

2003

Salary Equity  
Analysis

University of California, Santa Barbara

Office of the Executive Vice Chancellor

## Introduction

In response to several previous studies on salary equity,<sup>1</sup> the administration has begun to analyze academic salaries to examine issues of equity, especially with respect to gender and ethnicity. Best practices for analyzing the data have been determined from other studies and applied here.

## Salary Data

The 2003 pay equity study at UC Santa Barbara was conducted for ladder rank faculty based on October 1, 2003 Payroll/Personnel data combined with data from the Office of Academic Personnel. The data include only ladder rank faculty members who were on active pay status. Every effort is made to assure accuracy in the input data.

The data are considered for the University of California Santa Barbara as a whole; and they are also divided into Colleges/Divisions: specifically, the Divisions of Humanities and Fine Arts (HFA); Mathematics, Physical and Life Sciences (MLPS); and Social Sciences (DSS) in the College of Letters and Science; the Gevirtz Graduate School of Education (GGSE), the Donald Bren School of Environmental Science and Engineering (BREN) and the College of Engineering (ENGR).

For purposes of analysis, the salary data for the campus and each division/college are divided into categories of White Males, Women and Male Minorities. The use of the term "minority" here includes Black/African-American, Asian/Pacific Islander, Native American, and Hispanic regardless of citizenship or country of origin. This is consistent with federal affirmative action definitions.

## Methodology and Results

The pay equity study employed here applies the methodology recommended by the American Association of University Professors (AAUP – see, for instance, <http://www.aaup.org>). A similar methodology has been followed by the University of California Irvine (see, for instance, <http://www.ap.uci.edu/Equity/studies/index.html>). The methodology is set up to test whether women and minority faculty members are paid differently than their white male counterparts. The methodology does not include any subjective measures of quality or merit. Therefore it is expected that some faculty members will have results that are not explained well by the methodology, which relies exclusively on quantifiable objective measures. Nonetheless, it serves as a tool for identifying broad trends.

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<sup>1</sup> In February 1996, The Associate Vice Chancellor for Academic Personnel formed a Gender Equity Advisory Group, which reviewed and reported on salary equity study methods (Zelmanowitz to Crawford, 5/28/98). In April 2002, the Associate Vice Chancellors and Divisional Chair of the Academic Senate constituted a Salary Equity Advisory Group to develop a set of recommendations on salary equity analysis, which it reported in July 2002.

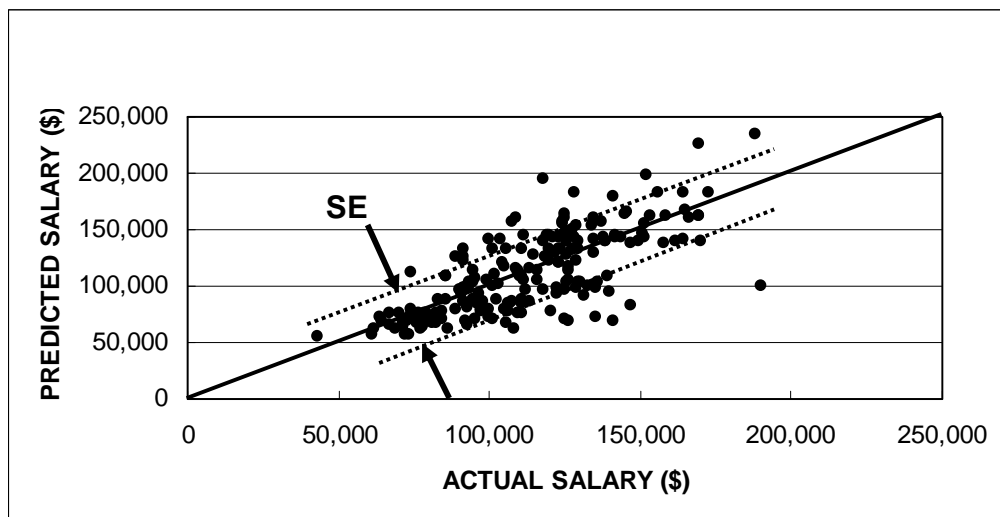
The first step is to fit the salary data for white males on the campus or in a College/Division by a linear regression analysis to an equation of the form:

$$\text{SALARY} = \mathbf{A} \times (\text{Appointment year}) + \mathbf{B} \times (\text{Birth Year}) + \mathbf{C} \times (\text{Degree Year}) + \mathbf{D}$$

where **A**, **B**, **C** and **D** are regression coefficients. For most academic units, these background factors do a very good job predicting the salary of white males (with a goodness of fit parameter,  $r^2$ , of 0.50 to 0.90).

A standard error (SE) on SALARY is also calculated as part of the regression analysis. Since the salary is not entirely captured by the three independent variables (Appointment, Birth and Degree years), the standard error reflects the uncertainty of the predicted salary.

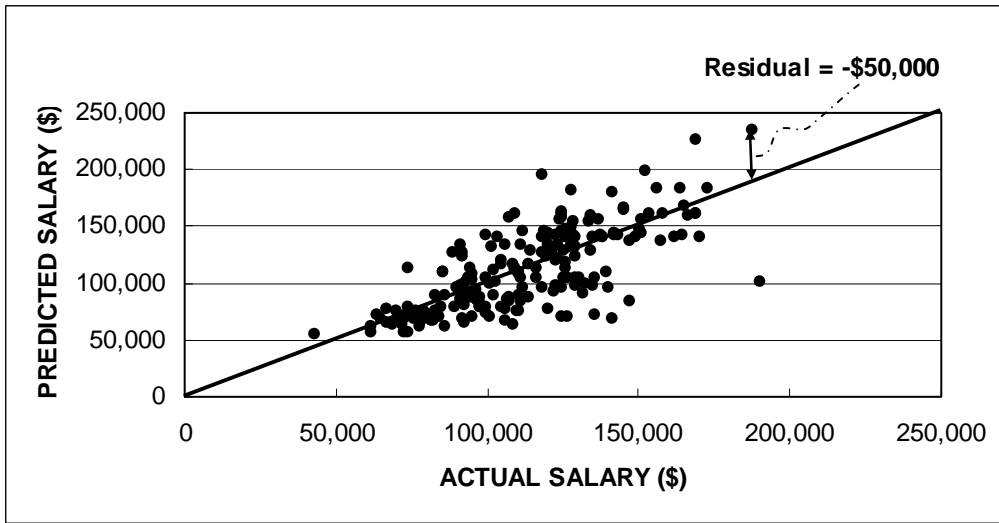
The example below shows a plot of PREDICTED versus ACTUAL SALARY, with the bounds (dotted lines) corresponding to the standard error (SE):



