THE THEORY OF THE DISTRIBUTION OF THE EXPENSES OF CASUALTY INSURANCE

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In the early days of insurance not a great deal of scientific attention was paid to the amounts that had of necessity to be included in the premiums charged in order to meet the expenses of the underwriter or company incurred in running his or its insurance business. To take care of these expenses rough percentages were added to the estimates of the loss costs. As the science of rate making advanced however, more exact provisions for expenses were made in the rates, and in practically all cases the amounts included for expenses were thought of and included in the premiums as percentages of the premiums charged. There should be mentioned the exceptional case of minimum premiums where one of the causes for setting up minimum charges was (and still is) on account of the recognition of certain costs which were incurred in the actual issuance and carrying of a policy covering even a very small hazard.

The refinements made gradually and from time to time were thus confined to determining the percentages more exactly in accordance with experience and in varying the percentage loadings between various classes of business. I am not speaking of life insurance where it has long been the practice to load the expenses in at least two parts, namely a percentage of the sum insured and a percentage of the premium, and where also a great amount of research has been done on the question of the distribution of expenses between new business and renewals. The greater scientific basis of life insurance premiums, the pressure of competition and the problems of profit distribution were the principal causes of this quicker progress in life insurance rating.

Of recent years however—and here I am referring more particularly to casualty insurance—much more attention has been paid to the question of expense loadings. It has been recognized that it is not necessarily fair and equitable in all cases to load expenses as a percentage of the rates and consequently a considerable amount of study has been made of the two related problems, first, what is the actual incidence of expenses and second, what are the correct methods of charging the expenses back to the assureds.

Confining this paper from now on to casualty insurance it may be stated broadly that up to three or four years ago expenses were charged as percentages of premiums, the percentages varying by "lines," defining a line roughly as being a division of the business, all the risks in which form a reasonable homogeneous collection of the same general type. There were however some exceptions, some of which are mentioned towards the end of this paper.

The purpose of this paper is to give some consideration to the proper theoretical treatment of the two problems mentioned above, but principally the first, namely, the discovery of the incidence of the expenses of a casualty company. My object is not so much to present conclusions as to the incidence of expenses or to lay down rules and methods for the distribution of actual expenses but rather to point out some considerations which ought to be borne in mind testing present methods and in revising these or setting up new ones. Very little has been written on this subject and I am hopeful that this paper may stimulate discussion and lead other actuaries to present their views. It is essential that the reader bear these objects in mind, as otherwise this paper may seem to be merely a collection of perhaps debatable assertions and of questions and doubts raised but not answered.

The first point that should be discussed is what is meant by "expenses." For example, should claim expenses be included in the term or should they be regarded as policy benefits? The same doubt may be raised regarding inspections. Thus one of the principal benefits of a liability policy is that the company undertakes to defend all claims and suits against the policyholder and one of the main reasons for taking out a steam boiler policy is to secure the benefit of the company's inspection service. For our purpose of equitable distribution all such expenses or benefits (however they may be regarded for other purpose such as for instance in presenting the make up of the premium dollar for publicity purposes) other than investment expenses should be included, as the ultimate aim is to be able to apportion, by way of premium charges, among the assureds, the amount of dollars which the company must secure for all services and expenses. It is assumed (in other words excluded from the present discussion) that the rate making procedure produces adequate and reasonable "pure premiums" for the "losses"; it may also in some cases take care of the "allocated" part of the claim expenses.

Apart from the aim of constructing adequate and fair scales of premiums (and parenthetically this includes adequate and fair in the sense that the premiums must be adequate and fair as between different types of companies writing different cross sections of casualty business) accurate distributions of expenses are needed to enable individual companies to check and control their operations, to test that their expenses are not excessive, to ensure that their services to the assureds are adequate and also to ascertain whether different sections of the company (e.g. different branch offices, or departments responsible for different lines) are being run efficiently.

Expenses may be distributed according to the following subdivisions or combinations of two or all of them:

(a) "nature" i.e. type of expense such as salary
rent
tax
printing
etc.

(b) "purpose," i.e. kind of service or expense such as claim
acquisition
inspection
etc.

(c) allocation to different types of policy or policyholders such as by "line"
by states
by agents or branch offices
by size of policy, etc.

