis  $H_1$  proposed

by the authors. The performed calculations provide a basis for analysts and management of companies - manufacturers and sellers of cars to make rational decisions in the direction of forming a policy that can maximize car sales in different world markets. In particular, this applies to the proven hypothesis  $H_2$ , according to which the projected sales of cars in the world during 2007-2019 coincide with the actual figures (Figure 5).

In particular, using Equations (3) - (15) it is possible to determine the feasibility of introducing certain measures when entering new markets in order to increase car sales, which confirms the hypothesis  $H_3$ . For each instrument of product, price, place, promotion and human resources policy, it is possible to determine the effect specific to this region. Thus, different parts of the world are characterized by their own specific behavior of consumers and their reaction to the introduction of certain tools to promote the car brand. For each tool to which potential buyers are sensitive, the effect of its use is determined. Furthermore, taking into account this effect, it is possible to form budgets for carrying out the corresponding actions.

Thus, these models, according to the authors' opinion, allow determining the key factors influencing the volume of car sales in the forecast period, which, in turn, allows car producers to reasonably use the marketing budgets.

The impact of the COVID-19 crisis on the car sales at the global car market is recommended to be studied in

the further reasearch, paying attention to the additional marketing factors such as online consumption, online mobility and the CSR activities. Their impact has considerably increased during the pandemic period.

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