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A Study of the Reasons for the Salary Differential Between Professional Staff Members at the University of Utah and Utah State University

Terrance R. Volb
Utah State University

A STUDY OF THE REASONS FOR THE SALARY DIFFERENTIAL BETWEEN PROFESSIONAL STAFF MEMBERS AT THE UNIVERSITY OF UTAH AND UTAH STATE UNIVERSITY

by

Terrance R. Volb

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Terrance Richard Volb

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF CHARTS

ABSTRACT

A Study of the Reasons for the Salary Differential Between Professional Staff Members at the University of Utah and Utah State University

by

Terrance R. Volb, Master of Business Administration

Utah State University, 1968

Major Professor: Dr. Norman S. Cannon
Department: Business Administration

Salary differentials by rank were studied at the University of Utah and Utah State University on a departmental basis.

Multiple regression equations were developed from criteria at Utah State University which were used to predict individual salaries for professional staff members at the University of Utah. Thirteen of the fourteen multiple regression equations developed showed statistical significance at the .05 level and twelve departments were significant at the .01 level.

Salary comparisons by rank were considerably reduced as a result of the department by department analysis.

(52 pages)

INTRODUCTION

The Utah Coordinating Council of Higher Education is responsible for state financial appropriations for all post-high school educational institutions.

Professional staff salaries demand a large portion of these allocations; and with the process of distribution varying between institutions, a potential problem arises when salaries of similar institutions are compared. For example, professional staff salaries at the University of Utah have exceeded salaries at Utah State University in most cases for at least ten years. The issue that consequently comes to view is the legitimacy of this differential.

The major objective of this thesis will be to study the salary differentials between the professional staff at the University of Utah and Utah State University to determine if there is sufficient justification to warrant the present and increasing variance.

REVIEW OF LITERATURE

To acquaint the reader with the necessary background concerning salary analysis it will be essential to understand two major areas. Discussion will initially be given to the purposes and objectives of the Coordinating Council of Higher Education in Utah. Secondly, within this broad framework, certain functional areas at Utah State University will be analyzed.

Coordinating Council of Utah

> People are the most important resource of any nation or state; the development of human resources is the greatest opportunity and the most important responsibility of any society. Fortunately Utah is committed to this philosophy.
>
> One of the continuing challenges facing the state is to reassess and redirect those institutions it has created to undertake the task of human development. Part of that process requires analysis of the problems faced by the institutions, of their approaches to these problems, of the policies which guide their action, as well as some effort to measure their shortcomings, their achievements and their needs.[1]

In the process of providing direction and assessment of public post-high school institutions, the Coordinating Council has provided numerous reports concerning curriculum analysis and budget analysis. The curriculum analysis reports are designed as a management tool for institutional use.[2] These reports provide a statewide picture of

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[1] Utah Coordinating Council of Higher Education. Financing Higher Education in Utah 1967 - 1969. 1202 University Club Building, Salt Lake City, Utah, January, 1967. p. iv.

[2] Utah Coordinating Council of Higher Education. A Study of Curricular Offering, Class Size, Teaching Load and Instructional Salary Cost. 15 Northwest Temple, Salt Lake City, Utah, 1960, p. iii.

appraising the productivity of higher institutions along instructional lines.[3]

The Coordinating Council is also responsible for major financial allocations applicable to each specific institution.[4] Briefly, the process involves the submission of budget requests by the institution for review and actual allocation by the Coordinating Council. For example, an institution would plan its expenditures in the areas of instruction, administration, library and physical plant. This budget would be submitted to the Coordinating Council for analysis, review and final appropriation.

A major allocation for all institutions is the request for funds for instruction. Table 1 to Table 3 shows the proportions of budgeted allocations that are applicable to instructional costs in Utah.

To allow for further understanding in the process of preparing these instructional budgets, it will be necessary to examine the functions at a specific institution.

Utah State University

The Board of Trustees at Utah State University invites the faculty Committee on Professional Relations and Faculty Welfare to submit a report dealing with salaries and salary problems. To accomplish this task, a sub-committee on Contracts and Salaries usually reports on statistics dealing with average salaries per rank in comparison to other

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[3] Ibid.

[4] These institutions are the University of Utah, Utah State University, Weber State College, College of Southern Utah, College of Eastern Utah, Snow College, Dixie College, Salt Lake Trade Technical Institute and the Utah Trade Technical Institute.

Table 1. Instruction costs as a percentage of total budget for all public post-high school institutions in Utah[5]

Year	Instruction Costs	Total Budget	Percentage of Instruction
1963-64a	$12,823,697	$26,582,944	50.2%
1964-65a	14,553,407	31,003,663	47.0%
1965-66a	18,207,345	40,640,693	44.8%
1966-67b	21,666,686	46,723,405	47.6%
1967-68c	29,259,395	63,246,784	47.0%
1968-69c	33,844,009	71,073,616	47.6%

a: actual
b: budgeted
c: requested

institutions in the intermountain area.

The ultimate purpose of these reports has been to allow the administrative officers concerned with instructional budget preparation the benefit of having concrete information to adequately defend their requests to the Coordinating Council. However, it was questioned if these reports actually did provide sufficient justification to warrant serious consideration by both administrative officers and the Coordinating Council. To give further substantiation to the need for increased salaries a report dated April 13, 1967, was submitted to the Faculty Association, the Board of Trustees, Administrative Officers, and President Chase.

[5]Utah Coordinating Council of Higher Education. Financing Higher Education, adapted from page E7.

Table 2. Instruction costs as a percentage of total budget for the University of Utah[6]

Year	Instruction Costs	Total Budget	Percentage of Instruction
1963-64a	$ 5,999,113	$12,088,762	49.2%
1964-65a	6,748,554	13,225,936	50.8%
1965-66a	8,108,398	15,553,883	52.1%
1966-67b	9,835,120	18,325,233	54.2%
1967-68c	13,135,054	24,093,962	54.5%
1968-69c	15,100,524	27,397,694	55.2%

a: actual
b: budgeted
c: requested

Table 3. Instruction costs as a percentage of total budget for Utah State University

Year	Instruction Costs	Total Budget	Percentage of Instruction
1963-64a	$ 3,308,366	$ 5,968,504	55.8%
1964-65a	3,770,863	6,960,880	54.2%
1965-66a	4,343,665	7,773,055	55.7%
1966-67b	5,316,575	9,130,857	58.3%
1967-68c	6,619,762	10,929,858	60.5%
1968-69c	7,602,872	12,379,278	61.5%

a: actual
b: budgeted
c: requested

[6]Utah Coordinating Council of Higher Education. Financing Higher Education, adapted from page E4.

[7]Utah Coordinating Council of Higher Education. Financing Higher Education, adapted from page E7.

Faculty Survey Report - April 13, 1967

This report was based on a survey conducted at Utah State University among the professional staff. Its prime objective was to have staff members indicate their preferences concerning the use of additional funds that might become available to the University. The information was to be used in developing recommendations for salary and benefit negotiations.[8]

In this report eight programs were supposedly requiring additional support. Each respondent indicated his preference for the program(s) he felt were most important. The "basic salary increase" alternative was the only program to be ranked most important in all the colleges on campus. Table 4 represents the results of this report.