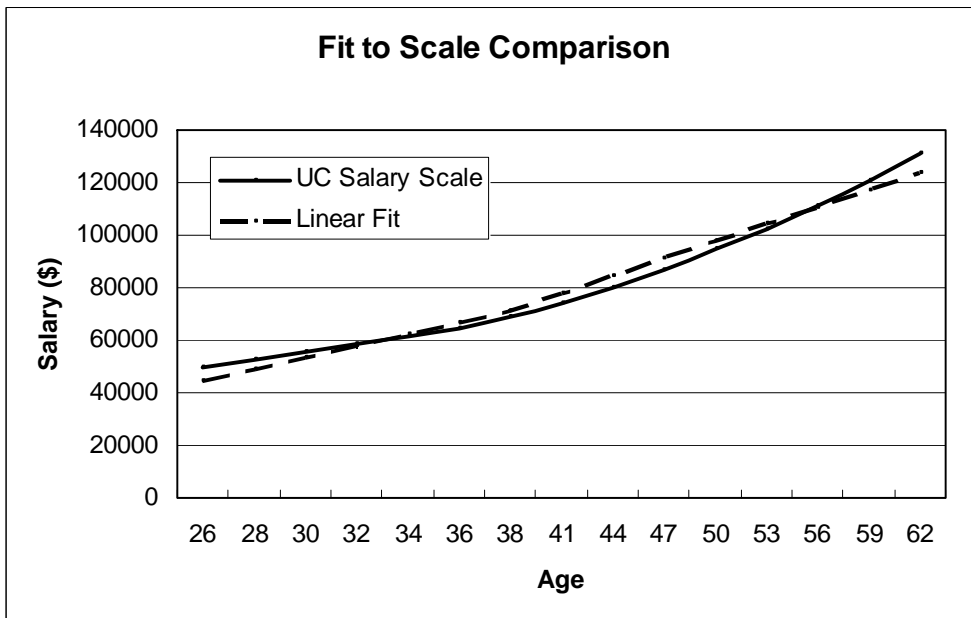
As can be seen, although the linear regression predicts the broad trend, it is imperfect, with data falling off the solid line of “ACTUAL SALARY = PREDICTED SALARY.” Most, but not all, of the data fall within one standard error of the line.

In the next step, residuals are calculated for the white male population, and then for women (white and minority) and male minority faculty members on the campus and in the each College/Division. The residual is the difference between actual salary and salary predicted by the regression equation. A negative residual indicates that the actual salary is lower than the amount predicted for a white male faculty in the same academic unit with the same attributes. A positive residual indicates that the salary is higher than the predicted value.

The example below shows the residual value of one data point, where the faculty member’s actual salary is \$50,000 less than the predicted salary:



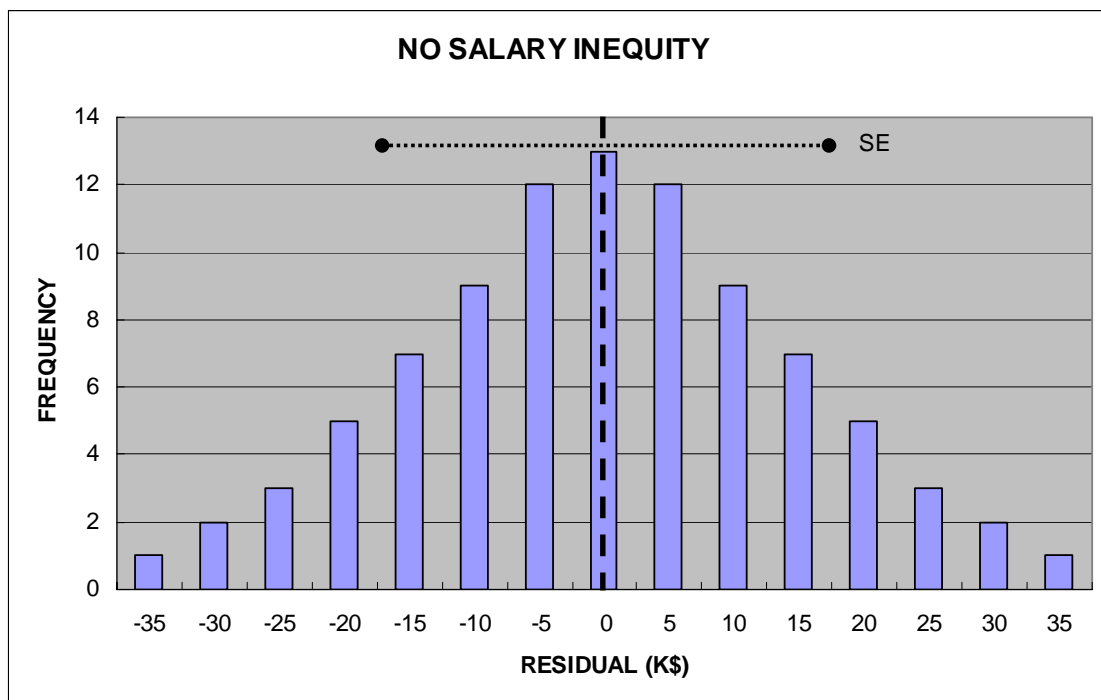
It should be noted that the UC salary scale increases with rank and step (and therefore normative length of appointment/age) faster than a linear scale. Hence, a linear fit to the UC salary scale produces a slight positive residual for early and late career appointments and slight negative residual in between as shown below:



