

INDUSTRY AS A GUIDE TO THE SELECTION OF  
THE LEVEL OF TURNOVER SCALES

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ABSTRACT

In the determination of pension costs the actuary normally has available for his use several turnover scales which indicate rates of turnover by attained age. In some cases, scales have been established which allow for select rates based on the duration of employment. These scales may be classified into three levels, which can be roughly designated "low," "medium," and "high" turnover. In order to apply one of these turnover scales to an employee group, judgment must be so exercised as to bring about as close a relationship as possible between the selected scale and the actual results. This paper attempts to outline broadly one method for classifying selected industries into three groups approximating low, medium, and high turnover levels, so that a more appropriate initial selection of turnover scales may be facilitated.

The industry classifications in this paper should not be assumed to be static but should be rechecked from time to time for reclassification. It should also be pointed out that the use of the classifications is limited to the same extent as the limitations embodied in the basic data. For a concise indication of these limitations, the appropriate references in the paper should be consulted and given consideration in making a final decision as to the selection of a turnover scale. In no sense should the rates used in the paper be considered as turnover rates. The rates used are used merely for ranking industries on a comparative basis.

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**I**N A recent volume of the *Transactions* of the Society of Actuaries, two excellent papers concerning the cost of vested benefits in pension plans were presented by Mr. McGinn<sup>1</sup> and Mr. Marples.<sup>2</sup> Both of these papers stressed the methodological approach, that is, the development of mathematical models and, by the use of sample or illustrative turnover scales and vesting provisions, numerical illustrations.

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<sup>1</sup> Daniel F. McGinn, "Indices to the Cost of Vested Pension Benefits," *TSA*, XVIII, 187.

<sup>2</sup> William F. Marples, "Cost of Vesting in Pensions," *TSA*, XVIII, 277.

In the reply to the discussions of his paper, Mr. McGinn broadly outlined a method for choosing an appropriate turnover scale: "Usually a pension actuary will attempt to review an employer's particular turnover experience and analyze current trends—both geographically and in the industry—to arrive at a reasonable index to the level of a company's turnover."<sup>3</sup> It seems clear that any turnover scale is affected by at least five general variables: (1) incidence (variations by age and duration), (2) sex, (3) geography, (4) industry, and (5) the individual business concern.

The purpose of this paper is to describe one approach for establishing the basic level of a turnover scale using the industry classification as a guide. A systematic statistical analysis of the termination experience of an employer and projections of expected experience for use as a guide in selecting a level of turnover rates suitable to the employer in question are certainly in the realm of possibility and represent the ideal solution. Such a procedure, however, might require considerable time and will certainly be expensive. In most cases either the required data are not readily available or the number of employees in the group will be too small to deduce statistically reliable guidelines from the data. In such cases it will be necessary to use data relating to the prospective policyholder's industry for deciding the level of an appropriate turnover scale. The approach that will be described is based on the use of the time series of industry termination rates published by the Bureau of Labor Statistics.<sup>4,5</sup> Twenty-one industries for which the Bureau publishes monthly and annual figures have been classified into high-, medium-, and low-turnover industries by this method.

The Bureau publishes monthly turnover rates combined for all ages and durations for several industries classified by the Standard Industrial Classification (S.I.C.) code system.<sup>4</sup> The monthly rates are seasonally adjusted, and annual averages are also provided. The rates are published separately for (a) new hires; (b) other accessions; (c) quits; (d) layoffs; and (e) other separations. They are based on data collected from a large sample

<sup>3</sup> McGinn, *op. cit.*, p. 252.

<sup>4</sup> *Employment and Earnings and Monthly Report on the Labor Force* (U.S. Department of Labor, Bureau of Labor Statistics [Washington, D.C.]).

<sup>5</sup> *Employment and Earnings Statistics for the United States, 1909-1966*, Bulletin No. 1312-4 (U.S. Department of Labor, Bureau of Labor Statistics [Washington, D.C., 1966]).

of individual establishments.<sup>5</sup> For the purpose of this paper, only separation rates are considered.

