

UNIVERSITY OF ILLINOIS AT SPRINGFIELD

Date: June 19, 2007

To: Harry Berman, Vice Chancellor of Academic Affairs and Provost

From: Salary Equity Budget Committee

Bill Bloemer
Patricia Byrnes
Denise Green
Karen Kirkendall, Chair
Patricia Sims
Larry Stonecipher
Nathan Steele
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Subject: AY2006-2007 Salary Equity Report

The Salary Equity Committee met three times during the spring semester to discuss the salary equity data for AY 2006-2007 and model results. The attached tables and figures are revised tables using the AY 2006-2007 data and model results. A summary of the results is also provided. Highlights of these results are:

- There were no changes in the definition of faculty from the previous report. The final AY2006-2007 sample size was 168.
- The model regression results are similar to last year with no change in model fit, and regression coefficient size (although they are slightly higher). The regression diagnostics were also similar to last year.
- In the model where race and gender are included for the entire faculty, the results are also similar to the previous year. The coefficient of gender is -1,503.01 (Female=1) including CBM and -15,006.43 for CBM alone. The coefficient of race is 5,635.13 (Black, Hispanic, and Native Indian =1) including CBM and 4,390.11 for CBM alone.
- The college-level analysis reveals that the College of Business and Management has a different salary structure than the rest of the campus. This result is similar to last year. Like last years results, the AY2006-2007 results show no relationship between years-in-rank, rank, and adjusted salary. Analysis of the individual faculty data in CBM reveal that the model does not adequately fit the new hires (most of whom are male). The committee believes that factors not captured in the model were used to determine initial salaries of these new hires.

For example, if these new hires have extensive experience that is not reflected in the rank under which they were hired, the model does not capture this. Thus, it is difficult to determine whether there is salary compression or gender bias in CBM.

- As a follow-up analysis we used two methods to identify outliers in CBM. One method identified observations with residuals greater than three and two standard deviations (s.d.) . We also used Cook's Distance measure (Cook's D) to identify "influential observations" or those data points that when removed substantially change the estimate of the coefficients. 12 observations were identified using a cutoff of .02381 (recommended Cook's D value is $4/N$). The top five of these observations could be found on all three lists of outliers (residuals greater than three s.d., residuals greater than two s.d., and Cook's D) and all five had salaries that were influenced by variables that are not normally used for salary determination of UIS faculty hires (i.e., market adjustment and extensive experience necessary for accreditation efforts). Consequently a final regression analysis was run without these five observations.

In conclusion, the Salary Equity Committee makes the following recommendations:

- The model is still relatively robust using the new cohort of salary data. The model results are consistent with other years and can be used as an input into the salary equity process. Spreadsheets of the model results can be made available.
- Further analysis of the salary of CBM faculty needs to be conducted. It is difficult to conclusively determine whether there is a salary compression or gender bias until a more suitable model is developed. A starting point for such a model may be a comparison of salaries with peer institutions and an analysis of recent hires relative to peer institutions.
- There is still some concern about not connecting the value of the groups to the market. This means that variance between groups, if it exists, is not only ignored, but reinforced. The process targets large variances within groups, even if the entire group is out of line. We could possibly use CUPA data to do this or even allow new hires to define their own market, at least for a year or two. We recommend that strategies for addressing this issue be considered in future reviews.
- The committee recommends the use of the regression model for making salary equity decisions for AY 07-08 that eliminates the five outliers based on the rationale and analysis provided above. However, given some of the issues concerning the removal of outliers in this type of analysis we have presented both analyses and accompanying data for your use.

AY06-07 Salary Equity Data Analysis and Model Results

➤ **Part 1: Sample Description and Variable Descriptive Statistics (Tables 1 to 5)**

Tables 1 through 4 provide a description of the sample by rank, gender, race, college and discipline group. The definition of faculty is the same as in previous years' analysis (see footnote to table 1). The final AY2006-2007 cohort consists of 168 faculty.

Table 5 provides descriptive statistics of the adjusted salary variable by rank and for the entire sample. Recall that adjusted salary is the actual salary adjusted for annual performance raises or reductions.