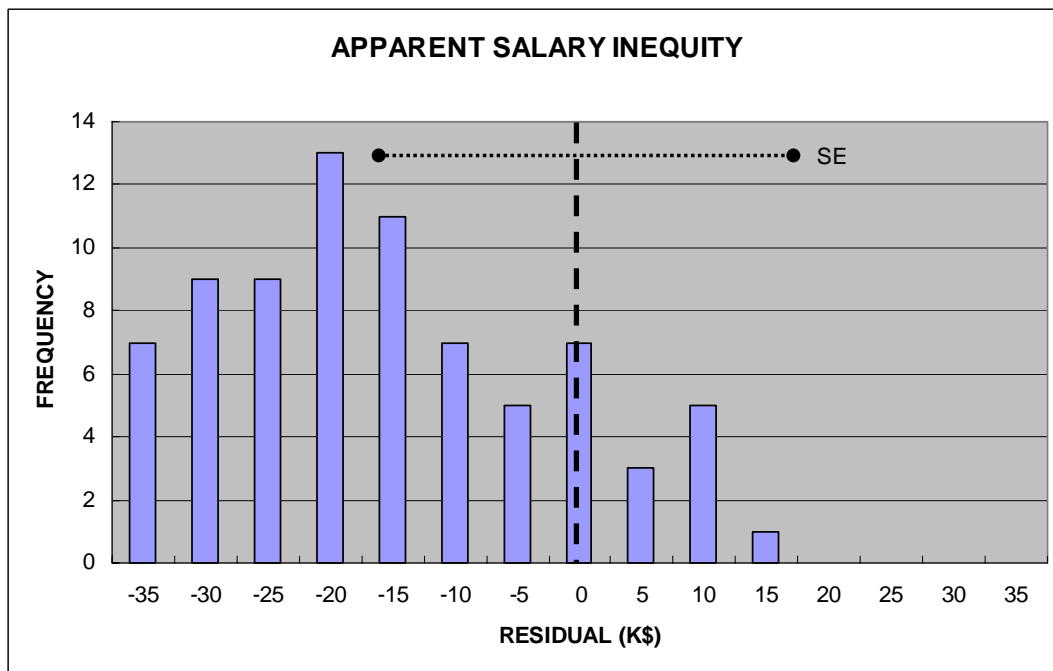
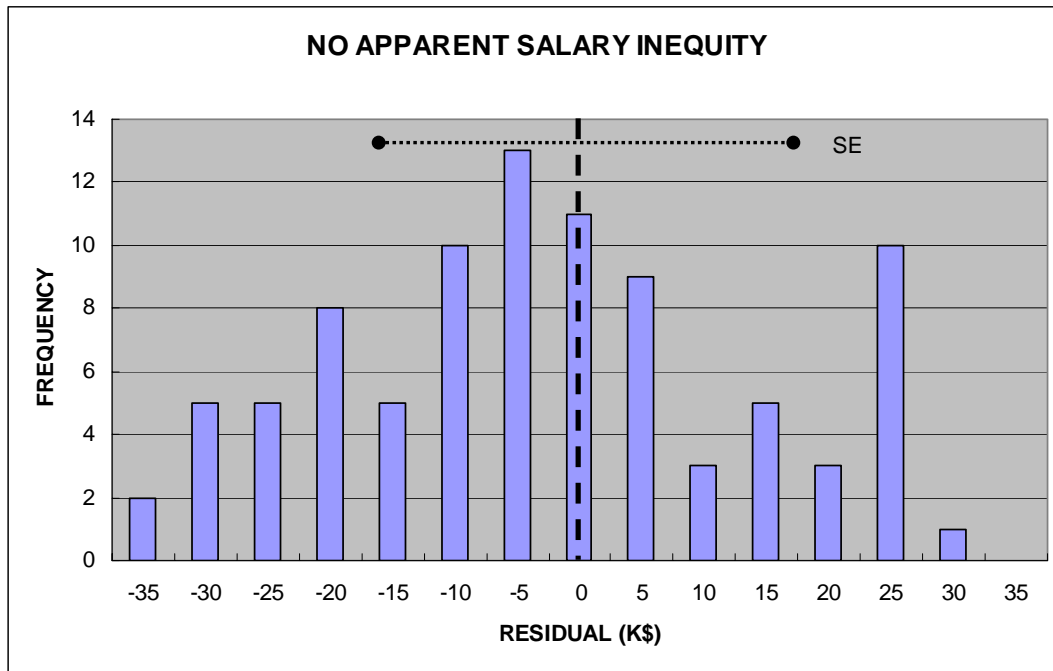
As a final step, the residuals for each population (white males, women, male minorities) for UCSB and for each College/Division are plotted on a frequency histogram (the number of times a residual is calculated in a particular range of values), along with a line indicating the range of the standard error (SE) on salary. The distribution provides some measure of the salary equity – or inequity – for the campus or College/Division.

Typically, for a large population of faculty members in a College or Division, the residual distribution for the white male population will be symmetric and peaked about the origin (a residual of 0), and most of the population will fall within the standard error (SE). The residual frequency will fall off with greater residual value on both sides of the origin, and a relatively small number of faculty (low frequency) will fall outside of the SE at both the low (negative residual) and high (positive residual) ends.

If there is salary equity in the population, the residual distributions for women and minorities in the College/Division should show a similar distribution to the white male distribution. An example is given below; here there are 13 faculty whose salaries fall within \$5000 of the predicted salary (residuals less than \$5000) and 1 each whose salaries are more than and less than \$35,000 of the predicted value. Most of the faculty have salaries which fall within \$18,000, the standard error (SE) of the predicted amount.



However, in all cases (white males, women and minorities), for a smaller population of faculty, the distributions may not be symmetric, nor peaked at the origin. Even in these cases, the degree of salary equity should be reflected by the extent to which the residuals fall within a standard error of the origin. Two examples are shown below: one in which there is no apparent salary inequity and one in which there is:



Residual histograms for white male, women and male minority populations for the campus as a whole and for each of the Colleges/Divisions are given in Figures 1-7. Residuals are given in units of k\$ = \$1000. Note the scale change on the Residual scale for the campus versus Division/College, since the variation across the campus is larger than it is for a given Division/College. In the case of Social Sciences, two analyses were performed, one with and one without the Department of Economics included in the analysis.