It is proposed to use rates relating to only quits and layoffs, since "other separations" (by definition) include separations due to deaths, retirements, and other miscellaneous causes.<sup>6</sup> Using the annual quit rates and layoff rates for 1958-65, we have classified the twenty-one industries into the three turnover groups.<sup>5</sup> Only two-digit code industries for which data are available are included in the study. The monthly publication of these data relating to the twenty-one industries facilitates the updating of this analysis and provides for changes in trends.

In the Appendix, Table 1 shows summary statistics based on annual data of quit and layoff rates combined for all ages and durations for 1958-66. These statistics were obtained by ranking the twenty-one industries with respect to their annual aggregate layoff and quit rates. After examination of the distribution of rates, they were divided into the following three groups:

1. Below the 30th percentile—low-turnover group
2. 30th-70th percentile—medium-turnover group
3. Above the 70th percentile—high-turnover group

The middle value of each group was equated to the measure of central tendency for that group. For example, the 15th percentile was used for the low-turnover group, the median of all data for the medium-turnover group, and the 85th percentile for the high-turnover group. For each year, ratios of the 15th and 85th percentiles to the median for all data in the corresponding year were computed. The distribution of these ratios suggested that low rates were approximately 40 per cent lower and that high rates were approximately 50 per cent greater than the median rates and, further, that no significant trend by time seems to be apparent for the years under analysis.

Table 2 (see the Appendix) lists those industries for which turnover rates lie below the 30th percentile, in the 30th-70th percentile, and above the 70th percentile.

Figures 1-5 in the Appendix illustrate the quit and layoff rates by year for the individual industries studied in this paper.

<sup>6</sup> *Measurement of Labor Turnover* (U.S. Department of Labor, Bureau of Labor Statistics [Washington, D.C., 1966]).

It is true that analyses such as this can at best provide only mere guidelines in the selection of turnover scales. It is not designed to provide a set of projected rates. It should be noted that the definition of the separation rates is a ratio of the number separated during the interval observed (the interval being one month) to the total number employed at the approximate mid-point of the appropriate interval.<sup>6</sup> In addition, one using these rates must allow for transfers of employees from one industry classification to another, where pension plan benefits will not be affected, as, for example, where an employee is a member of a trade union pension plan and loses no credit on his transfer.

Systematic projections should take into account the several forces that affect turnover in any industry. These forces will vary according to industry, and the ultimate impact will also vary. Analyses required for identifying the forces and determining their significance will need considerable data, which it is believed are not readily available at this time. In light of the growing popularity of pension funds, and the recognition of the significance of appropriate turnover scales, it would be helpful if more satisfactory data or analyses could be obtained and published in this area.

## APPENDIX

TABLE 1

TURNOVER RATES IN TWENTY-ONE INDUSTRIES  
SUMMARY STATISTICS

(All Figures Are Rates per 100 Employees)

Year	Lowest Rate	Highest Rate	15th Percentile Rate	Median Rate	85th Percentile Rate	Range
1958.....	1.0	5.7	2.0	3.2	4.8	4.7
1959.....	1.0	5.5	1.9	3.0	4.7	4.5
1960.....	1.1	5.4	2.0	3.5	5.1	4.3
1961.....	1.1	5.5	1.8	3.0	5.0	4.4
1962.....	1.3	6.2	1.9	3.1	5.0	4.9
1963.....	1.4	5.9	2.1	3.1	4.7	4.5
1964.....	1.3	6.2	1.7	3.0	4.8	4.9
1965.....	1.3	5.9	1.9	3.3	5.0	4.6

TABLE 2

S.I.C. Code	Industry
<i>Low-Turnover Industries</i>	
29.....	Petroleum refining and related industries
28.....	Chemicals and allied products
19.....	Ordnance and accessories
38.....	Instruments and related products
26.....	Paper and allied products
35.....	Machinery
<i>Medium-Turnover Industries</i>	
25.....	Furniture and fixtures
32.....	Stone, clay, and glass products
34.....	Fabricated metal products
36.....	Electrical equipment and supplies
22.....	Textile mill products
27.....	Printing, publishing, and allied industries
30.....	Rubber and miscellaneous products
37.....	Transportation equipment
33.....	Primary metal industries
<i>High-Turnover Industries</i>	
24.....	Lumber and wood products, except furniture
39.....	Miscellaneous manufacturing industries
20.....	Food and kindred products
21.....	Tobacco manufacturers
23.....	Apparel and related products
31.....	Leather and leather products

