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EVEN AND ODD NUMBERS

Richard W. Koeneman
National Weather Service Forecast Office
Chicago, Illinois

1. Introduction

How do you feel about the number ten? Chances are, you have never given it any thought. How, then, do you feel about the number eleven? Given a choice between the numbers ten and eleven, which do you prefer? Which "feels" better? If you indicated a preference for ten, you chose with the majority. Selections from similar pairs of numbers will yield majority preferences for the EVEN numbers from each pair.

Explanations for this curious phenomenon are rooted deep within the human psyche and are based on complex relationships between our minds and our physical bodies. These explanations, while interesting, are unimportant here. What is important is that:

WHEN NO OTHER FACTORS ARE AT WORK, PEOPLE APPARENTLY PREFER EVEN NUMBERS.

2. Implications

This phenomenon can have significant implications in meteorology and climatology. Measurements of daily maximum temperatures are a good example of how the tendency to favor even numbers affects one aspect of meteorology. Before the days of digital readouts, which means before the early 1980's at most National Weather Service observation stations, the temperature display at a typical observer's console consisted of a temperature scale above which were mounted three pointers. One of those pointers, colored orange and located in the middle, indicated the current air temperature. The other two pointers displayed highest and lowest temperatures since the instrument was reset.

Relative to the temperature scale above which they were mounted, the pointers were thick -- about the width of one Fahrenheit degree. This means that a temperature measurement was sometimes a "judgement call." When a pointer was positioned directly above a degree marker on the scale, the reading was obvious; but when the pointer lay approximately half way between degree marks, observer discretion played a role in the value selected.

Remembering that: **WHEN NO OTHER FACTORS ARE AT WORK, PEOPLE APPARENTLY PREFER EVEN NUMBERS;** an attempt was made to look at some recorded data, daily maximum temperatures. Daily high temperatures in the 70's are a common occurrence in May for Chicago. The data period from 1873 through 1977 contain 3255 days, of which 821 recorded maximum temperatures in the 70's. Actual daily high temperature occurrences for each degree from 70 through 79 are listed in the table below.

High Temperature	Number of Occurrences	Percent of Occurrences
70	101	12
71	74	9
72	112	14
73	69	8
74	104	13
75	71	9
76	83	10
77	72	9
78	74	9
79	61	7

Although it seems reasonable to anticipate a smooth distribution of maximum temperatures, with little variation in the number of occurrences from one degree to the next, the actual distribution shows a strong bias in favor of the even-valued readings. Of the 821 maximum temperatures in the 70's, 474 of the values were even-numbered and only 374 were odd-numbered.

Brief investigations of other meteorological data suggest the anti-odd, pro-even bias exists in all temperature data as well as in precipitation data, measurements of air pressure, and especially strongly in wind direction and speed measurements (which, under current methods of measurement, are genuine judgement calls).

The bias is not limited to observed values. It is also strongly evident in forecast values (numbers whose selection depends almost totally on human discretion). For example, in 231 terminal forecasts of wind speeds selected at random from the issuances of Chicago, Des Moines, Indianapolis, and Milwaukee last winter, the following distribution of forecast wind speeds was noted:

Forecast Wind Speed (Knots)	Number of Occurrences	Forecast Wind Speed (Knots)	Number of Occurrences
6	19	16	19
7	3	17	0
8	17	18	8
9	0	19	0
10	62	20	9
11	0	21	0
12	21	22	4
13	0	23	0
14	10	24	2
15	49	25	8

(no speeds above 25 knots were forecast)

Forecasters selected even-numbered values for wind speeds 171 times and odd-numbered values only 60 times. This represents an even-to-odd ratio of about 3 to 1.

Although forecasters are prone to under-use odd numbers, it is interesting to note that those ending in 7 and 9 (17, 19, 27, 29, etc.) are especially "bad," whereas odd numbers ending with 5 (15, 25, 35, etc.) are "good" and will sometimes occur more often than even values which surround them. Similarly, even numbers ending with 0 (10, 20, 30, etc.) are especially "good" even numbers.

3. Conclusion

Failure to take the anti-odd bias into consideration can introduce significant errors in quantitative studies. Grouping occurrences in five-unit intervals, for example, is especially risky because successive five-unit intervals contain alternating numbers of even and odd values. Thus, three temperatures in the five degree interval from 70 through 74 degrees are even, whereas only two even values appear in the five degree intervals surrounding it (65 through 69 degrees, and 76 through 79).

Finally, remember that when dealing with manually-generated numbers, be aware that even numbers appear more frequently than odd numbers. This is because when the forecaster is placed in the situation of selecting an even or odd number to represent weather conditions the tendency is to select the even number.