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Faculty Salary Analysis

Office of Institutional Research
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Data

Analyses were conducted based on the following data:

- Sample population: Fall 2017 full-time faculty members
  - 2,477 faculty members in the sample
- Dependent variable: Converted 9-month base salary
  - Calculated by converting the12-month salaries using this equation: (12-month salary * 9) / 11
  - Base salaries from Fall 2017 was the most recent faculty salary data (Fall 2017), which do not contain any historical data. Any change made after September 30, 2017 will not be reflected in the analysis.
- Independent variables: gender, rank, tenure status, age, years since hire, years since highest degree, years in rank, and employee type (only for School of Medicine).
  - Rank: Professor, Associate Professor, Assistant Professor, and Lecturer/Instructor
  - Tenure Status: Tenured, Earning Tenure, and No Tenure Track
  - Employee Type – Faculty and UMMG Faculty
- Professors and Associate Professors with a tenure status of Earning Tenure were converted to a Tenured status for this analysis.
- Separate analysis was performed for all 13 schools/colleges, including the Division of Continuing and International Education, and University Libraries. The College of Arts and Sciences was separated into 3 disciplines: Arts/Humanities, STEM, and Social Sciences. The School of Medicine was separated into 2 disciplines: Basic Science and Clinical.

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Methodology

Multi-Regression and Analysis of Covariance (ANCOVA) statistical methods were used together to examine the difference in the mean values of base salary among groups of faculty for each school. There were 5 steps in the statistic analyses:

1. Find the collinear relationship between the continuous independent variables, using 0.8 as reference to remove highly correlated continuous independent variable(s).
2. Run regression model to find the outliers and remove the outliers from data if its standardized absolute residual is greater than 3.
3. After removing outliers, the regression model was run again to get the R-square and p-values for each independent variable to determine if there was a significant difference between the categories within gender, rank, and tenure status.
4. Run ANCOVA on the same dependent and independent variables to see how much each independent variable contributes to the variation of dependent variable.
5. Run analysis of variance (ANOVA) to examine the difference between male and female faculty members in the same rank and same tenure status, for those with a sample size greater than or equal to 5.

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Limitations of Analysis

- Certain populations within the sample had small sample size populations existed in the analysis might affect the statistic results. For example, we only have 3 female and 8 male earning tenure professor in the university.
- In the plot of residual vs. predicted values, most schools have randomly distributed residuals and most R-square values are above 0.6, which means base salary can be well-predicted with our chosen independent variables.
    - However, the School of Medicine (R^2 =0.39) did not have randomly distributed residual plots, therefore, it didn't meet the Multi-Regression assumption of multivariate normality and homoscedasticity. As a result, Employee Type was added as an additional independent variable and the base salary was log transformed.
- Within the School of Medicine, some faculty had low base salaries, but high total salaries. There were 38 faculty members whose base salary was less than 50% of their total salary. This can be due to their clinical duties being the major contributor to their salary.
- All independent variable values are as of the day this analysis was performed. No historical data was used in this analysis.
- There are 167 missing values in the independent variable Years Since Highest Degree.
- The Years in Rank variable does not take any type of leave (e.g., maternity/paternity, health, etc.) into account.
- No data related to academic or scholarly productivity were included in this analysis.
- Excluded a total of five faculty members who had a base salary of $0.

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Research Questions

- Within a given school, is there a difference in salary between male and female faculty members?
- Within a given school, is there a difference in salary among the faculty rank and tenure status categories?

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Key Findings

- There are salary gaps between men and women, but only significantly in the School of Medicine – Clinical and the School of Music.
- The difference in salary between men and women is the highest in the Business School with men making $15,500 more than women, on average. Although this difference is not significant (R^2=0.055), it is very close to being so.
- The next highest difference in salaries between men and women without being significant is in the College of Engineering. Women, on average, make $9000 more than men.
- The Business School has the largest difference in salary across ranks and tenure statuses, when compared to the other schools.
- The School of Music and School of Nursing have the smallest differences in salary across tenure statuses, when compared to the other schools.
- The variation in the base salary for most schools can be well predicted using the independent variables included in this analysis. Rank contributes much more to the variation in the base salary than any other independent variable.

