# "Noise" and Social Judgment Theory: A Commentary on Kahneman, Sibony and Sunstein

Michael E. Doherty
Bowling Green State University

Thomas R. Stewart
University at Albany

R. James Holzworth
University of Connecticut

Contact: mdohertyjdm@gmail.com

The book *Noise: A flaw in human judgment* by Kahneman, Sibony, and Sunstein (hereafter, KSS) is a step toward fulfilling the promise inherent in judgment and decision making (JDM) of greater understanding of judgment processes and also better decision making. JDMers have long been delivering on that second promise by teaching, consulting, and writing books such as Thaler and Sunstein's *Nudge* and Hammond's *Human Judgment and Social Policy*. This paper is aimed at two sets of readers. One is, of course, the readers of this newsletter. The other set is the authors of *Noise*, to whom we have sent a copy. To those who have not read "Noise," we encourage you to read it.

Noise is defined by KSS as "unwanted variability in judgments" and, according to them, noise has been largely ignored by the JDM community. In their words on p. 10 "The topic of bias has been discussed in thousands of scientific articles, … few of which even mention the issue of noise." They go on to write:

> *Understanding the problem of noise, and trying to solve it, is a work in progress and a collective endeavor. All of us have opportunities to contribute to this work. This book is written in the hope that we can seize those opportunities. (KSS, p. 14)*

*Our objectives*

We read KSS with great interest because they address problems that have been the focus of Brunswikian research and Social Judgment Theory (SJT) since 1955 (although the word "noise" is rarely used in that research). We thought it would be useful to describe the approach that SJT has taken to problems that KSS describe. In a spirit of cooperation, desiring to contribute to KSS's efforts to make JDM research useful in practice, we explore noise from the perspective of SJT and indicate its possible relations to their prescriptive ideas. We begin with brief summaries of two analytical tools that have proven useful in SJT research and application: judgment analysis and the lens model equation.

*Judgment analysis (JA)*

Judgment analysis (sometimes called "policy capturing") is a powerful method for externalizing the consistent policy underlying inconsistent judgments. Holzworth describes the birth of judgment analysis:

> *… judgment analysis as a field of endeavor got its start as a systematic approach to cognition with Hammond's article titled "Probabilistic Functionalism and the Clinical Method" (published in the Psychological Review in 1955). For whereas Meehl's book showed the superiority of statistical prediction over clinical prediction and thus cast doubt on the value of the latter, Hammond's article took a theoretical approach to the analysis of judgment. Brunswik's lens model was used to analyze, or externalize, the judgment processes of clinical psychologists, thus demonstrating that the lens model could be generalized from visual perception to clinical judgment. Judgment analysis, as the term is used now, was born at that point. (Holzworth, 2001, p. 324)*

The data for judgment analysis (JA) are a set of judgments ($Y_S$) made by a single judge presented with a set of cases defined by varying values on a set of cues ($X_i$, multiple fallible indicators). Although not limited to linear models, a typical judgment analysis is based on standard linear least squares regression analysis. JA methods have been extended and adapted in many ways (e.g., Holzworth, 1996, Stewart, 1976). For details of JA methods, see Cooksey (1996).

For our purposes, we will simply point out that JA leads to a decomposition of judgment into a systematic part that is a function of the cues and a residual part, sometimes called error, that is not related to the cues. That decomposition leads to a standard decomposition of variance that is central to the topic of this paper.

$$\sigma^2_{Y_s} = \sigma^2_{\hat{Y}_s} + \sigma^2_{E_s}$$

In words,

Total judgment variance = systematic variance + unsystematic ("error") variance

or, using KSS terms (p. 190),

(Pattern noise)$^2$ = (Stable Pattern Noise)$^2$ + (Occasion Noise)$^2$

The multiple correlation ($R^2_Y$) is considered a measure of the judge's consistent use of cues while $\left(1\text{-}R^2_Y\right)$ is a measure of inconsistency, that is, variance in judgment not related to the cues.

Hundreds of studies have shown that JA provides useful models of judgment even if those models are not isomorphic to the mental operations of judgment (Hoffman, 1960). A major application of JA is "cognitive feedback" showing people the weights and functional relations that describe their own policy. Such feedback is much more effective than the traditional outcome feedback for learning complex multiple-cue tasks. It has also proven useful in interpersonal learning, negotiation, and resolving disagreements.