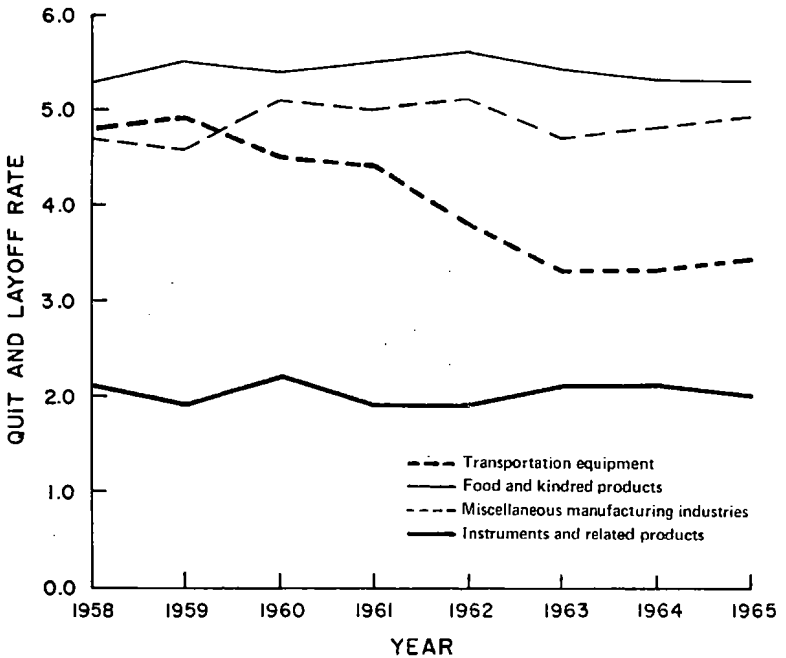


FIG. 1

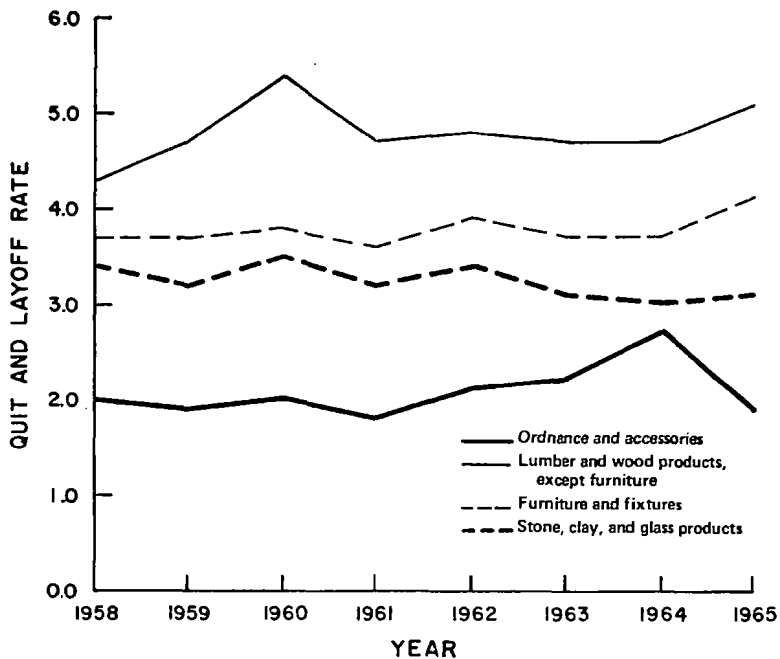


FIG. 2

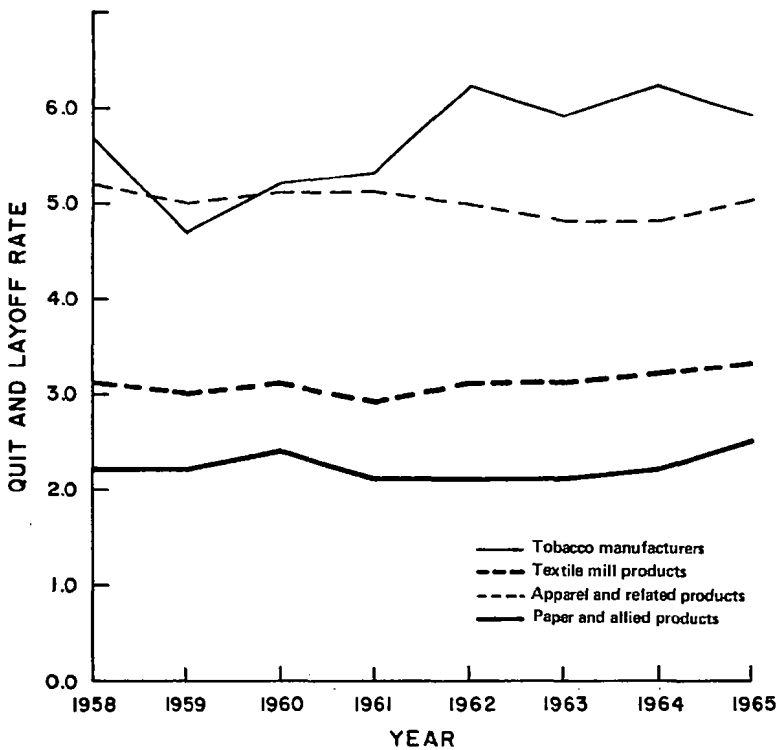


FIG. 3

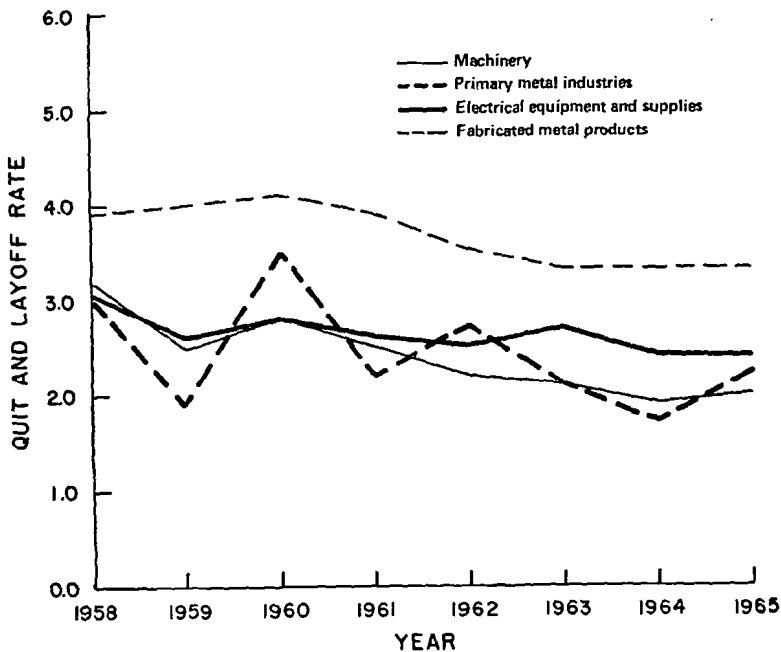


FIG. 4

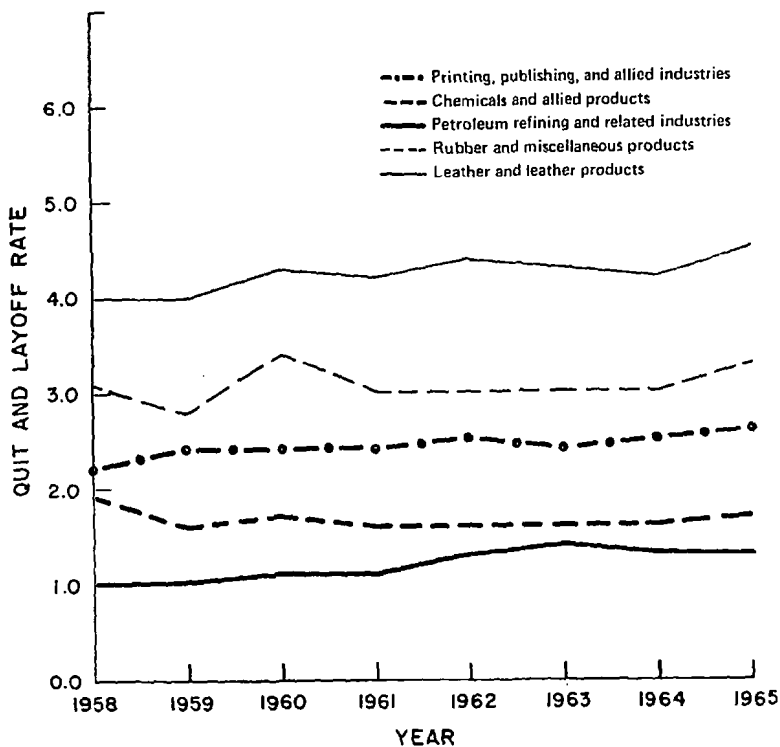


FIG. 5

## DISCUSSION OF PRECEDING PAPER

BARNET N. BERIN:

The actuary's problems in choosing an actuarial assumption initially involve reasonableness and acceptability. The actuary's responsibilities, however, do not end here but involve a regular review of the appropriateness of the actuarial assumptions by a detailed analysis of actuarial gains and loss. Only by regular comparisons of actual experience with expected experience can each of the actuarial assumptions be appropriately tested, and only by this means can the significance of the over-all actuarial gain or loss be assessed.

The authors have touched a difficult area. Their statement that "Analyses required for identifying the forces and determining their significance will need considerable data, which it is believed are not readily available at this time" requires expansion to cover the *true role of actuarial assumptions as estimates subject to regular testing and subject to periodic changes on the basis of actual results*. Only by this approach can the experience of an individual case, in time, be understood and, to the extent desired by the actuary and the employer, be uniquely reflected.

CHARLES E. FARR:

The authors deserve the thanks and appreciation of the many actuaries who are involved in the valuation of pension plans for opening once again the subject of the turnover assumption. Although turnover is only one of the several actuarial assumptions that must be chosen, it is an important one in terms of the effect it has on estimated pension plan costs.