Faculty Report - March 14, 1967

One month before the Faculty Survey Report was completed the Committee on Contracts and Salaries submitted another report to President Chase, Administrative Officers, the Board of Trustees and the Faculty Association. This report contained recommendations concerning contracts, salaries, benefits, and various policies and procedures. The report was submitted for the consideration of the administration in establishing base salaries and salary supplements for the next fiscal year and biennium.[9]

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[8]Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Survey Report, Utah State University, Logan, Utah, April 13, 1967, p. 1.

[9]Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Report, Utah State University, Logan, Utah, March 14, 1967. p. 1.

Table 4. Desirability index for increasing support of indicated program at Utah State University[10]

College	Program							
	A	B	C	D	E	F	G	H
Agriculture	1.94	2.22	2.40	1.94	1.81	2.68	2.08	2.62
Business and Social Science	2.31	2.18	2.46	1.86	2.48	2.90	2.69	2.24
Education	2.18	2.18	2.18	1.79	2.68	2.83	2.20	2.18
Engineering	1.77	2.60	2.23	1.85	2.10	2.75	2.06	2.38
Family Life	2.62	2.38	2.00	2.07	2.23	2.79	2.22	2.16
Natural Resources	1.90	2.25	2.50	1.65	2.40	2.89	2.45	2.56
Humanities and Arts	2.38	2.33	2.11	2.08	1.89	2.78	2.61	2.00
Science	1.88	2.53	2.55	1.96	2.12	2.92	2.45	2.34

A = more classroom space; B = equipment; C = graduate scholarships; D = undergraduate scholarships; E = travel budget increases; F = basic salary increase; G = new staff; H = increasing salary and other benefits for non-professional staff.

The index numbers are weighted averages (I) calculated as follows:

$$I = \frac{3a + 2b + 1c + 0d}{a + b + c + d}$$

where a = a great need for additional funds
b = more funds desired but the need not great
c = increase not important
d = opposed to increase

[10] Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Survey Report, Utah State University, Logan, Utah, April 13, 1967. p. 4.

The major contribution of this report was the compilation of information that compared the salaries paid by rank at the University of Utah and Utah State University. These results are shown in Table 5 and portrayed graphically in Chart 1.

Problem

The differences in the salary levels at each rank brings to question the legitimacy of this spread. Trend projections indicate this difference will continue to increase. Inherent in these salary differentials may be numerous potential reasons that could sufficiently justify the salary variance.

It is the purpose of this thesis to study selected criteria in an attempt to account for the major reasons for the salary variation.

Table 5. Analysis of salary differentials paid to professional staff members at the University of Utah and Utah State University[11]

	Professors			Associate Professors		
	Utah State Univ.	Univ. of Utah	Difference (Utah over USU	Utah State Univ.	Univ. of Utah	Difference (Utah over USU
1958-59	$ 8,107	$ 8,096	$ 11	$ 6,865	$ 6,886	$ 21
1959-60	8,783	9,301	518	7,311	7,545	234
1960-61	9,150	9,548	398	7,608	7,759	151
1961-62	9,813	9,888	75	8,130	8,010	-120
1962-63	10,280	10,519	239	8,370	8,492	122
1963-64	10,706	11,335	629	8,758	8,976	218
1964-65	11,268	11,830	562	9,265	9,285	20
1965-66	11,810	12,752	942	9,757	10,010	253
1966-67	12,489	13,351	862	10,286	10,542	256
1967-68a	13,363	14,277	914	11,022	11,360	338
1968-69a	14,031	14,991	960	11,573	11,928	355

a: proposed by Coordinating Council

[11] Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Report. Utah State University, Logan, Utah, March 14, 1967. p. 8.

Table 5. Continued

	Assistant Professors			Instructors		
	Utah State Univ.	Univ. of Utah	Difference (Utah over USU	Utah State Univ.	Univ. of Utah	Difference (Utah over USU
1958-59	$ 5,934	$ 5,931	$ 3	$ 4,893	$ 5,007	$114
1959-60	6,327	6,635	308	5,121	5,493	372
1960-61	6,633	6,782	149	5,354	5,533	179
1961-62	7,052	6,925	-127	5,444	5,600	156
1962-63	7,314	7,564	250	5,465	6,041	576
1963-64	7,557	7,839	282	5,933	6,212	279
1964-65	7,884	8,033	149	6,178	6,508	330
1965-66	8,309	8,613	304	6,577	6,912	335
1966-67	8,760	8,966	206	6,902	7,572	670
1967-68a	9,402	9,758	356	7,438	7,899	461
1968-69a	9,603	10,246	643	7,576	8,294	718

a: proposed by Coordinating Council

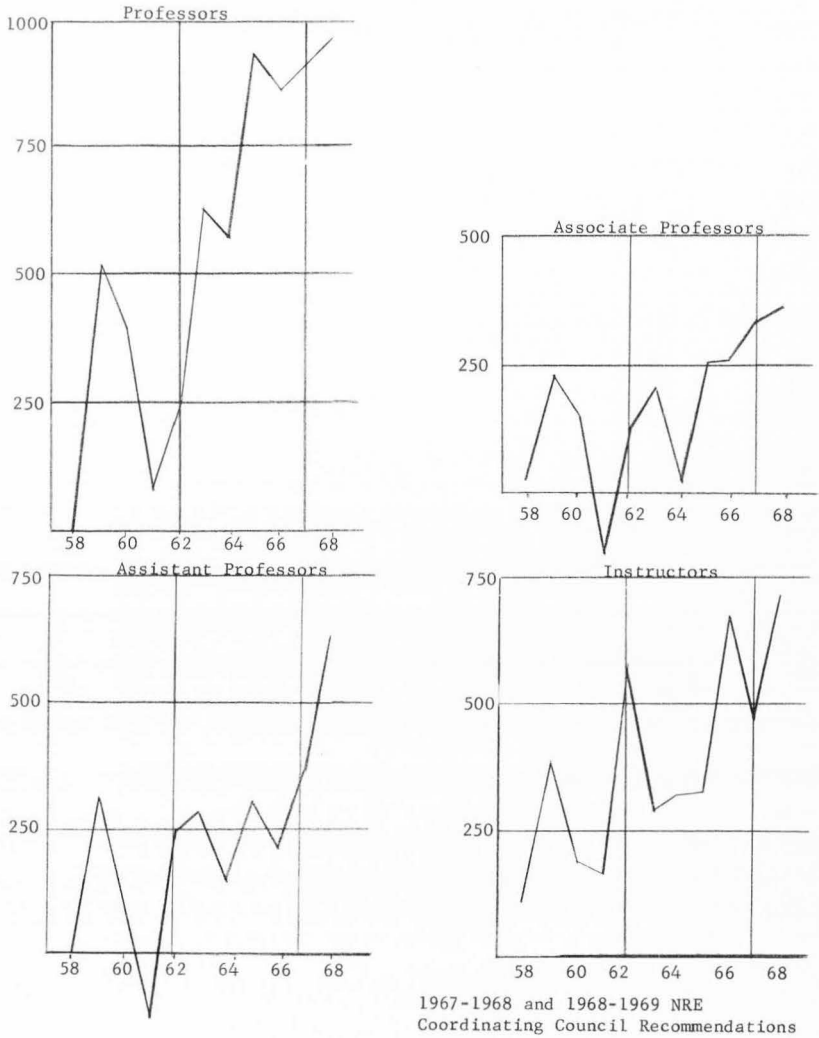

Chart 1. Professional staff salary differences per rank (Excess of the University of Utah over Utah State University)

