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# Development of a Scale to Measure Professional Skepticism

**R. Kathy Hurtt**

**SUMMARY:** Professional skepticism is an important concept in audit practice, as evidenced by its prominence throughout the auditing standards. In this paper I propose that professional skepticism is a multi-dimensional individual characteristic. As an individual characteristic, professional skepticism can be both a trait (a relatively stable, enduring aspect of an individual) and also a state (a temporary condition aroused by situational variables). I develop a scale designed to *ex ante* measure an individual's level of trait professional skepticism based on characteristics derived from audit standards, psychology, philosophy, and consumer behavior research. I conduct a rigorous and iterative scale validation process using students and professional auditors. The final 30-item professional skepticism scale with instructions for use is included, as well as suggestions for future research.

**Keywords:** professional skepticism; scale development; trait skepticism.

**Data Availability:** Contact the author.

## INTRODUCTION AND SUMMARY

An individual auditor's professional skepticism is at the foundation of the auditing profession. From the earliest codification of professional standards through today, the auditing profession has recognized the importance of professional skepticism. For example, SAS No. 1 (American Institute of Certified Public Accountants [AICPA] 1997b) mandates an auditor's use of professional skepticism, stating "Due professional care requires the auditor to exercise *professional skepticism*" (AU 230.07; emphasis added). The Public Company Accounting Oversight Board (PCAOB) has affirmed the importance of professional skepticism both in the standards (e.g., PCAOB 2007, AS No. 5, ¶4) and in its most recent *Report on the PCAOB's Inspections of Domestic Annually Inspected Firms* (PCAOB 2008). Although the concept of professional skepticism is widely accepted, there has been very little research on exactly what comprises

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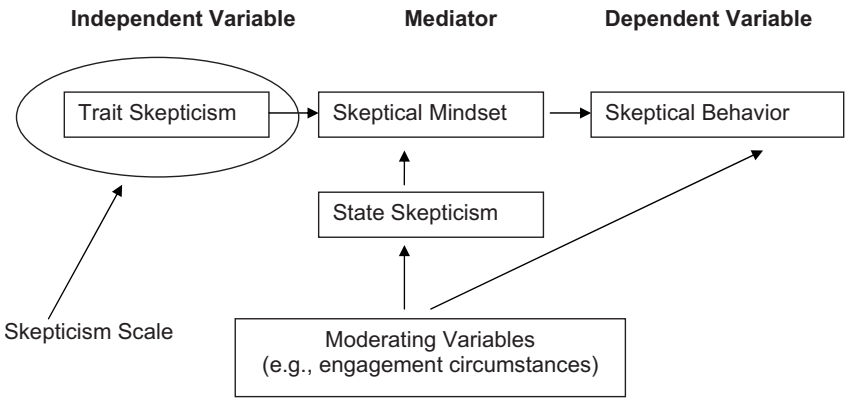
professional skepticism, or how it can be measured. When accounting researchers have needed to measure professional skepticism, they have turned to scales designed to measure some other construct such as trust (Shaub and Lawrence 1996; Choo and Tan 2000), independence (Shaub 1996), or suspicion (Shaub and Lawrence 1996). Some researchers have even developed measures unique to their experimental condition (e.g., McMillan and White 1993).

In this paper I propose that professional skepticism is a multi-dimensional individual characteristic. As an individual characteristic, professional skepticism can be both a trait (a relatively stable, enduring aspect of an individual) and also a state (a temporary condition aroused by situational variables). I develop a scale designed to *ex ante* measure an individual's level of trait professional skepticism based on characteristics derived from audit standards, psychology, philosophy, and consumer behavior research. Those same literatures also suggest a possible set of behaviors that are indicative of professional skepticism. Figure 1 models how an individual's trait skepticism and situational variables which arouse state skepticism influence an auditor's mindset, and how this mindset then influences skeptical behaviors.

With a scale capable of measuring trait skepticism, researchers can begin to pursue critical issues such as identifying whether an auditor can be too skeptical and reach a level where over-auditing or inefficient audits might occur. Research could similarly examine whether there is an optimal level of trait skepticism and whether all members of an audit team need to measure as "highly skeptical." Other questions that might be addressed are: whether trait skepticism facilitates, or is necessary in, risk identification or alternative generation; whether auditor trait skepticism influences modification of audit testing to respond appropriately to risk; and whether auditor trait skepticism influences client negotiations, audit planning, or even fraud brainstorming. Both regulators and academic researchers have indicated that professional skepticism is related to fraud detection. With an instrument designed to measure professional skepticism, the relationship between skepticism and fraud detection may begin to be more clearly understood.

