THE MODEL OF GRADED SALARY INCREASE A SOLUTION TO THE PROBLEM OF SALARY COMPRESSION AND INVERSION IN FACULTY SALARIES

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ABSTRACT

This study tested a model of graded salary increase (MGSI) as a solution to the problem of salary compression and inversion in faculty salaries. The model ties salary increase rates with tenure of faculty members. Based on the faculty salary data collected by College and University Professional Association for Human Resources (CUPA-HR) between 2005 and 2014, we found that MGSI solves the problem of salary compression and inversion.

Keywords: *equity, salary compression, salary inversion, faculty salaries.*

INTRODUCTION

Equity is an important issue in pay determination. John Adams' Equity Theory (1963) posits that employees constantly compare how much they gain from a job with how much effort, time and experience they input in the job. A perception of over-input and under-payment will lead to negative feelings and such behavioral consequences as reduction of work effort, expression of grievance, making requests for higher pay or simply resigning from the job. A major component of job input is employee's work experience. People with more work experience tend to perform better than those without work experience. Since work experience is largely related to employee's tenure on a job within an organization, it is a common thought that tenure should be compensated. However, rewarding employees' tenure is not easy to practice in spite of its obvious benefits for employee motivation. In reality, senior employees often find themselves getting paid similar to new employees. Moreover in some organizations and occupations, new employees get paid more than senior employees. The former phenomenon is termed as salary compression and the latter is termed as salary inversion.

Various studies reported the problems of salary compression and salary inversion in faculty salaries (e.g. Brown & Woodbury, 1998; Duncan, Krall, Maxcy, & Prus, 2004; Finch, Allen & Weeks, 2010; Jacobs & Herring, III, 1987; Lillydahl & Singell, 1992; Martinello, 2009). Brown & Woodbury (1998) discovered a negative relationship between faculty job tenure and their financial return based on personnel data between 1981 and 1990 at Michigan State University. Data from a national survey to AACSB-accredited business schools showed replacement hires for vacant positions of assistant professors and associate professors require an average salary increase between $10,000 and $30,000 (Finch, et al, 2010). The salary compression and inversion problems are usually more serious during the first several years of faculty tenure. Jacobs & Herring, III (1987) found a strong negative relationship between experience and pay for assistant professors but a positive relationship between experience and

Pay for associate professors and full professors. It seems that productivity of professors becomes a more dominant factor in pay determination as professors' academic tenure grows (Jacobs & Herring, III, 1987). Ransom (1993) observed a u-shaped relationship between faculty seniority and their pay. Specifically, pay is negatively related to faculty seniority for new assistant professors and assistant professors. However, the relationship between the two becomes positive for associate and full professors. This u-shaped pattern was also observed by other studies (e.g. Duncan, et. al., 2004; Martinello, 2009).

Faculty salary compression and inversion are believed to result from higher growth rate of entry salaries and lower salary increase rate of long term employees (Gomez-Mejia & Balkin, 1987). Entry salaries are tied to the market rates. Market rates are largely determined by the balance between supply and demand of faculty. Academic disciplines experiencing the biggest imbalance between faculty demand and supply (e.g. business and engineering) usually suffer the most from the salary compression and inversion. On the other hand, salary increases for employed faculty are mostly adjustments of cost of living, which are limited by the annual budgets of the universities. Because of a short supply and a rising demand for faculty and other priorities of annual budgets, entry salaries for faculty grow much faster than salaries of employed faculty (Finch, et. al., 2010; Gomez-Mejia & Balkin, 1987).

As suggested by the Equity theory (Adams, 1963), salary compression and inversion could lead to negative attitudinal and behavioral consequences. It is no exception for faculty members. Previous studies revealed that faculty with compressed pay tend to exert less work effort, pay less attention to work quality, request higher pay, engage in unionization activities, spend more time on profitable work outside the employment (e.g. consulting job), create difficulties in work for more highly paid junior faculty members, demonstrate unwillingness to serve on committees or leave the university for a better paid position in another university or in private industry (Daniels, Shane, & Wall, 1984; Huseman, McHone, Rungeling, 1996).

Various approaches have been created to cope with the problem of salary compression and inversion. Most of them focus on periodical salary adjustment. The amount of salary adjustment is usually determined by one's pay deviance from the national level. Many experts in employee compensation suggest extracting faculty performance level from faculty pay while calculating pay deviance (Duncan, et. al., 2004). Huseman, et al. (1996) presented a model of salary adjustment, which was built on four basic blocks: college-based model, inclusion of national salary standards in calculation, and incorporation of employee performance and tenure. In spite of its wide practice, salary adjustment is obviously an aftermath solution to salary compression and inversion. It requires enormous time and effort to complete the whole administration process periodically. One IOMA's report on salary survey claimed such process could require at least 2 years (IOMA, 2002). For that reason, it is necessary to explore approaches aimed to prevent salary compression/inversion from happening.