*The Lens Model Equation*

While the analyses described below apply specifically to situations in which a judge or judges make repeated judgments of situations characterized by multiple fallible indicators (cues), the experimental and analytic work is broadly generalizable to many judgment and

decision situations. The body of research and theory to which we refer originates in the rich tradition of Egon Brunswik. That body of research and theory is based on Brunswik's Lens Model and Social Judgment Theory (SJT) as explicated by Kenneth Hammond (1996) and many others.

Considering the readership of this newsletter, we will not dwell on the lens model, but simply remind the reader of the simplified (basic) lens model equation (LME) and its components. (For this short paper, we have omitted the second term of the original LME because it is usually small enough to be ignored.)

$$r_a \cong GR_eR_s$$

The correlation $r_a$ is called achievement and denotes how well a person's judgments match an environmental criterion. An important aspect of an environment is its predictability, measured by the multiple correlation $R_e$ between multiple fallible indicators (cues) and the environmental criterion. $R_e$ is closely related to what KSS call "objective ignorance." In many situations "objective ignorance" can be estimated by ($1-R_e^2$). Similarly, judgmental consistency is measured by the multiple correlation $R_s$ between cues and judgments. $R_s$ is closely related to what KSS call "occasion noise" which can be estimated by ($1-R_s^2$). G is the correlation between the outputs of linear models of two sides of the lens. G is typically high. There is nothing in KSS corresponding to G.

Bias ("level noise" for KSS) is not represented in the LME because it is based on correlations which do not reflect differences in means. However, Stewart and Lusk (2000) developed an extended version of the LME that does include bias, and bias is clearly an appropriate topic for study within SJT (e.g., Ullman and Doherty, 1984).

*Interpersonal agreement*

The LME can also be applied to the study of agreement between people, in which case $r_a$ represents agreement rather than achievement. For KSS, disagreement ($1-r_a^2$) is the most important consequence of "noise." In research on disagreement the role of inconsistency is evident. The lens model can be used to model judgments of two people making judgments of the same set of cases. Analysis of those judgments will yield two $R_s$ values which factor into the analysis of agreement, $r_a$, as follows:

$$r_a \cong GR_{S_1}R_{S_2}$$

Thus, the LME clearly demonstrates how inconsistency, i.e., lower multiple correlations between judgments and cues, severely affects interpersonal agreement in that agreement involves the product of two correlation coefficients that are both affected by inconsistency. Dhami and Olsson (2008) discuss evolution of the lens model for investigating interpersonal learning and conflict.

*Single individuals*

Another application of the lens model is the single system case, which may be used to great effect in cognitive conflict situations, as will be explored below. The single system case describes, based on judgment analysis, the cue usage of a single individual without reference to

an environment or another individual. The values of $R_S$ and the cue utilization coefficients are calculated, but the indices $r_a$ and G are not involved. To the extent that people are inconsistent (i.e., low $R_S$), their judgments of an external criterion will be less accurate, and they will disagree more with their colleagues. Additionally, they'll disagree more when their cue utilization coefficients differ from their colleagues' weights.

*Inconsistency of judgment*

An extensive body of research in judgment and decision making has focused on judgmental inconsistency ("occasion noise" for KSS) and disagreement ("noise" for KSS). Much of that work has been conducted within the framework provided by SJT. Among the findings are that inconsistency is pervasive in human judgment and contributes both to inaccurate judgment and disagreement. The LME allows us to quantify these effects and separate effects of inconsistent and consistent components of judgment. Furthermore, we understand that inconsistency is affected not only by characteristics of the judge, but also by characteristics of the task (environment).

It would be hard to improve on the words of Berndt Brehmer. In his 1976 *Psychological Bulletin* article, *Social Judgment Theory and the Analysis of Personal Conflict*, he cited evidence that

> *…the empirical fact of inconsistency remains, and it is the lack of consistency that explains why people fail to reach stable agreement.*
>
> *…Inconsistency not only produces conflict, it also leads to a lack of understanding. Brehmer and Hammond (1973) pointed out that such a lack of understanding may lead to severe problems in reducing conflict. Since the persons in conflict cannot understand their opponents in terms of any systematic differences in policy, they will seek other explanations for the failure to reach agreement. Because behavior is usually explained in terms of motives or ability, these explanations will almost inevitably involve assumptions about hidden sinister motives on the part of the other. Explanations of this kind are, of course, not likely to facilitate resolution. (1976, p. 1000).*

Brehmer, in this and other papers, has extensively explored the ramifications of inconsistency using the technology of SJT.