PROCEDURE

Introduction

The professional staff at the University of Utah have enjoyed a preferred position regarding salaries in all ranks for most of the previous ten years. On a university wide basis, argument may be advanced regarding the dissimilarity of the personnel employed. For example, the University of Utah has five colleges that are not a part of the curriculum at Utah State University.[12] Likewise Utah State University has three colleges that are not at the University of Utah.[13] It is because of these differing colleges that a university wide comparison cannot be made. Therefore if a comparison is to be initiated there must be a comparable base from which further analysis can be undertaken.

It was decided to conduct an analysis on a department by department basis to allow for maximum comparability. All salary comparisons would be on a nine-month base. Such factors as teaching load, student-teacher ratios and opportunities for extra assignments will not be discussed. This chapter will discuss the selection of the departments, the criteria used in the analysis and a progression of the phases involved in the actual assessment.

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[12]The University of Utah has the colleges of Nursing, Pharmacy, Graduate School of Social Work, Medicine, and Law that are not at Utah State University.

[13]Utah State University has the colleges of Agriculture, Family Life and Natural Resources that are not at the University of Utah.

Selection of Departments

Initially fifteen departments that were common to both universities were chosen by the use of a random numbers table. However, some departments, particularly the smaller ones were dropped because the statistical techniques that had been planned could have produced erroneous results. With the elimination of several departments from the original list it was decided to study all the similar departments providing there were a minimum of ten persons in that department on the faculty at Utah State University. In certain cases two departments from an institution were combined for the analysis. For example, the English and Journalism departments from the University of Utah were combined and studied with the one department by the same name at Utah State University. Table 6 shows the selected departments for study.

Criteria for Assessment

In developing criteria for the professional competence of the staff of each department it was necessary to classify each person by degrees received, time since receiving degrees, the length of service at the institution and the individual rank. For example, a specific person would be evaluated by the following criteria.

A. Time elapsed since receiving a bachelor's degree.

B. Time elapsed since receiving a master's degree.

C. Time elapsed since receiving a doctorate degree.

D. Present rank of the individual.

E. Time since arrival at the institution.

In order to allow the examination of as many departments as possible and with as great an accuracy as possible it was decided to

Table 6. Departments used for the analysis of salary differentials between the University of Utah and Utah State University

	Utah State University	University of Utah
1.	Educational Administration	Educational Administration
2.	English and Journalism	English and Journalism
3.	Languages and Philosophy	Languages and Philosophy
4.	Mathematics	Mathematics
5.	Physics	Physics
6.	Psychology	Psychology
7.	Sociology, Social Work and Anthropology	Sociology and Social Work and Anthropology
8.	Zoology	Zoology and Entomology
9.	Botany	Botany
10.	Chemistry	Chemistry
11.	Civil Engineering	Civil Engineering
12.	Electrical Engineering	Electrical Engineering
13.	Mechanical Engineering	Mechanical Engineering
14.	Health, Physical Education and Recreation	Health, Physical Education and Recreation

eliminate criteria "A" from the above list. There were two major reasons for this decision. Firstly, in the case of small departments the statistical techniques that were planned would not allow sufficient confidence limits and secondly criteria "A" was considered the least important of the variables mentioned.

The above list does not purport to be all-inclusive in the assessment of professional competence. The basic objective is to

determine the majority of the factors that are responsible for an individual's salary. Recognition is given to certain qualifiable criteria that have not been included. For example, an individual's salary may be dependent upon his experience prior to joining the university staff. Conversely, the above list could also be too extensive for actual salary prediction.

The determination of the importance of each of the above criteria on an individual and group basis was calculated by a series of step-wise multiple regression equations.

Regression Analysis

Each department at Utah State University was analyzed on an individual basis in the following manner.

1. Each individual in a department was assigned a numerical value indicating the time he had spent at the institution, the time since receiving his master's degree, the time since receiving his doctorate degree, and his rank. These criteria were called the independent variables.
2. The individual's salary was considered the dependent variable to which the independent variables contributed.
3. The actual process analyzed the contribution of the independent variables to the dependent variable on a group basis.
4. At this stage the least important independent variable was deleted and the same technique of analysis took place to determine the contribution of the remaining independent variables to the dependent variable.
5. This process of eliminating the least important variable

continued until only the most important predictor was left.

The results of this analysis allow for the determination of applicable coefficients (a to e) for the prediction of the dependent variable. For example, with salary (y_1) being the dependent variable and the independent variables being denoted as x_1, x_2, x_3, and x_4, an appropriate equation may be:

$$y_1 = a + bx_1 + cx_2 + dx_3 + ex_4$$

where x_1 = rank

x_2 = number of years at the institution

x_3 = number of years since the master's degree

x_4 = number of years since the doctorate degree.

An equation for each department at Utah State University was developed to determine the relative importance of each variable in addition to the required coefficients. A detailed progression of the essential steps in this process can be found in Appendix 1.

University of Utah Predictions

After developing the regression equations for each department at Utah State University, the next step was to predict a salary (the dependent variable) for members of the staff at the University of Utah. This was accomplished by substituting the independent variables of each person at the University of Utah into the equation. The results of these calculations would show the salary that could be earned if a specific individual were at Utah State University instead of the University of Utah. The predicted salary would then be compared with the actual salary being received.

Example:

The analysis of department "x" has shown that the dependent variable is accounted for in the following equation.

$$y_1 = 8{,}000 + 72x_2 + 20x_2 - 50x_3 + 10x_4.$$

The independent variables for the University of Utah are: $x_1 = 4$; $x_2 = 12$; $x_3 = 6$; $x_4 = 4$. It should be noted that the above equation was developed on a departmental basis at Utah State University. By substitution the predicted salary for the individual at the University of Utah will be:

$$y_1 = 8{,}000 + 72(4) + 20(12) - 50(6) + 10(4)$$

$$= 8{,}000 + 288 + 240 - 300 + 40$$

$$= 8{,}268.$$

The addition of two more figures will complete the example. Assume it is known that the actual salary of the person at the University of Utah was $8,300 and the actual salary of the person at Utah State University was $8,148. Previous to the analysis the two salaries would be compared in the following manner.

University of Utah Salary	$8,300
Utah State University Salary	8,148
Difference	$ 152

The predicted salary of $8,268 is $120 more than the salary at Utah State University, while the actual difference is $152. As a result of the analysis it can be seen that eighty percent of the variance has been accounted for. This can be calculated by dividing the predicted difference by the actual difference, in this case 120/152 = 80 percent approximately.