Division of expenses by "natures." For the majority of expenses there is little difficulty in effecting such a division. Every expense is of some fairly definite nature and provided we allow a long enough list of different kinds it is easy to make the division. However, if we desire to limit the list then doubt may arise as to the particular category to which to allot an item. For example, the annual statement calls for expenses paid (other than claim expenses and inspections) to be divided into:

Policy fees retained by agents.
Commissions or brokerage.
Salaries, fees, other compensation and traveling expenses of officers, directors, trustees and home office employees.

Salaries, traveling and all other expenses of branch office employees and agents not paid by commissions.
Medical examiners' fees and salaries.
Inspections, including accident prevention.
Rents.
General office maintenance and expense.
State taxes on premiums.
Insurance department licenses and fees.
Federal taxes.
All other licenses, fees and taxes (give items and amount).
Legal expenses.
Advertising.
Printing and stationery.
Postage, telegraph, telephone, exchange and express.
Insurance.
Furniture and fixtures.
Books, newspapers and periodicals.
Bureau and Association dues and assessments.
Other disbursements (give items and amounts).

In complying with such a division of expenses doubt might arise for example, as to whether to charge the cost of certain reports made by an association—to which the company belonged for the purpose of exchanging confidential reports—to "Bureau and association dues and assessments," or to "Inspections" or even to a separate item under "Other disbursements." Even a liberal use of the loophole of "Other Disbursements" will not obviate all doubt. This difficulty is partly inherent in the attempt to reduce expenses to a small number of kinds and partly due to the items in the annual statement list not being clearly mutually exclusive. Thus does "Salaries, traveling and all other expenses of branch office employees and agents not paid by commissions" include *all* the branch office expenses even furniture and fixtures, postage, bureau and association dues, etc.? Most companies keep their records to show finer subdivisions of expenses than these annual statement groups. The expenses for the two "purposes," claims and inspections, are also usually kept divided by certain groups of natures of expenses for the company's own information even though the annual statement does not call for any such division.

Another point that it seems advisable to mention at this time—it affects all the other manners of allocations also—is that all expenses

(other than investment expenses) should be regarded as expenses and included. An example of departure from this principle is the following: "Agents balances charged off" (less any income from "agents balances previously charged off") is to my mind a legitimate expense and should be included in the expense ratio but the underwriting exhibit of the annual statement and also the New York Casualty Experience Exhibit excludes it from the underwriting expenses.

The distribution of expense by "natures" while important from the point of view of control of the efficiency of a company's operating is not so important when considering the proper allocation of expenses between types of policyholders, although it is convenient in the discussion of this to be able to deal with the expenses by these parts.

Division of expenses by "purposes." This is also extremely convenient for similar reasons to those given in the last paragraph but like the division by "natures" is not theoretically necessary for the proper determination of incidence of expenses. It is also extremely useful in presenting the insurance companies' case in justification of rates to supervising authorities and the public. An "expense" loading of 40% for compensation rates may seem high to the uninformed but the picture looks different when it is stated that of the 40, 17½ goes to the agent (for his services), 2½ to the state (for taxes), 8½ is for the cost of settling the losses, 2½ is for inspection and safety work to prevent accidents, 2 is for auditing and only 7½ for the general expenses of the company, with nothing for profit or contingencies.

The usual divisions made under this head are:

Commissions and other acquisition cost.
Inspections.
Bureau expense.
Claim expense.
Payroll audit expense.
Taxes.
General administration expense.

These are the divisions in the New York Casualty Experience Exhibit—which is referred to so much now for arriving at, checking and supporting expense loadings—except that in this exhibit payroll audit expense (which however affects only compensation and a

few other lines, not relatively very important) is not separated out of general administration: also in the exhibit bureau expense is associated with inspections but is shown separately. In the annual statement claim expenses are required to be shown divided by lines while inspections are shown not divided at all. Commissions are shown by lines but "Other Acquisition" cannot be picked out at all. The Casualty Experience Exhibit shows all the above "purposes" (audit and general administration combined) by lines.

