

COGNITIVE HEURISTICS AND BIASES IN BEHAVIORAL AUDITING: REVIEW, COMMENTS AND OBSERVATIONS

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ABSTRACT

The purposes of this paper are: (1) to provide background on the heuristics and biases approach to decision making; (2) to describe some of the issues being debated in psychology concerning this approach; (3) to review relevant studies from the behavioral auditing research literature; (4) to provide comments on the trends in the auditing literature; (5) to offer comments about the advantages and disadvantages of this approach; and (6) to make some observations about future prospects for this research tradition.

INTRODUCTION

In the early 1970's, Tversky and Kahneman described a research orientation which has dominated the judgment and decision making literature ever since. They argued that humans make use of cognitive heuristics which reduce the complexity of making probabilistic judgments. "In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors" (Tversky & Kahneman, 1974, p. 1124). As evidence for the use of heuristics, numerous demonstrations were developed in which subjects' behavior deviated from normative standards (e.g., Bayes theorem). Such errors, or biases, were reported for both naive students and expert subjects (Tversky & Kahneman, 1971). In recent years, an extensive and often-cited literature has developed around heuristics and biases.

This approach has reached a level of popularity rarely seen in psychology. There have been numerous accounts of the implications of the research in the press. Under the headline, "Two eminent psychologists disclose the mental pitfalls in which rational people find themselves when they try to arrive at logical conclusions," the writer McKean (1985, p. 23) states,

Kahneman and Tversky's research has resulted in a theory that provides a systematic explanation for some of the most puzzling aspects of human behavior, and spearheaded the growth of a new discipline of science devoted to the behavioral aspects of decision making.... Kahneman and Tversky's work has begun to attract the attention of a wider audience – doctors, lawyers, business, and politicians, who see applications for it in choosing therapies, devising legal arguments and corporate strategies, and even conducting foreign affairs.

Similarly the headline from an article by Curran (1987) reads, "Recent psychological studies suggest that irrational fears cause bad buy-and-sell decisions. Knowing why can help you outwit the crowd." The piece continues, "professional money managers, whose own decisions are made in a high-stakes environment, have begun to pay attention to the researchers' findings" (p. 6).

Given the prominence of this approach, it is not surprising to find that behavioral auditing investigators have become interested in cognitive heuristics and biases. Before turning to a consideration of relevant auditing research, some background will be provided on the heuristics and biases approach and the on-going debate in psychology about its usefulness. The paper will continue with comments about the current state of affairs and concludes with observations about the future of this approach.

BACKGROUND

Kahneman and Tversky described their view of heuristics and biases as follows: "In making predictions and judgments under uncertainty, people do not appear to follow the calculus of chance or the statistical theory of prediction. Instead, They rely on a limited number of heuristics which sometimes yield reasonable judgments and sometimes lead to severe and systematic errors" (Kahneman & Tversky, 1973, p. 237). They then defined three cognitive heuristics for risk judgments: representativeness, availability, and anchoring-and-adjustment.

Representativeness

Representativeness refers to making an uncertainty judgment on the basis of "the degree to which it is (i) similar in essential properties to its parent population and (ii) reflects the salient features of the process by which it is generated" (Kahneman & Tversky, 1972, p. 431). Supporting evidence has come from reports that people ignore base rates, neglect sample size, overlook regression toward the mean, and misestimate conjunctive probabilities (Kahneman & Tversky, 1973; Tversky & Kahneman, 1983).

Availability

Availability is used to estimate "frequency or probability by the ease with which instances or associations come to mind" (Tversky & Kahneman, 1973, p. 208). In contrast to representativeness which involves assessments of similarity or connotative distance, availability reflects assessments of associative distance (Tversky & Kahneman, 1973). Availability has been reported to be influenced by imaginability, familiarity, and vividness, and has been supported by evidence of stereotypic and scenario thinking (Kahneman & Tversky, 1979a).