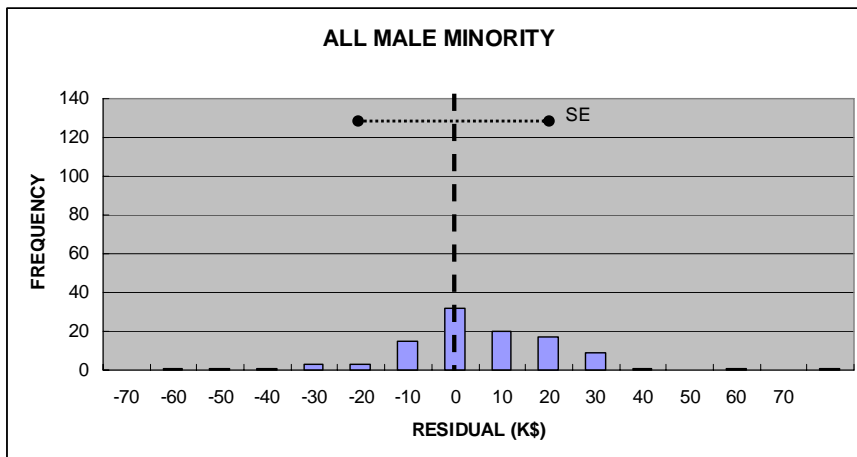
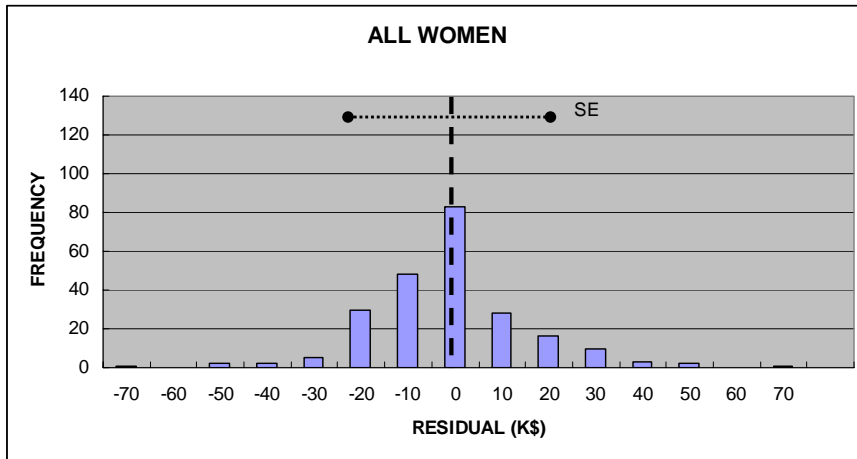
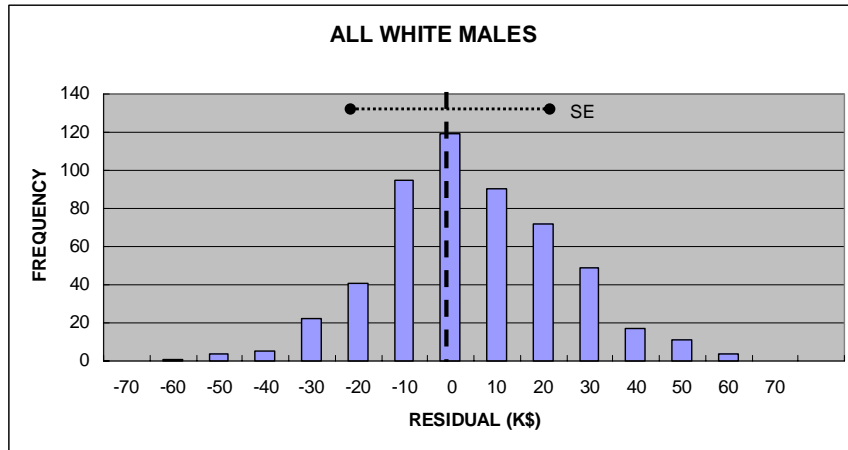


Figure 1 -- Residual histograms for UCSB for white males, women and male minority faculty.

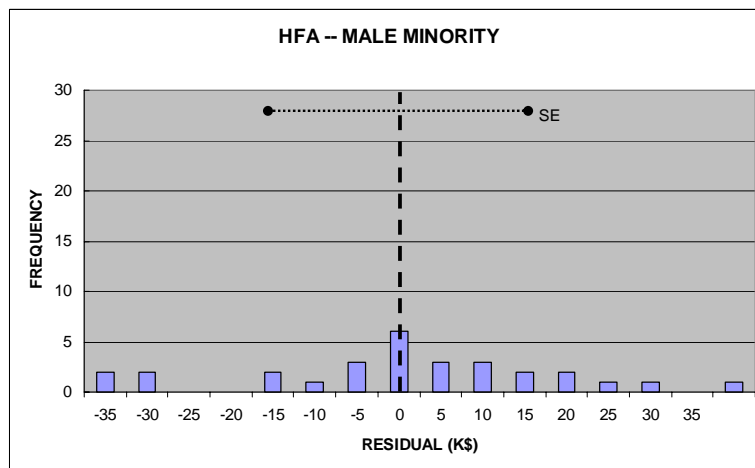
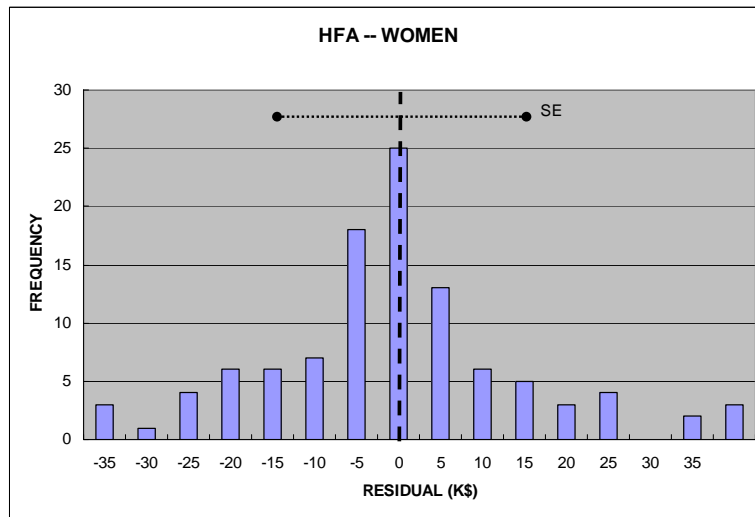
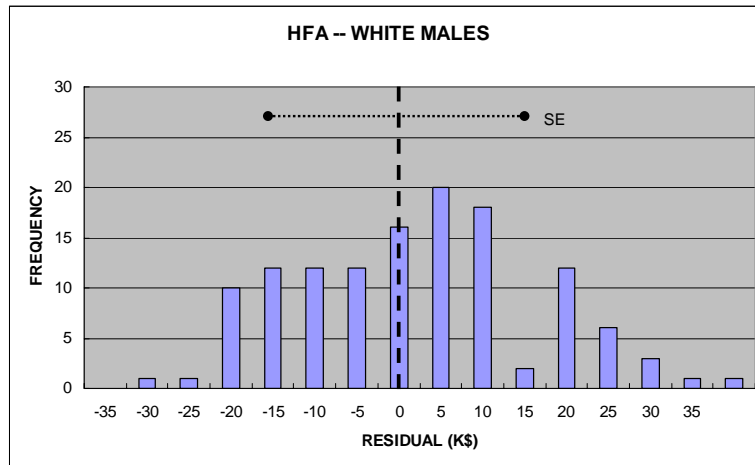