Even more than for the division of expenses into "natures," problems and differences of opinion arise as to the proper allocation of expenses by "purpose." One of great practical importance (in view of acquisition cost limitations) is what expenses fall under "Acquisition." A whole series of rulings have been given as to this by the Acquisition Cost Conference and several committees of actuaries and statisticians have gone into the question. I shall not go into this matter here. Again take claim expense. All "allocated" payments are included of course and so are the cost of claim offices, and claim departments in the head office; but should there be included such items as the cost of handling the claim drafts in the cashiers and accounting departments and the keeping of claim records and outstanding reserves in the statistical department, and the share of the general office overhead applicable to the claim departments? Some think one way and some the other. Similar problems arise in connection with inspections and audits. However, for our present purpose these are not of very great importance as the doubtful expenses if not included in, for example, claim expense will fall under general administration. Nevertheless, it would be very desirable if uniform practices were observed by all companies.

Now we come to the question of the allocation of expenses to different divisions of the business or to different types of policyholders. I intend the language "different divisions of the business or different type of policyholders" to be broad as we should not be (at any rate in the theoretical discussion and in research work) limited by pre-conceived ideas. The problem to be solved can be divided into two parts: the first is what differences in policies cause expenses to vary, and the second is by how much do the expenses vary on account of these various differences. In mathematical language the first part is "Of what variables and parameters are expenses a function?" and the second is "What are the func-

tions and parameters?" It seems advisable therefore to examine carefully the different items of expenses with a view to determining the causes of them and what circumstances vary them. Until this has been done statistical distributions of actual expenses should not be attempted. It would be useless for instance to distribute personal accident expenses by age of assured if there were no *a priori* grounds for expecting a variation by ages, and precautions were not taken to eliminate the effect of some other varying conditions as for instance state of residence. On the other hand when it has been determined by what attributes the expenses vary (of what variables the expenses are functions) then it will be necessary to make statistical investigations of the distributions of these attributes and of the corresponding expenses (to determine the functions and parameters); that is unless the expenses—or the portion being at that moment investigated—vary by some simple function of some attribute when all that will be required will be a distribution of that attribute. To illustrate: if some expense, say the cost of having the policy approved by a central office, was constant for each policy, then to distribute the cost of approval we would have to know only the distribution of numbers of policies; but if another expense, say the cost of examining and passing on policies in a certain line in the home office underwriting department, were to vary by size of policy, then we would require not only the distribution of policies by sizes but we would also have to find out the distribution of those expenses by sizes. In mathematical language in the first of these instances it is known what function of the variables is the expense, the function being a constant; while in the second we require information from which to determine what function the expense is of the variables (in this case the variable is the size of risk).

Of course, if we break the expenses down into every little item and try to discover the relationship between each expense and those circumstances (to be discovered) of a policy or group of policies upon which the expense depends we would, after a prohibitive amount of work, arrive at the result that the expenses varied according to such a multitude of different things (some of major, some of intermediate and some of minor importance) that the expense for every policy was different from that of all others. Now we must remember that insurance is in its very nature a matter of averages and averaging out: if we analyzed the loss producing causes to the

finest point we would produce a separate pure premium for every risk; and just as for losses so we must for expenses discard the factors of minor importance so as to throw the policies for expense loading purposes into groups or classes, as homogeneous as possible, and for which groups or classes the expenses are averaged. For practical convenience the groups should be as broad as possible, provided no substantial injustice is done as between the various members of a group. On the other hand the groups must be numerous enough to give effect in the expense loading to any real variations in expenses incurred. In addition the scheme of loading should not exclude if warranted (and I think in many instances it would be) a procedure analogous to that of schedule or experience rating the loss hazard whereby the loadings within a group might be adjusted on the merits of each individual case. These adjustments would on account of the labor involved and of the law of averages have to be limited to the larger risks. I do not mean by these remarks that I think a complete scheme of expense loading with or without merit rating for expenses could be set up all at once: the scheme will have to be built up little by little by a process of gradual refinement and improvement, and will never be finally finished for conditions will change.

