Accounting Information for Improvement of Cost Planning in Accident Insurance[1]

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Abstract

Accounting information facilitates business analysis in previous periods and forms a basis for prediction and planning. Application of accounting information about costs of acquisition and expenditure for insured cases in accident insurance in the insurance market provides an information base for consideration of current, and prediction of future, annual market trends.

Prediction models, therefore, become a necessity in insurance company modern business practice.

By the research, a prediction model is obtained which, by application of accounting information about costs of acquisition and expenditure for insured cases, with the use of statistical and mathematical methods, enables estimates of annual costs of acquisition and expenditure for insured cases in the insurance market. By differentiating acquisition costs from commission costs and other acquisition costs, detailed information is provided about the structure of the accident insurance acquisition costs. By research and setting up of the model, accounting information is obtained about anticipated annual costs and expenses for claims and its application in insurance company business is demonstrated. The positions of earned premiums, acquisition costs, expenses for insured cases and number of accident insurance policies are thus encompassed by the model.

The aim of the conducted research was to develop a model which generates prognostic information for the needs of business management in accident insurance. The information provided by the model improves the processes of planning and prediction of costs of acquisition and expenditure for claims in the market and the model practicability is shown on the example of insurance company acquisition cost management.

Keywords: accounting information, insurance companies, accident insurance, acquisition costs, commission costs, cost management

1. Introduction

The main role of insurance is underwriting and provision of financial protection to the insured person, with payment of an insurance premium. [5]. Business performance of insurance companies depends on two components, namely performance in the businesses of underwriting and fund investment. Depending on whether costs are incurred in the underwriting business or outside the process itself, they are grouped into acquisition costs and administrative costs. Acquisition costs include costs which are created in the processes of insurance sales and underwriting. Costs of sales staff salaries, commission costs, promotion costs and costs related to the issue of policies come under acquisition costs [10]. Administrative costs contain costs associated to portfolio management, employee expenses and other material and non-material costs.

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The business underwriter's/insurer's costs can be monitored in regulatory bodies' published reports about the situation and trends of the national insurance market. Those reports contain the overall level of costs realised by all insurance companies which operate in this market. The analysis of the published accounting information enables a comparison between insurance company cost efficiency and cost trends in the insurance market.

By calculation of indicators of the annual relationship between acquisition costs, expenses for claims and earned premium in accident insurance, shares of costs and expenses for claims are obtained in the earned premium in the insurance market. This information facilitates recognition of trends in the accident insurance market. Using scientific methods and accounting information from the insurance market, we began to develop a model for prediction of values of acquisition costs and claims expenses.

By application of the obtained information, planning of the acquisition costs and claims costs is improved, with included correlation between the earned premium and the number of accident insurance policies. By the research, the process of application of annual accounting information has been formed for the creation of planned accounting information about market trends. The process is illustrated of modelling, applicability and use for the accident insurance market in the Republic of Croatia.

2. Theoretical Hypotheses

Planning and decision making require estimation and prediction of market parameters by the insurance company management. For that purpose, combinations of statistical and mathematical methods are used in business analysis. The importance of collection and processing of statistical data about property and personal insurance emanates from the fact that the insurance business is based on statistical science and probability theory [3].

The regression analysis is a statistical method which is often used to explain the relationship between variables and is used in many fields of applied science such as statistical, actuarial, financial and economic studies [6]. The statistical method of regression analysis determines the existence of correlation between observed phenomena. By application of this statistical method, the movement of the value trend is found, depending on the changes in the analysed variables. This is how the relationships between two and more phenomena in the regression analysis are analysed, where phenomena are shown as dependent and independent variables. The independent variable affects the variability of the dependent variable and the dependent variable values change due to the changes in the value of the independent variable [1]. With the application of regression analysis, a regression model is formed, which, among other things, facilitates the prediction of the dependent variable due to the change in the independent variable. The movement trend of the observed variables shows a dynamic mean value, expressed by the mathematical function for demonstration of the tendency for change.