As is true of some of the other assumptions, such as death, disability, and salary increases, the level of turnover experienced in the past is not known unless a study is made. History, however, is not likely to be repeated in the area of turnover experience, so the results of such a study can only be used as a starting point. Turnover experienced in the past can be affected for the future by many influences, so the study results should be altered as the result of other knowledge about factors expected to influence the employee group. Since this is the case, other less expensively derived starting points are frequently desirable, and the authors have given us broad industry classifications for this purpose.

One wonders, though, if classification of employee groups by broad industry groupings is the most appropriate starting point. Certainly there are wide variations in level of turnover within a particular industry



classification. For example, is it more appropriate to classify the largely female, salaried office group in a publishing firm as a medium-turnover group because of industry or as a high-turnover group because of office-female content?

This example suggests another possible factor influencing turnover, namely, office versus factory (or salaried versus hourly or nonunion versus union). Other influences are suggested by general reason. For example, one factor influencing the absolute level of turnover could be the economic times. Voluntary employee terminations would tend to reduce when job opportunities are scarce. Working in the opposite direction is the likelihood of more layoffs as economic times worsen.

The initial selection of a turnover assumption may well turn out to be the result of a discussion, or of a fairly rapid mental process, rather than a statistical analysis. Several factors would be considered rather than industry alone. The age-sex-service characteristics of the existing employee group have much to do with the expected turnover experience. Industries have many different occupations within them, each having its own turnover characteristics; the type of occupations in the employee group will therefore have an effect on turnover. Turnover experience varies from business concern to business concern, even though the same occupations are present. Such things as the employee benefit package, working conditions, personnel policies, and so forth, will have an influence.

In some instances—perhaps in many—the turnover assumption, once chosen, will not be adjusted for many years. If it is adjusted, it is in the direction indicated by observed turnover experience as to the group, altered by other knowledge about the expected future. Whether the revised assumption would approximate subsequent actual turnover is problematic once again.

Finally, of equal if not greater importance than the level of the turnover assumption initially selected is the means of adjusting for the differences that will develop between turnover assumed and turnover experienced. The various spreading techniques used in connection with actuarial gains are essential to adjusting on a gradual basis for the differences that are likely to appear after selection of a turnover assumption.