Summarized Results

Summarized Tables by Gender, Rank, and Tenure Status across Entire University

Gender	Number of Faculties	Avg. Converted 9month BaseSalary	Std. dev. of Converted 9month BaseSalary
F	952	123,537	72,034
M	1,525	171,246	108,244

Ranks	TenureStatus_New	Gender	Number of Faculties	Avg. Converted 9month BaseSalary	Std. dev. of Converted 9month BaseSalary
Professor	Tenured	F	130	177,443	74,562
		M	470	207,095	115,650
	No Tenure	F	37	203,095	84,039
		M	106	256,474	135,314
Associate Professor	Tenured	F	118	110,325	41,648
		M	191	118,357	47,943
	No Tenure	F	110	147,239	80,478
		M	143	215,159	106,810
Assistant Professor	Earning Tenure	F	65	91,039	31,962
		M	97	106,638	45,409
	No Tenure	F	296	133,406	66,657
		M	334	181,801	87,776
Lecturer	No Tenure	F	163	62,272	25,569
		M	142	68,844	27,649
Instructor	No Tenure	F	33	68,306	46,110
		M	42	57,481	42,554

Faculty Salary Analysis - Summarized by Gender

- Only the School of Music and School of Medicine - Clinical had significant differences between male and female faculty. In these two schools, male faculty tend to earn more than female faculty. Even though the Business School has no significant difference (R^2=0.055) between gender, the difference in salary is much higher compared to other schools.

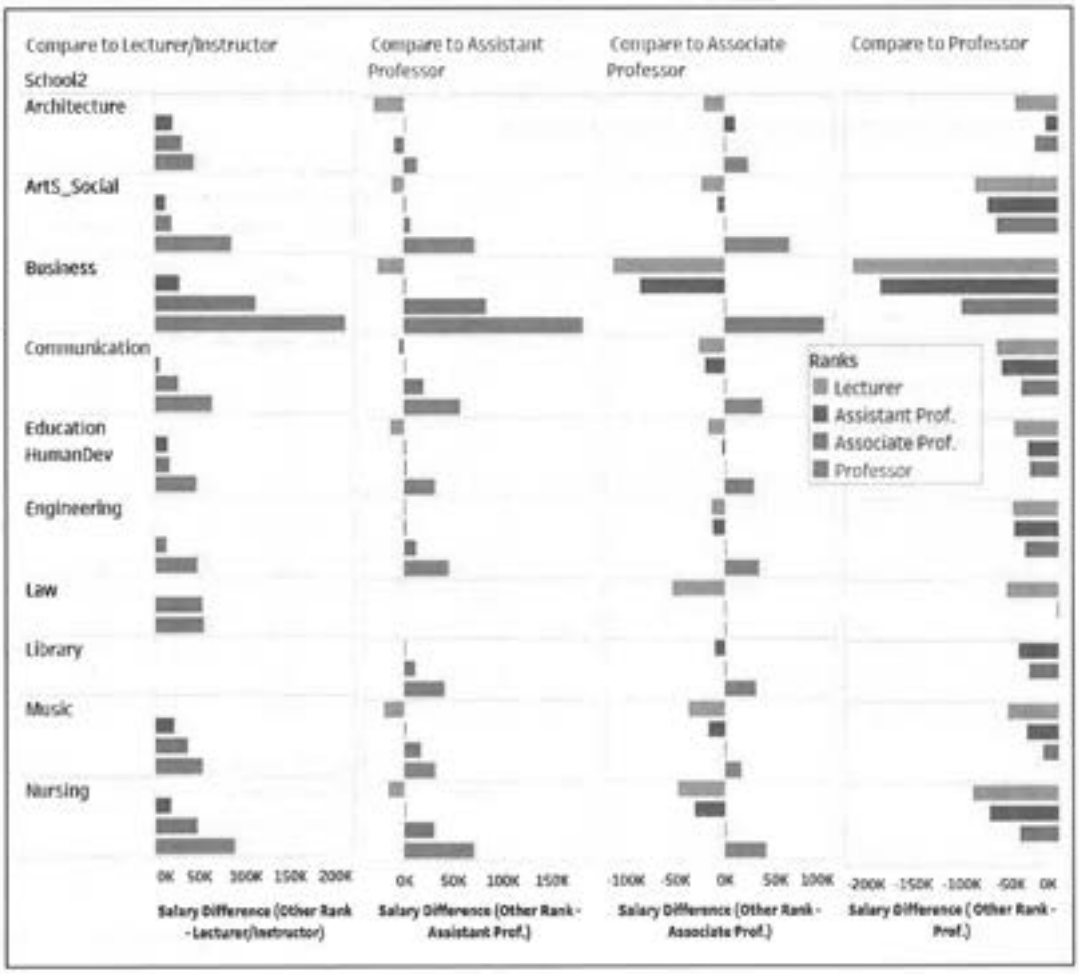
School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males	R-Square
Architecture	0.779	1700	10	33	0.743
Arts and Sciences - Arts/Humanities	0.222	3431	113	95	0.775
Arts and Sciences – Social	0.791	-1834	45	54	0.632
Arts and Sciences - STEM	0.519	2625	40	92	0.776
Business	0.055	15514	49	103	0.736
Communication	0.821	801	31	41	0.772
Division of Continuing/ International Education	0.488	-1473	10	3	0.327
Education and Human Development	0.478	-4436	30	22	0.814
Engineering	0.216	-9056	8	52	0.785
Law	0.882	1367	45	40	0.577
Music	0.024	9424	23	62	0.673
Nursing and Health Studies	0.882	832	32	11	0.858
Marine and Atmospheric Science	0.961	384	21	52	0.591
University Libraries	0.178	3788	34	18	0.675