Anchoring-and-adjustment

Anchoring-and-adjustment involves "starting from an initial value that is adjusted to yield the final answer. The initial value, or starting point, may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, adjustments are typically insufficient" (Tversky & Kahneman, 1974, p. 1128). Supporting evidence comes from biases in evaluation of conjunctive and disjunctive events, insufficient revision of probabilities relative to Bayes theorem (Tversky & Kahneman, 1974), and framing (problem restatement) effects (Kahneman & Tversky, 1984).

The purpose of this paper is to evaluate the role that heuristics and biases approach has played in behavioral auditing research on probability and risk judgments. Space does not allow consideration, however, of the other contributions of Kahneman and Tversky, such as prospect theory (Kahneman & Tversky, 1979b), which involve utility or value judgments.

PSYCHOLOGICAL CRITICISMS

Given the popularity of this approach, it may be surprising for some to learn of the extent of criticism offered in the psychological literature of the heuristics and biases research. Many of the major investigators in the judgment and decision making field have written negatively about this work. For instance, consider the following partial list of critics: Abelson, Anderson, Beach, Cohen, Edwards, Einhorn, Hammond, Hogarth, Humphreys, Jungermann, Manis, March, Phillips, Christensen-Szalanski, Wallsten, Winkler, and G. Wright. Even supporters of this approach (e.g., Fischhoff, Slovic, & Lichtenstein, 1979) have occasionally offered negative comments.

The criticisms have generally taken one of five forms. First, it has been suggested that heuristic strategies may produce cost-effective decisions in certain contexts. Hogarth (1981, p. 197), for example, states "the more serious criticism is the failure to specify conditions under which people do or do not perform well." He goes on to note that "insufficient attention has been paid to the effects of feedback between organism and environment." Therefore, Hogarth (also see Thorngate, 1980) argues that heuristics may be adaptive, especially in dynamic situations.

The second type of criticism questions the generality of empirical results. Wallsten (1983) states that "the generalization that subjects judge according to representativeness ... is clearly overstated." Similarly, Fischhoff, Slovic, and Lichtenstein (1979, P. 339) conclude that "people know or can figure out somewhat more than what they have been given credit for in the past." Thus, there may have been a tendency to overstate the generality of judgmental biases.

The third criticism concerns the relevance of heuristics and biases in the real world. Edwards and vonWinterfeldt (1986, p. 679) argue: "The whole issue of how good human intuitive performance is may be more or less irrelevant to the broader question of human intellectual competence, because if the problem is important and the tools are available people will use them and thus get right answers." They point out that experimenters get the correct answers using the very tools denied subjects.

The fourth type of criticism reflects a selection bias of researchers to cite evidence of judgmental errors and to ignore research reporting appropriate behavior. As stated by Christensen-Szalanski and Beach (1984, p. 75), "It is our hypothesis that the widely held belief in the hopelessness of human judgment and decision performance results less from evidence to that effect than from the fact that only evidence to that effect gets much attention."

The final category of criticism questions the logic of the heuristics and biases approach. "Research on judgment and decision making has been driven too much by a concern for errors relative to a normative standard the validity of which one can doubt with good arguments.... A final lesson to be learned from the debate might be that one should avoid the term rationality in psychology at all" (Jungermann, 1983, p. 639-640). Cohen (1981) arrives at a similar conclusion.

Based on such criticisms, N. H. Anderson (1987, p. 6) offers the following: "It is now widely recognized that the three heuristics of representativeness, availability, and anchoring and adjustment ... are seriously incorrect.... It is also becoming clear that the study of these heuristics has been pretty much a sterile blind alley."

In apparent response to their critics, Kahneman and Tversky (1982, p. 494) have offered several defenses of their approach and its emphasis on judgmental errors:

There are three related reasons for the focus on systematic errors and inferential biases in the study of reasoning. First, they expose some of our intellectual limitations and suggest ways to improve the quality of our thinking. Second, errors and biases often reveal the psychological processes that govern judgment and inference. Third, mistakes and fallacies help the mapping of human intuitions by indicating which principles of statistics or logic are non-intuitive.