➤ **Part 2: Regression Results (Tables 6 to 9)**

The estimated model results using the AY06-07 data are presented in table 6. The model is relatively robust with over 84 percent of the variation in adjusted salary explained. Comparing the results to last year's model estimation results (see table 7) the model is stable with small increases in the coefficients.

Table 8 gives the model results when race and gender are included. Table 9 compares the race and gender coefficient estimates to last year's data. There is little change in the size of the coefficients or the significance level.

➤ **Part 3: Salary Adjustment Table (Table 10)**

The committee created a spreadsheet that describes faculty adjustments for a 90%, 92% and 95% salary adjustment program. Table 10 summarizes the results for a 92% policy. This type of program would result in adjustments for 25 faculty and would cost \$71,299 (about 0.7% of actual salaries).

➤ **Part 4: Discipline Group Analysis (Table 11 and Figure 1)**

The committee analyzed the defined discipline groups again by comparing the distribution of estimated salaries within each group (see Tables 11 and figure 3).

➤ **Part 5: College of Business Only (Table 12 and 13)**

Separate models by college were estimated with significant differences for the College of Business and Management (CBM) only. Like last year's results, CBM has a different salary structure than the rest of the campus. The AY2006-2007 results show no relationship between years-in-rank, rank, and adjusted salary. Differences by discipline group are only relevant for the Economics faculty. The coefficient of MIS compared to accounting, business and management does not reveal significant differences between these groups. This result is slightly different from last year's result as the coefficient on the MIS group was larger and statistically significant.

The committee spent time analyzing individual faculty data in CBM. This analysis provides further evidence that the model does not adequately fit the new hires (most of whom are male) in CBM. These new hires were brought in at a rank lower than their salary would suggest. The committee believes that factors not captured in the model were used to determine initial salaries of these new hires. For example, if these new hires have significant experience that is not reflected in the rank under which they were hired, the model does not capture this. Thus, it is difficult to determine whether there is salary compression or gender bias in CBM.

➤ **Part 6: Regression Diagnostics**

Similar to appendix C of the report, regression diagnostics were performed. The results were as follows:

- **Functional form:** The model was estimated using the logarithmic form for adjusted salary. This increased the adjusted R-square from 0.845 to 0.876.
- **Time-in-rank specification:** Using time-in-rank squared or cubed is not significant. The linear relationship as specified provides the best fit for the model.
- **Multi-collinearity analysis:** Using traditional ways of detecting multicollinearity there was no problem none detected.
- **Outliers/Influential Observations:** Outliers or influential observations were identified using outlier detection and Cooks Distance measure. Tables 14 and 15 list the observations identified as potential issues using these two approaches. These analyses have identified observations that potentially influence the estimate results. There are five individuals with the highest Cook's D score (having the most influence) and who were identified with a salary determination history that does not fit the model. Either these individuals fit a unique role in obtaining accreditation in CBM or their salary was determined by matching an outside offer. The model estimation results, excluding these five individuals, are in tables 16 (without race and gender) and 17 (with race and gender). Table 18 summarizes the 92.5 salary adjustment (see accompanying spreadsheet) for this model.

Table 1: AY2006-2007 Tenured / Tenure-Track Faculty*: By Rank and Gender			
RANK	GENDER		Total Sample
	F	M	
Assistant Professor	33	52	85 (50.6%)
Associate Professor	29	36	65 (38.7%)
Professor	5	13	18 (10.7%)
TOTAL	67 (39.9%)	101 (60.1%)	168 (100.0%)
*Excludes the following categories of faculty; full-time non-tenure track faculty; part-time/adjunct faculty; faculty currently or formerly holding endowed professorships/ chairs; academic administrators; former academic administrators			

Table 2: Sample Description by Race		
Race Category	Number	Percent
Asian	22	13.1
Black	11	6.5
Hispanic	3	1.8
Native American	1	0.6
White	131	78.0
Total	168	100.0

Table 3: Sample Description by College		
College	Number	Percent
BUS	35	20.8
EHS	21	12.5
LAS	77	45.8
LIB	5	3.0
PAA	30	17.9
Total	168	100.0