Prediction of future insurance market trends is significant for many of reasons. The insurance industry is one of the more important economic sectors in developed countries. [15]. Based on estimates of future market trends, participants in the insurance market create their business strategies.

This is how, in the insurance company business, trends are estimated to determine the advantages which they can achieve in the insurance market. The estimate of future market trends must therefore be realistic, as trend prediction affects the decisions of all market subjects who base their undertakings on information about insurance market trends.

3. Research Methodology

The information published in the reports on statistical insurance market trends is an important source for all interested users. Such a collection of external information complements insurance

company internal information sources obtained from accounting and non-accounting systems. Market trends are analysed and planned by means of comparison of external and internal information sources.

The comparison of insurance company business in relation to the national insurance market trends is carried out using publicly published annual and financial reports. By using such reports, the insurance company business is compared with the main competitors in the market. By application of this information, decisions are made about business activities, essential for realisation of planned goals.

Planning starts with an analysis of trends in the insurance market by types of insurance and an analysis of insurance business activity. Planned values are adapted to predicted insurance company trends and capacity. The plan should include all the variables in order to achieve business efficiency in the market. [9]

Accounting and financial models are considered to be the key tools for the management process [14]. Starting from the stated facts, the research was directed towards the development of a model for business improvement in accident insurance. Accident insurances are a type of insurance which covers a sudden occurrence which affects the insured person, resulting in bodily injury or death. [2].

The research field is the earned insurance premium, claims costs and acquisition costs in accident insurance, with the assumption that market movements will occur in line with the trend movement of the years analysed.

Annual amounts of paid claims and acquisition costs in the accident insurance market are put into relation with the annual earned premium so that the indicators can be adapted for use in insurance companies. By this procedure, the relationships between earned premium, claim costs and acquisition costs are obtained. Given that the acquisition costs are divided into commission costs and other acquisition costs, for the purposes of a more detailed information base for decision making, the indicators are calculated by the stated cost segments. The commission costs include paid commission for issued accident insurance policies, while other acquisition costs contain the costs of policy issue, advertisement costs, etc.

$$Indicator\ of\ the\ ratio\ between\ claims\ costs\ and\ earned\ premium = \frac{claims\ costs}{earned\ premium} \quad (1)$$

The indicator of the ratio between claim costs and earned premium expresses expenses for claims in a unit value of the earned premium, i.e., converted into relative amounts; it shows a claims cost share in the earned accident insurance premium.

$$Indicator\ of\ the\ ratio\ between\ commission\ costs\ and\ earned\ premium = \frac{commission\ costs}{earned\ premium} \quad (2)$$

$$Indicator\ of\ the\ ratio\ between\ other\ acquisition\ costs\ and\ earned\ premium = \frac{other\ acquisition\ costs}{earned\ premium} \quad (3)$$

The indicators of the ratio between commission costs and other acquisition costs in earned premium shows a share of commission costs and other acquisition costs in a unit value of the earned premium. Ratio indicators facilitate monitoring of costs of acquisition and claims expenses by unit value of the earned premium. In this way, comparison is enabled between the insurance market and insurance companies.

The research encompassed the period between the years 2007 and 2018, where, for each year, ratio indicators were calculated. Under the presumption that some more significant changes will not occur in the market which would lead to disruption in the accident insurance market, the ratio indicators were applied in the regression analysis. Regression analysis was used in the observed phenomena,

where the change in independent variable affects the change in the dependent variable. Given that all variables were observed in time periods; the independent variable was time. Dependent variables, which are affected by the independent variable of time were the ratio indicators. So, regression trend models were used for prediction of change in the dependent variable ratio indicator in units of time.

The unit of time is the annual period and is an independent variable which affects the change in the dependent variable, i.e., analysed indicators. In this method of application of regression analysis, prognostic trend models were obtained.

