THE DEVELOPMENT OF PUBLIC LIABILITY INSURANCE RATES FOR AUTOMOBILES

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The scope of this paper is limited to automobile public liability insurance. It may be said however, that fundamentally the process of making rates for property damage and collision insurance does not differ greatly from that of public liability rates. There is a wealth of literature available dealing with the hazards insured against, the various forms of coverage, . underwriting methods and methods of adjusting claims, but in none of the material is there a comprehensive description of rate making.

Perhaps this is because, until recently, rate making was more or less a matter of taking whatever experience was available and of using this as a rough guide to the judgment of the underwriters. It has been rather a simple matter to get the experience of the companies on any line of business, on any classification, or in any territory. But up to the present, the volume of experience obtained in this manner was not sufficient to produce an indication of true cost in more than a few of the larger territorial and underwriting classifications. This prevented the development of analytical methods in rate making and it being rather difficult to describe the processes by which judgment rates are established little or no literature has been written on the subject.

More recently the need for rates which more closely follow the statistical experience of the business has become apparent, first because the underwriters have come to realize that rule of thumb methods have not produced satisfactory results and second because of the development of a lively interest on the part of the general public.

The number of automobiles in use has increased enormously during the last decade and because of this, the traffic congestion in cities and even on the country highways has made the hazards of automobile operation a matter of public concern. Premiums for automobile insurance have increased by leaps and bounds until at the present time they amount to many millions of

dollars annually. It is not at all surprising therefore, that the public is taking a real interest in the rates for automobile insurance. When a man has to pay from one hundred to three or four hundred dollars a year to insure his car, it is certain that he is going to interest himself in seeing that the rates are reasonable and in keeping with the loss and expense requirements of the business. This interest is manifested through the state legislatures and insurance departments. At the present time there are ten states which require that the rates shall be filed with insurance departments, before they can be put into effect within the state. This is indicative of the movement toward state regulation of rates within the last four or five years.

When it becomes necessary to prevail upon an insurance department to approve a complete set of rates, it is obvious that it is desirable to have a sound statistical basis underlying the rates. Insurance departments have a habit of taking nothing for granted. The burden of proof is always on the insurance carriers and there must be some means whereby they can show that their rates are reasonable and adequate. Facts are required rather than a mere statement that the rates are based on a limited amount of experience developed on business written several years past, supplemented by a generous supply of personal judgment.

The coverage for which these rates are designed may best be described by quoting from the Automobile Casualty Manual:

"Automobile Public Liability Coverage shall provide 'indemnity' for the assured against loss by reason of his legal liability to others for bodily injuries, accidentally sustained, including death at any time resulting therefrom, on account of any accident due to the ownership, maintenance, or use of any automobile described in the policy. . . . ."

The standard limits of liability assumed by a company are $5,000 for injury or death to one person and $10,000 for injuries or death to all persons involved in a single accident. There is no limit placed on the number of accidents covered during the policy period. Higher limits may be obtained by paying a comparatively small additional premium.

Automobiles are assigned to four broad divisions for the purpose of rating; (1) Private Passenger Cars, (2) Commercial Cars, (3) Public Automobiles and (4) Garages', Automobile Dealers' and Manufacturers' Cars.

Private Passenger Cars include electric as well as gasoline and steam propelled cars of the pleasure type. The basic coverage permits the car to be driven by anyone, over the legal age, with the consent of the owner for either pleasure or business purposes. But the car may not be used for carrying passengers for a consideration. At the present time a reduced rate is granted if business use is excluded from the policy. A further reduction is allowed if the car is driven only by the owner. The basis of the premium charged is for one car insured for one year.

In the group of Commercial Cars are included trucks and delivery cars used for the ordinary transportation or delivery of goods or merchandise. There are four rate classifications to which cars are assigned according to the use to which they are put. For example, Police Patrols are assigned to the first and highest rated classification. Moving Vans are put in the third classification while ordinary wholesale and retail delivery cars are assigned to class four which is the lowest rated. Within each classification cars are further classified according to the load capacity of the car as Heavy, Medium or Light.

