The Seven Pillars of Statistical Wisdom

Stephen M. Stigler
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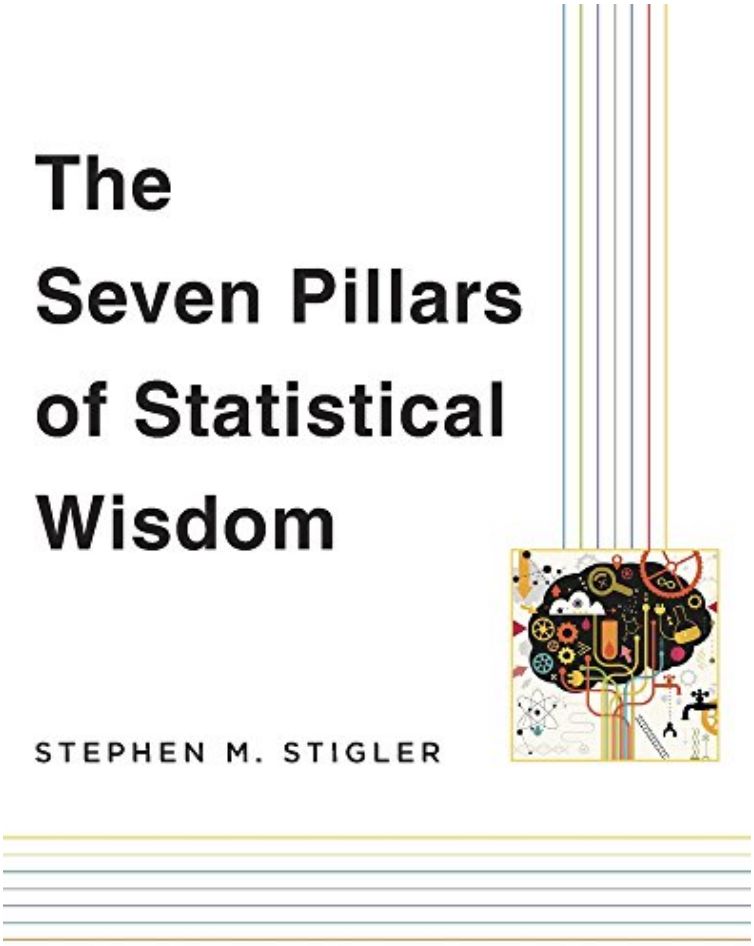

#47429 in Books Stigler Stephen M 2016-03-07Original language:EnglishPDF # 1 6.90 x .80 x 5.40l, .0 #File Name: 0674088913240 pagesThe Seven Pillars of Statistical Wisdom | File size: 62.Mb

Stephen M. Stigler : The Seven Pillars of Statistical Wisdom before purchasing it in order to gage whether or not it would be worth my time, and all praised The Seven Pillars of Statistical Wisdom:

164 of 169 people found the following review helpful. An excellent book on the subject it treatsBy George HaritonAn excellent book on the subject it treats. Unfortunately the subject is extremely specialized, and that is not clear from either the title or the blurbs.Stigler has long been the pre-eminent historian of statistics. In this book, not only does he identify the origins of seven very important ideas in statistics, he shows the reader at length how they originated. And there's the problem for most of us. For example, he quotes frequently and occasionally at length from the original papers and monographs (tracts, really), complete with illustrations and mathematics. This is satisfies an antiquarian interest, but I suspect that the vast majority of readers would-be readers would rather have a traditional sort of history.Much of the story stops around 1920 or 1930. While Stigler does mention some of the techniques that have since built on the early work, it is only a couple of sentences at the end of a chapter. Some of this is useful: I had my own Aha! moment when I realized what motivated modern shrinkage techniques. But I think that you have to know an