In 1983, Tversky and Kahneman go on to state that "the focus on bias and illusion is a research strategy that exploits human error, although it neither assumes nor entails that people are perceptually or cognitively inept" (p. 313).

Others have also offered support for this approach: "this study provide strong evidence that previous laboratory research on decision heuristics and biases is applicable to the ' real world,'n-formation-rich, interactive estimation and decision contexts" (Northcraft & Neale, 1987, p. 96). In addition, Taylor (1982) points out that the Kahneman and Tversky approach has had a great impact on social psychology.

As these comments illustrate, there has been considerable disagreement between the supporters and critics of the heuristics and biases research. Most outside the judgment and decision making area of psychology, however, seem unaware of the extent of this disagreement.

BEHAVIORAL AUDITING STUDIES

By my rough count, there have been at least 40 studies of heuristics and biases in the auditing literature. Most of these have investigated representativeness and related risk phenomena, with fewer studies of availability or anchoring-and-adjustment. Interestingly, there are over 20 papers, which provide reviews or commentaries of this work. It is obvious that heuristics and biases have generated considerable interest in behavioral auditing.

Rather than reviewing all these papers, three recent studies of heuristics and biases will be considered briefly as examples of the approach. Then more global comments will be offered about the research in general.

In a study of representativeness, Holt (1987) reexamined the conclusions of Joyce and Biddle (1981a) about auditors' use of base rate information in judgments of management fraud. Base rates, because they are unrepresentative, are frequently underweighted relative to case-specific evidence (Kahneman & Tversky, 1973). Joyce and Biddle reported that auditors under utilized base rates relative to normative (Bayesian) standards, but that auditors did better than student subjects. In a series of five experiments, Holt reported that it was the wording of the problems, rather than any innate or learned ability, that led to the Joyce and Biddle results. She interpreted

these findings as evidence of a framing effect (see below).

The availability heuristic was examined in a study of analytic review by Libby (1985). Professional auditors were asked to generate hypotheses which might account for material financial statement errors. Auditors were also asked about perceived frequency and recency of their experience with various types of errors. The results suggested that "perceived error frequency played a major role in the accessibility of error hypotheses in analytical review" (p. 663). The data also revealed a positive relation between recency of experience and generation of hypotheses. The findings were inconsistent, however, concerning effects of memory structure on accessibility.

Joyce and Biddle (1981b) investigated the effects of anchoring-and-adjustment on probabilistic inferences in auditing judgment. They conducted six experiments to determine the extent of effects on practicing auditors' judgments. The authors conclude, "The results of these experiments indicate that auditor sometimes make judgments that are in violation of normative principles of decision making, but that these violations cannot always be accounted for the anchoring and adjustment heuristic" (p. 141). An extension of this research by Wright and Anderson (1982) did find that anchoring effects were robust.

These studies typify the somewhat confusing state of affairs about the role of heuristics and biases in auditing judgment. As Ashton (1983, p. 34) concludes, "the research on heuristics and biases in audit decision making has been somewhat limited and the results have been mixed." In the remainder of this paper, I will offer several comments and observations which may be of some value in reducing the confusion.

COMMENTS ON BEHAVIORAL AUDITING RESEARCH

Based on reading through many of the papers on heuristics and biases in behavioral auditing, four comments seem appropriate. First, accounting researchers have frequently had difficulty translating the Kahneman and Tversky demonstrations into an auditing framework. As Biddle and Joyce (1982, p. 187) commented, "our failure to observe behavior consistent with availability may be due, at least in part, to problems with our experiment." These authors in devising a task to test for anchoring-and-adjustment, had selected a problem that was unrelated to risk, probability, or frequency judgments – the domains for which the heuristics were developed and evaluated.

A related problem can be seen in the research by Libby (1985) intended to study availability (described above). The experiment in fact manipulated accessibility, not availability. These two concepts generally are differentiated by psychologists. Libby apparently recognized the distinction and is careful to use the term "accessibility" throughout the paper. Nonetheless, this illustrates how difficult it can be to investigate heuristics using auditing stimuli.