When salary compression/inversion occurs, new faculty members are overpaid whereas senior faculty members are underpaid. A general HR practice to cope with the overpaying and underpaying issues is to reduce the salary increase rate of those who are overpaid and improve the salary increase rate of those who are underpaid (Dessler, 2012; IOMA, 2008). Along the same line of this thought, applying lower rates of salary increase to junior faculty members and higher rates of salary increase to senior faculty members will likely solve the problem of salary compression/inversion. This paper proposes a model of graded salary increase (MGSI), which is aimed to tie salary increase rates with tenure of faculty members. As previous section mentions, faculty salary compression and inversion most likely occur during the first several years of employment and among assistant professors (Duncan, et. al., 2004; Martinello, 2009; Ransom, 1993). Since the standard period for an assistant professor to be promoted to associate professor is 6 years, the proposed model merely covers the first six years of employment, which includes five processes of salary increase.

The Model of Graded Salary Increase

Traditionally, employees' salaries increase by following the following formula:

Salary = (1+Salary Increase Rate) * Salary of the Previous Year

Unlike traditional model of salary increase, the Model of Graded Salary Increase ties salary increase rate to employees' tenure. To achieve this goal, tenure-based constants can be used for creation of graded salary increase rates. The median point of 5 years of salary increase is the third year (which is the fourth year of the employment). By assigning constant "1" to the median point, constants for salary increase rates from Year 1 to Year 5 should be 0, 0.5, 1, 1.5 and 2. Here is the mathematic formula for this model:

Salary = (1+Salary Increase Rate*Tenure Constant) * Salary of the Previous Year

The model proposed in this paper focuses on tenure only. Other factors such as performance level can be built into the model by creating an overall product of the constants of different factors, such as tenure and performance level.

METHODOLOGY

Data

The salary data are gathered from the annual executive reports of "Faculty in Higher Education Salary Survey" by College and University Professional Association for Human Resources (CUPA-HR) from 2005 to 2014 (CUPA-HR, 2014). The average annual salaries of full professor, associate professor, assistant professor and new assistant professor are reported in the following disciplines:

1. Agriculture, Agriculture Operations, and Related Sciences
2. Natural Resources and Conservation
3. Architecture and Related Services
4. Area, Ethnic, Cultural, Gender and Group Studies
5. Communication, Journalism and Related Programs
6. Communications Technologies/Technicians and Support Services
7. Computer and Information Sciences and Support Services
8. Education
9. Engineering
10. Engineering Technologies and Engineering Related Fields
11. Foreign Languages, Literatures, and Linguistics
12. Family and Consumer Sciences/Human Sciences
13. Legal Professions and Studies
14. English Language and Literature/Letters
15. Liberal Arts and Sciences, General Studies and Humanities

16. Library Sciences
17. Biological and Biomedical Sciences
18. Mathematics and Statistics
19. Multi/Interdisciplinary studies
20. Parks, Recreation, Leisure and Fitness Studies
21. Philosophy and Religious Studies
22. Theology and Religious Vocations
23. Physical Sciences
24. Psychology
25. Homeland Security, Law Enforcement, Firefighting and Related Protc Servs
26. Public Administration and Social Service Professions
27. Social Science
28. Visual and Performing Arts
29. Health Professions and Related Programs
30. Business, Management, Marketing, and Related Support Services
31. History General

Statistical Methods

ANOVA tests will be used to compare the means of the salaries of new assistant professors with those of full professors, associate professors and assistant professors in each year from 2005-2014. If the means of the salaries of new assistant professors are not significantly different from those of professors of other ranks, then salary compression exists.

To demonstrate how the Model of Graded Salary Increase solves the problem of salary compression and inversion, two steps will be taken. First, the salaries of new assistant professors hired in different years from 2005 to 2013 will be calculated for each of the years following their employment. Two formulas will be used for calculation: one follows the Model of Graded Salary Increase and the other one follows the traditional model of straight forward salary increase. 2.36%, the average of the median salary increase rates for assistant professors from the year 2006 to 2014 (CUPA-HR, 2015), will be used for calculation as the salary increase rate for those years. Appendix A is an example of calculation of salary increases using two methods with the salary data of assistant professors in the area of agriculture/agricultural operations/the related sciences. Second, salaries of assistant professors in their last year of the tenure track (6th year) will be compared to salaries of junior assistant professors in the same year. The model of graded salary increase is effective if senior assistant professors have higher salaries than junior assistant professors by the end of their tenure track. Independent-samples t test will be used to test the mean differences of salaries of assistant professors in their 6th year and the salaries of assistant Professors in their 1st, 2nd, 3rd, 4th, and 5th year.