School	P-value	Difference in base salary (ratio)? (Male:Female)	Number of Females	Number of Males	R-Square
Medicine - Clinical	0.000	1.25	337	503	0.481
Medicine - Basic Science	0.796	1.01	123	342	0.712

Note: The schools in Red contain significant differences.

Faculty Salary Analysis - Summarized by Rank

- The Business School has a higher difference between ranks when comparing with other 9 schools.
- The School of Marine and Atmospheric Science, College of Arts & Sciences (Art/Humanities and STEM) are not included in the graph because their statistic analyses were based on combination of rank and tenure status. Details shown in later slides.
- The Division of Continuing and International Education is not included in the graph because there is only one type of rank.
- School of Medicine (Basic Science and Clinical) is not included in this graph because log-transforming base salary was performed in their statistic analysis, which was not used for the other schools.



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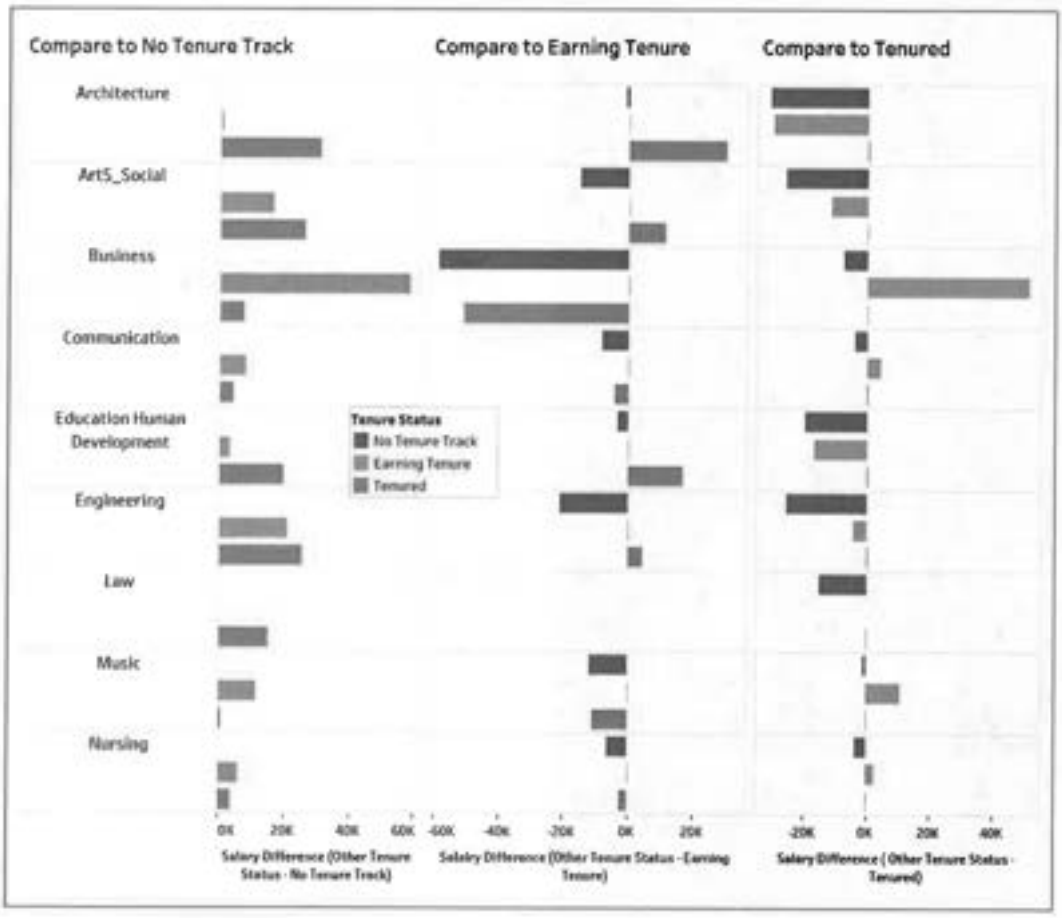
Faculty Salary Analysis - Summarized by Tenure Status

- The School of Music and School of Nursing have relative small differences between tenure status compared to other 7 schools.
- The School of Marine and Atmospheric Science and College of Arts & Sciences (Art/Humanities and STEM) are not included in the graph because their statistic analyses were based on combination of rank and tenure status. Details shown in later slides.
- The Division of Continuing and International Education and University Library are not included in the graph because there is one type of tenure status.
- The School of Medicine (Basic Science and Clinical) is not included in this graph because log-transforming base salary was performed in their statistic analysis, which was not used for the other schools.



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School/College Analysis Results

School of Architecture

- With the control of other independent variables, there is no significant difference between males and females, in terms of base salary.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males
Architecture	0.779	1700	10	33

- No further statistic analysis on gender was conducted in the same rank and tenure status, because of the small sample size (< 5).

Sumarized table

Ranks	Tenure Status	Gender	Avg. Converted 9month BaseSalary	Number of Records	Std. dev. of Converted 9month BaseSalary
Professor	N	F			
		M			
	T	F	160,582	3	67,338
		M	124,518	7	31,740
Associate Professor	N	F			
		M			
	T	F			
		M	99,340	9	16,028
Assistant Professor	E	F			
		M	92,033	5	3,827
	N	M			
Lecturer	N	F			
		M	66,176	7	4,336

College of Arts and Sciences – Arts/Humanities

- With the control of other independent variables, there is no significant difference between male and female in term of base salary.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males	R-Square
Arts and Sciences - Arts/Humanities	0.222	3431	113	95	0.775

- Further statistic analyses (ANOVA) on gender were conducted in the same rank and tenure status groupings, but there were no significant differences between male and female base salary.

