Statistics for Compensation

A Practical Guide to Compensation Analysis

JOHN H. DAVIS

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Preface

The objective of this book is to provide statistical and analytical techniques and guidance that will help compensation professionals and human resources professionals responsible for compensation make better decisions as they go about their day-to-day analyses.

This book presents the most needed and most useful statistical techniques in compensation analysis that I have found through my experience as a practitioner, consultant, and teacher. The book is designed to be a thorough reference for the practitioner. It may also serve as a textbook for a college-level course for those specializing in compensation or human resources. In all the chapters following the Introduction, there are practice problems to help reinforce the material presented. Answers to them are given at the end of the book.

The reader will gain the most benefit by working the examples given in the case studies and the practice problems. The data for the examples and practice problems are all contained in the book, and should be entered in a spreadsheet program or statistical package. In addition, more lengthy data sets are available for downloading from the Wiley website mentioned in the Introduction.

The content of this book has evolved over the years from analyzing internal and external compensation data for many clients, statistics courses taught in college classrooms, courses developed and taught as part of the WorldatWork (formerly, American Compensation Association) certification program, workshops given by Davis Consulting and later Davis & Neusch, in-house courses given to organizations, workshops given to various compensation associations, and in particular as part of the professional development program of the North Texas Compensation Association.

During that time, clients and students have provided examples to share and have given feedback on improving the usefulness and presentation of this material. To all of them I owe a great debt of gratitude. In particular, I want to thank my colleagues Sarah Hutchinson, Becky Wood, Janet Koechel, and Billie Day, who so graciously read the entire text of earlier versions of this book and gave me honest and most valuable feedback on improving it. I could not have done it without them.

I sincerely hope that the reader will find this book highly useful and informative. As any teacher or consultant will tell you, our greatest pleasure comes from knowing that the material presented has been grasped by the student or client and that it has been found to be valuable in helping to make sound decisions.

John H. Davis

CHAPTER 1

Introduction

The purpose of this book is to provide statistical tools and guides to compensation professionals and human resources professionals responsible for compensation to enable them to conduct sound statistical analyses, focusing on the descriptive statistics that are most used and needed in compensation. This in turn will help their organizations make sound decisions to better attract, retain, motivate, and align the kinds and numbers of people the organizations need.

> Compensation is the branch of human resources dealing with the elements of pay provided by an employer to its employees for work performed. Elements of pay include base pay, variable pay, and stock. Human resources is the function of an organization dealing with the management of people employed by the organization.
>
> In a broad sense, compensation helps decide how much jobs are worth and how to pay employees fairly for the work they do. Compensation professionals get involved with analyzing both internal and external pay and organizational data, developing salary structures (the range of pay for jobs), recommending salary increase budgets, creating guidelines for individual salary increases, designing incentive programs, and developing performance management systems. They do all this in the context of an organization's mission, operational and financial considerations, and compensation philosophy, the latter of which they may have helped developed, and integrate all the compensation programs with the other branches of human resources.

The thrust of most professional jobs involves a great deal of decision making. Indeed, on a fundamental basis, making decisions *is* the job of a compensation (and human resources) professional—decisions that will help the organization

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achieve its goals and the employees achieve their job-related goals. In the analytical realm, decisions are made in deciding what questions to ask, what related issues are important contextually, what data to use, how to analyze the data, what to recommend, how to present it, and how to act upon the recommendations.

Many times we need to decide and act in the face of uncertainty, as facts are always limited. Furthermore, we often work under great time pressure. All this occurs in the context that the answer to most questions is, "It depends."

Most of the time we have to make a business case for a recommendation, and the executives to whom we are making a presentation tell us, "Prove it to us using data." Behind the scenes we have to perform a number of critical thinking steps.[1]

- Identify the question behind the question, and identify implications and impacts on business plans, budgets, employee engagement, legal/regulatory restrictions, and so on.
- Translate the question into analyses and quickly assess how the analyses are best conducted and presented.
- Get the right data from internal and external data sources, and ensure they are accurate and appropriate.
- Organize and conduct the analyses and draw conclusions, which is usually an iterative process. The initial analyses may raise more questions than provide answers.
- Identify the underlying assumptions (i.e., what the answer "depends" on) and implications of the conclusions.
- Prepare executive-ready analyses and conclusions.