Summary

The following steps summarize the methodology employed in this thesis.

1. Select a sample of departments similar to the University of Utah and Utah State University.
2. Develop a multiple regression equation for each department at Utah State University with the dependent variable being a specific salary and the independent variables being the time elapsed since the receipt of the master's degree, the doctorate degree, the time at the institution, and the individual rank.
3. Substitute the independent variables from the University of Utah into the pre-developed regression equation to predict the salary the individual would be earning if he were employed at Utah State University.
4. Compare the actual salaries between the University of Utah and Utah State University.
5. Compare the actual salaries at Utah State University with the predicted salaries from the University of Utah.
6. Compare the predicted salaries of the University of Utah with the actual salaries at the University of Utah.

FINDINGS

The objective of this chapter is to account for any salary differentials that may occur on a department by department basis. This will be accomplished by giving the predicting equation as it was developed from information pertinent to a specific department at Utah State University. Secondly, each specific variable and its importance to the equation will be given. Finally, three basic comparisons will be made. These will be the comparisons as outlined in the summary of the previous chapter.

Regression Equations

Table 7 shows the multiple regression equations that were developed on a departmental basis from information applicable to Utah State University.

Independent Variable Importance

An important part of the technique employed in the analysis is the deletion of independent variables according to their contribution to the dependent variable. For example, a multiple regression equation is initially developed using all four of the independent variables. A second equation is then developed using three variables with the least important independent variable having been omitted. This technique is called a "step-wise multiple regression analysis." Reference is directed to Appendix 1 where a more complete description of this technique is given. Table 8 shows the importance of the independent variables.

Table 7. Multiple regression equations to be used for salary predictions, developed on a departmental basis from Utah State University

Department	Multiple Regression Equations
1.	$y = 10,882 + 36,44x_1 + 58.01x_2 - 103.85x_3 + 306.82x_4$
2.	$y = 6,205 + 791.15x_1 + 160.98x_2 - 63.86x_3 + 261.18x_4$
3.	$y = 6,788 + 309.66x_1 + 111.00x_2 + 49.59x_3 + 119.70x_4$
4.	$y = 7,289 + 1,531.86x_1 + 45.79x_2 - 47.22x_3 + 111.47x_4$
5.	$y = 4,070 + 3,288.78x_1 - 64,30x_2 - 171.22x_3 + 131.37x_4$
6.	$y = 7,362 + 1,230.64x_1 + 92.63x_2 - 53.82x_3 - 16.42x_4$
7.	$y = 7,377 + 2\text{-}102.39x_1 + 71.55x_2 - 203.63x_3 + 98.76x_4$
8.	$y = 5,036 + 1,663.72x_1 - 106.41x_2 + 101.84x_3 + 186.71x_4$
9.	$y = 4,718 + 1,590.63x_1 + 22.85x_2 + 84.78x_3 + 22.10x_4$
10.	$y = 6,203 + 1,675.31x_1 + 62.47x_2 - 245.30x_3 + 308.22x_4$
11.	$y = 7,389 + 1,190.44x_1 + 20.27x_2 + 62.30x_3 + 266.95x_4$
12.	$y = 9,197 + 156.64x_1 + 177.15x_2 + 19.91x_3 + 295.51x_4$
13.	$y = 4,469 + 2,532.61x_1 - 50.76x_2 - 13.48x_3 + 79.18x_4$
14.	$y = 6,012 + 1,631.35x_1 - 9.01x_2 + 7.74x_3 - 68.24x_4$

y = salary

x_1 = rank

x_2 = number of years at the institution

x_3 = number of years since the master's degree

x_4 = number of years since the doctorate degree

Table 8. Contribution and importance of the independent variables "x_1 to x_4" to the dependent variable "y" (by department)

	Deletion of Variable	Variance R^2
Department 1	None	61.757
	x_1	61.755
	x_2	59.423
	x_3	53.367
Department 2	None	89.053
	x_3	88.585
	x_1	87.391
	x_2	66.805
Department 3	None	94.452
	x_1	94.133
	x_3	91.316
	x_2	77.987
Department 4	None	81.080
	x_2	80.451
	x_3	80.111
	x_4	74.036
Department 5	None	85.010
	x_4	83.519
	x_3	80.999
	x_2	77.791
Department 6	None	86.049
	x_4	85.933
	x_3	83.945
	x_2	81.074
Department 7	None	93.956
	x_2	92.039
	x_4	88.464
	x_3	84.634
Department 8	None	82.218
	x_2	79.980
	x_3	79.357
	x_1	75.290
Department 9	None	94.118
	x_2	94.078
	x_4	93.995
	x_3	61.000

Table 8. Continued

	Deletion of Variable	Variance R^2
Department 10	None	94.836
	x_2	93.935
	x_4	81.314
	x_3	75.502
Department 11	None	82.336
	x_2	82.213
	x_3	78.970
	x_1	58.294
Department 12	None	88.863
	x_1	88.811
	x_3	88.675
	x_4	62.080
Department 13	None	87.840
	x_3	87.690
	x_4	86.558
	x_2	82.911
Department 14	None	88.305
	x_3	88.282
	x_2	88.252
	x_4	86.987

College Affiliation

The administration at Utah State University has cooperated very willingly regarding the need for salary information. Unfortunately, it was more difficult to obtain specific salary information at the University of Utah. The Coordinating Council of Utah did, however, supply salary information on a college basis for this school. Consequently, when University of Utah salaries are quoted in the following tables they will be salaries of the college the particular department belongs to. Although it is recognized this situation is not ideal, the results of the analysis

will resemble the true states of nature better than just a total institutional comparison. Table 9 shows the colleges that the various departments belong to.

Table 9. College affiliation of specific departments at the University of Utah

Department	College	Department	College
1	Education	8	Letters and Science
2	Letters and Science	9	Letters and Science
3	Letters and Science	10	Letters and Science
4	Letters and Science	11	Engineering
5	Letters and Science	12	Engineering
6	Letters and Science	13	Engineering
7	Letters and Science	14	Education

Rank Distribution

Prior to the presentation of salary comparisons the question of relative rank distribution should be considered. Tables 10 and 11 compare the various rank proportions in the sample to the actual distributions for both institutions.

Salary Comparisons

The remainder of this section will consist of various salary comparisons. Three basic types of comparisons will be made under three general headings.