awful lot of modern statistics for this material's relevance to come through.So for the handful of true statistical enthusiasts, this merits at least six stars. For the intelligent lay reader, less than one star. Since there are a lot more of the latter than the former, I am giving it three stars only.82 of 83 people found the following review helpful. The foundations of statistics were hard come byBy Nigel SeelEvery student of an abstract subject like maths, physics or even philosophy is familiar with this: you are introduced to a foundational concept yet it seems pretty counterintuitive, and you can think of a number of reasons why the said concept ought to be considered problematic. Yet somehow, the textbooks are less than sympathetic.My advice is to check the history of the under-motivated concept. The original formulations were often so much more compelling, especially when you realise precisely what problem their authors were trying to solve. Your own misgivings may well be represented in critiques by the innovators contemporaries.It was the very success of later generations which led to the wholesale reconceptualisation of their subjects foundations.And so it is with statistics, a subject where deep ideas are often obscured by a focus on technique, and where it sometimes seems that little distinguishes a correct line of argument from an equally plausible, but fallacious, alternative.Professor Stephen Stigler, in this determinedly historical book, starts with a concept as apparently trivial as the mean, or average, of a sequence of observations. Even this is counterintuitive as it requires discarding information, the individuality of the observations. By what right are bad measurements to be treated in the same way as ones we think, or know, to be of higher quality? It took quite a few years for the idea to catch on.Stiglers second pillar, information measurement, looks at the processing of large data sets. Opinion polls have made us somewhat aware that the accuracy of the proposed mean is proportional to the square root of the number of observations, not the absolute number.Sampling was applied to the Royal Mint in Isaac Newtons time, to ensure that the coins they produced used the right amount of gold. In the absence of a correct theory of standard deviation, the tolerance boundaries were set way too wide. Stigler dryly notes that Newton was warden, then master of the Royal Mint from 1696 to 1727 and that on his death in that year left a sizeable fortune. But evidently his wealth can be attributed to investments, and there is no reason to cast suspicion that he had seen the flaw in the Mints procedures and exploited it for personal gain.Later chapters deal with hypothesis testing (pillar 3); statistical processing within the dataset itself, without reference to population norms as in Students t-test (pillar 4); regression to the mean - a concept which proved very hard to pin down (pillar 5); experimental design, particularly when varying multiple qualities at the same time (pillar 6); and finally pillar 7, the notion that a complicated phenomenon may be simplified by subtracting the effect of known causes, leaving a residual phenomenon to which attention may now be focused.If you are both interested and well-versed in statistics, you will find this book illuminating and witty. The converse also applies.82 of 84 people found the following review helpful. The Magic Number SevenBy Howard WainerStatistics, the science of uncertainty, is young as sciences go. Physics, chemistry, geology, botany and biology were firmly established long before its birth. But despite its late start the edifice that has become modern statistics is as broadly influential as its elders. But what are the big ideas that have been contributed by statistics? Too often they are looked upon as a set of arcane procedures that are implemented, without much thought, by computer algorithms described primarily by acronyms. Such a myopic view of this most modern of the sciences deprives the viewer of the accumulated product of a great deal of beautiful and subtle thinking. Stiglers wonderful new book rides to the rescue and remedies this lack.Stiglers title echoes that of T.E. Lawrences iconic 1926 memoir of his military adventures in Arabia, which in turn was taken from Proverbs 9:1 -- Wisdom hath built her house, she hath hewn out her seven pillars". Each of the seven pillars that Stigler, in his wisdom, has hewn from the past two centuries of statistical thought provides the reader with surprising insights.The first pillar on which stands the edifice of modern statistics is Aggregation; one manifestation of this is taking a mean. The powerful idea that we can gain deeper understanding of a mass of data by summarizing them into a single number is revolutionary. Who would have guessed, without a lot of experience, that we learn more by disregarding information!The second of Stiglers pillars is Information. This too is an idea with surprising implications. We are all used to De Moivres equation that shows that the accuracy of a data summary improves as the square root of the number of observations. But what this means is that as we gather more information the value of each additional piece is less than that which preceded it! Thus if we want to double the precision of a measurement we need to quadruple the data sample. Curiouser and curiouser!The third pillar is Likelihood, which refers to the calibration of inferences with probability. This is a very old idea, but it awaited the 20th century for a systematic treatment. Stigler illustrates this pillar, as with all others, with examples drawn from the past; the plinths of the pillars to stay with his metaphor. But his likelihood example is one of my favorites. In 1748 David Hume, himself a pillar of British empiricism, published the essay Of Miracles. As you might expect Hume believed that no credence should be given to reported miracles, since they were, by definition, a violation of natural laws and hence extremely improbable. He argued that a more likely explanation was that the reporter of the miracle was mistaken or had lied (Immanuel Kant (1724-1804), a contemporary of Hume, held similar beliefs about the existence of miracles. And he too was concerned about the response of the Church to such a view, so he hedged his bets. He concluded that, as a practical matter, miracles had no place in the modern world, but they were more frequent in the distant past. This was one of the rare times I know of when Kant waffled.). Humes courage was manifest when he examined probabilistically, the prime example of a miracle, the resurrection of Christ. His argument rested upon the relative likelihood of a reporter of the miracle being