Figure 2 – Residual Histograms for HFA for white males, women and male minority faculty.

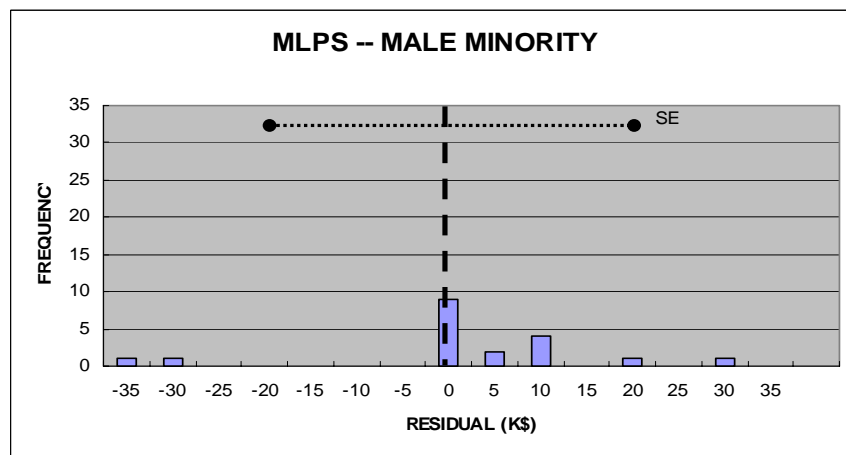
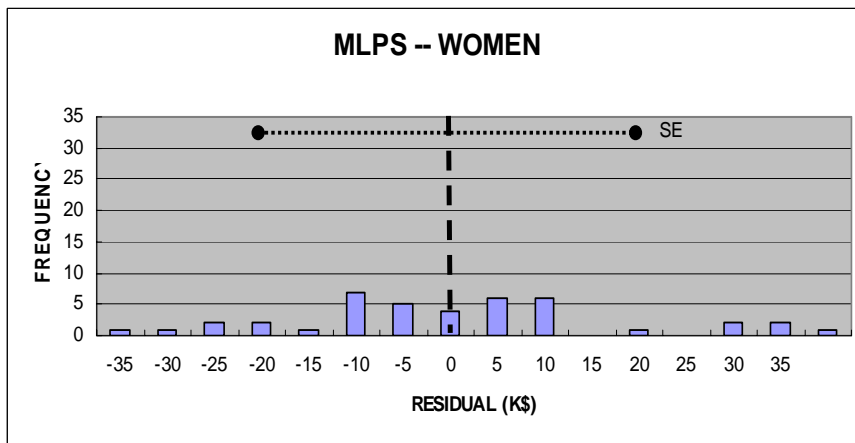
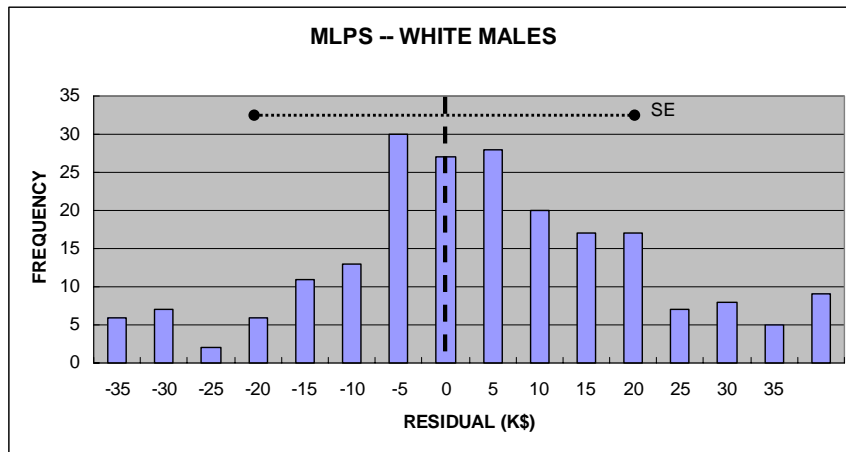


Figure 3 – Residual Histograms for MLPS for white males, women and male minority faculty.