The first general area will consist of departmental comparisons. This will be followed by a more specific presentation dealing with the

Table 10. The rank distribution for the sample compared to the average rank distribution for the years 1964-1965 to 1966-1967 at the University of Utah

Rank	Sample	Average Distribution[14]	Difference (actual over sample)
Professor	112 - 39.2%	175 - 37.1%	(2.1%)
Associate	67 - 23.4%	121 - 25.5%	2.1%
Assistant	82 - 28.6%	162 - 27.2%	(1.4%)
Instructor	25 - 8.8%	48 - 10.2%	1.4%
Totals	286 - 100.0%	472 - 100.0%	

Table 11. The rank distribution for the sample compared to the average rank distribution for the years 1964-1965 to 1966-1967 at Utah State University

Rank	Sample	Average Distribution[15]	Difference (actual over sample)
Professor	54 - 27.8%	76 - 25.3%	(2.5%)
Associate	54 - 27.8%	82 - 27.4%	(0.4%)
Assistant	66 - 34.1%	99 - 32.9%	(1.2%)
Instructor	20 - 10.3%	43 - 14.4%	4.1%
Totals	194 - 100.0%	300[a] - 100.0%	

a: estimated

ranks within each department. Finally, from the information presented, various salary comparisons on a rank basis for the total sample will be made.

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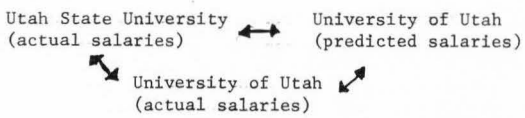
[14] Utah Coordinating Council of Higher Education. Financing Higher Education, adapted from page C3.

[15] Ibid., adapted from page C4.

Departmental Comparisons

Three types of comparisons will be made according to the following diagram.



Utah State University "actual salaries" are derived from the sample. The University of Utah "predicted salaries" are also derived from the sample. The University of Utah "actual salaries" are derived from the various colleges the sample departments belong to. Tables 12, 13, and 14 show the departmental salary comparisons.

Department by Rank Comparisons

Three comparisons will be made according to the conditions as described under departmental comparisons. These are shown in Tables 15, 16, and 17.

Rank Comparisons for Sample

Thus far the various salary comparisons have moved through two stages. Firstly, individual salaries were compiled to show departmental variances. Secondly, each department was analyzed by rank. The third stage requires the examination of salaries by rank for the total sample. Table 18 is a transition step that presents salary variances by rank for the sample compared to the total institution. Table 19 shows the derivation of the "actual salaries" by rank for the University of Utah.

Table 12. Actual salary comparisons between the University of Utah and Utah State University

Dept.	Utah State University (Actual)			University of Utah (Actual)			Differences (Utah over USU)		
	High	Low	Mean	High	Low	Mean	High	Low	Mean
1.	$20,400	$9,810	$13,245	$17,000	$6,000	$10,364	($ 3,400)	($ 3,810)	($2,881)
2.	20,500	6,500	9,202	25,000	6,300	12,151	4,500	(200)	2,949
3.	13,950	7,100	8,964	25,000	6,300	12,151	11,050	(800)	3,187
4.	15,000	8,400	11,171	25,000	6,300	12,151	10,000	(2,100)	980
5.	13,900	8,600	11,017	25,000	6,300	12,151	11,100	(2,300)	1,134
6.	13,000	9,200	10,957	25,000	6,300	12,151	12,000	(2,900)	1,194
7.	13,650	7,400	11,341	25,000	6,300	12,151	11,350	(1,100)	810
8.	21,500	8,500	12,205	25,000	6,300	12,151	3,500	(2,200)	(54)
9.	14,900	8,100	12,050	25,000	6,300	12,151	10,100	(1,800)	101
10.	15,400	9,200	12,155	25,000	6,300	12,151	9,600	(2,900)	(4)
11.	22,600	8,700	13,059	17,000	8,000	11,469	(5,000)	(700)	(1,590)
12.	19,200	9,800	13,035	17,000	8,000	11,469	(1,600)	(1,800)	(1,566)
13.	15,000	7,800	10,667	17,000	8,000	11,469	2,600	200	802
14.	13,000	7,455	9,762	17,000	6,000	10,364	4,000	(1,455)	602

Table 13. A comparison of the actual salaries at Utah State University and the predicted salaries at the University of Utah

Dept.	Utah State University (Actual)			University of Utah (Predicted)			Difference (Utah over USU)		
	High	Low	Mean	High	Low	Mean	High	Low	Mean
1.	$20,400	$9,810	$13,245	$18,775	$ 9,373	$13,155	($1,625)	($ 437)	($ 95)
2.	20,500	6,500	9,202	21,545	6,330	11,737	1,045	(170)	(2,535)
3.	13,950	7,100	8,964	18,777	7,407	11,507	4,827	(307)	2,543
4.	15,000	8,400	11,171	15,900	8,722	11,862	900	322	91
5.	13,900	8,600	11,017	15,770	9,188	12,424	1,870	588	1,407
6.	13,000	9,200	10,957	12,513	9,547	11,249	(487)	347	292
7.	13,650	7,400	11,341	14,528	5,754	10,616	878	(1,646)	(725)
8.	21,500	8,500	12,205	17,561	6,486	12,448	(3,939)	(2,014)	243
9.	14,900	8,100	12,050	15,597	8,554	11,351	697	444	(699)
10.	15,400	9,200	12,155	15,997	9,440	12,831	597	240	676
11.	22,600	8,700	13,059	13,658	10,014	12,290	(8,942)	1,314	(769)
12.	19,200	9,800	13,035	20,070	10,379	14,611	870	579	1,576
13.	15,000	7,800	10,667	15,919	6,795	11,985	919	(1,005)	1,318
14.	13,000	7,455	9,762	12,613	7,642	9,884	(387)	187	122

Table 14. A comparison of the predicted salaries and the actual salaries at the University of Utah

Dept.	University of Utah (Predicted)			University of Utah (Actual)			Difference (Actual over predicted)		
	High	Low	Mean	High	Low	Mean	High	Mean	Low
1.	$18,775	$ 9,373	$13,155	$17,000	$6,000	$10,364	($ 1,775)	($2,791)	($3,373)
2.	21,545	6,330	11,737	25,000	6,300	12,151	3,445	414	(30)
3.	18,777	7,407	11,507	25,000	6,300	12,151	6,223	644	(1,107)
4.	15,900	8,722	11,862	25,000	6,300	12,151	9,100	289	(2,422)
5.	15,770	9,188	12,424	25,000	6,300	12,151	9,230	(273)	(2,888)
6.	12,513	9,547	11,249	25,000	6,300	12,151	12,487	902	(3,247)
7.	14,528	5,754	10,616	25,000	6,300	12,151	10,472	1,535	546
8.	17,561	6,486	12,448	25,000	6,300	12,151	7,439	(297)	(186)
9.	15,597	8,544	11,351	25,000	6,300	12,151	9,403	800	(2,244)
10.	15,997	9,440	12,831	25,000	6,300	12,151	0,003	(680)	(3,140)
11.	13,658	10,014	12,290	17,000	8,000	11,469	3,342	(821)	(3,714)
12.	20,070	10,379	14,611	17,000	8,000	11,469	(3,070)	(3,142)	(4,079)
13.	15,919	6,795	11,985	17,000	8,000	11,469	1,081	(516)	(495)
14.	12,613	7,642	9,884	17,000	6,000	10,364	4,387	480	(1,342)

Table 15. A comparison between the actual average salaries at Utah State University and the actual average salaries at the University of Utah (By rank)