Public Automobiles include livery cars, taxicabs, omnibuses and jitneys. They are classified according to the use to which the car is put. That is taxicabs are treated as a class and no distinction is made between them. Livery cars are treated as another classification without subdivision. Busses are further classified according to the number of passengers they seat.

The garage group includes "cars operated by public garages, automobile sales agencies and service stations, automobile manufacturers and automobile schools." Risks falling in this group require coverage not only for all the cars which they own but also for the operations of all employees, regardless of what car is being driven. For example, the repair man must be covered while he is bringing in or returning a customer's car for overhauling and the demonstrator must be covered no matter which one of the demonstrating cars he may be driving. In order to insure risks of this type, there are two alternative ways of granting coverage and computing the premium in addition to the method of describing and charging for a specific car. The first is the Pay-roll Basis. Under this form of coverage the premium is based on the entire pay-roll of the assured including all employees. The rate in this case is quoted per hundred

dollars of pay-roll. The policy may cover all the operations of the assured or may be limited to operations on the premises, and the rate charged varies accordingly. The second method is known as the Named Driver Basis. Each driver is named in the policy and coverage is given to all accidents occurring while any automobile is being operated by one of the named drivers. The premium charged is per driver insured for a year. This basis is intended only for risks having a small number of drivers. On large risks, the pay-roll basis is ordinarily used.

The manual also provides methods of completely covering fleets of five or more private passenger, commercial or public automobiles. The Daily Use Basis provides that the assured must keep an accurate record of new cars put in service and of cars suspended from service, or reinstated. At the end of the policy period the premium is computed on the actual number of days which each car was in use. This method provides automatic coverage for new cars without the necessity of notifying the company every time an addition to the fleet is made. At the same time it does not require payment of a premium for the time when a car may be out of service.

Fleets which have more cars than drivers may be insured on the Named Driver Basis. Under this form each driver is named in the policy and a premium charged on an equal number of the highest rated cars at full rates. The remaining cars are covered at 25 per cent. of their full manual rates. The Pay-roll Basis may be used in the case of commercial cars to determine the number of drivers. The total pay-roll of all chauffeurs is divided by the average salary to determine the average number of drivers employed during the year. The premium is then based on the number so obtained. It is to be noted that the pay-roll basis applied to commercial cars differs from that used in the case of Garages.

The Private Passenger car division has developed far more experience than the other three and it is principally this type of car which is treated in this paper. The methods of compiling and using the experience do not differ fundamentally for the other groups and it is hardly possible to treat, in detail, in a paper of this kind, all of the various problems arising in connection with all divisions.

Practically every casualty company with any volume of busi-

ness has always kept experience on its automobile business for each city of importance and for each state. It has also kept its experience for each of a large number of underwriting classifications. But without a uniform set of rules for classifying premiums and losses and in the absence of a uniform division of territories, it is obvious that the early experience of the various companies was not comparable except in the aggregate. This was realized early in the history of automobile insurance and led to the adoption by the National Workmen's Compensation Service Bureau of a uniform automobile statistical plan for the use of member companies.

A description of the details of this plan and of the methods of tabulating statistics compiled in accordance with its provisions would be of little interest. It is sufficient to say, that the majority of the member companies have adhered to the plan for a number of years and that as a result they have accumulated a mass of experience which is uniform in every respect.

It has been necessary to make numerous amendments to the plant to keep it in line with changes in underwriting practice. Every time a change in an existing classification has been made, a classification erected or several old classifications combined, the statistical plan has been amended accordingly. When it was necessary to call for experience from the companies for the purpose of revising rates, a statistical committee met with a committee of underwriters to determine first what experience was necessary and second whether the data was available in the form desired. This has been no small task, for with the changes in underwriting and statistical procedure which have taken place within the last three years the preparation of a call now involves the examination of a veritable labyrinth of codes.