Although this book is directed mainly toward compensation, we will sometimes illustrate techniques with other human resources issues, as compensation professionals, with their statistical and analytical skills, often get involved in broader human resources projects.

1.1 WHY DO STATISTICAL ANALYSIS?

A compensation professional encounters many issues, such as

- What is our market position?
- What should our salary increase budget be this year?
- What should the new accounting supervisor be paid?
- What should our strategy be in balancing pay and benefits?
- Do we have any pay inequities?

[1] I am indebted to Sarah Hutchinson for articulating this approach.

and might be involved in helping analyzing other human resources issues, such as

- How do we decide who gets released when we have a reduction in force?
- Can we justify the training program?
- How effective are our employee communications programs?
- Should our policies for time off for two plants be the same?
- How do the benefits costs of our company compare with those of our competitors?
- What is the company day care usage?

These examples illustrate three types of issues addressed.

- Specific issues, such as what should the new accounting supervisor be paid.
- Policy issues, such as what should be our pay policy with respect to competition.
- Broad strategy issues, such as how should we balance pay and benefits to attract, retain, and motivate the kinds and numbers of employees we need to achieve the company goals.

In addressing these issues, we use numbers as one of our starting points—all kinds of numbers that represent all kinds of things such as number of employees, average salary, benefits premiums, performance level, time to vesting, turnover rate, percent using day care facilities, training utilization, productivity, and so on.

But numbers alone will not help us. We have to do something with them to help lead to sound decisions.

Example Analysis

Throughout this book, we will be using a fictitious manufacturing company, BPD, to illustrate the various techniques.

Suppose you are the compensation manager of BPD and the vice president of finance asks you to conduct a quick competitive analysis on accounting supervisors to help determine if a subordinate supervisor is paid competitively. The supervisor in question is paid $68,580.

You gather the data in Table 1.1 on what accounting supervisors are paid in the market.

Can you make sense out of these raw data? Would you present these as the final result of your analysis? Hopefully, the answer to both questions is "no." Data in its raw form are often of little use.

TABLE 1.1 RAW DATA MARKET PAY ACCOUNTING SUPERVISOR

70,200	59,800	57,200	75,200	59,800
55,000	60,400	61,600	60,200	63,000
59,800	65,000	66,200	59,800	65,200
76,800	65,200	61,400	59,400	56,400
56,400	53,800	63,600	63,000	62,400
55,200	68,400	66,600	60,200	59,000

So you decide to organize, analyze, and describe the data, and provide a tabular and graphical summary as shown in Table 1.2 and Figure 1.1.

The table lists various statistics that are a summary of the raw data. In Chapters 3, 4 and 5, we will define and calculate all the terms (and many more), and discuss how to interpret them, as well as how to construct the graph. The graph is a picture of the distribution of the data. On the horizontal axis are salary

TABLE 1.2 SUMMARY MARKET PAY ACCOUNTING SUPERVISOR

No. of Incumbents	30
Average	62,207
Low	53,800
P10	56,280
P25	59,500
P50	60,900
P75	65,150
P90	68,580
High	76,800
Standard Deviation	5,465
CV	8.8%
P90/P10	1.22