Table 4
Discipline Groups
(n=168)

Group A (n=13)	Computer Science Management Information Systems
Group B (n=5)	Library
Group C (n=24)	Accountancy Business Management
Group D (n=12)	Economics Public Administration Public Health
Group E (n=24)	Biology Chemistry Clinical Laboratory Science Environmental Studies Mathematics
Group F (n=38)	Communication Educational Leadership Human Development Counseling Human Services Psychology Social Work Sociology/Anthropology Teacher Education
Group G (n=17)	Legal Studies Political Studies Criminal Justice
Group H (n=35)	African-American Studies English History Individual Option Philosophy Visual Art Women's Studies

Table 5: Description Statistics for Adjusted-Salary: Total Sample and By Rank				
Rank (n)	Mean	St. Dev.	Minimum	Maximum
Assistant (85)	52,802	15,522	31,500	108,150
Associate (65)	63,606	16,122	38,034	114,577
Full (18)	81,532	19,986	54,833	130,000
Total (168)	60,168	18,644	31,500	130,000

Table 6: AY006-07 Adjusted Salary Regression Results (N=168)			
	Estimated Coefficient	Standard Error	t-value
Constant ⁺	44,930.68	1,337.89	33.6*
Years In Rank	335.49	116.94	2.9*
Associate	5,641.17	1,388.48	4.1*
Full	15,958.76	2,064.12	7.7*
Group A: CMS_MIS (Info Tech)	38,220.10	2,404.37	15.9*
Group B Library	-11,310.12	3,516.59	-3.2*
Group C: ACC_BUS_MGT (Business)	35,677.31	1,999.32	17.8*
Group D: ECO_MPH_PAD	11,945.63	2,484.17	4.8*
Group E: BIO_CHE_ENS_MAT_CLS	2,843.51	1,948.07	1.5
Group F: COM_EDL_HDC_HMS_PSY_SOA_SWK_TEP	390.14	1,722.52	0.2
Group G: CRJ_LES_POS	7,780.51	2,180.15	3.6*
Model Fit: Adjusted R ² =0.845 F-Statistic=92.06			
Notes: +The baseline group is assistant professors in group H—African American Studies, English, History, Individual Option, Philosophy, Visual Arts and Women’s Studies.			
* Significant at 0.01 level or below.			

**Table 7:
Comparison and AY05-06 and AY06-07 Regression Results**

Variable	Estimated Coefficient (t-statistic)	
	AY2005-2006 (n=147)	AY2006-2007 (n=168)
Constant ⁺	43,905.10 (31.8)*	44,930.68 (33.6)*
Years In Rank	395.97 (3.4)*	335.49 (2.9)*
Associate	4,280.64 (3.1)*	5,641.17 (4.1)*
Full	15,067.46 (7.6)*	15,958.76 (7.7)*
Group A: CMS_MIS (Info Tech)	37,436.44 (15.6)*	38,220.10 (15.9)*
Group B Library	-10,470.87 (-3.5)*	-11,310.12 (-3.2)*
Group C: ACC_BUS_MGT (Business)	30,155.95 (15.3)*	35,677.31 (17.8)*
Group D: ECO_MPH_PAD	12,792.40 (5.1)*	11,945.63 (4.8)*
Group E: BIO_CHE_ENS_MAT_CLS	2,881.68 (1.4)	2,843.51 (1.5)
Group F: COM_EDL_HDC_HMS_PSY_SOA_SWK_TEP	688.35 (0.4)	390.14 (0.2)
Group G: CRJ_LES_POS	8,376.95 (3.8)*	7,780.51 (3.6)*
Model Fit	Adjusted R ² =0.849 F-Statistic=82.89	Adjusted R ² =0.845 F-Statistic=92.06

Data for AY05-06 are from table 7 of that years report.

Notes: +The baseline group is assistant professors in group H—African American Studies, English, History, Individual Option, Philosophy, Visual Arts and Women’s Studies.

* Significant at 0.01 level or below.

