

## **A Quantitative Study of Faculty Salaries**

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An essential replication of Northern Illinois University's 2008 university wide-study of faculty salaries was conducted with data that were current as of spring 2011. Multiple regression analyses showed that gender and ethnicity were not related to faculty salaries whether starting salary was included or excluded as a predictor variable. In contrast, market value for the discipline, rank of full professor, long-term merit ratings, and years in current rank accounted for 82 percent of the differences (variance) in faculty salaries in both analyses. Other variables were also significant and accounted for an additional 6 to 12 percent of the differences in faculty salaries. Criteria for possible salary adjustments, limitations of this study, and possible directions for future studies were also discussed.

Northern Illinois University (NIU) has a relatively long history of conducting statistical investigations of faculty salaries. In the mid-1990's, for example, the Colleges of Liberal Arts and Sciences and Visual and Performing Arts initiated the first such studies for their own purposes. The other colleges soon joined them. In 2005, then Provost Ivan Legg created a large faculty committee to investigate faculty salaries from both quantitative and qualitative perspectives. In 2008, Provost Ray Alden initiated the first consolidated or university-wide quantitative investigation of faculty salaries. The present study is a natural outgrowth of this rich history. Specifically, it follows a recommendation of the 2005 committee to conduct periodic studies of faculty salaries. It also represents a replication of the two primary analyses that were conducted in the 2008 university-wide study of faculty salaries.<sup>1</sup>

### **Method**

## **Sample**

In the spring of 2011 when the data were being compiled and checked, there were 745 individuals who were tenured or held tenure-track appointments outside the libraries. A total of 74 of these cases were dropped from the study. Specifically, individuals were excluded because they were newly hired and did not have merit scores, were retiring, were resigning, or held administrative positions that are evaluated by supervisors rather than faculty. The final sample consisted of 671 individuals, including 297 (44%) female and 138 (21%) minority faculty. Minorities included 91 Asians, 23 African Americans, 22 Hispanics, and 2 Native Americans.

## **Technique**

Multiple regression analysis was selected as the basic data analytic technique because it is arguably the statistical method most frequently employed by scholars, courts, and universities to determine whether employers are discriminating against certain classes of employees in the matter of salaries. Essentially, this technique uses a set of variables to construct a predicted salary for each individual in the sample. These variables include factors that would be expected to affect salaries (e.g., rank, merit, and seniority) as well as factors that would not be expected to impact salaries (i.e., gender or ethnicity). Once significant predictor variables have been identified and predicted scores constructed for each individual, correlations are computed between the predicted and actual salaries. The degree of correspondence between these two variables is then expressed in terms of the percent of the differences (variance) between actual salaries that can be explained or accounted for by the predicted salaries.<sup>2</sup>

The analyses relied on probability estimates to determine whether patterns in the data were significant or due to chance alone. In this regard, any finding that could occur 5 or fewer times out of 100 by chance is the scholarly standard that was adopted here to decide whether an observed finding was statistically significant and should be treated as important.

## **Variables**

Over the past fifteen years, NIU has evolved a set of predictor variables that can be used to explain or account for differences in salaries. The standard set now includes the following 20 variables:

Age	Matching offer
College-level adjustment	Merit x years at NIU interaction
Current rank of full professor	Merit x years in rank interaction
Current rank of associate professor	Presidential Research Professor
Ethnicity	Presidential Teaching Professor
Gender	Retention/Equity adjustment
Hired as associate professor	Starting salary
Hired as full professor	Years at NIU
Long-term merit	Years at other universities
Market value of discipline	Years in current rank

Descriptions of how each variable was coded, scored, or otherwise assigned a numerical value can be found in Appendix A. A brief word perhaps should be said here, however, about the two interaction terms: merit x years at NIU and merit x years in rank. Essentially, these interaction terms give extra credit (attribute more salary) to individuals who are still performing at very high levels many years into their careers. Although listed above, “age” was not used in this study because of its possible confounding effects on other variables such as years at NIU. Lastly, it should be noted that an outside consultant conducted the statistical analyses that are reported below.