There is another aspect of the problem, namely the level of expenses about which a few observations must be made at this point. Even if it were possible to determine accurately the expenses (for a given company in a given period) for a certain type of policy it would be found that these expenses would vary from company to company and from time to time and for various reasons. Some companies are more efficiently run than others: some may spend more on certain objects and services than others—for example on accident prevention thereby expecting to save more by way of reduced loss payments than the cost of the excess expenditures on prevention: certain expenses may depend mainly on the size of the company or on its distribution of business or on the proportions of different lines: if a company's volume of business goes up or down the actual expenses may not (and probably will not) go up or down in the same proportion, at any rate for some little time, for there is a certain "lag" in the expenses.

In a good many instances these causes tend to offset one another: a large company can do certain things more economically than a small one but on the other hand the cost of certain items will be

greater (supervision and coordination for example: also specialized services—big companies maintain large actuarial departments while the small companies often do not). In any case by and large the pressure of competition tends to bring together the expense levels of different companies, regard being had to the quantity and quality of service rendered.

Although expenses may thus vary from company to company and from time to time, nevertheless the expenses have to be apportioned back to groups of policies for rates have to be made usually for all companies of a certain kind—all stock compensation carriers or all bureau companies. To overcome the difficulty appeal must be again had to the fundamental basis of insurance namely that it is a question of averaging. The expense loadings are usually chosen to reproduce the average expenses of all companies (of the kind for which the rates are being made) except that certain expenses—as for example acquisition costs—may be arbitrarily limited or fixed by agreement. Of course certain other companies (for example non-bureau companies) may adopt the same schedule of rates and reckon on effecting economies in either or both the loss and expense elements by selective underwriting and efficient operating. However, as far as the expense end is concerned, if the bureau companies are properly run it should be difficult for the non-bureau companies to give the same service at a cheaper cost. In the regulation of rates the principle seems fairly well established (though not always strictly adhered to in practice) that on account of expenses the companies are entitled to enough loading to cover their actual expenses. The principle seems sound for there is sufficient competition to keep the expense cost down to the lowest efficient level and the only alternative would seem to be to limit expenses to what the companies *should* spend and the determination of that would not be easy: the tendency anyhow would be to limit expenses unduly and stifle initiative and progress to the ultimate detriment of the service the policyholders receive.

Now let us examine different varieties of expenses to see how the allocation problem can be approached. Broadly speaking all expenses fall into the following groups:

(a) Those (in theory) definitely assignable (or nearly enough for practical purposes) to individual policies—such as the cost of printing policies, writing them, mailing them, indexing them, allocated claim expenses, etc.

(b) Those definitely assignable to some group of policies, e.g., assessments for a Compensation Rating Bureau, etc.
(c) Overhead of actual operating departments such as cost of supervision of claim departments, underwriting departments, etc.
(d) General overhead of company—personnel department, general executives, etc.

Under (a) we have costs such as allocated claim expenses, cost of individual inspections, audits, that are commonly kept track of statistically: but there are also many other items (among them the cost of many of the usual routine operations of the company). These can for practical purposes be investigated and assigned to groups according to the nature of the attribute that measures the variation of the expense. Thus we might have groups for (1) expenses constant per policy (2) expenses a percentage of the premium, (3) expenses varying according to the number of classifications, etc.; and within each of these groups sub-groups where for instance expenses vary per premium but differently per state.

A feature of expense allocation as contrasted with loss allocation is that in the former there are numerous items of expenses for policies never effective (or for which no premium is collected) e.g. on prospective risks and policies not taken. These expenses it would seem should be charged against the other policies of the same group.

Under (b) we get expenses that usually can be assigned to a broad group of policies and which must be studied with a view to spreading the expense equitably between smaller groups, each item being treated on its merits.

Under (c) we have the general overhead of the operating departments which again must be studied so as to be divided equitably over the groups of policies for which the expenses under (a) and (b) vary. To give one example the general overhead of accident and health claims might be divided in proportion to all accident and health losses and all accident and health allocated loss expenses on the theory that the object of the insurance being to redistribute accident and health losses over all the accident and health policyholders the cost of the supervision of this redistribution (the overhead we are considering) should be a percentage of the amounts redistributed.