*Consistency of judgment: judgment policy vs. stable pattern noise*

What is called "judgment policy" in SJT research is called "stable pattern noise" by KSS. This is a fundamental difference. Judgment policy describes the consistent component of judgment. It reflects the goals, values, training, and experience of the judge. As KSS point out, this is often the most important source of disagreement. However, in our view, rather than just being considered a source of "noise," differences in judgment policy should be taken seriously and examined carefully because they often reflect the grounds for honest differences of opinion. Furthermore, extensive research has shown that people, even experienced experts,

have difficulty accurately describing their judgment policies. In other words, they lack self-insight. Inconsistency, along with that lack of self-insight can exacerbate conflict when people attribute judgment differences to traditional explanations: incompetence, venality, or ideology. Hammond (1965) described another explanation—cognitive conflict—and designed a research paradigm for studying it. That has led to many laboratory studies and to a prescription, based on cognitive feedback, for resolving disagreement that has been used in a number of applications.

*Research within SJT*

We turn now to a few investigations to show that judgment analysis can represent useful aspects of the underlying cognitive process of judgment and to argue that judgment analysis can clarify what is noise and what is consistently applied judgment. Our argument relies on two sets of empirical facts: judgment policy equations predict judgments of holdout samples, and people can recognize statistical representations of their own policies to a high degree of accuracy. In this section we also describe investigations showing that judgment analysis has been successfully applied in practice.

*The validity and reliability of judgment analysis*

Reilly and Doherty (1989) investigated job choice behavior of university seniors who were graduating with a bachelor's degree in accounting. Forty seniors made holistic evaluations of 160 hypothetical job offers each described by 19 attributes. Job attributes were based on surveys of accounting companies. The judgment policies calculated for each student were shown to be reliable by traditional cross validation procedures. Eleven students acceded to a request to return for a second session. These returnees were asked to select their judgment policies from a 40 X 19 matrix of attribute utilization coefficients (Darlington, 1968). Seven of 11 selected their own policies. The probability of 7 or more successes in 11 chances under the assumption of random selection (P = .025) is $1.84 \times 10^{-9}$. The recognition results just described conflict with the accepted view that people have poor self-insight. The situation may be illuminated by the following analogy. I can't describe my own face very well in words and numbers, but I can pick my own face out of a set of pictures.

The accuracy of self-insight as assessed via recognition was replicated and extended by Reilly and Doherty (1992) and Reilly (1996). Such a remarkable degree of insight provides evidence for the construct validity of JA because it shows that the resulting policy descriptions are meaningful to the judges. This convincingly demonstrates that judgment analysis can measure what it claims to measure.

*Investigation of hiring policies of insurance agency managers*

Roose and Doherty (1976) used lens model technology to investigate hiring policies of insurance agency managers. The company provided 360 case files, 200 of which were used to create profiles to be judged by each of 16 agency managers, the other 160 serving as a holdout sample for cross validation. Each case was represented by 66 cues. The cross-validated $R_S$ values, i.e., the cross-validated multiple correlations representing the judge's consistent cue

usage, ranged from a low of .45 to a high of .70. This is an example of hundreds of studies showing that judgments can be described by a systematic policy that is implemented with low to moderate consistency.

When judgments were averaged over managers, the cross-validated $R_S$ of the composite judge was .74, higher than that of the highest individual, and consistent with the repeated exhortation in KSS to aggregate judgments. The judgment results led to a series of recommendations to the company, several of which were adopted.

*An investigation of bias in faculty salaries*

In light of a claim of sex bias in faculty salaries, Roose and Doherty (1978) investigated the salary structure of the faculty at Bowling Green State University. The university administration fully supported the investigation and urged faculty cooperation. Lengthy questionnaires concerning education and performance were sent to all faculty. There were 349 usable questionnaires returned, from which 28 variables were selected. A total of 175 profiles were constructed, 25 of which were repeated for purposes of assessing reliability. Gender was not shown on the profiles. Ranks and salaries were then assigned by each of 42 faculty volunteers.

Each faculty judge's policy equation was applied to the 28 variables describing each of the 349 faculty respondents. Discrepancy scores were calculated for each respondent between the mean of the 42 scores assigned to that respondent and that respondent's actual salary. The results indicated a modest degree of sex bias in faculty salaries. The most immediate result was that the authors provided a list of case numbers for cases that met certain criteria to the administration to be matched with names, which were unknown to the investigators, in order that the administration might consider redress. The vice president of the university who paid for the study did make salary adjustments based on our data at that time. Two years later he requested that we use the equations to address a salary inequity claim by a non-participant who then agreed to complete the lengthy questionnaire.