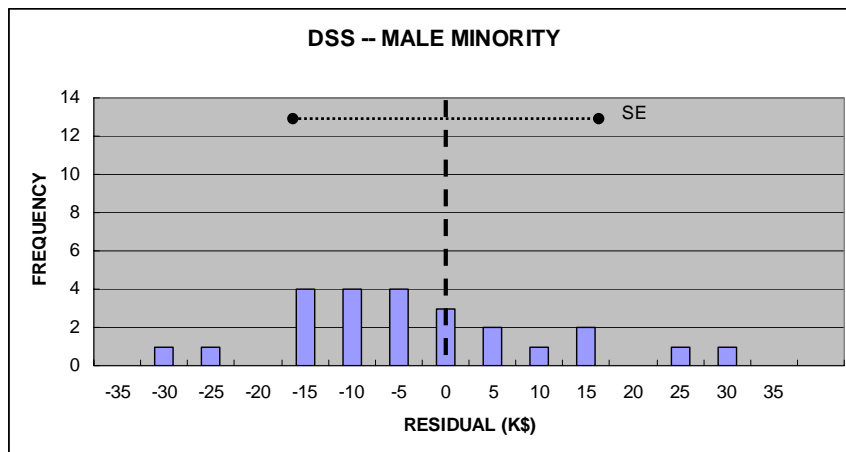
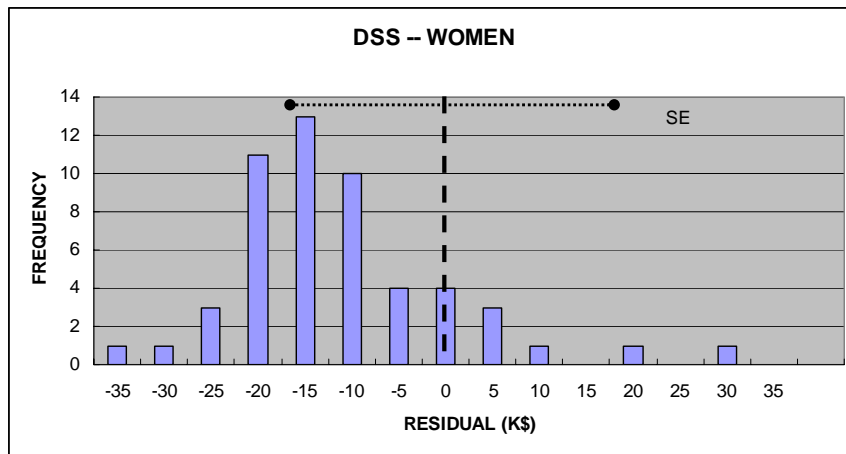
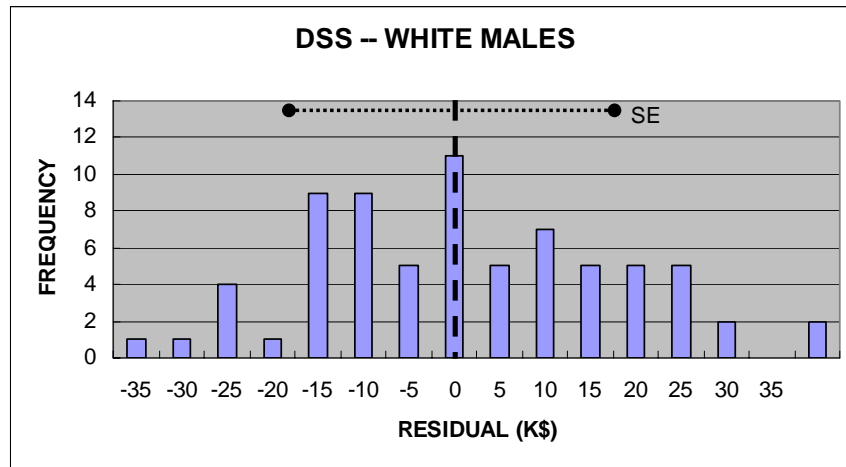


Figure 4a – Residual histograms for DSS for white males, women and male minority faculty.

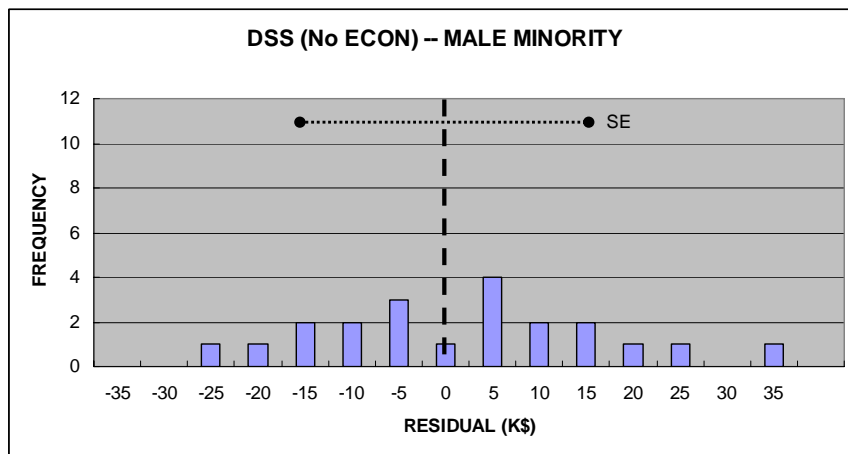
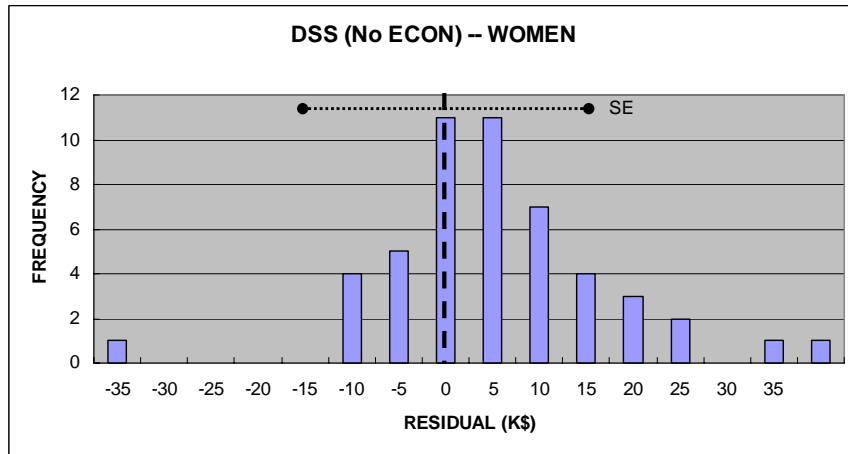
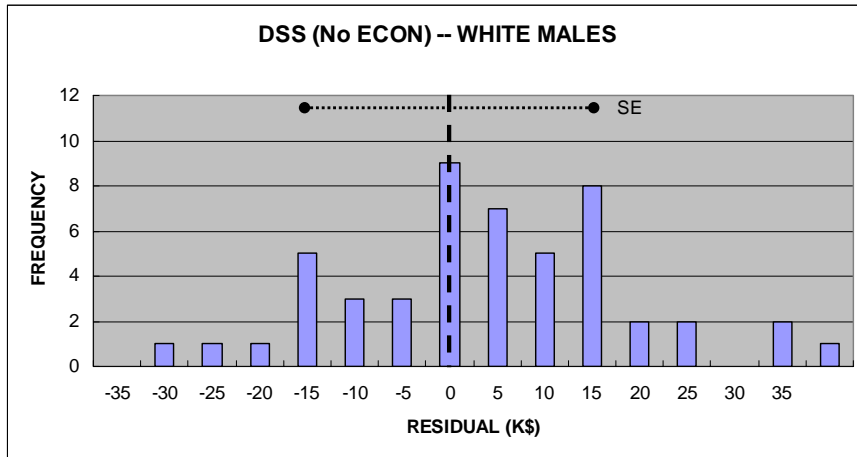