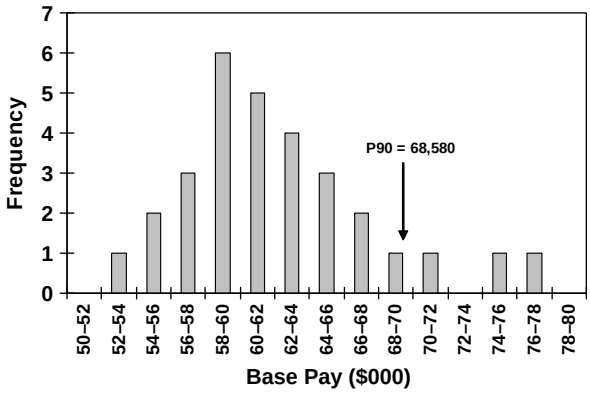

FIGURE 1.1 MARKET PAY ACCOUNTING SUPERVISOR

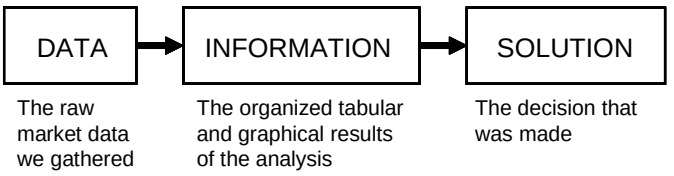

FIGURE 1.2 DECISION MODEL

categories in $2,000 buckets. The vertical axis is a scale indicating how many data points are in each category. For example, there are six salaries that are between $58,000 and $60,000.

Shown on the chart is the location of what the BPD accounting supervisor is paid. Her salary is $68,580, which is at the 90th percentile, meaning that 90% of the market salaries are below or equal to her salary. She is very well paid with respect to the market.

Now the vice president has the information needed to make a sound decision. The subordinate supervisor is paid at the 90th percentile. The vice president's decision is to leave the pay as is.

The decision model in Figure 1.2 describes the process we just completed.

We started with the statement of the problem, namely to determine if the accounting supervisor was being paid competitively. The pending decision was that if the pay level was too low, an adjustment would be made; otherwise the pay would remain unchanged.

The bottom line is that we gather, summarize, describe, analyze, interpret, and present information to help make better decisions—decisions on your part as to what to do or recommend and decisions on the organization's part as to what to do. In other words, we use statistics to help make better decisions.

The purpose of this book is to give basic statistical and analytical tools to help you, as a compensation professional, and the organization make *smart* decisions.

1.2 STATISTICS

Just what is statistics? Following are three definitions.

Statistics text [1] . . .

> A body of methods for obtaining, organizing, summarizing, presenting, interpreting, analyzing, and acting upon numerical facts related to an activity of interest.

Another statistics text [11] . . .

> A branch of applied mathematics that constitutes the science of decision making in the face of uncertainty.

A book on the history of statistics [7] . . .

> A logic and methodology for the measurement of uncertainty and for an examination of the consequences of that uncertainty in the planning and interpretation of experimentation and observation.

Although statistics is all of these, we will use the following definition.

> Statistics is the branch of mathematics concerned with the measurement of uncertainty. Mathematics is the science of measurement.

Statistics is divided into two broad categories: descriptive statistics and inferential statistics. Descriptive statistics is a branch of statistics that describes variables and the strength and nature of relationships between them. Inferential statistics is a branch of statistics in which conclusions or generalizations are made about a population based on the results from a properly constructed sample from that population.

Most of the statistics used and needed in compensation are descriptive statistics. We seldom are taking random samples from a population. Most of the time we *have* the population, such as compensation, benefits, employment, and training data on our employees, or sales, expense, operational, marketing, and facilities data on our organization or industry group, and are simply trying to make sense out of the data.

Rarely do we get involved in true random sampling where we can apply inferential statistics, and then, it is important to have someone with statistical expertise as our partner so that both the sampling procedure and the analysis are appropriate.

Hence, as mentioned at the beginning of this chapter, the focus of this book is on the descriptive statistics that are most used and needed in compensation. The topic of inferential statistics is briefly discussed in the Appendix.

1.3 Numbers Raise Issues

In statistical analyses, whether analyzing a salary survey, modeling employee engagement, identifying causes of turnover, or assessing managerial effectiveness, the numbers themselves often do not answer our questions. They just raise issues and challenge our assumptions and policies. Here are some examples from the author's experience.