Unpublished was the comparison between the predictions of holdout samples of salary assignments via subjective weights vs. predictions via policy weights. Forty of the 42 judges also provided subjective weights. For all 40 judges, policy weights outpredicted subjective weights ($p = 9.09 \times 10^{-13}$).

To summarize, Roose and Doherty used judgment analysis to isolate the consistent component of judgment from the inconsistent component, thereby reducing unwanted variability that contributes to conflict. Doing so allowed them to develop equations that were used to help resolve salary disputes, one of the most contentious issues in any organization.

*Labor negotiations*

Balke, Hammond and Meyer (1973) explicitly used SJT in a negotiation setting in the corporate world. Their study bears directly on the issue of inconsistency in interpersonal situations, especially how inconsistency can wreak havoc and generate system noise. In the words of the authors:

> *Inconsistency means that identical circumstances do not always evoke identical judgments. When inconsistency is noted by others, it may give rise to the observation that words do not match deeds. When this observation is combined with the traditional motivational explanation, it leads us to assume that an individual's behavior is self-serving… (p. 312)*

That is an early description of the roots of conflicts that are rooted in cognitive limitations rather than in motivation. The research describes a reenactment of the negotiations over a bitter strike and shows how the lens model and graphic representation were employed to externalize aspects of cognition that are normally covert, thus diminishing the impact of inconsistency.

In 1971 The Dow Chemical Company saw a bitter three-month strike. Management and union both agreed to a reenactment of the strike in the hope that new techniques of negotiation might be developed that might in the future help avert such chaos. All seven of the original negotiators from each side agreed to participate in the reenactment. Three from each side were selected to participate and were subsequently treated as three pairs. The participants, who knew each other well, included the two chief negotiators and the most influential member of each side. They agreed that there were four key issues that had been involved in the original negotiations and would be involved in the reenactment. The four issues were: 1. Duration of the contract in years, 2. wage increase in percent, 3. Number and use of operators, and 4. Number of strikers to be recalled. There were 5 levels of each possible contract, resulting in a total of 625 possible contracts, from which 25 were selected randomly to present to the negotiators. The possible contracts were presented and judges' responses recorded on a computer. The negotiators made evaluations of the contracts on a 7-point scale ranging from recommend rejection to recommend acceptance. Negotiators also provided subjective weights concerning their own policy and that of a counterpart on the other side.

Relative weight on issues, which are normally covert aspects of cognition, were externalized on a computer graphics display, as were the function forms derived from the regression analyses. In much judgment analysis research linear relations are assumed, but in labor management issues some function forms are non-linear. After such graphic feedback was given to two of the paired negotiators, all three pairs of negotiators rated the 25 contracts again, then entered a negotiation phase in which each pair was instructed to come to agreement on an evaluation of each of the 25 contracts.

We leave it up to the reader who may not have read the original paper, which is a classic in the SJT literature, to imagine the rich sets of comparisons within individuals, within the judges on a given side and between sides. Significantly, negotiators' self-reported weights did not match very closely the weights they had put on the issues. Similarly, understanding of the other, that is, the counterpart in the negotiation, was poor. *"The negotiators were confident that they understood their counterpart's policies, a belief based on years of association and negotiation. They were wrong"* (p. 320).

Balke, Hammond and Meyer concluded that "... the theory and technique described here may be useful for union-management negotiation and mediation proceedings." We concur.

*Group Process*

KSS describe a number of problems that can limit the effectiveness of decision-making groups. They stress the importance of having group members make independent judgments and point out that the average of independent judgments usually outperforms the results of group process. They prescribe the use of a "noise audit" to assess the extent of disagreement and a "decision observer" to help the group identify possible process problems and avoid them. Clearly these steps should improve the quality of group work.

SJT adds a powerful technique based on Hammond's cognitive conflict model. SJT research and practical applications have shown that JA can be used in many group situations to help participants understand the reasons for disagreement and focus discussion and group work to resolve them. We provide an illustrative example of that technique.