The expenses falling under (d) must be similarly distributed. The theory that the general overhead of the company should be a

percentage of the amounts of losses redistributed over the policyholders plus the cost of redistribution would lead to practically a premium volume allocation of these expenses; it must be remembered, however, that this should apply only to the absolutely general overhead—that portion of the expenses that cannot be allocated, under (a), (b) and (c) above, more directly to policies or groups of policies. Thus the salary and other expenses of a vice-president in general charge of say burglary business would be a direct charge against burglary, to be distributed over smaller groups of burglary policies on the principles indicated above. It must be remembered in all of this that we are endeavoring to make a distribution *ab novo*, free from all preconceived or inherited ideas. For instance it is not necessarily sufficient to get certain expenses allotted to a particular line—the expense may (and often will) vary within the line. In any case all the risks of a "line" is not absolutely homogeneous—there is a great deal of difference for example between private passenger automobile policies and garage risks.

The above analysis will seem to indicate a rather involved problem. However, when a detailed investigation on these lines is undertaken, many problems arise still more to complicate the analysis. Thus at the best we have an allocation to policies but some policies include more than one form of coverage—accident and health; automobile liability, and property damage and perhaps collision, and plate glass; general liability (owners, landlords and tenants) and elevator with perhaps both liability and property damage under each. Some of the expenses (such as claim expenses or inspection) may be directly separable as to the different coverages but the others must be divided indirectly. Should the cost of underwriting an automobile policy be divided equally between liability, property damage, etc., or according to the premiums received (it must be remembered that if the allocation is to be used as the basis of fresh methods of loadings the proportions of premiums may be changed thereby)? Compensation, and manufacturers and contractors liability (and property damage) policies are often written in conjunction and audited together. How are the expenses to be split?

Then further from a practical point of view the question of distribution is complicated still more if, as is becoming quite common now, there are two or more companies under the same management. If the companies in the group are all casualty companies (whether

all writing all lines or some some lines and the others others) then the theory of the distribution does not include any further points than those already mentioned but in practice all results of expense distribution require to be brought out separately for each company not only by lines (or other groups of policies) but also by "purposes" and by "natures" of expense, and the necessity for this leads to a great increase in the accounting and statistical work. If on the other hand some of the companies also write other kinds of insurance (life, fire, marine, etc.) with or without casualty business then the above principles have to be applied to securing division of expenses between the kinds of insurance, life, casualty, fire, etc., and then within the kinds by "purposes" and by "natures"—and the accounting and statistical procedures are thereby still further complicated.

On the other hand (fortunately) a large portion of the expenses can be allotted with reasonable accuracy. Taking the 1929 New York Casualty Experience Exhibit we find that for 54 stock companies the total expenses (including claim) were 50.5% divided:—

Claim	9.3%
Acquisition	26.3%
General Administration (including audit)	10.2%
Inspections and Bureaus	2.1%
Taxes, Insurance Dept. fees, etc.	2.6%

Now claim expenses do not present (to a good first approximation anyhow) very grave distribution problems. A large proportion is "allocated" (and in a number of casualty lines is included with losses in the pure premiums) and the unallocated vary very nearly in proportion to the losses and allocated expenses.

Commissions are charged as percentages of the premiums and in any case the total acquisition cost is limited (as far as the most important stock companies are concerned) to a percentage of the premiums.

Inspections are to a large extent "allocated" and the problem is reduced to the distribution of the inspection overhead. Bureau charges are usually definitely percentages of certain premiums (whether this is always equitable is another question).

Taxes again (except federal and some state income taxes) are definite percentages of premiums (though on widely varying bases as to reinsurance, etc.) and insurance department fees, etc., are

small. In practice percentage loadings in the rates are almost always used to provide for taxes and this seems reasonably fair. This leaves as the main item to be equitably allocated general administration expenses including audit (audit however affects only compensation and a few liability and property damage lines—not major ones). It is of course precisely this group on which, up to the present, least work has been done with regard to equitable distribution.

The actual work of arriving at the distribution of expenses thus falls into two processes, the same as in all similar scientific problems, analysis or breaking down and synthesis or building up. The expenses are first of all broken down into groups as homogeneous as possible: the causes of variation of each of these groups is studied and then an attempt is made to put together in a practical manner the causes and amounts of variation by practical groups of policies so that the final answer will show the variation of expenses depending upon the major causes of variation and in such a way that a practical method of loading the pure premiums can be used to reproduce the expenses by these groups. The early endeavors to do this will naturally make use of practical expedients and approximations—so as to limit the loadings to as simple functions as possible of the more important variables affecting the incidence of the expenses. It is to be expected that the greatest attention will be paid to those divisions of the business (lines) where the need for action is most urgent either on account of the necessity for correcting inequities (or what comes to the same thing the pressure of competition, for if one section is too heavily burdened the old line or bureau companies will find themselves faced with competition aimed at writing the risks in this section at more equitable rates) or to those divisions where most attention is being paid by regulating authorities—these divisions will naturally be those of a quasi public nature or those closely affecting social conditions.