Figure 4b – Residual histograms for DSS for white males, women and male minority faculty (without Economics in the data base)

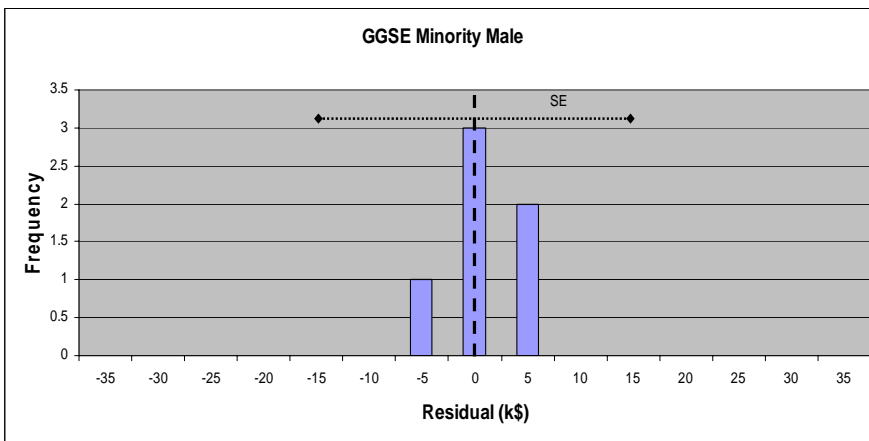
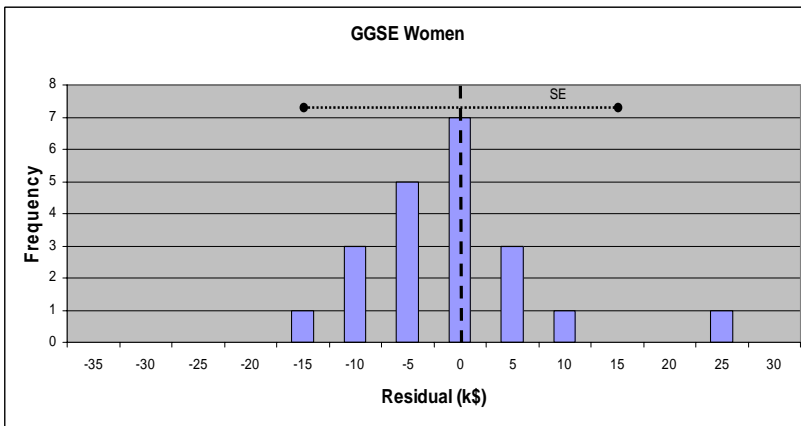
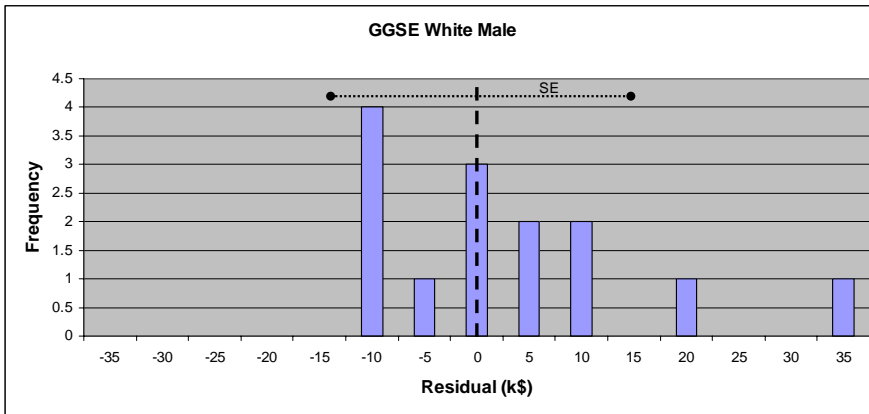


Figure 4 – Residual Histograms for GGSE for white males, women and minority faculty.