**Table 8:
AY06-07 Adjusted Salary Regression Results
With Gender and Race (N=168)**

	Estimated Coefficient	Standard Error	t-value
Constant ⁺	44,880.00	1,440.43	31.2*
Years In Rank	303.12	115.07	2.6*
Associate	5,855.36	1,363.93	4.3*
Full	15,780.72	2,018.27	7.8*
Group A: CMS_MIS (Info Tech)	38,349.58	2,429.89	15.8*
Group B Library	-10,065.02	3,469.62	-2.9*
Group C: ACC_BUS_MGT (Business)	36,078.03	1,975.99	18.3*
Group D: ECO_MPH_PAD	11,638.18	2,432.89	4.8*
Group E: BIO_CHE_ENS_MAT_CLS	3,167.31	1,923.83	1.6
Group F: COM_EDL_HDC_HMS_PSY_SOA_SWK_TEP	879.58	1,691.53	0.5
Group G: CRJ_LES_POS	7,659.59	2,131.29	3.6*
Gender (FEMALE =1)	-1,503.01	1,210.56	-1.2
Race (BLACK, HISPANIC, NATIVE IN =1)	5,635.13	1,987.68	2.8*
Model Fit: Adjusted R ² =0.852 F-Statistic= 81.11			
Notes: +The baseline group is White or Asian, male assistant professors in group H—African American Studies, English, History, Individual Option, Philosophy, Visual Arts and Women’s Studies.			
* Significant at 0.01 level or below.			

**Table 9:
Comparison and AY05-06 and AY06-07 Regression Results for Race and Gender**

Variable	Estimated Coefficient (t-statistic)	
	AY2005-2006 (n=147)	AY2006-2007 (n=168)
Gender (Female=1)	-1,513.37 (-1.3)	-1,503.01 (-1.2)
Race (Black, Hispanic, Native American=1)	6,820.61 (3.2)*	5,635.13 (2.8)*

Data for AY05-06 are from table 12 of that year's report.

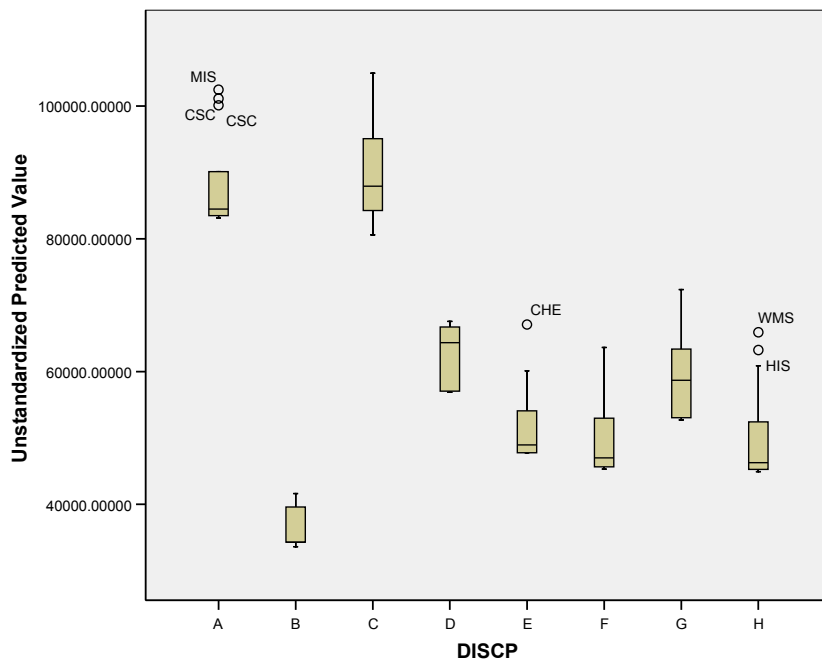
*Significant at 0.01 level

**Table 10:
Budget Impact of 92.5 Percent Salary Adjustment Program
(n=168)**

College	Number of Faculty with Adjustments	Percent of Faculty w/ Adjustments	Total Adjustments	Adjustment as Percent of Total AY05-06 Salaries
BUS	11	31.4%	\$54,795	1.78%
EHS	0	0.0%	\$0	0.00%
LAS	8	10.4%	\$15,585	0.38%
LIB	1	20.0%	\$455	0.25%
PAA	5	16.7%	\$89,589	0.55%
Total	25	14.9%	\$80,424	0.79%