Corresponding difficulties with the word problems used to test heuristics and biases have been reported by psychological researchers. Evans and Dusoir (1977, p. 130), for instance, argue that "the construction of their (Kahneman and Tversky) problems seems unnecessarily complex;" they go on to show how simplifying the wording can almost eliminate a representativeness ef-

fect. Bar-Hillel (1979) reported a similar finding. This difficulty in devising appropriate task examples suggests that heuristics and biases may have limited applicability in real-world auditing contexts.

Second, the results reported in many auditing studies of heuristics and biases are often close to normative (as seen for Joyce and Biddle studies described above). Consider the following examples: Gibbins (1977) found that about 40% of auditors' responses were predicted by representativeness, about half made the normative response, and the remainder were inconsistent with either. Bamber (1982) found that auditor managers were not only sensitive to the reliability of information, they overcompensated. Kinney and Uecker (1982) observed results contrary to anchoring-and-adjustment in two experiments. Biddle and Joyce (1982) failed to find the effects predicted by the availability heuristic. Related findings are reported by Abdolmohammadi and Wright (1982), Shields, Solomon, and Waller (1987), Tomassini, Solomon, Romney, and Krogstad (1982), and Waller and Felix (1987).

Even for studies which report findings consistent with heuristics and biases (e.g., Uecker & Kinney, 1977), the effects are generally smaller than those reported by Kahneman and Tversky. Biddle and Joyce (1979, p. 31) suggest that "this superior performance by auditors may be attributable, in part, to their acquisition of professional skills in evaluating sample evidence and to their familiarity with the decision settings portrayed in the experiments." Similarly, Tomassini, et al. (1982) note that auditors are trained to evaluate sample evidence as part of their professional responsibilities. Whatever the reason, if the heuristics and biases research had started out using auditors as subjects (instead of introductory psychology students), it is doubtful that the small effects observed would have generated much interest.

Third, despite these generally inconclusive results, many auditing researchers nevertheless have argued for the heuristic-and-bias approach. When Biddle and Joyce (1982) failed to support the anchoring-and-adjustment heuristic, they concluded that "some as yet unidentified heuristic was at work" (p. 189). The possibility that the heuristics approach may have been inappropriate apparently wasn't considered. It's rather curious when failure to support a hypothesis only strengthens the resolve to find support. Similar arguments against the Biddle and Joyce conclusions were offered by Holstrum (1982) and Lewis (1982).

There seems to be a tendency in behavioral auditing research on heuristics to define success or failure of a study by whether biases are observed or not. Normatively appropriate behavior does not get the attention that normatively inappropriate behavior gets. For example, Ashton (1983, p. 35) concludes "despite the mixed nature of the overall results in the heuristics area, findings such as these suggest that auditors often have difficulty understanding the implications of sample information." As noted above, this same "bias" toward emphasizing poor decision behavior has been reported in the psychological literature (Christensen-Szalanski & Beach, 1984).

Fourth, there has been a trend in recent auditing studies to cite framing effects to account for the inconsistent results on heuristics and biases. Framing was defined by Kahneman and Tversky (1984) as a cognitive perspective elicited by task characteristics. They present as an example the framing of gambles in terms of status quo or in terms of initial wealth. Empirical effects are demonstrated by showing that subjects respond differently to logically equivalent but restated

versions of the same problems. Auditing judgments, by this view, may depend on problem characteristics which are irrelevant to the decision itself. This could account for why biases were observed in some studies and not others (see the Holt study discussed above).

Framing differences, in fact, may be able to account for some of the apparent inconsistencies between studies. There is, however, a tendency in auditing research to label any and all context effects as "framing" (Demski & Swieringa, 1981). Context effects have a long history in psychology, going back to the Gestalt approach to perception (e.g., Wertheimer, 1938). Context effects were later quantized in Helson's (1964) Adaptation Level theory into three components: (1) stimulus factors, (2) background factors, and (3) personality factors. Framing appears to be concerned primarily with stimulus restatements, e.g., is the glass half full or half empty? However, all three of Helson's components are likely to have an important impact on auditing judgment and deserve separate consideration.