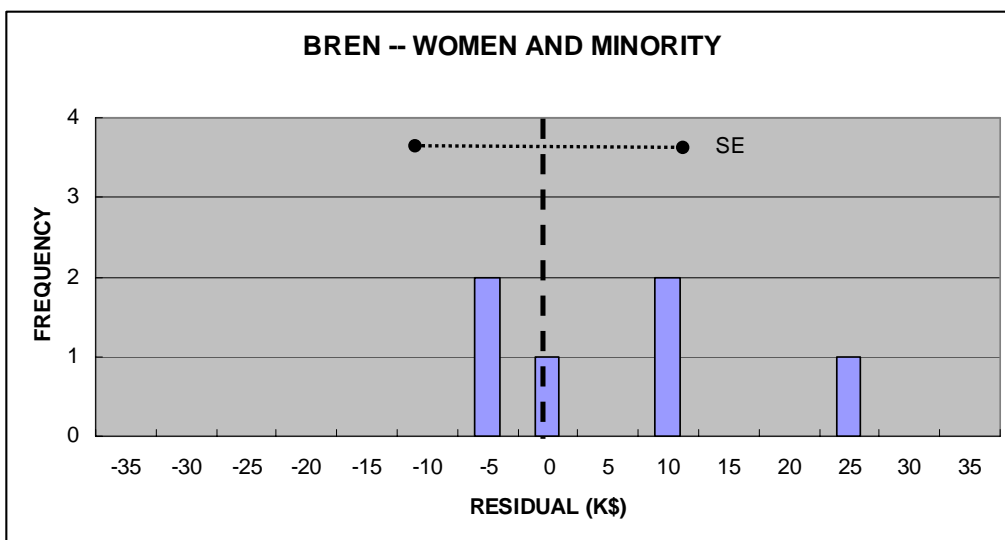
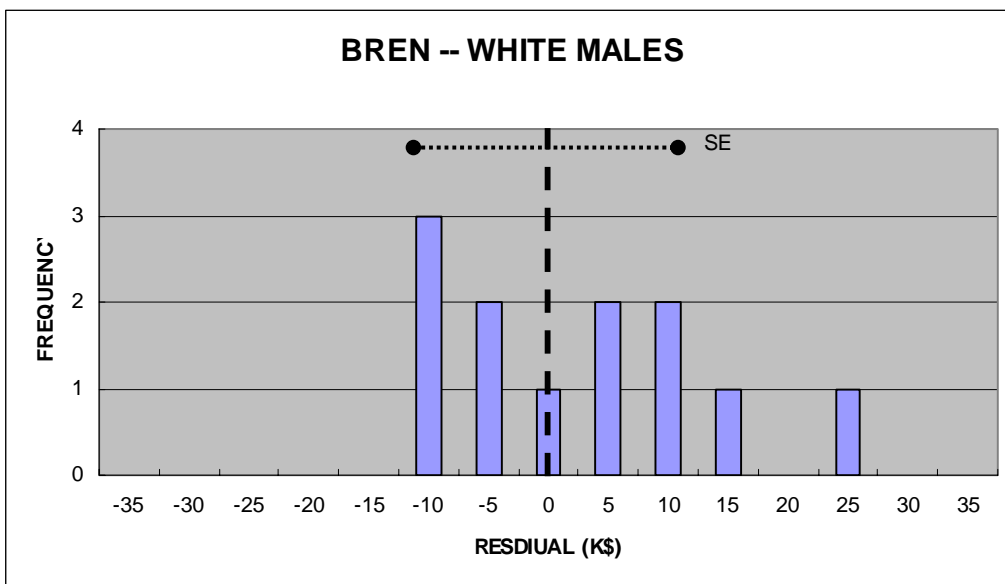


Figure 6 – Residual Histograms for BREN for white males, women and minority faculty.

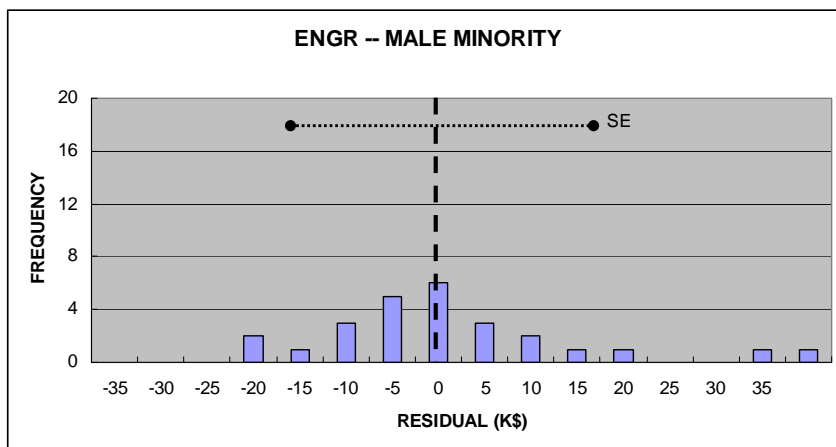
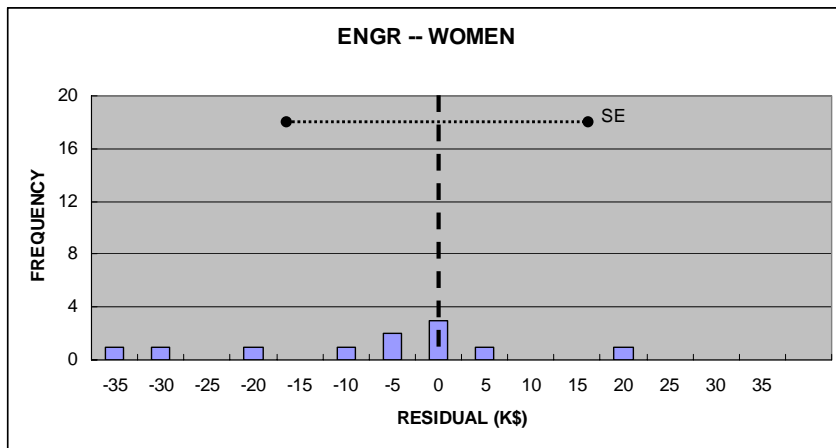
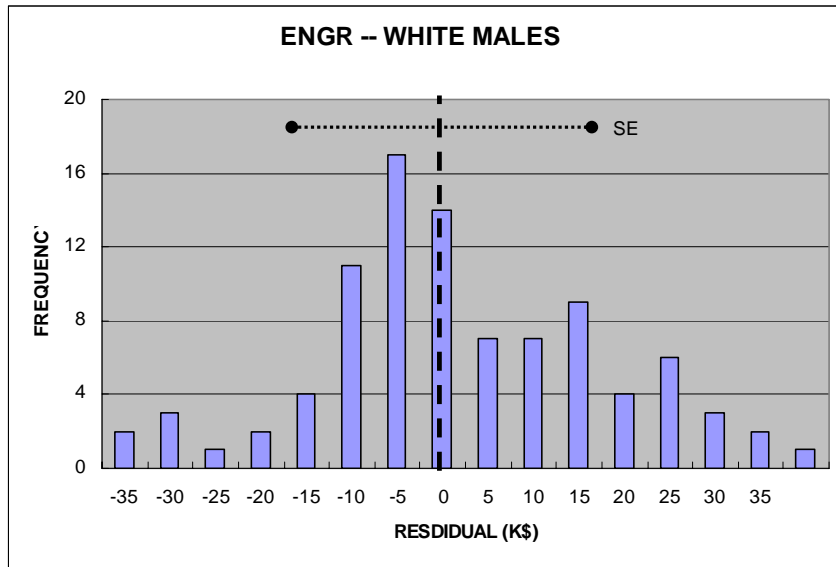


Figure 7 – Residual Histograms for ENGR for white males, women and male minority faculty.