#### (AUTHORS' REVIEW OF DISCUSSION)

B. GEORGE ISEN AND VASANT H. KARMARKAR:

We wish to thank Messrs. Berin and Farr for their discussions of our paper. The discussions not only increase the value of the paper presented but also enable the authors to supplement their original writing by presenting the background which led to it.

Mr. Berin has emphasized what we believe to be an important point in the use of any turnover scale, that being the need for adjusting the turnover rates from time to time. This is done as a result of appropriate tests of any actuarial gains and losses due to actual turnover compared to those expected in an assumed scale. However, our desire for more historical data relates not merely to the general levels of turnover scales but also to an analysis of labor-force movements related to the other categories mentioned early in our paper, those being incidence by age and service, sex, geography, and individual business concern.

Mr. Farr has attempted to convey two main ideas. The first is the relative importance of the categories influencing turnover. Indeed, we mentioned early in our paper the variables we believed influenced turnover and, happily, Mr. Farr has confirmed our belief by elaborating on them. Despite the questions concerning an adequate starting point for making a choice, Mr. Farr has given no definitive answer. It should not be thought, however, that the paper gives one; nor is the paper begging the question, implying that broad industry groups are of far more importance than the other categories mentioned by Mr. Farr or the authors.

It was generally assumed that the actuary has available to him several turnover scales which indicate rates of turnover by attained age, sex, and sometimes duration of service. By means of his judgment, the actuary could classify these scales into three broad classifications, roughly designated "low," "medium," and "high" turnover.

Application of one of these scales to an employee group would require added judgment so as to bring about as close a relationship as possible between the selected scale and the actual results emerging over time. The basic thrust of the paper is to outline a method for classifying industries into three turnover groups roughly corresponding to the three sets of turnover scales. In other words, this is merely a method by which some judgment may be traded in for some science. As is true of all science, judgment and reason cannot be abandoned. Blind dependence on statistics alone is very dangerous in arriving at realistic and practical solutions. The choice of assumptions on an intuitive basis, when no other basis is available, is reasonable. However, there is no reason why a systematic procedure which substitutes "facts for appearances and demonstrations for impressions" cannot be developed in an organized way. We have attempted in our paper to take a first step, perhaps a small one, in the direction of establishing a basis for guiding intuition in at least one of the many areas that affect employee turnover.

The paper includes its own warning as to the use of the results, but it may be helpful to restate them. The paper does not purport to derive

turnover rates. It does not establish industry scales of turnover. The industry classifications are not assumed to be static. The graphs in the paper indicate the shift in average turnover level over an eight-year period. For instance, Figure 1 shows that, while the food and kindred products group has remained consistently high, the transportation equipment group has dropped off somewhat. Therefore, even though these two industry groups are not very different in turnover in 1958, we classified the first group as high turnover and the second as medium turnover (see Table 2), reflecting thereby the trend over time of the average turnover rates. That another actuary might have classified these groups differently is of no concern to the authors, who were, in fact, outlining a method for classification and illustrating the results of that method.

It may be of interest to outline the type of situation which gave rise to the attempt to choose scales by a more objective method. Proposals for pension plans involve laborious calculations in order to determine annual deposit requirements. As a result, we desired that such calculations be performed by electronic computer. By storing, say, three turnover scales (with rates graded by age, service, and sex) in the memory, the computer could select the correct scale for use in a calculation merely by identifying the industry in which the proposal fell. Of course, there is an added semantics problem introduced by the use of industry; that problem involves the proper identification of a group of employees as belonging to a certain industry. However, reference to our paper indicates that in extremely large employee groups (whether they cross industry lines or not), when adequate records of employees have been maintained, the experience of the group itself should be used. We feel that such large groups are the exception, and smaller groups tend to be easily located in a broad industrial class.

Second, Mr. Farr also stresses the importance of recognizing gains and losses from turnover. The subject of our paper is the initial selection of a turnover scale. The handling of actuarial gains and losses, or the adjustment of the scale from time to time, is outside the scope of the paper.

To be sure, these other matters raised in the discussions are of interest to all actuaries engaged in pension plan valuation, and their resolution may be even more important than the questions answered in our paper. We, therefore, again thank those who were interested enough to trouble themselves to write discussions, thereby enlarging the scope of the paper and presenting further questions which may yet be answered by future papers.