Before briefly reviewing what has been done to date in respect of more equitable loadings than those produced by straight percentages let us briefly consider, as an illustration, the steps in the allocation of expenses of a stock company writing compensation business in one state only: it will be noted that in order to make the example as simple as possible we have eliminated the complications of more than one line of business and of a wide territorial spread of business. First of all we consider the division of expenses by

"purposes"—acquisition cost, claim expense, inspection cost, bureau assessments, payroll audit cost, taxes, and general administration: we might eliminate at once any further detailed consideration of:

(a) Acquisition cost, on the ground that this is mostly charged as a percentage of net premiums written and is anyhow limited to a maximum such percentage: this item is therefore to be loaded as a percentage of the premiums in accordance with the scale under which it is charged and limited.

(b) Claim expense, deciding that it will be sufficient to regard this as a percentage of the losses (which as a first approximation is nearly true) and therefore to be loaded as a percentage of the pure premiums.

(c) Bureau assessments, as these are charged as a percentage of net premiums written, and are therefore to be loaded accordingly.

(d) Taxes, as the great bulk of these are state premium taxes charged as a percentage of the net premiums written, the remainder being small items (licenses and fees) which it is equitable to charge as a percentage of premiums. This item is therefore to be loaded as a percentage of premiums.

If in addition to the above the company has to pay assessments for the maintenance of an industrial commission in the state the cost of these must be loaded in accordance with the method of assessment and can be eliminated from further analysis.

This leaves us with inspections, payroll audits and general administration to be considered.

Taking these in order, the total inspection cost can be broken into the following parts: (1) Field cost; salaries and traveling being the greatest part of this. (2) Home office cost of actual

inspection work—routing inspectors, corresponding, keeping records, etc.—salaries and rent are the biggest items of this. (3) General supervision—the home office "unallocated" as opposed to the "allocated" in (2). Studying (1) and (2) first in detail—probably by making time studies so as to throw the costs against different types of policies it will possibly be found that the cost of inspecting an individual risk depends first of all on the general type of the risk, perhaps by schedule groups (of rating classifications) or smaller groups of classifications and secondly within each such group according to the size of the risk (not necessarily in direct ratio to the premium or payroll). A small risk may need only a cursory inspection while risks over a certain size may require a lot of inspection and safety work the cost relative to the size nevertheless tending to fall as the size increases. Of course, there will be a host of other circumstances affecting the cost of inspecting individual risks but the object at any rate at first is to discover the general law: as a first approximation it may be determined that the cost of inspections varies as a simple function of the size (defined in some manner such as amount of premium or of payroll) with possible variations by industry groups. The "function" may be a constant plus a percentage (or different percentages for two or more size ranges) of the size. The general supervision (3) will probably be treated after due consideration as a percentage addition to the distributed costs of (1) and (2).

Coming now to auditing cost we make the same divisions of the total cost as for inspections. The results here may turn out to be that the cost is much more nearly constant depending more on the number of classifications involved and on the completeness of the assured's records. A good first approximation may prove to be given by a constant plus small percentages of the size with possible variations by industry groups.

Lastly proceeding to general administration the first step again is to break down the total cost into items say

(1) Operating Department costs
    (a) Salaries and rent for underwriting department
    (b) Salaries and rent for policy writing department
    (c) Salaries and rent for index department
    (d) Salaries and rent for policy file department
        and so on

(2) General Supervising Department costs
  (a) Salaries and rent for general executive department
  (b) Salaries and rent for personnel department
  (c) Salaries and rent for cashiers department
    and so on
(3) Miscellaneous expenses
  (a) Head office travel
  (b) Furniture and fixtures
  (c) Postage, telephone, etc.
    and so on.