The consultant also provided the statistical tables and graphic figures of the findings that are contained in the appendices.<sup>3</sup>

## **Results**

Results of the regression analysis with starting salaries included as a possible predictor variable showed that 14 variables were significant. Market value of the discipline, rank of full professor, long-term merit, and years in rank accounted for 82% of the differences (variance) in faculty salaries. Ten other variables including factors such as starting salary, years at NIU, and the interaction of merit with years at NIU collectively accounted for another 12% of the variance. In contrast, gender, ethnicity, retention/equity adjustments, starting rank of full professor, and years at other universities were not significant. The summary statistics for this analysis are presented in Appendix B and a graphic representation of the relationship between predicted and actual salaries is contained in Appendix C.

The second analysis excluded starting salary because it can act as a "suppressor" variable by masking potential biasing effects that might occur at the point of entry to NIU. For example, if John Smith is hired at a monthly salary that is \$400 higher than Jane Doe who has the same credentials and is hired in the same department in the same year, then the first analysis might falsely conclude that "All other things being equal, Jane's current monthly salary should be \$400 lower than John's salary."

The results of this second regression analysis showed that the same four variables of market value for the discipline, rank of full professor, long-term merit, and years in current rank again accounted for 82% of the differences (variance) in faculty salaries. Not surprisingly, starting rank of

full professor and years at other universities emerged as significant when starting salary (which previously subsumed them) was excluded. These two variables, together with five other variables that were significant, collectively accounted for another 6% of the differences in faculty salaries. Once again, neither gender nor ethnicity had a significant relationship to faculty salaries. The summary statistics for this analysis are presented in Appendix D and a graphic representation of the relationship between predicted and actual salaries is contained in Appendix E.

### **Salary Adjustments**

A secondary purpose of this study was to identify individual faculty members who might deserve salary adjustments. Toward this end, consultations were held individually and collectively with the current and former Vice Provosts for Resource Planning. These particular individuals were consulted because they are the most knowledgeable on campus about how recent and past adjustments of this nature have been handled by the Provost's Office.<sup>4</sup> After several discussions, there was agreement on the following criteria:

To be considered for a salary adjustment, full and associate professors had to have:

- (1) average standardized residual scores of -1.00 or worse in the analyses that included and excluded starting salary;
- (2) average long-term merit rankings that placed them in the first or second highest quintiles for their respective departments;
- (3) average short-term merit ratings that placed them in the top sixty percent of tenured faculty in their respective departments;
- (4) monthly salaries that are not more than \$250 higher than their disciplinary cohorts at comparable universities; and
- (5) less than 12 years in rank if they are associate professors.

For full and associate professors, “long-term merit” was defined by the colleges in terms of merit scores for at least 7 and as many as the 15 most recent years. “Short-term merit” was defined in terms of the 3 most recent years prior to the FY11 mid-year merit raise.

To be considered for a salary adjustment, assistant professors had to have:

- (1) average standardized residuals as in (1) above;
- (2) average short-term merit ranking as in (2) above;
- (3) received an average or above average raise from the January 2012 merit pool;
- (4) monthly salaries as in (4) above; and
- (5) been recommended for tenure and promotion to associate professor at the highest decision making levels of the university.

For assistant professors, “long-term merit” was defined in terms of as many years for which they were evaluated at NIU. “Short-term merit” was defined by the colleges in terms of the most recent, one, two, or more years.

Seventeen (17) individuals met all five of their respective criteria. A sixth eligibility criterion was added even though it was beyond the Provost’s Office to assess. Specifically, the criterion was that “nothing in the personnel record should preclude this individual from receiving a salary adjustment.” The colleges will be asked to perform these reviews of their faculty members.

The 17 candidates for the possible salary increases represented 11 departments in 5 colleges. These individuals included 9 men and 8 women as well as 14 Caucasians, 2 Asians, and 1 African American. Coincidentally, these distributions closely resemble the demographic make-up of NIU’s faculty (see opening paragraph of this report).

## **Summary**

A now standard set of nineteen and eighteen predictor variables were used in two regression analyses to determine if there were any statistical evidence of systemic bias against women or minority faculty in the area of salaries. As with previous analyses conducted by individual colleges as well as in the 2008 university-wide study of faculty salaries, no evidence was found of gender or ethnicity discrimination.

Whether starting salary was included or excluded as a possible predictor variable, the results across both analyses showed that 11 to 14 variables were individually significant and collectively accounted for 88 to 94 percent of the differences (variance) in faculty salaries. In both analyses, four (4) significant variables combined to account for 82 percent of the differences in salaries. While market value of the discipline explained the largest portion of the differences, higher salaries were meaningfully related to high merit ratings, rank of full professor, and the “added value” of performing well for a sustained period of time (merit by years at NIU). In contrast, gender and ethnicity were not significantly related to faculty salaries in either analysis.