In sum, it's relevant to ask about the contribution of the heuristics and biases' approach in increasing understanding of audit judgment. Mumpower (1978) suggests three questions that behavioral accounting studies might address: (1) What task variables influence accounting judgment? (2) What individual difference variables are important? (3) How do task and individual-difference variables interact? Added to the list might be: (4) How can accounting judgment be improved? The heuristics and biases research has provided some answers to the first question, but has not addressed the other questions.

TYPES OF BEHAVIORAL AUDITING RESEARCH

The study of heuristics and biases appears to have been of limited relevance for behavioral auditing research for several reasons. First, the results have failed to reveal any consistent effects attributable to heuristics and biases. Second, only a narrow range of auditing tasks have been used in heuristics and biases research. Third, it's not clear that heuristics and biases are connected to central issues in behavioral auditing. The latter two comments will be elaborated on in this section.

As a psychologist looking at the field, there appear to have been three types of behavioral auditing studies (see Shanteau (1987) for a more complete discussion). These are as follows:

Replication Studies

The first type of project is a replication of a previously conducted behavioral study, only with auditors rather than introductory students as subjects. The methods and procedures are borrowed in total. The major research question is: Will the original findings replicate with auditors as subjects? For the most part, behavioral auditing studies of heuristics and biases fall into this category. They offer little advance in methodology, analysis, theory, etc., over the original Kahneman and Tversky studies.

One positive feature of replication studies is that they have introduced many auditing investigators to behavioral research. On the negative side, however, replication studies are limited in two important ways. First, they investigate issues which originate with non-auditors and may be of questionable relevance to auditing. Second, replication studies ask auditing subjects to answer

questions which have little relationship to their professional skills and knowledge.

Adaptation Studies

The second type of auditing study looks at a research problem originating from accounting and/or auditing concepts, but using methods adapted from behavioral research approaches. The procedures are borrowed, but the problems arise from accounting / auditing. One example involves analysis of sunk cost effects (e.g., Arkes & Blumer, 1985; Thaler, 1980). The topic is of direct concern in accounting, but the methods and analyses reflect procedures used in heuristics and biases research.

Adaptation studies are obviously an advance over replication research, since the research problems originate from accounting / auditing. However, behavioral methods may be insufficient to investigate many complex auditing issues, e.g., the effects of a new auditing policy. Instead, it may be necessary to combine behavioral and non-behavioral methods in unique ways to investigate such issues.

Problem-Driven Studies

The third type of project involves research designed uniquely around the concerns of behavioral auditing. Such studies lead to their own methods and procedures; in contrast, the first two types of studies are largely spin-offs from behavioral research. Thus, the methods and procedures flow from important auditing problems, not the other way around.

This type of research marks the dividing line as far as a non-auditor is concerned – as a psychologist, I am no longer qualified to comment on specific projects. I firmly believe, however, that this is the direction that behavioral research in auditing should head.

In summary, behavioral auditing research on heuristics and biases falls primarily into the replication category; such research can be viewed as a transition stage. Adaptation studies may apply some of the methods from heuristics and biases research to accounting / auditing problems; this is clearly an improvement over replication research. Finally, problem-driven studies represent the future of behavioral auditing research; it's not clear, however, that heuristics and biases will play any role in that future.

WHERE'S THE THEORY?

A number of judgment and decision making researchers have criticized the heuristics and biases research for the absence of theoretical underpinnings (e.g., Anderson, 1987; Jungermann, 1983; Slovic, Fischhoff, & Lichtenstein, 1977). As Wallsten (1983, p. 13) observes,

We have now reached the point where it is necessary to develop theories of problem representation and of judgment.... The research on heuristics should rely less on individual word problems, and more on the systematic manipulation of features in a manner determined by the theory under consideration.

It is troubling that after more than 15 years of research on heuristics and biases, there is still no general theory or even specific models of underlying processes.