The linear prognostic trend model was used for the prediction of ratio indicators, as it was determined that the observed variables had linear movement. The linear models are applicable as phenomena in insurance are observed through specific linear combinations of assessment variables [7]. The linear prognostic trend model is formulated with the expression [17]:

$$\hat{Y}_t = a + bx_t \qquad (4)$$

$$b = \frac{\sum_{i=1}^{n} x_t y_t - n\bar{x}\bar{y}}{\sum_{i=1}^{n} x_t^2 - n\bar{x}^2} \qquad (5)$$

$$a = \bar{y} - b\bar{x} \qquad (6)$$

$$r^2 = \frac{\sum_{i=1}^{n}(\bar{y}_i - \bar{y})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} = \frac{a\sum_{i=1}^{n} y_i + b\sum_{i=1}^{n} x_i\, y_i - n\bar{y}^2}{\sum_{i=1}^{n} y_i^2 - n\bar{y}^2}, \quad 0 \le r^2 \le 1. \qquad (7)$$

$\hat{Y}$ – regression value of dependent variable of relationship indicator in observed time
a – constant member for time estimate
b – average increase in value of dependent variable in time
x_t – time unit of one year
r^2 – determination coefficient

By application of regression analysis, trend model functions are obtained for each relationship indicator. The trend model of the ratio indicators of expenses for claims in earned premium facilitates perception of the share of expenses for claims per unit of earned premium and prediction of annual trends. Loss occurrence is a certain phenomenon; however, the expense per unit of earned premium can be predicted by means of the trend model and insurance company solvency can be managed in this way.

The trend model of the ratio indicators of acquisition costs in earned premium shows the share of acquisition costs per unit of earned premium. Acquisition costs, as opposed to claims expenses, are manageable in the segment of their optimisation. This includes undertaking of adequate actions with the aim to reduce acquisition costs by the same degree of underwriting volume, realisation of a higher degree of underwriting volume with constant acquisition costs or an increase of the volume of underwriting with disproportional increase of acquisition costs.

The advantage of the model lies in the fact that, with its application, prediction of expenses for claims per earned premium is enabled, as well as commission cost management and management of other acquisition costs in planned annual periods. By predicting shares of costs in earned premium, a parallel variable is provided for cost management in insurance companies. By the obtained information about the predicted shares of acquisition costs in earned premiums, the model improves insurance company business in the segment of costs. The structure of the obtained information is applicable for accident insurance in insurance companies and for the market trend analysis.

4. Research Application

The initial data which was used in the research was accounting information about realised annual expenses for claims, costs of commission, other acquisition costs and the amount of annual earned premiums in the insurance market. The number of issued accident insurance policies was used to calculate the average earned premium per insurance policy. The data for the Republic of Croatia's market in the period between 2007 and 2018 was used for the application of the model.

Table 1. Earned premium, acquisition costs, claims expenses and number of accident insurance policies in the Republic of Croatia's market in the period between 2007 and 2018. (in kunas)

| Year | Earned premium | Acquisition costs | | Acquisition costs | Expenses for insured cases, net of reinsurance | Number of insurances | Average earned premium per policy |
		Commission costs	Other acquisition costs				
2007	461,547,792	48,809,389	53,264,278	102,073,667	173,550,890	2,496,341	184.89
2008	505,905,771	44,480,122	33,941,727	78,421,848	161,359,148	2,595,489	194.92
2009	492,996,595	42,457,371	44,844,809	87,302,180	150,487,095	2,517,205	195.85
2010	490,381,635	38,142,196	58,528,140	96,670,336	129,727,070	2,524,004	194.29
2011	472,814,337	46,278,999	40,785,891	87,064,889	98,123,694	2,498,173	189.26
2012	468,118,083	48,437,222	42,015,222	90,452,444	103,269,410	2,453,536	190.79
2013	450,311,185	56,846,146	75,084,427	131,930,573	98,354,614	2,452,433	183.62
2014	423,655,749	57,321,688	75,173,717	132,495,405	86,375,297	2,343,688	180.76
2015	439,845,291	63,071,886	73,647,092	136,718,979	90,374,619	2,403,811	182.98
2016	436,666,847	66,195,396	93,447,460	159,642,856	89,157,152	2,433,183	179.46
2017	425,317,186	56,894,724	94,764,679	151,659,402	80,762,980	2,468,172	172.32
2018	439,470,050	62,689,525	105,300,493	167,990,018	83,664,055	2,617,372	167.91