Because of the lack of clear understanding about what constitutes professional skepticism, it can be difficult to compare or draw conclusions among accounting research studies that address professional skepticism. While many auditing studies have examined or discussed the *behaviors* of skeptical auditors (e.g., Anderson and Maletta 1999; Asare and McDaniel 1996; Mueller and

**FIGURE 1**
**Professional Skepticism Framework**



Anderson 2002; Peecher 1996; Rose 2007), only a few studies have attempted to *measure* participants' professional skepticism using existing scales (McMillan and White 1993; Shaub 1996; Shaub and Lawrence 1996). Because each of these studies uses a different scale, it is unlikely that they are capturing the same construct, and it is difficult to draw inferences due to the lack of common measurement. It is also unclear whether these studies are attempting to measure state or trait professional skepticism. Another concern with using scales designed to measure single-dimensional constructs, such as independence or trust, is the difficulty in identifying the subconstruct of professional skepticism that is actually being measured.

Nelson (2009) discusses this lack of precision in the use of the term "professional skepticism" and categorizes professional standards and academic research as holding either a neutral position, a presumptive doubt position, or a position of Bayesian unbiasedness when discussing professional skepticism. For example, Nelson characterizes SAS No. 1 (AICPA 1997b) as portraying a neutral perspective of skepticism where "the auditor works hard to gather and evaluate evidence, but does not assume any bias *ex ante*" (Nelson 2009, 3). He also categorizes international auditing standards, the PCAOB (2004) in AS No. 2, and other statements such as SAS No. 67 and SAS No. 109 (AICPA 1992, 2006) as portraying this neutral view of professional skepticism. In developing the measure of trait skepticism described in this paper, I use the neutral view of professional skepticism and define professional skepticism as a multi-dimensional construct that characterizes the propensity of an individual to defer concluding until the evidence provides sufficient support for one alternative/explanation over others.

To create an instrument for measuring professional skepticism, I first define a theoretical set of the characteristics and behaviors of skepticism based on relevant research and professional standards. While professional skepticism is not explicitly described in the standards as multi-dimensional, a careful review of the relevant standards reveals that multiple characteristics of professional skepticism do exist. For example, professional skepticism is portrayed as a multi-dimensional characteristic when described in the auditing standards (e.g., "a questioning mind and a critical assessment of audit evidence" [AU 230.07; PCAOB 2006a]). In nonauditing contexts, skepticism is also considered to have multiple dimensions. For example, Ford et al. (1990) suggest that consumer skepticism about advertisements is a multi-faceted concept, and call for research into the dimensionality of the construct.

Accepting the multi-dimensionality of professional skepticism, I identify six characteristics that comprise professional skepticism: a questioning mind, a suspension of judgment, a search for knowledge, interpersonal understanding, self-esteem, and autonomy. I determine these characteristics through an intensive review of the auditing standards as well as a review of the research on skepticism from auditing, psychology, philosophy, and consumer behavior. I include characteristics from other literatures in an attempt to expand the accounting profession's understanding of professional skepticism. Using the six professional skepticism characteristics as the basis for the skepticism instrument, I define constructs and develop an initial item pool of 220 questions. One hundred and seventy of these questions were drawn from available psychological scales relating to the six professional skepticism characteristics, and an additional 50 questions were written to focus on aspects of professional skepticism that did not correspond well to items from existing scales. Through an iterative validation process (Churchill 1979; Clark and Watson 1998) including both students and practicing auditors, I reduced these questions to a 30-item psychological scale designed to measure the level of trait skepticism possessed by an individual auditor.

The remainder of this paper is organized as follows. In the next section, I discuss the theoretical support for the six characteristics used to develop the skepticism scale. The third section describes the scale development process based on the characteristics identified through the literature review. Included in this section is information on the scale testing and validation process. I

conclude with possible implications of the professional skepticism scale for practice and research, including possible links between professional skepticism and certain audit behaviors, and suggestions for future research.