This same concern applies to behavioral auditing studies – there doesn't appear to have been much progress on theory development related to heuristics and biases. Presently, there are many borrowed concepts in behavioral auditing research, but little in the way of original theories. Although psychology and other the behavioral sciences can provide methodologies for answering questions about auditing, they cannot identify which auditing problems are theoretically important to pursue.

Although the absence of theory has been commented on by auditing researchers (Gibbins, 1984; Swieringa & Weick, 1982), there is a tendency to look for psychology for the answer. For instance, Biddle and Joyce (1982, p. 190) conclude that efforts to improve audit decision making "are likely to be impeded until the psychology theory of decision making is better formulated." This may be true, but audit researchers should also be looking to develop their own theories.

The lack of theoretical progress is troubling, not only at the scientific level, but also at a practical level. Practitioners, no less than basic researchers, want answers to such theoretically-based questions as how can judgments be made with greater accuracy and what can be done about systematic errors? It will be up to audit researchers to develop interesting theories and models.

What is the theoretical status of cognitive illusions, heuristics, and biases in behavioral accounting /auditing research? Let me address each of these concepts in turn.

COGNITIVE ILLUSIONS

Frequently, an analogy is made between perceptual illusions and the biases resulting from the use of heuristics. In both cases, "errors and biases often reveal the psychological processes and the heuristic procedures that govern judgment and inference" (Kahneman & Tversky, 1982, p. 124). In parallel to sensory-based perceptual illusions, judgment errors are often labeled "cognitive illusions" (Tversky & Kahneman, 1983).

There is, however, a serious problem with this analogy. In the case of a perceptual illusion, the subject is directly exposed to but misperceives a stimulus object. The size of the illusion can be measured by comparing the subject's response with the actual stimulus value. With cognitive illusions, on the other hand, the subject is never actually exposed to the correct value. Instead, the correct answer is derived from normative considerations, such as Bayes theorem. Since subjects are asked to make judgments about things they have not actually experienced (most of us don't have a Bayesian calculator in our head), it shouldn't be surprising that responses turn out to be inaccurate. But unlike the study of perceptual illusions, such inaccuracies have not been shown to have any necessary connection to psychological mechanisms. Therefore, it seems somewhat tenuous to offer psychological interpretations of cognitive illusions when the basis of these "illusions" has yet to be established.

This argument was first offered by Shanteau (1978) who concluded that it would be more convincing if subjects who had experienced the relevant events were used. For such subjects, there would be some relevant basis for comparing their judgments to a perceived standard.

This suggestion was later investigated by Christensen-Szalanski, Beck, Christensen-Szalanski,

and Koepsell (1983). They found that experienced physicians were substantially less influenced by availability than college students in making morality estimates. Results from Lichtenstein, Slovic, Fischhoff, Layman, and Combs (1978, experiment 2) also showed that greater experience led to decreased errors. The extent of the "illusion" thus depends on experience; those that have experience with the stimuli don't show the illusion and those that don't have experience do show the illusion. Rather than an illusion, this pattern of results suggests that the observed errors arise from ignorance, not an illusion-like process of misperception.

A different argument can be made from the auditing study by Biddle and Joyce (1979). When they used tasks familiar to auditors, they found less evidence of a representativeness bias. They reported "contingent processing of information; viz., assess sampling error using a representativeness heuristic based on the sampling fraction unless the sample sizes are significantly different" (p. 17). This suggests a hierarchical decision strategy under which the use or non-use of the heuristic is under the auditor's control—hardly the description of an "illusion." (Consideration of contingent processing strategies has been receiving increasing emphasis in the psychological literature (Beach, Barnes, & Christensen-Szalanski, 1986; Payne, 1982; Tversky, et al., 1988).

In short, the use of perception illusions as an analogy for the "cognitive illusions" of heuristics and biases appears unjustified from both logical and empirical perspectives. Subjects may be making errors, but that doesn't mean that the errors are the result of an "illusion."