*U.S. Federal Motor Carrier Safety Administration*

The U.S. Federal Motor Carrier Safety Administration (FMCSA), established in 2000, is responsible for enforcing safety regulations that apply to commercial vehicles and trucking companies. Initially their federal investigators conducted audits of companies to identify violations and determined fines based on their best judgment. After a few years of operation, they observed that identical violations could be subject to different fines depending on where in the U.S. they occurred and which Investigators determined the fines. Even if national trucking companies did not draw attention to the discrepancies, this would be a major problem to the agency.

FMCSA chose to address this problem directly through a series of meetings facilitated by a team (including one of us) versed in SJT. An initial meeting, focused on safety violations, was convened in March 2005 and included federal investigators from all regions of the U.S. In the early stages of the project, the facilitating team used a procedure very similar to the "Noise Audit" described by KSS. As recommended by KSS, participants independently judged appropriate fines for a number of cases that were represented by different levels on legislatively mandated criteria (such as culpability and history of prior conduct). But, in an additional step, the resulting judgments were analyzed (using JA) to obtain a judgment policy equation for each participant. Then participants were shown not only the (surprising, to them) extent of their disagreement, but the (unknown, to them) underlying differences in criteria weights (cue utilization) that created that disagreement.

Subsequent facilitated discussion could then focus constructively on the honest differences of opinion that resulted in disagreement. Through several iterations, including field testing, participants were able to develop a consensus model. That model was incorporated into the Uniform Fine Assessment system (UFA, FMCSA, 2021) that was distributed on laptops to all federal investigators. Based on the success of the initial meetings, subsequent meetings were held to develop consensus models for other violation types (household goods, hazardous materials, record keeping).

Similar methods have been used in projects at the NYS Office of Mental Health, the US Department of Transportation, the Texas Office of Children and Families, Albany Medical

Center, the NYS Public Employee Relations Board, the NYS Division of Alcoholism, the NYS Temporary Commission on Returnable Beverage Containers, and the National Oceanic and Atmospheric Administration. In each case, the approach was to identify the cues and cue ranges, ask individual participants to make their own judgments regarding hypothetical (or real) cases, provide cognitive feedback to each person, lead discussion of the apparent differences in their weights and function forms, ask the group to specify a shared policy, make judgments of new cases and receive case-by-case feedback about how the specified policy would predict, provide cognitive feedback from the new judgments relative to the specified policy, and repeat this process if necessary until group judgments and predicted judgments converged. In a laboratory study, Reagan-Cirincione (1994) showed that small groups using this technique could outperform their most capable member (a very high bar in group process research). She concluded "The findings suggest that Group Decision Support Systems that integrate facilitation, social judgment analysis, and information technology should be used to improve the accuracy of group judgment." (p. 246)

*Conclusions*

Research and application have shown that cognitive conflict can lead to disagreements among experts that are difficult to resolve, and that using judgment analysis to expose differences in judgment policies so that they can be openly discussed can help resolve those disagreements. Although SJT researchers don't often use the term "noise," our concern with inconsistency of judgment (KSS: occasion noise) and disagreement among experts (KSS: noise) spans nearly seven decades and countless published works. We not only recognize the existence and importance of noise, in the sense that KSS use it, but we have made extensive use of methods for studying it and addressing the problem in applied settings.

The aim of SJT is both to increase understanding and to solve problems involving judgment, interpersonal learning, and disagreement. We believe that KSS missed an opportunity to allow readers to learn about a program of research rich in ideas quite relevant to the purpose of their book. SJT focuses on uncertainty and inconsistency, which exist in physical and social environments, as well as in people's minds. The LME more than simply complements noise equations in the KSS book. It offers a quantitative way to represent all aspects of noise in interpersonal as well as task/environmental relationships. Examples of research reveal the usefulness of judgment analysis methodology and the LME in discovering important aspects of judgment insight and agreement.

We will close by reminding the reader of the words of Paul Slovic and Sarah Lichtenstein in their classic 1973 paper comparing approaches to judgment research.

> *Several research paradigms have been wound up around common points of interest and are chugging rapidly down diverging roads. Since any study almost always raises additional questions for investigation, there has been no dearth of interesting problems to fuel these research vehicles. Unfortunately, these vehicles lack side windows, and few investigators are looking far enough to the left or right. Of several hundred studies, only a handful indicate any awareness of the existence of comparable research under another paradigm.*

> *The fact remains, however, that all these investigators are interested in the same general problem--that of understanding how humans integrate fallible information to produce a judgment or decision. (p. 90)*

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