RESULTS

The ANOVA tests of mean salaries of professors of different ranks showed that the mean salaries of new assistant professors in 31 disciplines are significantly lower than those of full professors and those of associate professors (See Table 1). The mean salaries of new assistant professors are not significantly different from those of assistant professors in all nine years (2005-2014). This result demonstrated existence of salary compression among assistant professors. In six of the nine years, the entry salaries of new assistant professors are higher than the average salaries of assistant professors, which implied existence of salary inversion during the years in study.

Table 1
MEAN DIFFERENCES BETWEEN NEW ASSISTANT PROFESSOR (NASTP) AND ASSISTANT PROFESSOR (ASTP), ASSOCIATE PROFESSOR (ASOP) AND FULL PROFESSOR (FP).

Year	Mean Differences NASTP – ASTP	Mean Differences NASTP – ASOP	Mean Differences NASTP – FP
2005-2006	-$286	-$10,058**	-$27,492**
2006-2007	$160	-$9,916**	-$27,955**
2007-2008	$-456	-$11,297**	-$30,392**
2008-2009	$-379	-$11,463**	-$31,599**
2009-2010	$438	-$10,462**	-$30,555**
2010-2011	$667	-$11,094**	-$31,673**
2011-2012	$1,100	-$10,041**	-$30,716**
2012-2013	$717	-$10,023**	-$30,692**
2013-2014	$759	-$10,130*	-$31,551**

Note: * p<.05; ** p<.01

Table 2 & 3 display the first six years' salaries of new assistant professors hired in different years from 2005 to 2013. Table 2 displays the results obtained through calculations following the traditional model. Table 3 displays the results obtained through calculations following the Model of Graded Salary Increase. The results of the independent-samples t tests showed that the mean difference of the salaries of assistant professors in their 6^{th} year and those of assistant professors in their 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, and 5^{th} year under the traditional model was -$622.25 (t=-.92, p>.05); the mean difference of the salaries calculated following the Model of Graded Salary Increase was $773.80 (t=1.12, p>.05) (See Table 4). Although not statistically significant, the results indicated that under the traditional model, salaries of senior assistant professors could not catch up to the salaries of junior assistant professors by the end of their tenure track; under the Model of Graded of Salary Increase, salaries of senior assistant professors did catch up and surpass the salaries of junior assistant professors by the end of their tenure track.

Table 2
ANNUAL MEAN SALARIES OF NEW ASSISTANT PROFESSORS (NASTP) HIRED IN YEAR 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 AND 2013 CALCULATED BY FOLLOWING THE TRADITIONAL MODEL OF SALARY INCREASE.

Year	NASTPs Hired in 2005	NASTPs Hired in 2006	NASTPs Hired in 2007	NASTPs Hired in 2008	NASTPs Hired in 2009	NASTPs Hired in 2010	NASTPs Hired in 2011	NASTPs Hired in 2012	NASTPs Hired in 2013
2005	Y1 $52,209								
2006	Y2 $53,441	Y1 $54,278							
2007	Y3 $54,702	Y2 $55,559	Y1 $55,909						
2008	Y4 $55,993	Y3 $56,870	Y2 $57,229	Y1 $57,969					
2009	Y5 $57,314	Y4 $58,212	Y3 $58,580	Y2 $59,337	Y1 $59,325				
2010	Y6 $58,667	Y5 $59,586	Y4 $59,963	Y3 $60,737	Y2 $60,725	Y1 $60,049			
2011		Y6 $60,992	Y5 $61,378	Y4 $62,170	Y3 $62,158	Y2 $61,466	Y1 $61,721		
2012			Y6 $62,827	Y5 $63,637	Y4 $63,625	Y3 $62,917	Y2 $63,178	Y1 $63,311	
2013				Y6 $65,139	Y5 $65,127	Y4 $64,401	Y3 $64,669	Y2 $64,805	Y1 $64,944

Table 3
ANNUAL MEAN SALARIES OF NEW ASSISTANT PROFESSORS (NASTP) HIRED IN YEAR 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 AND 2013 CALCULATED BY FOLLOWING THE MODEL OF GRADED SALARY INCREASE.