Study of (1) (which includes the larger part of the expenses) and such items of (3) as are susceptible of direct allocation may lead to the conclusion that certain expenses depend on the number of policies, certain on the classifications and sizes, certain on the size and others seem to be a fair charge on the whole business probably most equitable by insurance cost (premiums). The picture is then pieced together, the supervising items of (2) and (3) being brought in partly on a premium volume basis and partly in proportion to the allocated charges (after due study of the nature of the various items) with perhaps the result that a good equitable distribution would be so much a policy plus certain percentages—the amounts varying possibly by types of policy and by size of policy.

The whole scheme of required loadings can now be worked out so that the required expenses for each type and size of policy are reproduced together with the required amount for profit and contingencies. Assuming the above results to be those found the various loadings could be incorporated by loading the pure premium for the claim expenses and adding to this result the appropriate constants for any inspection, audit or general expenses (if any), varying as ratios of the payrolls and multiplying the result by a factor to produce the amounts required for inspection, audit and general expenses varying with the premium, and for acquisition, taxes and bureau assessments and for profit and contingencies. This would produce the rate to be applied to the payroll and in addition there would be charged a constant for each policy made up of the amounts required as constants per policy for inspections, audits and general expenses multiplied by a factor to take care of acquisition, taxes and bureau expenses and for profit and contingencies. If an industrial commission assessment were payable, provision would have in addition to be made in accordance with

the method of its assessment. If the expenses had been found to vary by say industry groups, the loadings would vary by these groups and if some or all of the inspection, audit and general expense percentage loadings were to have to vary by size group ranges separate rates would have to be brought out for these ranges or modifying factors given to go from the rate for one range to another: similarly if the acquisition cost were to vary by size. Suitable "minimum premiums" would also have to be established. I do not intend to deal with these in this paper except to mention that in the determination of the amounts of expense loadings account would have to be taken of the amounts realized for expenses from these minimum premiums. In connection with the application of these rates some attention would have to be given to the effect of experience and schedule rating plans. The present plans modify not only the pure premiums but also the amounts available for expenses—and in the same proportions—and whether this should be so should be considered. If the experience rating plan (for instance) were in balance the amounts of expense loadings lost on credit risks would be in total made up by the excess amounts collected on debit risks. At present the experience rating plan is purposely producing net credits and the net lost loadings are in making rates as above spread over the whole business. In theory the point is whether the expense loadings should be reduced or increased on experience rated risks depending on the loss experience. For large risks a scheme of "schedule rating" of expenses as mentioned earlier would seem appropriate.

The possible practical variations in expense loadings are limited by several considerations:

(a) Insurance is a scheme of averaging and as for loss cost variations in expense cost can be recognized only in broad groups and to prevent manifest injustices to different classes of insureds and companies.

(b) The rate schedule must not be too complicated. This limits us to variations for expenses on classes of risks not differing greatly from those used for determining the variations in loss costs (in other words we have now a large number of separate *rates* on account of loss variations and do not wish to extend the number greatly on account of expense variations) plus variations effected by some simple manner of applying the rates such as the addition

of a constant, or a simple variation of the rate times the exposure: or the addition of a fixed amount to the exposure.

(c) Since, in order to see how the actual loadings received compare with the expenses in future and in order to be in a position to vary the loadings from time to time as experience indicates, it will be necessary to keep track of expenses incurred and loadings received according to the methods of loading, it is of great practical advantage to have the scheme of loading as simple as possible. Also too complicated a scheme will give rise to difficulties in ascertaining the expected losses to know whether the loss ratio is high or low.

(d) The necessity of justifying the rate schedules to supervising authorities (if any) and to the insuring public; for this purpose a simple scheme is more readily demonstrated and is more easily backed up by experience.

(e) If a fresh method of expense loading is evolved, companies must take care that this is applied wherever appropriate; otherwise they may find the net effect is to reduce the amount received by way of expense loadings. For instance if a new scale of loadings varying by states were proposed, the companies should watch lest it were accepted in those states where the effect was to reduce the rates and rejected where the rates were raised. Such selection against the companies would probably be manifested.