Table 11: Description Statistics for Predicted-Salary: Total Sample and By Discipline Group (n=168)			
Group (n)	Mean	St. Dev.	Range
A (13)	89,039	7,376	19,313
B (5)	36,682	3,660	7,990
C (24)	89,598	7,073	24,346
D (12)	62,292	4,782	10,673
E (24)	51,703	5,198	19,314
F (38)	50,088	5,147	18,307
G (17)	58,806	6,356	19,649
H (35)	49,308	5,626	20,991

Figure 1: Box-Plot of Predicted Salary



- Box contains the middle 50% of the data. The upper line (hinge) of the box is the 75th percentile and the lower hinge is the 25th percentile.
- Line in the box contains the median.
- The ends of the vertical lines indicate min and max, unless there are outliers, then the lines represent 1.5 times the interquartile range.

**Table 12:
AY05-06 Adjusted Salary Regression Results: College of Business Only (n=35)**

	Without Race and Gender⁺	With Race and Gender⁺⁺
Constant ⁺	86,384.95 (18.3)*	90,695.16 (19.7)*
Years In Rank	-277.46 (-0.8)	-474.06 (-1.5)
Associate	3,312.20 (0.6)	6,648.86 (1.2)
Full	13,343.36 (1.9)	11,283.86 (1.8)
Group A: CMS_MIS (Info Tech)	3,887.50 (0.6)	-71.52 (-0.1)
Group D: ECO_MPH_PAD	-19,930.82 (-2.7)*	-17,520.06 (-2.6)**
GENDER (FEMALE=1)		-15,006.43 (-2.7)**
RACE (BLACK, HISPANIC, NATIVE_AMER=1)		4,390.11 (0.3)
Adjusted R ²	0.240	0.377

+The baseline group is assistant professors in Group C—Accounting, Business or Management.

++ The baseline group is male, white or Asian assistant professors in Group C—Accounting, Business or Management.

* Significant at 0.01 level. ** Significant at 0.05 level.

**Table 13:
Comparison of CBM Regression Results for Race and Gender**

Variable	Estimated Coefficient (t-statistic)	
	AY2005-2006 (n=147)	AY2006-2007 (n=168)
Gender (Female=1)	-14,793.14 (-2.9)*	-15,006.43 (-2.7)**
Race (Black, Hispanic, Native American=1)	9,405.29 (0.9)	4,390.11 (0.7)

Data for AY05-06 are from table 13 of that years report.

*Significant at 0.01 level **Significant at the 0.05 level

Table 14: Suspected Outliers Based on Size of Residuals*

OBS (Name)	Std. Residual	Actual Salary	Predicted Salary	Residual
117 Ma	4.509	\$130,000.00	\$96,902.23	\$33,097.77
25 Blodgett	3.768	\$114,577.00	\$86,920.14	\$27,656.86
3 Decker	3.707	\$108,150.00	\$80,943.48	\$27,206.52
116 Karri	3.508	\$112,000.00	\$86,249.16	\$25,750.84
168 Langley	3.010	\$88,012.00	\$65,921.76	\$22,090.24
4 Morris	2.642	\$100,000.00	\$80,607.99	\$19,392.01
128 Parssian	2.087	\$99,811.00	\$84,492.73	\$15,318.27
56 Dezhgosha	-2.116	\$73,600.00	\$89,127.44	-\$15,527.44
28 Puclik	-2.16	\$76,100.00	\$91,952.46	-\$15,852.46
118 O'Neal	-2.252	\$80,036.00	\$96,566.74	-\$16,530.74

Outliers are identified using two rule that the residual. Observations with a residual three standard deviations or more from the average residual (zero) are the top 5 (shaded rows) listed in the table. Observations with residuals two standard deviations were also identified resulting in a longer list of 10 outliers