For years private passenger cars were classified and experience kept for public liability and property damage insurance according to horse-power rating. In 1919, it was found that horse-power was no longer an adequate measure of the accident producing qualities of a car. The ratable horse-power was originally computed according to the formula of the Society of Automobile Engineers and the results were quite satisfactory. Then came a new departure in engine building, which involved the use of a smaller cylinder bore combined with a longer stroke. As the formula was based upon certain assumptions with ref-

erence to the relationship of bore and stroke it immediately produced inequitable results. A common instance cited is that of the Ford and Mercer cars, which were assigned to the same horse-power group under the formula, but which actually developed totally different horse-powers. Under these circumstances it became necessary to abandon this basis and to adopt a new method of classifying cars for rating.

It was during 1919 that the list price basis was adopted with a further qualification depending upon the use of the car and the extent to which different drivers of the car were covered. This method had not been in force long when another difficulty was encountered. With the rapidly increasing price of cars, it frequently happened that a new model of a certain make of car fell into a higher list price group and therefore took a considerably higher rate than the earlier model. In construction the two cars were probably similar and thus equally hazardous and this difficulty was overcome by substituting for list price groups, a set of so-called symbol groups, designating them by letters, W., X., Y. and Z. A separate statistical group was erected for Fords although at the present time they are rated the same as Group "W" cars.

With the change of basis of manual classification from "horse-power" to "list price" and later to "symbol group" the statistical classifications were also changed. It is needless to say that all the classification experience which the companies had been keeping for years was somewhat reduced in value when it came to making rates on the symbol group basis. At first thought it appeared that all past experience might have to be thrown into the discard, but further study showed that the classification experience could be converted to the symbol basis.

There is a certain relationship between the horse-power and list price of cars, the two tending to increase together. In order to avoid scrapping the available experience the rating committee took advantage of this relationship. A large number of applications were drawn at random to obtain a fair sample of the business as a whole. These were tabulated by horse-power and by rate symbol group and the distribution of cars within a horse-power group was obtained by rate symbol groups. The resulting percentages were then applied to the distribution by horse-power groups in the general experience. For the sake

of illustration, let us assume that the following tables show the actual results of the investigation. Table I shows the calculation of the percentages as the result of a review of 17,434 sample applications. In Table II is shown the distribution of experience by horse-power groups in the general experience. Table III is the result of the redistribution by rate symbol groups of the experience contained in Table II. For example, the 90,659 cars in symbol group W, Table III, 1917 policy year is obtained by adding together 67.7% of the 18,874.4* cars in horse-power group 11-20, 55% of the 141,016.0 cars in group 21-30, and .8% of the 40,281.4 cars in group 31-40. The use of Table III will be taken up in a later paragraph.

What the next change in basis will be, if a further change is made, is difficult to foresee but it is certain that until there is some stability in the underwriting practice, no company can furnish statistical data of great value for rate making purposes. It is hoped, that the time will soon come when a satisfactory method of underwriting may be permanently maintained, without radical modifications. When that point is reached it will be possible to conduct extensive statistical studies and to make use of methods which will solve many of the present day difficulties in automobile rate making.

Up to the present time it has not been possible to base rates upon the experience of more than two policy years or at most three years. There are two reasons for this. In the first place, as has been stated, changes in bases of rating have made early experience obsolete or nearly so. What old experience was used had to be modified as best it could to reflect the new basis. Secondly, cost conditions have changed so rapidly that even experience a year old has had but little value for rate making, while experience three and four years old has been ancient history and therefore valueless. These changes have been brought about by the rapid development of the automobile business with changing construction and design and more particularly by the increased hazard of operating automobiles on public thoroughfares.

In the past, the experience used by the National Workmen's Compensation Service Bureau in its rate revisions covered the

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*One car insured for a fraction of a year is treated statistically as a fraction of a car.

TABLE I.
DISTRIBUTION OF PRIVATE PASSENGER CARS IN EACH HORSE-POWER GROUP BY RATE SYMBOLS

H. P. Group	Total	Number					Total	Per cent			
		Fords	W	X	Y	Z		W*	X	Y	Z
1-20	1,983	0	1,343	627	13	0	100.0	67.7	31.6	.7	0
21-30	12,685	3,361	3,616	4,024	1,634	50	100.0	55.0	31.7	12.9	.4
31-40	2,167	0	18	513	1,278	358	100.0	.8	23.7	59.0	16.5
Over 40	599	0	0	6	33	560	100.0	.0	1.0	5.5	93.5
Total	17,434	3,361	4,114	5,816	3,175	968	..	..	..	..	..