Department	Rank	Univ. of Utah (Actual)	USU (Actual)	Difference (Utah over USU)
Department 1	Professor	$13,531	$14,880	($1,349)
	Associate	10,412	12,059	(1,647)
	Assistant	8,753	9,810	(1,057)
	Instructor	7,319	--	--
	All	10,364	13,245	(2,881)
Department 2	Professor	14,718	14,660	58
	Associate	11,864	10,075	1,789
	Assistant	9,560	8,814	746
	Instructor	7,912	7,066	846
	All	12,151	9,202	2,949
Department 3	Professor	14,718	13,950	768
	Associate	11,864	9,700	2,164
	Assistant	9,560	9,350	210
	Instructor	7,912	7,440	472
	All	12,151	8,964	3,187
Department 4	Professor	14,718	14,350	368
	Associate	11,864	11,800	64
	Assistant	9,560	10,255	(695)
	Instructor	7,912	--	--
	All	12,151	11,171	980
Department 5	Professor	14,718	13,900	818
	Associate	11,864	12,012	(148)
	Assistant	9,560	9,644	(84)
	Instructor	7,912	--	--
	All	12,151	11,017	1,134
Department 6	Professor	14,718	12,373	2,345
	Associate	11,864	10,965	899
	Assistant	9,560	9,524	36
	Instructor	7,912	--	--
	All	12,151	10,957	1,194
Department 7	Professor	14,718	13,237	1,481
	Associate	11,864	11,280	584
	Assistant	9,560	7,400	2,160
	Instructor	7,912	8,000	(88)
	All	12,151	11,341	810

Table 15. Continued

Department	Rank	Univ. of Utah (Actual)	USU (Actual)	Difference (Utah over USU)
Department 8	Professor	$14,718	$17,400	($2,682)
	Associate	11,864	11,694	170
	Assistant	9,560	9,330	230
	Instructor	7,912	--	--
	All	12,151	12,205	(54)
Department 9	Professor	14,718	13,900	818
	Associate	11,864	11,233	631
	Assistant	9,560	8,650	910
	Instructor	7,912	--	--
	All	12,151	12,050	101
Department 10	Professor	14,718	13,767	951
	Associate	11,864	11,650	214
	Assistant	9,560	9,600	(40)
	Instructor	7,912	--	--
	All	12,151	12,155	(4)
Department 11	Professor	14,295	15,700	(1,505)
	Associate	11,050	12,150	(1,100)
	Assistant	9,350	10,571	(1,221)
	Instructor	8,600	--	--
	All	11,469	13,059	(1,590)
Department 12	Professor	14,295	15,763	(1,468)
	Associate	11,050	12,067	(1,017)
	Assistant	9,350	10,125	(775)
	Instructor	8,600	--	--
	All	11,469	13,035	(1,566)
Department 13	Professor	14,295	15,000	(705)
	Associate	11,050	11,600	(550)
	Assistant	9,350	9,045	305
	Instructor	8,600	--	--
	All	11,469	10,667	802
Department 14	Professor	13,531	12,400	1,131
	Associate	10,412	10,600	(182)
	Assistant	8,753	9,101	(348)
	Instructor	7,319	7,940	(621)
	All	10,364	9,762	602

Table 16. A comparison between the actual average salaries at Utah State University and the predicted average salaries at the University of Utah (by rank)

Department	Rank	Univ. of Utah (Predicted)	USU (Actual)	Difference (Utah over USU)
Department 1	Professor	$13,804	$14,880	($1,076)
	Associate	13,030	12,059	971
	Assistant	12,229	9,810	2,489
	Instructor	9,811	--	--
	All	13,155	13,245	(90)
Department 2	Professor	15,542	14,660	882
	Associate	10,295	10,075	220
	Assistant	8,209	8,814	(605)
	Instructor	6,754	7,066	(312)
	All	11,737	9,202	2,535
Department 3	Professor	13,977	13,950	27
	Associate	11,599	9,700	1,899
	Assistant	9,657	9,350	307
	Instructor	7,584	7,440	144
	All	11,507	8,964	2,543
Department 4	Professor	14,871	14,350	521
	Associate	12,335	11,800	535
	Assistant	10,426	10,255	171
	Instructor	8,837	--	--
	All	11,862	11,171	691
Department 5	Professor	14,757	13,900	857
	Associate	12,829	12,012	817
	Assistant	9,626	9,644	(18)
	Instructor	--	--	--
	All	12,424	11,017	1,407
Department 6	Professor	12,091	12,373	(282)
	Associate	10,706	10,965	(259)
	Assistant	9,714	9,524	190
	Instructor	--	--	--
	All	11,249	10,957	292
Department 7	Professor	13,605	13,237	368
	Associate	11,782	11,280	502
	Assistant	9,641	7,400	2,241
	Instructor	7,812	8,000	(188)
	All	10,616	11,341	(725)

Table 16. Continued

Department	Rank	Univ. of Utah (Predicted)	USU (Actual)	Difference (Utah over USU)
Department 8	Professor	$15,927	$17,400	($,473)
	Associate	12,413	11,694	719
	Assistant	9,259	9,330	(71)
	Instructor	6,539	--	--
	All	12,448	12,205	243
Department 9	Professor	14,581	13,900	681
	Associate	11,019	11,233	(114)
	Assistant	8,617	8,650	(33)
	Instructor	--	--	--
	All	11,351	12,050	(699)
Department 10	Professor	14,829	13,767	1,062
	Associate	11,636	11,650	(14)
	Assistant	9,628	9,600	28
	Instructor	--	--	--
	All	12,831	12,155	676
Department 11	Professor	13,538	15,700	(2,162)
	Associate	12,480	12,150	330
	Assistant	11,079	10,571	508
	Instructor	--	--	--
	All	12,290	13,059	(769)
Department 12	Professor	15,694	15,763	(59)
	Associate	13,742	12,067	1,675
	Assistant	11,905	10,125	1,780
	Instructor	--	--	--
	All	14,611	13,035	1,576
Department 13	Professor	14,737	15,000	(267)
	Associate	12,215	11,600	615
	Assistant	9,456	9,045	411
	Instructor	6,822	--	--
	All	11,985	10,667	1,318
Department 14	Professor	11,342	12,400	(1,058)
	Associate	10,699	10,600	99
	Assistant	9,215	9,101	114
	Instructor	7,194	7,940	(746)
	All	9,884	9,762	122

Table 17. A comparison between the actual average salaries and the predicted average salaries at the University of Utah