## **Limitations**

Like its predecessor, this study has several limitations that should be explicitly noted. Foremost among them is the fact that it investigated only institution-wide or systemic bias directed against groups of faculty. In other words, it did not address the issue of possible discrimination directed against individuals or even isolated pockets of individuals. In this regard, it should be noted that the university provides multiple venues for individuals or groups of individuals to seek redress of perceived discrimination directed against them.

Two other salary related concerns were also beyond the scope of this study to address. One concern is that faculty salaries at NIU lag those of cohorts at comparable universities elsewhere. The administration is well aware of this fact and has publicly committed to achieving greater salary competitiveness for faculty and staff. The second concern focuses on promotions. While most faculty take about six years to earn tenure and to be promoted to associate professor, little is known whether female and minority faculty take more, less, or the same amount of time to be promoted to full professor as their male or non-minority cohorts. While the time and effort needed to conduct such a study precluded its inclusion here, it certainly would be worthwhile to conduct such a study in the future.

One other point warrants brief comment. Specifically, if a quantitative study of faculty salaries such as this one is conducted again in three to four years, it would be desirable to include any data that might emerge from a qualitative study of the perceived economic well-being of the faculty. Among other issues, such a study could investigate the procedures and processes used to establish initial salaries, to increment those salaries annually, and to adjust the salaries of individual faculty members via matching offers, retention/equity adjustments, and college initiated increases.



## Endnotes

<sup>1</sup>A comprehensive report of Northern Illinois University's first consolidated study of faculty salaries for all its colleges can be found at [www.niu.edu/provost](http://www.niu.edu/provost) under the general link to the University-Wide Study of Faculty Salaries.

<sup>2</sup>Step-wise regression analyses were used in this study so that every predictor variable had an equal opportunity to enter the regression equation.

<sup>3</sup>Dr. Thomas Briggs served as the consultant and statistician for this and previous studies of faculty salaries conducted by the Provost's Office and the College of Liberal Arts and Sciences at Northern Illinois University. Dr. Briggs is the Executive Director of Performance Measurement and Reporting of the Data Integration Measurement and Reporting Division of Alberta Health Services, Calgary, Alberta CA.

<sup>4</sup>Professor Susan Mini is the current Vice Provost for Resource Planning at Northern Illinois University. Before becoming Vice Provost, Dr. Mini served as Associate Dean for Research and Graduate Studies in the College of Liberal Arts and Sciences and Chair of the Department of Physics at NIU. Professor Frederick Schwantes served as Vice Provost for Resource Planning at Northern Illinois University from 2001 to 2007. Before serving as Vice Provost, Dr. Schwantes was the Chair of the Department of Psychology at NIU.

## APPENDIX A

### Coding System for University-Wide Study of Faculty Salaries

Variable Code	Variable	Calculation
CONTROL #	Individual ID#	Confidential
MATCH	Matching Offer	\$ Monthly Adjustment Coded as follows: \$0 = 0      \$1001-1500 = 3 Up to \$500 = 1      \$1501-2000 = 4 \$501-1000 = 2      \$2001 or more = 5
GENDER	Gender	Females coded as 1, males as 0
MINORITY	Minority Status	Minority coded as 1, else 0
PRP	Presidential Research Professor	PRP coded as 1, else 0
PTP	Presidential Teaching Professor	PTP coded as 1, else 0
CR/SE	Critical Retention/Salary Equity	Recipient coded as 1, else 0
FY11 MO	Current Monthly Salary	As is
MARKET	Market Rate for Discipline	CUPA data = $((\text{Avg Sal} + ((\text{Avg Full} + \text{Avg Assoc} + \text{Avg Asst}) / 3))2)9$
STRT SAL	Starting Monthly Salary	As is
YRS NIU	Years at NIU	2010 minus year hired at NIU
OTR YRS	Years at other schools	As is
RNKPF	Present Rank: Full	Full Professor coded as 1, else 0
RNKPAS	Present Rank: Associate	Associate Professor coded as 1, else 0
RNKHP	Rank Hired: Full	Full Professor coded as 1, else 0
RNKHAS	Rank Hired: Associate	Associate Professor coded as 1, else 0
YRS RANK	Years in Current Rank	2010 minus year promoted to current rank
MERIT	Average Merit Rating	Average rating for up to 15 years converted to quintile scores within departments, with 5 = highest and 1 = lowest
COL ADJUST	College Adjustments	Coded same as MATCH
AGE	Chronological Age	Age 40 or older coded as 1, else 0
YRS NIU x MERIT	Interaction Term	Raw scores multiplied by each other to give additional credit to long-term faculty who continue to perform well
YRS RANK x MERIT	Interaction Term	Raw scores multiplied to give additional credit to long-term faculty who continue to perform well after promotion