*Includes Fords.

TABLE II
COUNTRYWIDE EXPERIENCE BY HORSE-POWER GROUPS

H. P. Group	1917		1918		Total 1917 & 1918		Pure Premiums				Apparent Diff.
	No. Cars	Total Losses	No. Cars	Total Losses	No. Cars	Total Losses	1916	1917	1918	1917 1918	
0-20	18,874.4	285,140	22,424.7	358,093	41,299.1	643,233	15.85	15.11	15.97	15.56	.82
21-30	141,016.0	2,353,375	168,606.9	3,047,649	309,622.9	5,401,024	16.89	16.69	18.08	17.44	.92
31-40	40,281.4	912,890	44,535.1	1,100,816	84,816.5	2,013,706	19.58	22.66	24.72	23.74	1.25
Over 40	15,059.5	388,055	16,069.2	454,122	31,128.7	842,177	22.84	25.77	28.26	27.05	1.42
Total	215,231.3	3,939,460	251,635.9	4,960,680	466,867.2	8,900,140	17.93	18.30	19.71	19.06	Base

TABLE III.
COUNTRYWIDE EXPERIENCE CONVERTED FROM HORSE-POWER TO RATE SYMBOL GROUPS.

Rate Symbols	1917		1918		1917 & 1918 Comb.		Pure Premiums				Differ- ential
	No. of Cars	Losses	No. of Cars	Losses	No. of Cars	Losses	1917	1918	1917 1918	
W	90,659	1,215,525	108,272	1,543,752	198,930	2,759,277	13.41	14.26	13.87	.73
X	60,362	1,095,553	71,251	1,419,039	131,613	2,514,592	16.15	19.92	19.11	1.00
Y	42,017	1,072,774	49,066	1,339,065	91,983	2,411,839	25.00	27.29	26.22	1.38
Z	21,292	555,182	23,047	659,250	44,339	1,214,432	26.07	28.60	27.39	1.44
Total	215,229	3,939,034	251,636	4,961,106	466,865	8,900,140	18.30	19.72	19.06	Base

two latest available policy years. For example, the revision of 1920 was based on the experience of policy years 1917 and 1918 reported as of December 31, 1919, and the rates were put into effect in the spring of 1921. In the main, there are two divisions of the experience. The first is reported by underwriting classifications without subdivision into territorial groups. The second division is a report by cities and rural territories without subdivision by underwriting classifications.

The first experience shows the loss cost per car separately for each classification and for each policy year. The second division shows the relative cost of losses on all the insured cars in the important cities and in each state. Having once determined the pure premium necessary to give an adequate rate for a given city or territory, the proper classification differential is applied to obtain the rate for a given make of car.

Take as an example, the City of Chicago, and suppose that the liability experience for all kinds of private passenger cars was as follows:

1918		Pure Premiums Per Car		
Number of cars	Total losses	1916	1917	1918
1551.1	52,789	19.91	32.93	34.00

It appears that a pure premium of $34.00 reflects the cost per car during the latest period covered by the experience, namely, policy year 1918. Table III shows us differentials to be applied to obtain a classification pure premium in Chicago. Cars in Group W will take 73% of $34.00 or $24.80. Group X cars will get a pure premium of 100% of $34.00. Similarly cars in Groups Y and Z will be rated at $47.00 and $49.00 respectively.

This procedure is necessarily predicated on the hypothesis that the distribution of cars by classifications is the same in all cities and the same in the city as in the country. The assumption was open to serious criticism until put to a test a year or so ago.

For the purpose of the test, a special report of experience was called for. In this report, the country was divided into three territorial groups. The first group contained New York City and surrounding suburban territory, Jersey City, Hoboken, Providence, Philadelphia, Buffalo, Cleveland and Boston.