Department	Rank	Univ. of Utah (Predicted)	Univ. of Utah (Actual)	Difference (Actual over predicted)
Department 1	Professor	$13,804	$13,531	($ 273)
	Associate	13,030	10,412	(2,619)
	Assistant	12,299	8,753	(3,546)
	Instructor	9,811	7,319	(2,492)
	All	13,155	10,364	(2,791)
Department 2	Professor	15,542	14,718	(842)
	Associate	10,295	11,864	1,569
	Assistant	8,209	9,560	1,351
	Instructor	6,754	7,912	1,158
	All	11,737	12,151	414
Department 3	Professor	13,977	14,718	741
	Associate	11,599	11,864	265
	Assistant	9,657	9,560	(97)
	Instructor	7,584	7,912	328
	All	11,507	12,151	644
Department 4	Professor	14,871	14,718	(153)
	Associate	12,335	11,864	(471)
	Assistant	10,426	9,560	(866)
	Instructor	8,837	7,912	(925)
	All	11,862	12,151	289
Department 5	Professor	14,757	14,718	(39)
	Associate	12,829	11,864	(965)
	Assistant	9,626	9,560	(66)
	Instructor	--	7,912	--
	All	12,424	12,151	(273)
Department 6	Professor	12,091	14,718	2,627
	Associate	10,706	11,864	1,158
	Assistant	9,714	9,560	(154)
	Instructor	--	7,912	--
	All	11,249	12,151	902
Department 7	Professor	13,065	14,718	1,113
	Associate	11,782	11,864	82
	Assistant	9,641	9,560	(81)
	Instructor	7,812	7,912	100
	All	10,616	12,151	1,531

Table 17. Continued

Department	Rank	Univ. of Utah (Predicted)	Univ. of Utah (Actual)	Difference (Actual over predicted)
Department 8	Professor	$15,927	$14,718	($1,209)
	Associate	12,413	11,864	(549)
	Assistant	9,259	9,560	301
	Instructor	6,539	7,912	1,373
	All	12,448	12,151	(297)
Department 9	Professor	14,581	14,718	137
	Associate	11,019	11,864	845
	Assistant	8,617	9,560	943
	Instructor	--	7,912	--
	All	11,531	12,151	600
Department 10	Professor	14,829	14,718	(111)
	Associate	11,636	11,864	228
	Assistant	9,628	9,560	(68)
	Instructor	--	7,912	--
	All	12,831	12,151	(680)
Department 11	Professor	13,538	14,295	757
	Associate	12,480	11,050	(1,430)
	Assistant	11,079	9,350	(1,729)
	Instructor	--	8,600	--
	All	12,290	11,469	(821)
Department 12	Professor	15,694	14,295	(1,399)
	Associate	13,742	11,050	(2,692)
	Assistant	11,905	9,350	(2,555)
	Instructor	--	8,600	--
	All	14,611	11,469	(3,412)
Department 13	Professor	14,737	14,718	(19)
	Associate	12,215	11,050	(1,165)
	Assistant	9,456	9,350	(106)
	Instructor	6,822	8,600	1,778
	All	11,985	11,469	(516)
Department 14	Professor	11,342	13,531	2,189
	Associate	10,699	10,412	(287)
	Assistant	9,215	8,753	(462)
	Instructor	7,194	7,319	125
	All	9,884	10,364	480

Table 18. Actual salaries of all personnel by rank for the study group in comparison to the stated salaries from Table 5 for the year 1967-1968 for the University of Utah and Utah State University

Rank	Univ. of Utah[a] (Actual)	Table 5	Diff. (Actual over Table 5)	USU (Actual)	Table 5	Diff. (Actual over Table 5)
Prof.	$14,538	$14,277	$261	$14,487	$13,363	$1,124
Assoc.	11,461	11,360	101	11,523	11,022	501
Assis.	9,389	9,758	(369)	9,537	9,402	135
Instr.	7,726	7,899	(173)	7,294	7,438	(144)

a: Since these figures are derived from information concerning salaries on a college basis the following table shows the derived weighted average for each rank.

Table 19. Calculation of the weighted average salary per rank at the University of Utah for 1967-1968

Rank	College (a)	No. (b)	Average Salary (c)	No. x Salary (d)	Sum d/Sum b (e)
Prof.	L & Sc.	90	$14,718	1,324,620	
	Educ.	16	13,531	219,496	
	Engin.	10	14,295	142,295	
Total		116		1,686,411	$14,538
Assoc.	L & Sc.	60	11,864	711,840	
	Educ.	19	10,412	197,728	
	Engin.	10	11,050	110,500	
Total		89		1,020,068	$11,461
Assis.	L & Sc.	58	9,560	554,480	
	Educ.	15	8,753	131,295	
	Engin.	10	9,350	93,500	
Total		83		779,275	$ 9,389
Instr.	L & Sc.	15	7,912	118,680	
	Educ.	9	7,312	65,871	
	Engin.	1	8,600	8,600	
Total		25		193,151	$ 7,726

CONCLUSION

The purpose of this chapter is to give verbal analysis to two main areas. Firstly, the statistical significance of the analysis will be discussed. Secondly, discussion will involve Table 20 which is the heart of this thesis.

Statistical Significance

In determining how significant the findings of this analysis were the statistical technique of "null hypothesis" is used. This requires the establishment of a certain null hypothesis and an alternative hypothesis. For example, the null hypothesis used in this thesis stated that the multiple correlation in the population equalled zero. The alternative hypothesis stated that the multiple correlation was not equal to zero. However, this is of little value should there actually be a multiple correlation of some nature. Additional meaning is given to the significance level if it is desired that some minimum multiple correlation exists.

Statistical tables are available that give lower confidence limits for multiple correlations.[16] For example, consider Department 14 of the study group. (See Table 21.) The square root of R^2 is .939 and since this value is higher than .867 and .927, the regression equation developed for this department is significant not only at the .05 level but at the .01 level.

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[16] Andrew Baggaley. Intermediate Correlation Methods. John Wiley and Sons, Inc., New York, 1964. p. 189.

Table 20. A comparison between total institutional salaries and the study group salaries at Utah State University and the University of Utah

Rank	Source	Univ. of Utah	Utah State University	Difference (Utah over USU)
Professor	Table 5	$14,277	$13,363	$914
	Sample	14,538	14,487	51
	Utah (Pred.)	14,388		
	Diff. (Sample over predicted)	150		
Associate	Table 5	$11,360	$11,022	$388
	Sample	11,461	11,523	(62)
	Utah (Pred.)	11,812		
	Diff. (Sample over predicted)	(351)		
Assistant	Table 5	$ 9,758	$ 9,402	$356
	Sample	9,389	9,537	(148)
	Utah (Pred.)	9,618		
	Diff. (Sample over predicted)	(229)		
Instructor	Table 5	$ 7,899	$ 7,438	$461
	Sample	7,726	7,294	432
	Utah (Pred.)	7,789		
	Diff. (Sample over predicted)	(63)		

Table 21. A comparison of the variances found in the regression analysis equations to lower confidence limits at the .05 and .01 significance levels[17]

Department	R^2	R	d.f.	.05	.01
1.	.617	.785	5	.898	.949
2.	.890	.943	26	.545	.624
3.	.944	.971	6	.867	.927
4.	.810	.900	9	.786	.861
5.	.850	.922	5	.898	.949
6.	.860	.927	8	.811	.882
7.	.939	.969	6	.867	.927
8.	.822	.906	11	.741	.821
9.	.941	.970	5	.898	.949
10.	.948	.973	6	.867	.927
11.	.823	.907	18	.628	.710
12.	.888	.942	7	.838	.904
13.	.878	.937	8	.811	.882
14.	.883	.939	6	.867	.927

In summary, thirteen of the fourteen departments in the study group showed significant results at the .05 level and twelve departments were significant at the .01 level.