**APPENDIX B**  
**Salary 2011 Run 1 (Standard) Results (FINAL)**

**MODEL INCLUDES STARTING SALARY**

Staff Exclusions: College 1

ID# 145101, 145102, 145103, and 145105

N = 671

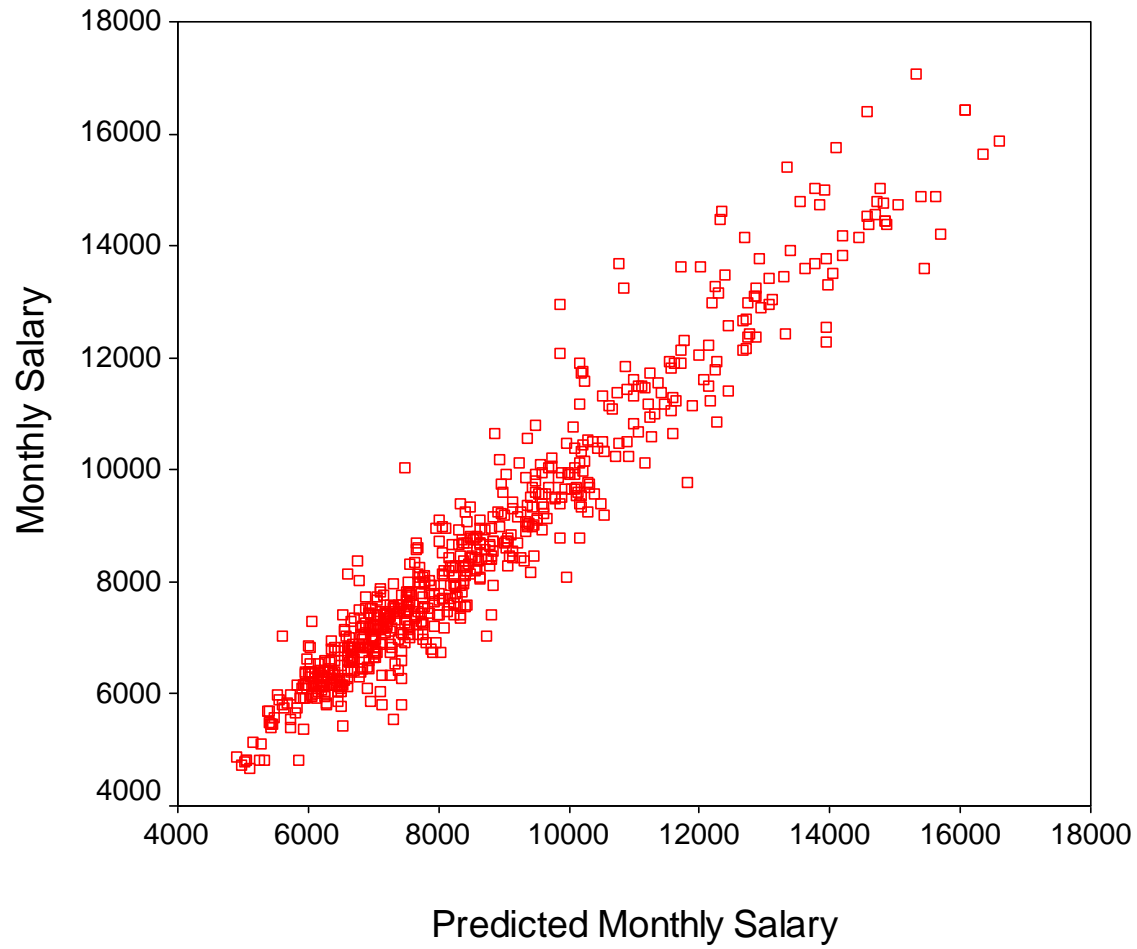
	Step	R Square	Adjusted R Square	Change R Square	B Weight	Std. Error	Beta	t	Sig.
					-3391.3	179.9		-18.853	0.000
Market Rate for Discipline	1	0.753	0.567	0.567	0.6	0.0	0.312	18.001	0.000
Present Rank: Full	2	0.881	0.776	0.775	2081.1	121.4	0.395	17.138	0.000
Quintile Merit Rating	3	0.898	0.807	0.806	236.2	19.1	0.134	12.347	0.000
Years in Current Rank	4	0.908	0.824	0.823	33.8	7.3	0.091	4.658	0.000
Starting Monthly Salary	5	0.928	0.861	0.860	0.7	0.0	0.653	27.043	0.000
Years at NIU	6	0.940	0.884	0.883	115.0	8.8	0.424	13.036	0.000
Years at NIU by Quintile Merit Interaction	7	0.949	0.900	0.899	248.4	35.5	0.107	7.002	0.000
College Adjustment	8	0.957	0.915	0.914	389.9	38.6	0.112	10.098	0.000
Matching Offer	9	0.963	0.926	0.925	489.3	47.0	0.104	10.420	0.000
Present Rank: Associate	10	0.967	0.936	0.935	764.3	75.8	0.156	10.082	0.000
Years in Rank by Merit Interaction	11	0.968	0.937	0.936	106.1	35.9	0.046	2.954	0.003
Presidential Research Professor	12	0.969	0.938	0.937	410.5	136.1	0.034	3.017	0.003
Starting Rank: Associate	13	0.969	0.939	0.938	-214.9	91.1	-0.027	-2.358	0.019
Presidential Teaching Professor	14	0.969	0.939	0.938	305.0	144.0	0.021	2.118	0.035