The second was made up of the remaining cities having a population of 200,000 or over; and the third consisted of the remainder of the United States. Each territory was divided into four horse-power groups. Some idea of the results of this test are given in Table IV.

TABLE IV

AUTOMOBILE LIABILITY EXPERIENCE

PRIVATE PASSENGER GASOLINE CARS BY HORSE-POWER GROUPS

Territorial Divisions	Horse-Power Groups	Pure Premiums			Apparent Differential	Aver. H. P.
		1917	1918	1917 1918		
N. Y. City, N. Y. Suburban...............	0-20	22.35	33.79	29.63	.81	18.5
Jersey City, Hoboken..	21-30	34.13	32.22	32.87	.90	25.1
Providence, Philadelphia	31-40	44.45	48.41	46.95	1.28	34.2
Buffalo, Cleveland.....	Over 40	39.00	56.35	49.81	1.36	43.0
Boston...............	Average	35.67	37.13	36.62	Base	27.64
	0-20	11.06	16.89	15.14	.93	
Remaining	21-30	15.19	14.96	15.02	.93	
"200,000" Cities	31-40	20.03	20.99	20.69	1.28	
Combined	Over 40	12.53	19.76	17.54	1.08	
	Average	15.55	16.48	16.21	Base	27.32
	0-20	12.93	11.06	11.73	.78	
Remainder	21-30	12.94	14.67	14.04	.93	
of the	31-40	18.99	17.99	18.36	1.22	
United States	Over 40	23.24	20.20	21.38	1.42	
	Average	14.70	15.23	15.03	Base	27.12
	0-20	15.11	15.97	15.58	.82	
	21-30	16.29	18.08	17.44	.92	
Whole Country	31-40	22.66	24.72	23.74	1.25	
	Over 40	25.77	28.26	27.05	1.42	
	Average	18.30	19.71	19.06	Base	27.27

Two things are at once apparent from this exhibit. First, the average horse-power in each of the three territories is almost exactly the same, which is a good indication that the distribution of cars by horse-power is practically consistent in all sections of the country. Second, the differentials for the horse-power groups are similar for each of the three territorial divisions. These results indicate that the method of using the national ex-

perience for the development of differential is reasonably accurate.

Now that rates are based on list price, the question of distribution within the various territories is raised again. It is possible that there are more closed cars in the cities than the rural districts since the automobiles can easily be operated all winter in the city whereas the country roads are likely to be impassable during a good part of the winter. It is further possible that there are enough high priced cars in the city to produce an average list price higher than in the country. This point has not yet been put to a test, but in view of the close relationship between the horse-power groups in the three territorial divisions, it is doubtful if any great difference would be found in the distribution by list price.

Having obtained an average pure premium for a territory and having subdivided it into classification pure premiums by the application of the proper differentials, an important problem arises because the results, being based upon past experience, are still several years behind the present time. All of the data which has been used so far is from two to four years old. It is necessary to exercise judgment here and there in adopting pure premiums to allow for certain discrepancies due to inadequacy of the exposure but in general the adopted pure premiums reflect cost conditions of a past period and considering recent trend these results are inadequate as a measure of the present cost of doing business.

The next step therefore, is to determine the proper modification to apply to the selected pure premiums to allow for the increase in cost between the time which the experience represents and the present day.

At the present time the experience of policy year 1921 has not developed far enough to give much of an indication of the ultimate loss ratio for this period. The experience of policy year 1920 is the closest to the present of any available data. At December 31, 1920, all of the premiums of policy year 1920 had been written and probably most of them had been recorded and half of the period for the occurrence of losses had elapsed. It has been found that there is a rather close relationship between the losses actually paid at that date and the ultimate payments which will be made to liquidate all claims of that policy year. It is

likewise true that the premiums written to the end of December bear a close relationship to the final earned premiums for the policy year.* Tables V and VI will serve to illustrate this point.