Summarized Table

Ranks	TenureStatus_ New	Gender	Number of Faculties	Avg. Converted 9month BaseSalary	Std. dev. of Converted 9month BaseSalary
Professor	T	F	15	137,056	48,440
		M	31	147,858	50,725
Associate Professor	T	F	24	83,377	19,399
		M	23	78,644	22,645
Assistant Professor	E	F	15	67,334	19,522
		M	7	71,375	3,622
	N	F	7	46,202	1,122
		M	4	50,780	4,331
Lecturer	N	F	52	47,905	7,635
		M	30	48,765	6,465

College of Arts and Sciences – STEM

- With the control of other independent variables, there is no significant difference between males and females, in terms of base salary.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males
ArtS_STEM	0.895	690	40	92

- Further statistic analyses (ANOVA) on gender were conducted on the same rank and tenure statuses, but there were no significant differences between male and female base salary.

Summarized Table

Ranks	TenureStatus_ New	Gender	Number of Faculties	Avg. Converted 9month BaseSalary	Std. dev. of Converted 9month BaseSalary
Professor	T	F	4	166,874	42,183
		M	41	154,773	37,640
Associate Professor	T	F	7	99,827	14,042
		M	26	107,407	19,583
Assistant Professor	E	F	7	84,701	6,135
		M	16	87,886	3,804
	N	F			
Lecturer	N	F	21	57,853	10,407
		M	9	59,603	12,360

College of Arts and Sciences – Social Science

- With the control of other independent variables, there is no significant difference between males and females, in term of base salary.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males
ArtS_Social	0.791	-1834	45	54

- Further statistic analyses (ANOVA) on gender were conducted on the same rank and tenure statuses, but there were no significant differences between male and female base salary.

Sumarized table

Ranks	Tenure Status	Gender	Avg. Converted 9month BaseSalary	Number of Records	Std. dev. of Converted 9month BaseSalary
Professor	N	M			
	T	F	172,512	10	56,412
		M	160,428	29	52,911
Associate Professor	N	F			
	T	F	95,803	16	11,935
		M	98,752	9	18,542
Assistant Professor	E	F	85,813	12	7,545
		M	78,455	7	16,279
	N	F			
Lecturer	N	F	50,935	4	8,363
		M	58,113	7	15,975
Instructor	N	M			

Business School

- With the control of other independent variables, there is a significant difference between males and females, in terms of base salary. Male faculty tend to earn $16,862 more than female faculties.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males	R-Square
Business	0.055	15514	49	103	0.736

- Further statistic analyses (ANOVA) on gender were conducted in the same rank and tenure statuses. A significant difference was found between genders for Tenured Professors.

Summarized Table

P = 0.007

Ranks	TenureStatus_ New	Gender	Number of Faculties	Avg. Converted 9month BaseSalary	Std. dev. of Converted 9month BaseSalary
Professor	T	F	8	200,327	58,872
		M	22	290,091	79,666
Associate Professor	T	F	13	175,158	45,063
		M	26	168,906	55,279
	N	M			
Assistant Professor	E	F	6	164,013	33,145
		M	17	170,714	42,863
	N	M	6	117,060	40,310
Lecturer	N	F	22	69,523	16,719
		M	30	77,417	23,471

School of Communication

- With the control of other independent variables, there is no significant difference between males and females, in terms of base salary.

School	P-value	Salary Difference ($) (Male - Female)	Number of Females	Number of Males
Communication	0.821	801	31	41

- Further statistic analyses (ANOVA) on gender were conducted on the same rank and tenure statuses, but there were no significant differences between male and female base salary.

Sumarized table

Ranks	Tenure Status	Gender	Avg. Converted 9month BaseSalary	Number of Records	Std. dev. of Converted 9month BaseSalary
Professor	N	F			
		M			
	T	F			
		M	144,609	12	53,201
Associate Professor	N	F			
		M	90,090	3	8,403
	T	F	91,418	9	5,815
		M	102,581	7	17,799
Assistant Professor	N	F	80,682	5	1,127
		M	81,440	4	1,781
	T	F	75,088	3	5,471
		M	87,540	5	30,095
Lecturer	N	F	68,513	10	3,745
		M	68,740	9	8,047