Year	NASTPs Hired in 2005	NASTPs Hired in 2006	NASTPs Hired in 2007	NASTPs Hired in 2008	NASTPs Hired in 2009	NASTPs Hired in 2010	NASTPs Hired in 2011	NASTPs Hired in 2012	NASTPs Hired in 2013
2005	Y1 $52,209								
2006	Y2 $52,209	Y1 $54,278							
2007	Y3 $52,825	Y2 $54,278	Y1 $55,909						
2008	Y4 $54,072	Y3 $54,919	Y2 $55,909	Y1 $57,969					
2009	Y5 $55,986	Y4 $56,215	Y3 $56,569	Y2 $57,969	Y1 $59,325				
2010	Y6 $58,629	Y5 $58,205	Y4 $57,904	Y3 $58,653	Y2 $59,325	Y1 $60,049			
2011		Y6 $60,952	Y5 $59,954	Y4 $60,037	Y3 $60,025	Y2 $60,049	Y1 $61,721		
2012			Y6 $62,784	Y5 $62,162	Y4 $61,442	Y3 $60,758	Y2 $61,721	Y1 $63,311	
2013				Y6 $65,096	Y5 $63,617	Y4 $62,192	Y3 $62,449	Y2 $63,311	Y1 $64,944

Table 4
INDEPENDENT-SAMPLES T TESTS OF SALARIES OF ASSISTANT PROFESSORS IN THE 6TH YEAR AND SALARIES OF ASSISTANT PROFESSORS IN THE 1st, 2nd, 3th, 4th, AND 5th YEAR.

Year	Salaries Calculated Based on the Traditional Model of Salary Increase				Salaries Calculated Based on the Graded Model of Salary Increase			
2010	AP (6th Y)	$58,667	AP (5th Y)	$59,586	AP (6th Y)	$58,629	AP (5th Y)	$58,205
		$58,667	AP (4th Y)	$59,963		$58,629	AP (4th Y)	$57,904
		$58,667	AP (3rd Y)	$60,737		$58,629	AP (3rd Y)	$58,653
		$58,667	AP (2nd Y)	$60,725		$58,629	AP (2nd Y)	$59,325
		$58,667	AP (1st Y)	$60,049		$58,629	AP (1st Y)	$60,049
2011	AP (6th Y)	$60,992	AP (5th Y)	$61,378	AP (6th Y)	$60,952	AP (5th Y)	$59,954
		$60,992	AP (4th Y)	$62,173		$60,952	AP (4th Y)	$60,037
		$60,992	AP (3rd Y)	$62,158		$60,952	AP (3rd Y)	$60,025
		$60,992	AP (2nd Y)	$61,466		$60,952	AP (2nd Y)	$60,049
		$60,992	AP (1st Y)	$61,721		$60,952	AP (1st Y)	$61,721
2012	AP (6th Y)	$62,827	AP (5th Y)	$63,637	AP (6th Y)	$62,784	AP (5th Y)	$62,162
		$62,827	AP (4th Y)	$63,625		$62,784	AP (4th Y)	$61,442
		$62,827	AP (3rd Y)	$62,917		$62,784	AP (3rd Y)	$60,758
		$62,827	AP (2nd Y)	$63,178		$62,784	AP (2nd Y)	$61,721
		$62,827	AP (1st Y)	$63,311		$62,784	AP (1st Y)	$63,311
2013	AP (6th Y)	$65,139	AP (5th Y)	$65,127	AP (6th Y)	$65,096	AP (5th Y)	$63,617
		$65,139	AP (4th Y)	$64,401		$65,096	AP (4th Y)	$62,192
		$65,139	AP (3rd Y)	$64,669		$65,096	AP (3rd Y)	$62,449
		$65,139	AP (2nd Y)	$64,805		$65,096	AP (2nd Y)	$63,311
		$65,139	AP (1st Y)	$64,944		$65,096	AP (1st Y)	$64,944
Independent – Samples T Test	Mean Difference= -$622.25 t= -.92 df=38 Sig. (2-tailed)=.36				Mean Difference=$773.80 t=1.12 df=38 Sig.(2-tailed)=.27			

Note: AP=Assistant Professor; Y = Year

For an exploratory purpose, we compared the total amount of salaries paid to an assistant professor in the full tenure track under the traditional model of salary increase versus the Model of Graded Salary Increase. The results showed that universities could save over $6,000 in one assistant professor's salary in 6 years of tenure track under the Model of Graded Salary Increase in comparison to the amount under the traditional model of salary increase. (See Table 5).