In Table V, the first column of premiums presents the premiums written on policies issued during 1916 as reported at December 31, 1916; premiums written on policies issued during 1917 as reported at December 31, 1917, and so on for years of issue 1918 and 1919. The second column shows the same figures a year later, *i. e.* at December 31, 1917 for policy year 1916, December 31, 1918 for policy year 1917, etc. The column headed "Ratio" shows the ratio of the second column to the first. Table VI shows the development of incurred losses reported at the same dates as the premiums in Table V and their relation to the paid losses at the end of the first twelve months of the policy year. The first column of losses shows the losses on policies issued in 1916, which have been actually paid during 1916; the losses on policies issued during 1917 paid during 1917, etc. These figures take no account of the outstanding estimates on claims which have occurred but have not been settled. The next column shows the incurred losses by policy years, twelve months later. These figures include both paid and outstanding amounts. The column headed "Ratio" is the ratio of these incurred losses to the paid losses of the first column.

It is quite evident from Table V that if the premiums on

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*If we could calculate the loss development factors on the total incurred losses, (*i. e.*, both paid and outstanding amounts) rather than on the paid losses above, the relationship from year to year might be found more uniform than they are in this exhibit. In such cases the development factor would take account only of the new claims which will be reported during the last half of the policy year. This method, however, is open to the objection, that the claims which have been reported have had very little time for development and investigation at the date of reporting. For this reason, the estimate of cost set up by a claim department is likely to be wide of the mark and lead to a serious error. This is particularly true in the case of liability claims. Over a sufficiently large number of claims this error is minimized and in the practice of an individual company, it tends to vary always in the same direction, to either over or underestimation. If this tendency can be accurately determined for the general experience of all companies this method of projection might prove more valuable than the one in use at present. It is only fair to say, however, that this is a recent development and has not yet been put to sufficient test to finally determine its worth.

TABLE V

Development of Premiums of a Given Policy Year

Policy Year	At 12 Months	At 24 Months		At 36 Months		At 48 Months	
	Premiums Written	Premiums	Ratio	Premiums	Ratio	Premiums	Ratio
1916	1,811,569	1,707,119	.942	1,706,242	.942	1,704,789	.941
1917	2,361,118	2,269,139	.961	2,263,746	.959	2,258,998	.957
1918	2,901,007	2,775,613	.957	2,770,713	.955	..	..
1919	4,745,680	4,647,886	.979	..	..	..	..
Total	11,819,374	11,399,757	.964	6,740,701	.933	3,963,787	.950

TABLE VI

Development of Ratio of Incurred to Paid Losses

Policy Year	Losses Paid to Dec. 31st of Issue Year	Total Losses Incurred					
		At 12 Mos.	Ratio	At 36 Mos.	Ratio	At 48 Mos.	Ratio
1916	296,294	717,415	2.421	714,175	2.410	712,192	2.404
1917	450,708	1,006,242	2.233	1,012,891	2.247	1,004,982	2.230
1918	492,817	1,252,607	2.542	1,234,020	2.504	..	..
1919	950,336	2,468,106	2.597	..	..	..	..
Total	2,190,155	5,444,370	2.486	2,961,086	2.388	1,717,174	2.299

1920 policy year as reported at December 31, 1921, are discounted by 4%, the result will give a remarkably good approximation of the ultimate premiums for that period. Since a decrease in the volume of premiums must go hand in hand with a corresponding decrease in the number of cars exposed, it is correct to discount the number of cars as of December 31st by 4% to get the number of cars exposed for a year in policy year 1920 as they will appear when the experience is complete.

The development of the losses is not as uniform from year to year as is that of the premiums. It is quite apparent from an inspection of Table VI that if a ratio of about 2.50 were chosen as representing the probable development of policy year 1920 losses that the maximum probable margin of error would not exceed 5%. By multiplying the reported paid losses by 2.50 the total ultimate 1920 losses are obtained. Dividing the losses by the number of cars gives the pure premium cost per car for policy year 1920.

Costs for 1920 year of issue are the latest which are available and represent the closest approximation to present day costs. A comparison of the pure premium cost for 1920 with the corresponding cost for any earlier year will give the percentage of increase in cost over the country as a whole.