BIASES

There is little doubt that judgment biases can be demonstrated in the judgments of undergraduate psychology students. Although there has been considerable debate about the size of some of these biases (Beyth-Marom & Arkes, 1983; Carroll & Siegler, 1977; Christensen-Szalanski & Beach, 1983; Manis, Dovalina, Avis, & Cardoze, 1980; Wright, 1984), replicability is not the central issue in my view. The original examples of Kahneman and Tversky are easily replicated in classroom settings and in fact provide nice teaching material.

A major question, however, is whether the biases observed with naive subjects also apply to experts. According to Tversky & Kahneman (1974, p. 1130), "The reliance on heuristics and the prevalence of biases are not restricted to laymen. Experienced researchers are also prone to the same biases – when they think intuitively." They go on to say, "Although the statistically sophisticated avoid elementary errors, such as the gambler's fallacy, their intuitive judgments are liable to similar fallacies in more intricate and less transparent problems."

Most of the research evaluating biases in experts has been conducted within medicine and auditing. In medical decision making, there have been numerous studies of whether doctors' judgments are biased. In their recent book, Schwartz and Griffin (1986) cite over 20 relevant papers. In the majority of these studies, the biases were smaller (or nonexistent) than the results observed for naive subjects (e.g., Wallsten, 1981). Schwartz and Griffin conclude that it is not clear which factors determine when biases will appear in expert medical judgment.

In behavioral auditing, there have been reports of both biased and unbiased behavior. As noted previously, it is difficult to see many consistencies in the pattern of results. One trend does

emerge, however. Generally, auditors are less biased in their judgments than naive subjects. For instance, Shields, Solomon, and Waller (1987, p.384) conclude that their results are "generally consistent with previous research indicating the auditors' judgments are less prone to biases than most subjects in psychological experiments." Ashton (1982, 1983) arrived at similar conclusions.

The primary evidence of biases in experts comes from Tversky and Kahneman's (1971) survey of psychologists at two meetings. The results revealed "a prevalence of the belief in the law of small numbers.... Apparently, acquaintance with formal logic and probability theory does not extinguish erroneous intuitions" (p. 109). They go on to explain this result in terms of representativeness. This research has been widely cited as showing that experts are biased in their professional judgments (Slovic, 1982; Slovic, Fischhoff, & Lichtenstein, 1985).

A former student of mine (Bowser, 1972) attempted to replicate this study using professional statisticians as subjects. He found that statisticians were less biased than the psychologists in the original study. More importantly, several of the statisticians disagreed with the "correct answers" given by Tversky and Kahneman. There was even disagreement among the statisticians about the appropriate answer. Apparently, the problems used in the Law of Small Numbers paper were ambiguous enough to allow for multiple interpretations and hence multiple solutions. If so, that is hardly a convincing basis for concluding that experts are biased in the same ways as naive subjects.

There is a growing debate on the question of whether appropriate normative standards have been used to define biases. The definition of base rate, for instance, depends on the population from which the sample is drawn – a given sample might have come from many populations (Cohen, 1981). Since experts are more likely to be aware of these alternative populations, it should not be surprising that they might disagree with the designated correct answer. But if the definition of the normative standard is uncertain, then the identification of a "bias" is equally uncertain. Thus, it is not clear that experts exhibit the sorts of biases so easily demonstrated with naive subjects.

HEURISTICS

The concept of heuristics was introduced by Simon (1957) in his discussion of "limited rationality." He argued that, because of cognitive limitations, humans have little option but to construct simplified models of the world. Heuristics are a product of these simplified models and provide shortcuts that can produce decisions efficiently and effectively. Simon saw heuristics as adaptive strategies used by humans to cope with their limited information processing capacity. As an example, Simon identified satisficing (select the first available option that meets minimal standards) as a strategy commonly used in complex decision situations.

As described by Howell and Dipboye (1986, p. 390-391), "In the 1970's, Simon's original argument was rediscovered and given additional impetus through a series of studies by Kahneman and Tversky. What they showed was, in essence, that behavior often does not even approximate normatively optimal rules. Rather, people seem to rely on handy rules of thumb or 'heuristics'." Therefore, the presence of biases was used to infer the existence of heuristics.