Before briefly reviewing the present status of expense loadings it should be mentioned that while above I have indicated that the scientific way of arriving at equitable loadings is to analyze to discover the incidence of expense—in other words to discover the variables upon which expense depends—and then determine the proper loadings to charge expenses accordingly, yet in actual practice a somewhat inverse route has been followed. It has long been recognized that expenses differ by "lines" (meaning by a line in this connection a broad division of business) but apart from varying the loadings for changes in such obvious items as commissions and taxes the only variations used were in the percentages for the different lines. Then under the pressure of conditions and competition some classes of compensation carriers saw that under this system they were not getting enough loading to take care of

the expenses on the risks they had. This called their attention to the fairly obvious variation of expenses on compensation risks by sizes and led to the proposal of the expense constant. Proposals have also been made from time to time by various parties to vary the loadings by states and some steps have been taken in this direction, particularly in some states. However, the desirability of such differentiations has been rather doubtful up to the present on account of the lack of adequate information on the incidence of expenses by states and also on account of the danger of a selection against the companies—see (e) in the last paragraph.

At present there exists but little refinement in expense loadings other than by variation of the percentages for different lines and subdivisions: the loadings are made, usually by the addition of flat percentages (derived from experience) for the various "purposes" (as defined above—claim, acquisition, etc.) that apply to the line in question. If some subdivisions of the line require for instance audit while others do not, then the loadings will recognize this distinction. In many of the lines the "allocated" loss expenses are usually treated along with the losses as part of the pure premium. In the boiler and machinery lines where the inspection service is so important and where the cost of this is so large a proportion of the premium, endeavors are made to recognize variations in the inspection costs by type of object—though this is a peculiarly difficult thing to do successfully and one on which not a great deal of information has been collected (neither has much actuarial attention been given to it). The boiler and machinery rate schedules also attempt to give effect to variations in cost of service on account of locations, number of plants and size of risk. In a few other cases we can also find attempts to take care of fixed expenses by means of policy fees, and in some other cases attempts are made to vary the rates for large risks. Such variations are usually in the direction of lesser rates for the larger risks, probably with a view to recognizing both decreased loss hazard and lessened expense ratios. It is, however, in compensation that—for the reasons given above—most attention has been given to variations in expense loadings. The introduction of expense constants in a number of states a year or two back has been followed recently by further proposals to recognize more closely variations in the expense incidence by creating a differential between the percentage expense loadings for small and medium risks and for large risks.

A word on the practical side of expense allocation. Great strides have been made of recent years particularly by some companies in the practical distribution of expenses, and the casualty insurance business is now in a much better position than it was a few years ago to undertake investigations into the actual incidence of expenses and the proper method of making provision for them. Some accounts of the new method have been placed before this Society—see "The Allocation of Adjusting Expenses to Line of Insurance" by W. B. Bailey (*Proceedings*, Vol. XIV, page 233), "The Analysis of Expenses by the Use of Hollerith Cards" by H. O. Van Tuyl (*Proceedings*, Vol. XVI, page 121), "Recent Developments with Respect to the Distribution of Workmen's Compensation Insurance Costs" by C. J. Haugh, Jr. (*Proceedings*, Vol. XIV, page 262). From time to time also various methods of expense distributions have been described before the Association of Casualty and Surety Statisticians and Accountants. Mr. Robert S. Hull's recent book on "Casualty Insurance Accounting" also deals with this subject.

However, it cannot be said that the distributions of expenses of all companies even to lines of business is entirely satisfactory. Too many rules of thumb and premium volume pro rates appear to be used by a good many companies—not all small ones—and we should not still have these at this stage of the development of casualty insurance. So that even if thorough investigations, along the lines suggested above, were to show that for some lines percentage loadings were correct—which is quite possible—yet I think that it will be found that the true percentages are not those shown by the figures we now have.

In closing let me once more reiterate that the object of this paper is to endeavor to stimulate others to study the question of the proper treatment of expenses. I am conscious that I have made a number of what may seem to be bald assertions but I trust the members of the Society will read them in the spirit in which they are written, that is, as an attempt to reduce to a succinct written form some of the numerous ideas that are being thought of and discussed at the present time by casualty actuaries. Finally I present this paper in the hope that others may make further—and without doubt much more able—contributions to the solution of the problems of the incidence of expenses.