in error; an event that occurs with enormous relative frequency compared to a singular happening. He thus concluded the probability of a resurrection was vanishingly small. His analysis was challenged in a 1767 book by Richard Price (Four Dissertations), who was responsible for the 1763 posthumous presentation and publication of Thomas Bayes now famous essay Towards solving a Problem in the Doctrine of Chances. Prices analysis (as described by Stigler) was the first use of Bayes theorem, and he used it to deduce that if in a million binomial trials (deaths) there had not been a single resurrection, the probability of a resurrection was not zero but was instead 1/1,600,000 small, but not impossible. And thus the probability of a single resurrection occurring in the next million trials was:1.0 (1,599,999/1,600,000)^1,000,000 = .465On which Stigler wryly comments, the probability of a miracle was much larger than Hume had supposed.Stigler calls the fourth pillar Intercomparison, borrowed from Francis Galton. It refers to the arsenal of procedures based on statistical comparisons made, not to some external standard, but to something interior to themselves. An obvious example is analysis of variance in which we estimate the likelihood of an effect by comparing two different internal estimates of error.Statistics fifth pillar is Regression, which is the inevitable outcome of a situation in which one variable is not perfectly predicted from another. In such a case the predicted outcome inexorably moves (regresses) toward the middle. Thus tall parents are likely to have tall children, but not as tall as they are. And, in parallel, short parents are likely to have short children, but not as short as they.The sixth pillar is Design, as in design of experiments, and includes the powerful role played by randomization. The understanding of the importance of design, even in observational studies, grew and changed over time. Early on a (not very profound) design insight was that if you wanted to understand the effect that some treatment had on an outcome you needed to hold everything else constant and just vary that treatment. This (by now) obvious design is nevertheless often ignored so that after the experiment you are no better informed than you were beforehand. The idea of keeping everything else constant was sometimes difficult in practice for example, agricultural experiments in which different seeds or different fertilizers were to be tested, they could not be tried out in the exactly the same location. Fisher resolved this. His genius was to turn a bug into a feature by carefully designing the experiment so that, on average, various factors of concern could be estimated simultaneously. Thus through careful design, multifactor experiments were born.And finally, Stiglers seventh pillar is Residual; a powerful idea for an analytic magnifying glass in which we subtract out the effects of obvious phenomena and look carefully at what is left over. In this way we can see what might previously had been obscured.Stigler concludes, The seven pillars are the principal support for statistical wisdom; they do not by themselves constitute wisdom. He leaves room for another pillar to emerge, perhaps associated with the problems of big data. He reminds us that every living science has its mysteries Astronomy its dark energy and dark matter; Physics its strings and quantum theory;Mathematics the Riemann Hypothesis. The existing seven pillars can support at least partial answers for even the most difficult cases. Statistics is a living science; the support of the seven is strong. and with strong allies in other fields we can be confident in having expectations of being equal to the challenges we will surely face.This is a wonderful book that summarizes the wisdom accumulated over a lifetime. I am grateful to the Stigler for his having shared his experiences.

What gives statistics its unity as a science? Stephen Stigler sets forth the seven foundational ideas of statisticsa scientific discipline related to but distinct from mathematics and computer science.Even the most basic ideaaggregation, exemplified by averagingis counterintuitive. It allows one to gain information by discarding information, namely, the individuality of the observations. Stiglers second pillar, information measurement, challenges the importance of big data by noting that observations are not all equally important: the amount of information in a data set is often proportional to only the square root of the number of observations, not the absolute number. The third idea is likelihood, the calibration of inferences with the use of probability. Intercomparison is the principle that statistical comparisons do not need to be made with respect to an external standard. The fifth pillar is regression, both a paradox (tall parents on average produce shorter children; tall children on average have shorter parents) and the basis of inference, including Bayesian inference and causal reasoning. The sixth concept captures the importance of experimental designfor example, by recognizing the gains to be had from a combinatorial approach with rigorous randomization. The seventh idea is the residual: the notion that a complicated phenomenon can be simplified by subtracting the effect of known causes, leaving a residual phenomenon that can be explained more easily.The Seven Pillars of Statistical Wisdom presents an original, unified account of statistical science that will fascinate the interested layperson and engage the professional statistician.

The hardest kind of scientific thinking concerns whats in a fields basementand Stigler has brought a bright flashlight to his subterranean investigations of the ever-more-influential field of statistics. (Bradley Efron, Stanford University)Distilled from centuries of statistical research and garnished with wit, this masterfully prepared seven-course food for thought is a real treat for anyone who wants to reason with data, big or small. (Xiao-Li Meng, Harvard University)Statistics has a core set of ideas that touch every aspect of our lives. Stigler has tapped into these and brought them to life. (Persi Diaconis, Stanford University)This lively account of a radically counter-intuitive past at least encourages us to question big datas reputation. Never entrust measurement to a monarchor judgment to a

computer. (Jonathon Keats New Scientist 2016-05-21)WonderfulEach of the seven pillars that Stigler, in his wisdom, has hewn from the past two centuries of statistical thought provides surprising insights. (Howard Wainer Science 2016-05-13)About the AuthorStephen M. Stigler is Ernest DeWitt Burton Distinguished Service Professor in the Department of Statistics at the University of Chicago.