Table 15: Influential Observations Based on Cook's D*

LAST NAME	COOK'S D
Ma	0.20252
Langley	0.10465
Blodgett	0.08575
Karri	0.08444
Decker	0.08030
O'Gorman	0.06797
O'Neal	0.05293
Orlandic	0.04930
Morris	0.04161
Parssian	0.04145
Harris	0.03580
Puclik	0.03490

An observation is influential if removing the observation substantially changes the estimate of coefficients. The Cook's Distance measure can be used to detect influential observations. Large values of the Cook's D identify those observations with large impacts. A rule of thumb an influential observation is one with a Cook's D value that exceeds $4/N$ (where N is number of observations). In our case this rule of thumb cut-off is 0.02381 ($=4/168$).

**Table 16:
AY006-07 Adjusted Salary Regression Results Without Influential Observations
(N=163)**

	Estimated Coefficient	Standard Error	t-value
Constant ⁺	44,211.05	931.75	47.4*
Years In Rank	482.66	83.48	5.8*
Associate	4,802.05	977.30	5.0*
Full	13,373.61	1,491.09	9.0*
Group A: CMS_MIS (Info Tech)	39,333.71	1,674.23	23.5*
Group B Library	-10,608.06	2,434.82	-4.4*
Group C: ACC_BUS_MGT (Business)	30,666.02	1,485.67	20.6*
Group D: ECO_MPH_PAD	12,222.64	1,724.95	7.1*
Group E: BIO_CHE_ENS_MAT_CLS	3,343.47	1,355.18	2.5
Group F: COM_EDL_HDC_HMS_PSY_SOA_SWK_TEP	1,083.51	1,200.66	0.9
Group G: CRJ_LES_POS	8,318.66	1,518.79	5.5*
Model Fit: Adjusted R ² =0.905 F-Statistic=155.78			
Notes: +The baseline group is assistant professors in group H—African American Studies, English, History, Individual Option, Philosophy, Visual Arts and Women’s Studies.			
* Significant at 0.01 level or below.			

**Table 17:
AY06-07 Adjusted Salary Regression Results Without Influential Observations
And With Gender and Race (N=163)**

	Estimated Coefficient	Standard Error	t-value
Constant ⁺	43,643.65	960.36	45.4*
Years In Rank	451.72	79.22	5.7*
Associate	4,948.07	922.82	5.4*
Full	13,045.49	1,399.05	9.3*
Group A: CMS_MIS (Info Tech)	40,026.43	1,619.94	24.7*
Group B Library	-9,513.16	2,306.12	-4.1*
Group C: ACC_BUS_MGT (Business)	331,385.27	1,401.73	22.4*
Group D: ECO_MPH_PAD	12,065.27	1,618.85	7.4*
Group E: BIO_CHE_ENS_MAT_CLS	3,927.85	1,282.59	3.1*
Group F: COM_EDL_HDC_HMS_PSY_SOA_SWK_TEP	1,593.91	1,132.69	1.4
Group G: CRJ_LES_POS	8,229.83	1,424.12	5.8*
Gender (FEMALE =1)	-639.56	816.64	-0.9
Race (BLACK, HISPANIC, NATIVE IN =1)	6,292.46	1,321.36	4.8*
Model Fit: Adjusted R ² =0.917 F-Statistic=149.74			
Notes: +The baseline group is White or Asian, male assistant professors in group H—African American Studies, English, History, Individual Option, Philosophy, Visual Arts and Women’s Studies.			
* Significant at 0.01 level or below.			

**Table 18:
Budget Impact of 92.5 Percent Salary Adjustment Program**

College	Number of Faculty with Adjustments	Percent of Faculty w/ Adjustments	Total Adjustments	Adjustment as Percent of Total AY05-06 Salaries
BUS (n=31)	6	19.3%	\$9,914	0.38%
EHS (n=21)	0	0.0%	\$0	0.00%
LAS (n=76)	9	11.8%	\$12,266	0.31%
LIB (n=5)	1	20.0%	\$616	0.34%
PAA (n=30)	5	16.7%	\$7,320	0.42%
Total (n=163)	21	12.9%	\$30,116	0.31%