- A market analysis indicates that all the competition has a base–bonus mix of 50–50 for its sales force. An analysis of the company's internal sales force shows a base–bonus mix of 80–20. Should the company structure its program to be similar to the competition? Is the company satisfied with the sales results it now gets? If it does change the mix, what are the implications on employee engagement? What do the employees think about the current mix? How will the company transition pay to be more heavily weighted on variable pay?
- A company thinks it needs to pay at the 75th percentile to attract employees with certain skills. An analysis of the market and of employee pay indicates that the cost would be prohibitive, given the current market position. This raises several issues. Does the company go ahead and spend the money for these employees, risking a short-term financial loss but with a hope of a long-term gain? Does the company forego hiring these employees and contract the work out? Does the company seek new technology or a different way of doing things to accomplish the same results?
- An analysis of turnover indicates that pay is not the issue. Rather there were indications that ineffective supervision and lack of training opportunities greatly influence employees' decisions to leave the organization. How should these two factors be dealt with?
- An analysis of benefits costs indicates that the company must "hold the line" on total costs. Further analysis shows that some costly programs are not very popular with the rank and file, but are with the executives. What should the company do?
- The company's policy for research scientists states that over time, there is no pay difference between those whose highest degree is a BS and those whose highest degree is an MS. An analysis of the actual practice shows that there is a definitely higher level of pay for MS employees than for the BS employees throughout their careers. How should the company resolve the difference between its policy and its practice?
- The company has certain benefits for its employees, such as time off for family illnesses and time off for community service. However, an analysis shows that those who use these benefits do not receive as many promotional opportunities as those who don't. There is an apparent cultural stigma against those who use them. What should the company do to resolve this apparent anomaly?

All these situations raise issues on priorities and address various strategies and policies. Ultimately, the organization seeks to determine the appropriate balance that will help attract, retain, motivate, and align the employees in accordance with both the short- and long-term business strategies.

Furthermore, in almost all cases, there isn't a single right answer. There is a myriad of solutions to various problems, and often subsequent statistical analyses can help identify implications of these solutions.

1.4 BEHIND EVERY DATA POINT, THERE IS A STORY

Every data point and every number represents some fact of reality along with the context as to how it came to be what it is. The number may indicate the number of employees in a division, and the number is low because the division just had a reduction in force. The number may indicate a large bonus that is large because the sales representative brought in a huge account. To discover what that fact is often takes some digging, but with enough effort, it can be done.

Figure 1.3 is a simple example of pay and experience for scientists in BPD. The figure is a scatter plot, or chart, that shows the relationship between pay and experience. The horizontal axis (x-axis) shows the scale for the years of experience. The vertical axis (y-axis) shows the scale for the pay. A dot on the chart represents the pay and experience for an individual scientist.

Notice that there seems to be a "nice" and positive relationship—in general, the more the experience, the higher the pay, except for one data point at 8 years of experience.

Before including this scatter plot, or chart, as part of a report or a presentation to management, you need to know "who is that point," because that will be the first question asked. You need to look behind the scenes to understand it. In this case, it might have been a former supervisor who is now an individual contributor and the pay was not cut when the demotion occurred. Or, it might be the president's nephew or niece. Whatever the story, there *is* a story.

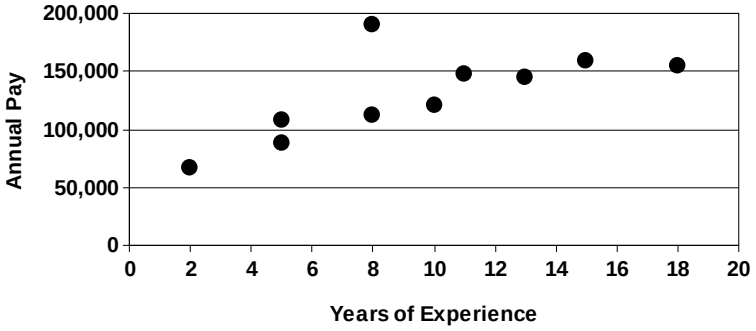

FIGURE 1.3 PAY AND EXPERIENCE FOR SCIENTISTS

1.5 AGGRESSIVE INQUISITIVENESS

In general, as in the above example, what should you do if you see something that seems out of line, or does not fit, or is an outlier, or does not meet your preconceived notions or expectations? The answer, though simple, has a bit of philosophy behind it. The answer is that you should try to explain the anomaly or the situation. You should look behind the scenes and try to discover why it is like it is.