It might appear to be a fair assumption that if the pure premium cost per car has increased, say 25% over the whole country from one year to the next, the same percentage of increase has taken place in all territories. As a matter of fact, however, there are found to be very great differences in some lines. This fact makes it necessary to use a different factor of increased cost in different territories. There might be a different factor for each city on which separate experience has been kept but only a few cities have enough exposure to adequately determine the cost for a given year and it becomes necessary therefore to group the cities where conditions are nearly alike and to apply the same factor to all cities in each group. The first step is to determine the pure premium cost for all cars in the group of cities during 1920 and also during the period covered by the experience used in adopting territorial pure premiums, *i. e.* 1918 and 1919 policy years. The ratio of these two pure premiums gives the increased cost factor. When the adopted pure premium for any territory is increased by this factor the result,

of course, will be the pure premium necessary to meet costs under 1920 cond tions.

The practice of using an estimated loss ratio for 1920 as a prediction of the experience results of 1921 is a distinct step in advance of old methods where the latest experience to be used would have been that of policy year 1919, part of which was in force during 1919 and part during 1920. But even the present practice does not go far enough. By the time the new rates actually go into effect it will be 1922. Notwithstanding this, the rates will be based on conditions which were in force more than a year prior. So far this obstacle has not been overcome in any line although more attention has been given to it in the Workmen's Compensation field than in any other. The need is for some index which will show the current trend of costs. This will be treated in a later paragraph as one of the possibilities for future development.

So far we have been dealing only with the pure premium or pure loss cost. In order to get a final manual rate it is, of course, necessary to add a loading for expenses. The loading for public liability insurance is made up of the following items and the percentages of premium given will serve as an illustration:

Acquisition Cost	25.0%
Claim Adjustment	7.0%
Taxes	3.5%
Administration Cost	9.5%
Total	45.0%

The above percentages are of the gross rates so that in order to properly load the pure premium, the following formula is used:

$$\text{Gross Rate} = \frac{\text{Pure Premium}}{1 - .45}$$

The cost of conducting the business is obtained from an analysis of the figures of a number of companies just as the pure premiums are obtained from actual experience. But there is often a considerable difference in the results shown by different companies when there is only one of the many lines of business under consideration. This is due, of course, largely to the difference in treatment of the various items of expense in allocating them to the various lines of business. Commissions and taxes produce little or no difficulty. They can easily be correctly charged

against the proper line of business.   But when we come to claim
expense and administration expense where there is a consider-
able item of cost which applies to all lines of business written
by the company, there arises considerable difficulty.   There
are a good many ways by which the allocation may be made,
but the simplest and most generally used is the distribution of
the expense in proportion to the premium volume of each line
of business.   This means that if the total administration cost
of a company during the year amounted to 9.5% of its premium
volume for the year that each line of business would be con-
sidered as having cost 9.5% of its premiums for administration
cost.   When this procedure is carried to the point of allocating
the expense to each policy as is actually done in making
a rate, we naturally charge 9.5% of the policy premium as
being the cost of handling that business.   A more complete
treatment is given the subject in a later paragraph.

So far this paper has dealt with present methods of making
rates.   The balance will be devoted to the possible future develop-
ment of rate making methods.   In this connection there are three
main problems: (1) Keeping rates in line with current experience
indications, (2) The zone problem and (3) The expense loading
problem.   Their solution has not yet been completed and just
what that solution may be cannot, of course, be foretold at this
time.   This presentation of the subject is intended to show the
points involved and to indicate where possible, the principals
which must govern the solutions, rather than attempt to lay
down a completed program.

It was previously pointed out that by the time a complete
set of rates has been developed, the experience on which they are
based may no longer, be representative of present day conditions
and it may be necessary to modify the adopted rates to allow for
that condition.   The development of the latest policy years
experience was designed to take care of this lag in the experience
at the time of the revision, but the same lag in the experience must
be dealt with between rate revisions.   The loss ratio experience
for the latest calendar year or any part of a calendar year is
very easily furnished by all companies and gives an approxi-
mation to the trend of loss costs as compared with premium
income.   It has a very serious weakness, however, in that it is
affected heavily by the over or underestimation in the claim

reserves both at the beginning and end of the experience period. This so weakens the experience that it can hardly serve as more than a rough guide in determining the final level of rates.