[17] Ibid.

Table 20 and Conclusions

When salaries by rank at the University of Utah and Utah State University are compared on a total institutional basis, large variances can legitimately be shown. However, when analysis is directed towards similar departments and the specific qualifications necessary to demand a salary in that department, these differentials become significantly smaller. As a part of the institutional difference consideration must be given regarding various colleges at the University of Utah that are not at Utah State University. For example, because the College of Law at the University of Utah has considerably higher salaries the institutional average per rank is raised. Conversely, an extremely low paying college would pull this average down.

It is the conclusions of this thesis that when the professional staff salaries at Utah State University are compared with the salaries at the University of Utah on a departmental basis that:

A. The ranks of professor and instructor are paid $51 and $432 per annum more at the University of Utah.

B. The ranks of associate professor and assistant professor are paid $62 and $148 per annum more at Utah State University.

C. The rank of professor at the University of Utah is overpaid $150 per annum by Utah State University standards.

D. The ranks of associate professor, assistant professor, and instructor are underpaid $351, $229, and $63 per annum at the University of Utah by Utah State University standards.

RECOMMENDATIONS

It is recommended that:

A. Future salary comparisons be made on a comparable basis; that is department by department.

B. Analysis similar to the techniques employed in this thesis be used with individual salaries for members at the University of Utah to determine multiple regression equations on a departmental basis.

APPENDIX

APPENDIX 1

Multiple Correlation Analysis

Multiple correlation and regression analysis is the study between a dependent variable and two or more independent variables.[18] The basic use of multiple regression is to predict or forecast. Although the complexities of multiple regression analysis are beyond the scope of this thesis, the basic steps in this type of analysis should be understood.

In simple regression analysis there is one dependent variable and one independent variable. These variables are commonly denoted as "x" and "y." By using the "method of least squares" a trend line can be assumed that most closely resembles the relationship between the two variables.[19] After determining the equation for the derived line, it is possible to predict with varying degrees of accuracy, the value of the variable "y" if the independent variable "x" is given. The degree of accuracy depends upon the relative dispersion of the various observations.

Two important factors should be mentioned. Firstly, in most cases the relationship is assumed linear. Secondly, the relationship can be shown graphically on a flat plane.

When more than two independent variables are said to account

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[18] William A. Spurr et al. Business and Economic Statistics. Homewood, Illinois: Richard D. Irwin, Inc., 1961. p. 477.

[19] Reference is directed to most statistics books which usually give an adequate description of the method of least squares.

for the magnitude of a given dependent variable, the method of least squares is able to fit a regression equation on a two-dimensional scale. Likewise, for three independent variables the scope of the results must be envisioned in the third dimension. Beyond this stage it becomes impossible to conceptualize additional dimensions. However, with the use of mathematics and statistics all independent variables can be correlated to the dependent variable with the final result being a regression equation that is able to predict the outcome of the dependent variable given the values for the chosen independent variables. For a description of the actual methodology used in this technique reference is directed to Spurr and others in their textbook "Business and Economic Statistics."[20]

Development of Coefficients

The first step in multiple regression analysis requires the development of the coefficients applicable to each independent variable. In order to determine the various coefficients in the regression equation,

$$x_1 = a + bx_2 + cx_3$$

the following three normal equations must be solved:

$$\Sigma x_1 = a + b\ \Sigma x_2 + c\ \Sigma x_3$$

$$\Sigma x_1 x_2 = a\ \Sigma\ b\ \Sigma x_2^2 + c\ \Sigma\ x_2 x_3$$

$$\Sigma x_1 x_3 = a\ \Sigma x_3 + b\ \Sigma x_2 x_3 = c\ \Sigma x_3^2$$

The resulting equation could be:

$$x_1 = 120 + 72x_2 + 6x_3.$$

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[20] William A. Spurr et al. Business and Economic Statistics. Homewood, Illinois: Richard D. Irwin, Inc., 1961.

Consequently, by substituting values for x_2 and x_3 the dependent variable (x_1) can be predicted.

Coefficient of Multiple Determination

This coefficient is an explanation of the variance in the developed equation and is denoted by the symbol R^2. For example, in Department 1 of the study group (see page 21) the use of all four variables in the equation accounts for 61.757 percent of the variance in the dependent variable. With the deletion of the variable x_1, the variance is 61.755 percent. However, with the use of only one independent variable (x_4) the accountable variance drops significantly to 53.367 percent. Reference is directed to Department 14 in the study group to note that the deletion of three variables only gives away approximately 1.4 percent in variance.

Coefficient of Multiple Correlation

The coefficient of multiple correlation is determined by calculating the square root of the coefficient of multiple determination. This calculated figure can then be compared to charts that show lower confidence limits for various values of R and "n" in the sample. Special reference should be made regarding "degrees of freedom," which are given by the number of cases minus the number of variables. In the case of Department 1, the number of cases equals ten and the number of variables equals five. The degrees of freedom equal five.

LITERATURE CITED

Books

Baggaley, Andrew. Intermediate Correlation Methods. John Wiley and Sons, Inc., New York, 1964. p. 189.

Spurr, William A., Lester S. Kellogg, and John H. Smith. Business and Economic Statistics. Homewood, Illinois: Richard D. Irwin, Inc., 1961. p. 477.

Public Documents

Utah Coordinating Council of Higher Education. A Study of Curricular Offering, Class Size, Teaching Load and Instructional Salary Cost. 15 Northwest Temple, Salt Lake City, Utah, 1960.

Utah Coordinating Council of Higher Education. Financing Higher Education in Utah 1967-1969. 1202 University Club Building, Salt Lake City, Utah, January, 1967.

Unpublished Material

Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Report. Utah State University, Logan, Utah, March 14, 1967.

Salaries and Contracts Committee, Oral L. Ballam, Chairman. Faculty Survey Report. Utah State University, Logan, Utah, April 13, 1967.

VITA

Terrance Richard Volb

Candidate for the Degree of

Master of Business Administration

Thesis: A Study of the Reasons for the Salary Differential Between Professional Staff Members at the University of Utah and Utah State University

Major Field: Business Administration

Biographical Information:

Personal Data: Born at Calgary, Alberta, Canada, January 11, 1944, son of Rudolph and Emily Volb; married Dorine Walker December 28, 1966.

Education: Attended elementary school in Calgary, Alberta; graduated from Queen Elizabeth High School in Calgary, Alberta, in 1962; received the Associate Diploma of Business Administration from Mount Royal Junior College, Calgary, Alberta, in 1966; received the Bachelor of Science degree from Utah State University with a major in finance and minor in economics in 1968; completed the requirements for the Master of Business Administration degree at Utah State University in 1968.

Professional Experience: 1962-1964, chief clerk with the Bank of Nova Scotia, Calgary, Alberta, Canada.