Source: HANFA http://www.hanfa.hr/HR/nav/106/statistika.html (17.01.2020)

In the next step, share indicators were calculated. This process is necessary in order for claims expenses to be reduced to comparable values. Namely, values related to total amounts of earned premium in the market facilitate the calculation of the insurance company market share. Total amounts of expenses for claims and acquisition costs in the market also enable an insight into market share. However, for the calculation of the efficiency of business performance and cost management, it is necessary to adapt information to a comparable value. Comparable values facilitate the comparison of realised values with market values and with values realised within the insurance company, as well as those of other competitors in the market. In this way, reference points are obtained for cost management. These reference points move in two directions of comparisons with the insurance market and comparisons with insurance companies.

When comparing insurance companies, it is necessary to compare companies with approximately the same asset value, as the insurance company's financial strength affects the realisation of operating results. The results per unit value, however, facilitate mutual comparison of insurance companies of all sizes, where indicator values differ depending on the value of insurance companies' assets. To the insurance companies' management, the indicators provide information about the performance of acquisition cost management and expected claims costs. Deviation from the market indicators regarding higher values of shares than the market shares points to the need to find measures for cost optimisation. Share indicators, therefore, have the role of comparison of indicators in insurance companies with the market, movement of market indicator trends in the following years and movement of indicator trends in insurance companies in the following annual periods.

Table 2. Shares of acquisition and claims costs in earned premium and average earned premium per accident insurance policy in the Republic of Croatia's market in the period between 2007 and 2018 (in kunas)

Year	xt	Acquisition cost shares		Acquisition cost share in earned premium	Expenses for insured cases, net of reinsurance	Average earned premium per policy
		Commission cost shares in earned premium	Other acquisition cost shares in earned premium			
2007	1	0.105751537	0.115403603	0.221155141	0.376019327	184.89
2008	2	0.087921752	0.067091005	0.155012757	0.318950993	194.92
2009	3	0.086121023	0.090963729	0.177084752	0.305249766	195.85
2010	4	0.077780637	0.119352226	0.197132863	0.264543084	194.29
2011	5	0.097879855	0.086261958	0.184141813	0.207531130	189.26
2012	6	0.103472231	0.089753468	0.193225699	0.220605471	190.79
2013	7	0.126237474	0.166738978	0.292976451	0.218414771	183.62
2014	8	0.135302514	0.177440569	0.312743083	0.203880858	180.76
2015	9	0.143395616	0.167438629	0.310834245	0.205469106	182.98
2016	10	0.151592448	0.214001728	0.365594176	0.204176598	179.46
2017	11	0.133770102	0.222809427	0.356579529	0.189888822	172.32
2018	12	0.142648003	0.239607894	0.382255897	0.190374874	167.91

Source: Authors' calculation according to Table 1. data

Based on the calculated indicators from table 2, and using the method of regression analysis, prognostic trend models were obtained. Two trend models refer to acquisition costs as, due to their significance, acquisition costs are monitored separately through commission costs and other acquisition costs. The trend model for cost prediction for insured cases shows a predicted share of expenses per unit of earned premium in the following years. The trend, expressed through the regression model, was thus used in the observed years for calculation of indicators of shares of claims expenses in the years 2019 and 2020.

The last trend model for prediction of average earned premium per policy facilitates the prediction of the amount of the average annual earned premium per accident insurance policy. From the value of the average annual earned premium per policy, obtained by the linear trend model, using predicted indicators for a 2-year period, the average annual amount of claims and acquisition costs per accident policy are calculated.