There are however two factors which enter into the loss cost by means of which its trend may be measured from month to month. They are claim frequency and average cost of claims. The chief difficulty encountered with these factors is to get the figures from the companies in the form required. Take first, claim frequency. It is easy of course, to determine the number of claims incurred during any period but this must be related to some unit of exposure. The measure of exposure most easily obtained is the earned premium for the period and this may be found of some use. But a change in rate level changes the earned premium without a change in the exposure. It is evident therefore that the indicated accident frequency might be changed by a change in rates and would not represent the true trend of affairs. To get a true exposure it would be necessary to tabulate the number of "cars in force" in the same manner as "premiums in force" are tabulated. This would put a considerable additional burden upon the statistical departments of the companies. It is only fair to point out here that even a frequency per car exposed obtained in this manner could not be taken as an absolute indication for the reason that weather conditions cause the number of cars in actual use to vary greatly from the number of insured cars "in force" and the indicated frequencies would have to be studied in the light of seasonal changes and the trend watched over both short and long periods of time.

The average cost per claim is not hard to obtain. Most companies now have these figures available and watch their trend rather closely. Use has been made of average costs in past revisions by comparing latest indications with those of former periods. But up to the present, the companies have not been induced to file the data at regular intervals for the purpose of studying the current trend. Having these figures available it would not be difficult to watch the trend of costs per claim. When it is apparent that either claim frequency or cost has changed materially from that which existed at the time the rates were made, then the rates can be increased or decreased as the need is indicated.

Experience has shown that pure premium costs vary widely from city to city. There are a good many reasons for these differences but probably the principal ones are the layout of the city streets, traffic conditions and the attitude of the general public and the courts toward automobile accidents and the settlement of claims arising out of them. If the insurance companies were able to establish safety standards for a city which if complied would obtain for that city an immediate reduction in the rates for its automobiles after the manner of the compensation rating schedule, there would be an added incentive to the automobile owners to see that such standards are followed out. There would be a definite monetary reward offered for efforts toward accident prevention. The difficulty with such a plan is to determine after the schedule has been put into effect, what results it is producing. In the first place, some of the cars insured in a given city, Newark for example, may meet with accidents in other cities. These accidents must be charged against Newark statistically but they do not reflect the conditions of Newark. On the other hand cars from other cities may meet with accidents in Newark and these accidents will be charged against the home city of the car. In many cities these two facts might offset each other but it would not be safe to make that assumption for all cities without a severe test, of its accuracy. The use of such a schedule might be made a powerful factor in the prevention of accidents.

The expense loading in a rate is at present determined as a percentage of that rate. This is the simplest way of handling the matter but leads to some rather peculiar results. For example it might appear inconsistent to continue to charge the same percentage regardless of changes in rate level. If a loading of 45% is adequate for a $30.00 rate it is not necessary to continue to charge 45% when that rate is raised to $35.00 since the actual cost of handling the business is not increased in proportion to the rate. The same argument holds true in the case of differentials between territorial and underwriting classifications. For instance, if the loading for home office administration is 10% of the rate then a 1921 Special Six Studebaker touring car in New York City pays $11.90 for that expense while the same car in Arizona pays $1.40. The apparent answer is that the expense loading should consist of a constant amount

for those items of fixed expense and a percentage for the variable items. Such a loading was tried in workmen's compensation rates not long ago and was subsequently abandoned as being impractical. The fact of the matter is, that if one variation is corrected all others must be taken into account also and to do that produces only an involved formula for the loading. The results are slightly different but not sufficiently so to warrant the difficulty and expense of such a procedure. Under those circumstances it appears that the present method is the most practical one to use.

In conclusion it should be said that a description of methods of making automobile rates at this time must be read with a realization of the fact that they are changing rapidly to meet the changing conditions and increasing importance of the business. Present methods may be greatly improved upon in the course of the next few years. This paper has attempted to indicate in general the nature of the problems to be faced. But it is impossible to predict how new developments in underwriting and statistical methods will affect the problems of rate making in the future.