Table 5
MEAN DIFFERENCES OF ANNUAL SALARIES OF ASSISTANT PROFESSORS IN 6 YEARS OF TENURE TRACK UNDER THE TRADITIONAL SALARY INCREASE MODEL (TSIM) VERSUS THOSE UNDER THE MODEL OF GRADED SALARY INCREASE (MGSI)

Year	Pay Difference Using TSIM versus MGSI New Assistant Professors Hired in 2005	Pay Difference Using TSIM versus MGSI New Assistant Professors Hired in 2006	Pay Difference Using TSIM versus MGSI New Assistant Professors Hired in 2007	Pay Difference Using TSIM versus MGSI New Assistant Professors Hired in 2008
2005-2006	1st Year: $0			
2006-2007	2nd Year: $1,232	1st Year: $0		
2007-2008	3rd Year: $1,877	2nd Year:$1,281	1st Year: $0	
2008-2009	4th Year: $1,921	3rd Year: $1,951	2nd Year: $1,320	1st Year: $0
2009-2010	5th Year: $1,328	4th Year: $1,997	3rd Year: $2,011	2nd Year: $1,368
2010-2011	6th Year: $38	5th Year: $1,381	4th Year: $2,059	3rd Year: $1,684
2011-2012		6th Year: $40	5th Year: $1,424	4th Year: $2,133
2012-2013			6th Year: $43	5th Year: $1,475
2013-2014				6th Year: $43
Total	$6,396	$6,650	$6,857	$6,703

DISCUSSION

This paper tested the Model of Graded of Salary Increase as a possible solution to the problem of salary compression and inversion. Faculty salary data collected by the CUPA-HR in the years from 2005 to 2014 were used to test the model in comparison to the traditional straight salary increase model. The results showed that the proposed model overall solved the problems of salary compression and salary inversion. One condition, however, must be met for this model to work: a consistent salary increase rate over the years. This model is aimed to reward assistant professors' tenure by putting increasing weight on the salary increase rate toward the end of their tenure track. If the salary increase rates fluctuate downward, then increasing weight of salary increase rates will be evened out. In order to maintain a consistent salary increase rate over the years, a university needs to create a reserve fund for salary. In years of high salary budget, the university should put aside certain amount in the reserve fund so as to maintain a consistent salary increase rate in years of low salary budget.

Our test results also showed that the proposed model considerably lower the total amount of salary the university pays to an assistant professor in 6 years of tenure track. The amount saved can be used to reward professors based on their performance level independent of their tenure. As we mentioned earlier, this proposed model only focuses on the tenure factor. However, performance factor can be incorporate in the model too. In addition to constants for tenure, other constants can be created to reflect different levels of performance. Assistant professors' salaries can be determined by both tenure and performance level by following the formula below:

Salary = Previous Year's Salary * (1+Average Salary Increase Rate*Tenure Constant*Performance Constant).

One more merit for the graded salary increase model proposed by this paper is that it is easy to administer, which wins over the contest against aftermath salary adjustment.

Salary compression and salary inversion are serious compensation problems. It is closely related employees' motivation and turnover intent. Our proposed model appeared to solve both problems from the mathematical perspective. The next step is to test the model in a real work setting on its practicality.

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APPENDIX A

An Example of Calculation of Salary Increases

Using the Traditional Salary Increase Model and the Graded Salary Increase Model

I. The Model of the Traditional Salary Increases

1st Year: The mean salary of new assistant professors in Agriculture/Agriculture Operations/Related Science in 2005: $55,911 (CUPA-HR Faculty Salary Survey)

2nd Year: The mean salary of the professors in 2006: $55,911 * (1+2.36%) = $57,231
3rd Year: The mean salary of the professors in 2007: $57,231 * (1+2.36%) = $58,582
4th Year: The mean salary of the professors in 2008: $58,582 * (1+2.36%) = $59,965
5th Year: The mean salary of the professors in 2009: $59,965 * (1+2.36%) = $61,380
6th Year: The mean salary of the professors in 2010: $61,380 * (1+2.36%) = $62,829

II. The Model of the Graded Salary Increases

1st Year: The mean salary of new professors in Agriculture/Agriculture Operations/Related Science in 2005: $55,911
2nd Year: The mean salary of the professors in 2006: $55,911 * (1+2.36%*0) = $55,911
3rd Year: The mean salary of the professors in 2007: $55,911 * (1+2.36%*.5) = $56,571
4th Year: The mean salary of the professors in 2008: $56,571 * (1+2.36%*1) = $57,906
5th Year: The mean salary of those professors in 2009:$57,906*(1+2.36%*1.5) = $59,956
6th Year: The mean salary of those professors in 2010: $59,956 * (1+2.36%*2) = $62,786