Table 3. Regression models for prediction of shares of acquisition and expenses of incurred losses in earned premium and of average earned premium per policy in the Republic of Croatia's accident insurance market

Description	Regression model	Determination coefficient
Trend model for prediction of commission costs	y = 0.006084x+0.076446	r²=0.729708
Trend model for prediction of other acquisition costs	y = 0.014755x+0.050498	r²=0.802452
Trend model for prediction of expenses for insured cases	y = -0.014754x+0.337994	r²=0.774496
Trend model for prediction of average earned premium per insurance policy	y = -2.077383x+198.257349	r²=0.716773

Source: Authors' calculation

Provided the trend of the observed variables of accident insurance in the Republic of Croatia's market moves according to the obtained regression models, values for the period of 2019 and 2020 are predicted. The calculated values are illustrated in table 4.

Table 4. Predicted indicators of shares of acquisition costs, expenses for insured cases per unit of earned premium and average earned premium per accident insurance policy in the Republic of Croatia in 2019 and 2020

Year	Acquisition costs		Acquisition costs	Expenses for insured cases	Average earned premium per policy
	Commission costs	Other acquisition costs			
2019	0.155538	0.242313	0.397851	0.146192	171.25137
2020	0.161622	0.257068	0.41869	0.131438	169.173987

Source: Authors' calculation

The indicator of the commission cost share is calculated using the trend model in the accident insurance market, equalling 0.155538 per unit of earned premium in 2019. The indicator of other acquisition costs equals 0.242313 per unit of earned premium. These indicators can also be expressed in relative figures which, for the year 2019, gives a share of 15.55% of commission costs and a share of 24.23% of other acquisition costs and which, in total, equals the predicted 39.78% of total acquisition costs from the earned premium value.

The indicators for the share of expenses for insured cases, net of reinsurance, equal 0.146192 and show the predicted ratio of paid claims per unit of earned premium. The relative amount shows that 14.61% of total annual earned premium will be paid for incurred losses per accident insurance.

According to the overall acquisition indicators and expenses for insured cases in 2019 it is expected that 0.544043 per unit of earned premium will be spent on expenses for insured cases and acquisition costs. Expressed in relative ratios, according to the accident insurance market trends, a total of 54.40% of earned premium will be paid for insured cases and acquisition costs, while the remaining portion of 45.60% will be used to cover the administration costs and other technical reserves. Following the settlement of all obligations according to the stated insurance type, the operating result will be determined. This methodology is also used for the year 2020.

Table 5. Predicted acquisition costs and expenses for insured cases per average earned premium in the accident insurance market in the Republic of Croatia in 2019 and 2020

No.	Description	2019	2020
1.	Average earned premium per policy	171.25	169.17
2.	Commission costs	26.64	27.34
3.	Other acquisition costs	41.50	43.49
4.	**Acquisition costs (2+3)**	**68.13**	**70.83**
5.	Expenses for insured cases	25.04	22.24
6.	**Total – Acquisition costs and claims costs (4+5)**	**93.17**	**93.07**

Source: Authors' calculation

The average earned premium per accident insurance policy is obtained through application of the model and equals 171.25 kn., for 2019 and 169.17 kn., for 2020. Using the average earned premium and using the obtained regression models for prediction of share indicators, average values are calculated of acquisition costs and claims costs per insurance policy. Consequently, in the Republic of Croatia, a commission cost of 26.63 kn., other acquisition costs of 41.50 kn., i.e., total acquisition costs of 68.13 kn., can be expected per average earned premium per accident insurance policy. Using the same methodology, values for the year 2020 are calculated and equal 27.34 kn., for commission costs, 43.89 kn., for other acquisition costs, i.e., total acquisition costs in the sum of 70.82 kn. The expenses for insured cases per average earned premium per insurance policy equal 25.35 kn., for 2019 and 22.35 kn. for 2020.