The *reason* you should do this is the philosophical part. If you want to be successful in compensation, or for that matter, any field of endeavor (or life), you must be *aggressively inquisitive*. You must have an inner drive, a natural curiosity, and a persistent inclination to figure out why things are like they are. Why are they different? Why are they same? Why . . .? You must want to be able to understand things and explain things. The drive to do this is the human mind constantly asking, "What is it?" and "Why?" about all aspects of reality. The mind's main role is to discover the facts of reality. This aggressive inquisitiveness is a definite and distinct human mode of survival.

1.6 MODEL BUILDING FRAMEWORK

The approach used to analyze problems and find solutions is through the use of models. This topic is discussed in more detail in Chapter 6, *Model Building*, but it is important to know the highlights of the general framework as we begin.

When you are addressing an issue or solving a problem, it is instructive to draw a picture of a model, such as the general model in Figure 1.4.[2]

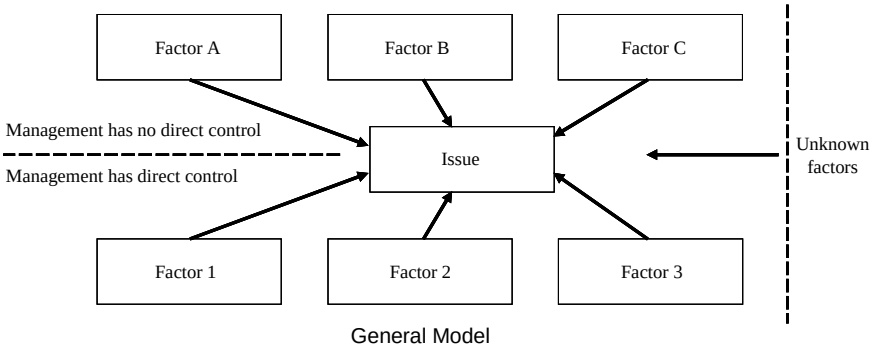

FIGURE 1.4 GENERAL MODEL

[2] I am indebted to Marc J. Wallace for this view of models.

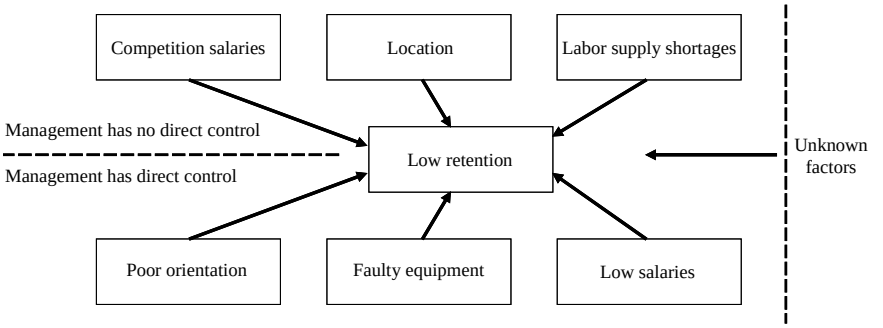

FIGURE 1.5 EXAMPLE RETENTION MODEL

The issue is the problem you are working on, the problem for which you are trying to find a solution. With subject matter experts, you identify factors that may influence the issue. Some of these are under direct control of management, and some are not. It is helpful to segregate them into these two categories. In addition, there are usually unknown factors that you are unable to identify, as we are not omniscient.

Example Model

You have been assigned to address turnover in the BPD call center that is believed to be too high. With recruiting costs rising, the turnover is affecting the bottom line. This is an important business issue. You meet with the manager and a small focus group of call center employees to brainstorm factors that could influence turnover. Figure 1.5 shows the resulting model.

This model identifies fruitful areas to investigate. As is typical, a problem is not one-dimensional. There is work for compensation, training, and management, and these factors are all interrelated.

We will use this general approach throughout this book.