**Not Significant:** Gender, Minority Status, Critical Retention/Salary Equity, Starting Rank of Full, Years at Other Schools

**Note:** Changed Coding Control 124110. Described as starting Assistant but dummy coded as starting as Associate.

Coded as Associate. No other issues identified in screening process.

**APPENDIX C**  
**Salary 2011 Run 1 (Standard) Results (FINAL)**  
**Model Includes Starting Salary**



**APPENDIX D**  
**Salary 2011 Run 2 (Without Starting Salary) Results (FINAL)**

**MODEL INCLUDES STARTING SALARY**

Staff Exclusions: College 1

ID# 145101, 145102, 145103, and 145105

N = 671

	Step	R Square	Adjusted R Square	Change R Square	B Weight	Std. Error	Beta	t	Sig.
					-4243.9	249.5		-17.007	0.000
Market Rate for Discipline	1	0.753	0.567	0.567	1.3	0.0	0.686	46.518	0.000
Present Rank: Full	2	0.881	0.776	0.775	2042.0	106.2	0.387	19.221	0.000
Quintile Merit Rating	3	0.898	0.807	0.806	259.3	26.6	0.147	9.756	0.000
Years in Current Rank	4	0.908	0.824	0.823	33.8	5.5	0.091	6.093	0.000
Years in Rank by Merit Interaction	5	0.917	0.841	0.840	175.8	50.9	0.076	3.451	0.001
Present Rank: Associate	6	0.923	0.851	0.850	566.9	92.0	0.116	6.164	0.000
Matching Offer	7	0.927	0.860	0.858	417.3	65.6	0.089	6.356	0.000
Years at other schools	8	0.931	0.867	0.865	55.0	10.9	0.088	5.049	0.000
College Adjustment	9	0.934	0.872	0.871	278.9	54.6	0.080	5.110	0.000
Years at NIU by Quintile Merit Interaction	10	0.935	0.874	0.873	195.1	51.4	0.084	3.799	0.000
Starting Rank: Full	11	0.936	0.876	0.874	733.8	276.1	0.046	2.657	0.008

**Not Significant:** Gender, Minority Status, Presidential Research Professor, Presidential Teaching Professor, Critical Retention/Salary Equity, Starting Rank of Associate, Years at NIU

**Note:** Changed Coding Control 124110. Described as starting Assistant but dummy coded as starting as Associate. Coded as Associate. No other issues identified in screening process.

**APPENDIX E**  
**Salary 2011 Run 2 (Without Starting Salary) Results (FINAL)**