Based on the information about the realised acquisition costs per unit of earned premium in the insurance market, insurance companies' management compare their own acquisition costs for this type of insurance. In insurance company business practice, annual plans are prepared of the earned premium and number of accident insurance policies, which are created based on demand in the

market. The accounting information, obtained by application of the model, facilitate management of planned acquisition costs per earned premium, predicted amount of average earned premium per policy and elaboration of acquisition costs and expenses for insured cases in the accident insurance market.

This will be shown on the example of insurance companies' business for the planned earned annual premium in the amount of 10 million kunas for 2019. Acquisition costs and expenses for insured cases per planned earned premium in the market are calculated using regression models. The values of planned commission costs, other acquisition costs, expenses for insured cases and average number of insurance policies needed for the planned earned premium of 10 million kunas are shown in the table below.

Table 6. Predicted acquisition costs, expenses for insured cases and number of policies per planned earned premium of 10 million kunas for 2019

No.	Description	2019
1.	Planned annual earned premium	10,000,000
2.	Predicted commission costs	1,555,380
3.	Predicted other acquisition costs	2,423,130
4.	**Predicted total acquisition costs (2+3)**	**3,978,510**
5.	**Predicted expenses for insured cases**	**1,461,920**
6.	**Average number of policies needed for realisation of planned earned premium**	**58,394**

Source: Authors' calculation

According to the data from the accident insurance market, the planned earned premium of 10 million kunas will require acquisition costs of 3,978,510 kn., and claims costs of 1,461,920 kn. for realisation of the planned earned premium, 58,394 insurance policies need to be sold. For comparison of the predicted values, the applied methodology can be used in insurance companies in the way that the accounting information about realised acquisition costs and claims expenses in the insurance company are included in the regression model for the same covered year period. In this way, two sets of prognostic information will be obtained, namely, those from the insurance market and those from the insurance company internal accounting records.

The obtained information is compared to the acquisition cost plans, expenses for insurance cases and plans for number of policies. This facilitates consideration of planned values with the predicted costs and expenses in the national market and the insurance company predicted costs and expenses.

Successful acquisition cost management is achieved by consideration of insurance market trends and competition's business practices, with attainment of optimal cost values in the insurance company, for which the presented research completes the information.

5. Conclusion

Maintenance of business-acceptable levels of cost enables successful business performance and competitive position in the insurance market. Participants in the insurance market implement innovative strategies to realise planned business goals. Flexibility and preparedness for changes are the main characteristics of insurance companies which are ready for challenging conditions imposed by increasingly demanding policyholders, development of information technology and competition.

In such circumstances, cost management has a substantial influence on insurance company successful business performance and survival in the insurance market.

Reports on overall insurance market movement represent summary data about realised business volumes of all market participants. By application of this information, trends are considered of annual market movement. Insurance sales are made through sales channels. For the majority of sales channels, it is necessary to pay a commission per agreed insurance type. The sales channel market potentials change through periods and recognition of sales possibilities and realisation of new sales

channels towards policy holders, based on new information technologies, enables a step forward in insurance company successful business performance. New sales channels, apart from opening new possibilities in insurance sales, facilitate acquisition cost reduction.

Considering the stated reasons, a need is stressed for research of new methods and models for management of insurance company business. The methodology in this research is directed towards acquisition costs and expenses per insured cases. The results of the conducted research facilitate consideration of trends and prediction of important business components in accident insurance.

Information about predicted trends of indicators of commission costs and other acquisition costs, as well as of expenses for insured cases in the accident insurance market, provides a parallel variable for insurance companies.

By application of the conducted research, three mutually comparable sets of information for the needs of planning can be formed. The first set of information relates to the accident insurance market which is processed in the research. The second set of information is obtained by use of the presented methodology, with the application of accounting information about insurance company acquisition costs and expenses for losses. In this way, by comparison of the first and second sets of information, predicted values can be linked of the insurance company and insurance market. The third set of information is obtained by application of the methodology and use of accounting information about acquisition costs and expenses per insured case in the main competition's publicly published annual reports. Mutual comparison of all three sets of information facilitates consideration and planning of insurance company acquisition costs and expected expenses for insured cases in line with the market and the competition.

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