1.7 DATA SETS

Throughout this book, we will use examples that draw on data from Data Sets located on the website ftp://ftp.wiley.com/public/sci_tech_med/statistics_compensation. The reader should download the data into a spreadsheet program or a statistical software program and follow along. In those cases, the data are also presented in tables in this book. For smaller sets of data, the data appear only in this book.

1.8 Prerequisites

This book is written for compensation professionals or human resources professionals who have responsibility for compensation. A course in college algebra and/or statistics (e.g., business statistics) will help the reader understand and use the material presented. However, one does not need to be a mathematician or statistician to comprehend and use these methods.

Related Topics in the Appendix

A.1 Value Exchange Theory
A.2 Factors Determining a Person's Pay

CHAPTER 2

Basic Notions

Many problems can be analyzed with the simple notion of a percent. We will describe a situation in which the use of percents was key in developing a solution.

CASE STUDY 1, PART 1 OF 2

BPD has a fleet of almost 500 trucks, and recruits, trains, and obtains certification for all the drivers. In the past, the hiring process was decentralized, with the six regions doing their own hiring and training. Management was concerned with the low retention rate, which was causing high recruiting costs. The task force that was addressing the issue developed the following model shown in Figure 2.1.

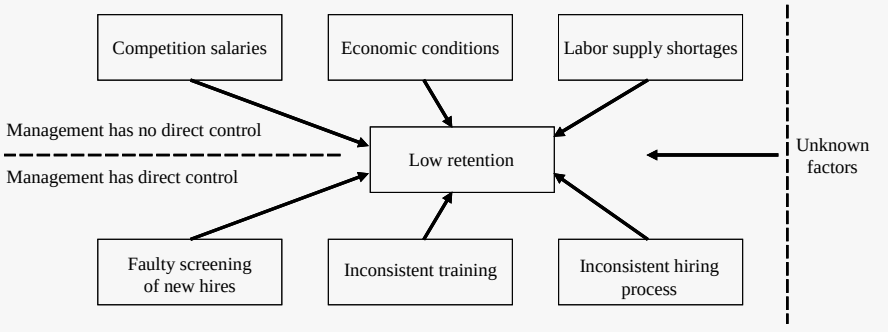

FIGURE 2.1 RETENTION MODEL

It was thought that centralizing the hiring process would help, so the entire process was centralized for a year, starting July 1, 2011. It is now 1 year later. You have been asked to answer the question "Is the driver hiring process better centralized or decentralized?"

The cost of the hiring process, which includes recruiting, training, and certification, is estimated to be an average of $6,500 per driver. You realize that this is an estimate but it is the best number you can come up with.

You also realize there may be other factors affecting turnover, such as changes in the business climate, the economy, the unemployment rate, the company's reputation, and changes in management during the past year.

You gather the data from each region for the year before centralization and for the first year of centralization. You decide to use data for 12-month periods to eliminate any seasonal fluctuations.

The raw data are shown in Table 2.1. For each region, the table shows how many drivers were hired during the 12-month period, what the turnover was, and how many were retained. Since you are concerned about the cost of hiring, the turnover includes both voluntary and involuntary terminations.

TABLE 2.1 RAW DATA RETENTION

	Decentralized Hiring (7/1/10–6/30/11)			Centralized Hiring (7/1/11–6/30/12)		
Region	**Hired**	**Turnover**	**Retained**	**Hired**	**Turnover**	**Retained**
Texas	73	49	24	54	19	35
California	57	30	27	36	7	29
Florida	62	32	30	76	30	46
Central	70	50	20	86	42	44
West	39	18	21	65	27	38
East	241	153	88	272	79	193
Total	**542**	**332**	**210**	**589**	**204**	**385**

You decide that since the absolute numbers vary between decentralized hiring and centralized hiring, the most meaningful comparison would be to use percentages and examine the percent of drivers retained. This will allow a comparison on a relative basis.

Before we continue with the analysis, we will discuss in detail the notion of percent.

2.1 PERCENT

A percent, or percentage, is a representation of the amount of a particular quantity *relative* to a reference quantity, expressed as a proportion or ratio that is multiplied