By connecting heuristics to biases, Kahneman and Tversky took a different approach than

Simon. Several authors have commented on the uncertain of this connection: "Reification of biases is logically strange. If the normative model is cognitively invalid, deviations from that model cannot have cognitive significance (Anderson, 1987, p. 1). Anderson continues,

The study of heuristics, as observed by Kahneman and Tversky (1982), was characterized by the study of errors. But errors of judgment, being definable only relative to some normative standard of correctness, cannot provide an adequate basis for cognitive theory. The study of heuristics, for the same reason, cannot provide an adequate base for cognitive theory. (p. 17).

A similar argument was offered by Jungermann (1983).

The problem is that when a bias (error) exists, it is difficult to establish a logical connection to any particular heuristic. That is because many heuristics may lead to the same bias. Consider the following "heuristic" explanations for ignoring base rates:

- (1) Recency order effects may lead to underweighting of earlier information (base rates) and overweighting of later information (case specific).
- (2) Subjects may misunderstand the instructions or be confused by the word problem and so rely on the easier-to-understand case specific information.
- (2) The base rate information lacks salience for the subject and is ignored in favor of the more relevant case specific information.
- (3) Memory factors may lead to forgetting or overlooking base rates and so leave only case specific material available.

Only one of these explanations (identified below) corresponds to the representativeness heuristic used by Tversky and Kahneman to account for base rate effects. But what is wrong with the others? The problem is that heuristics are offered post hoc as an explanation of biases (Schwartz & Griffin, 1986). Representativeness may, or may not, provide the best account of the observed effect. Without further evidence, there is no way to know.

Although the concept of judgmental heuristics seems compelling, the connection between representativeness (or other heuristics) and specific errors has yet to be firmly established. Therefore, the status of judgmental heuristics is problematic.

(In the base rate example above, explanation 1 reflects order or serial-position effects, explanation 2 represents instruction or context effects, explanation 3 corresponds to representativeness, and explanation 4 is based on memory or availability factors. Potentially, each could be used to explain why subjects might ignore base rates.)

FUTURE DIRECTIONS

Although making predictions about the future is presumptuous, if not foolish, I believe that judgment / decision research generally and auditing research specifically needs to move in several directions:

- (1) There is a need for more and better experiments on decision processes, as opposed to demonstrations of heuristics (Wallsten, 1983). Ideally, these experiments will be theory driven and based on quantitative concepts and models.
- (2) The goal should be to understand, not just describe, judgment and decision processes (Jungermann, 1983). Heuristics often provide interesting behavior descriptions, but so far have shed little understanding on the underlying psychological processes.
- (3) This increased understanding should be applied to improving decision making through training or decision aids. Without an adequate understanding of underlying decision processes, efforts at debiasing will continue to be unrewarding (G. Wright, 1984).
- (4) Unless more convincing evidence is offered, there does not appear to be much future for the heuristics and biases approach in behavioral auditing research. Instead, the emphasis should be on research which addresses the unique concerns of accountants and auditors.

FINAL COMMENTS

Let me conclude with several comments. It is important to acknowledge the many contributions of Kahneman and Tversky. They have stimulated tremendous interest in the field on judgment and decision making. Because of their work, many more people now know about the area than ever before. This has brought a number of new investigators into the field, both in psychology and in accounting and auditing.

Although this paper might be seen as an attack on their work, that was not the goal. Rather, the purpose was to identify the limitations of the heuristics and biases approach and to look ahead to a new era. In the future Kahneman and Tversky' s research is likely to be viewed as an important transition from the narrow concerns of the past to the broader perspectives of the future.

Finally, I look forward to the day when we can be as enthusiastic about good decision behavior as we have been about poor behavior. Behavioral auditing is replete with examples of positive performance. I believe the future of judgment / decision research lies in understanding the sources of such exemplary behavior. Auditing researchers may well lead the way in that effort.

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