## CHARACTERISTICS OF PROFESSIONAL SKEPTICISM

The first three characteristics of professional skepticism (a questioning mind, suspension of judgment, search for knowledge) relate to the way an auditor examines evidence. All three indicate a willingness to search for and fully examine sufficient evidence before making a decision. An auditor who exhibits professional skepticism is willing to wait to make a judgment, and as stated in SAS No. 1, "should not be satisfied with less than persuasive evidence" (AU 230.09; PCAOB 2006a). The fourth characteristic, interpersonal understanding, identifies the need to also consider the human aspects of an audit when evaluating evidence as is indicated in SAS No. 99's (AICPA 1997b) instruction, "the auditor may identify events or conditions that indicate incentives/pressures [on individuals][1] to perpetrate fraud, opportunities [for individuals] to carry out the fraud, or attitudes/rationalizations [used by individuals] to justify a fraudulent action" (AU 316.31; PCAOB 2006b). The last two characteristics, self-esteem and autonomy, address the ability of the individual to act on the information obtained. Mautz and Sharaf (1961, 35), in their classic AAA monograph, *The Philosophy of Auditing*, discuss this, stating "[the auditor] must have the professional courage not only to critically examine and perhaps discard the proposals of others, but to submit his own inventions to the same kind of detached and searching evaluation."

### Questioning Mind (Questioning)

There seems to be no doubt that one aspect of professional skepticism is a questioning mindset. SAS No. 82 (AICPA 1997a) and SAS No. 99 (AICPA 2002) both indicate that professional skepticism is an attitude that "includes a questioning mind." In fact, SAS No. 99 specifically increased the focus on professional skepticism as compared to previous standards by indicating that "professional skepticism requires an ongoing questioning of whether the information and evidence obtained suggests that a material misstatement due to fraud has occurred" (AICPA 2002, ¶13). Many accounting studies equate skepticism with suspicion, disbelief, or doubt, all of which have some aspect of this questioning construct (for a comprehensive review of professional skepticism literature, see Nelson 2009).

Research in consumer behavior also seems to indicate that skepticism entails questioning. This is especially true of the research stream that deals with skepticism about advertising (e.g., Ford et al. 1990; Koslow 2000; Mangleburg and Bristol 1998; Obermiller and Spangenberg 1998). Obermiller and Spangenberg (1998), in their scale to measure consumer skepticism of advertising, suggest that one aspect of skepticism is a tendency to question advertisers' claims. Communications researchers discuss the concept of media skepticism, the extent to which individuals question or discount the information provided by the mass media (e.g., Cozzens and Contractor 1987; Irving and Berel 2001; Irving et al. 1998). This research on media skepticism indicates that obtaining information from known sources such as friends and family increases questioning about the information obtained from unknown sources such as the media.

Similarly, extensive philosophy literature discusses a disposition toward inquiry as an important characteristic of skepticism. Stough (1969, 3) indicates that the word "skeptic" is derived from a term meaning "to observe carefully," "to examine," "to consider." Fogelin (1994, 3) defines a philosophical skeptic as one who "calls things into question." Bunge (1991, 131) concurs, stating

[1] This emphasis on individuals is implied but not stated in the standard. All information in brackets was inserted for clarification.

"methodological doubt is the nucleus of methodological skepticism."[2] McGinn (1989, 6) supports this position, writing that a skeptic questions everything, even his or her own judgments. That a skeptic has a questioning nature is also supported by Kurtz (1992, 21), who writes, "Skeptics ask, '*What* do you mean?' seeking clarification and definition, and '*Why* do you believe what you do?' demanding reasons, evidence, justification, or proof" (emphasis added). The questioning and doubting of professional skepticism is not merely a lack of belief. As Kurtz (1992, 66) indicates, "doubt initiates inquiry and leads to the formation of beliefs." Thus, the characteristic of a "questioning mind" as an aspect of skepticism is widely supported from accounting standards, accounting research, and research in many other disciplines.

### Suspension of Judgment

The second aspect of professional skepticism is the characteristic of withholding judgment until there is an appropriate level of evidence on which to base a conclusion. Statement on Auditing Standards No. 1 (AICPA 1997b) discusses using due professional care in the performance of work, and makes several references to gathering sufficient evidence and waiting for persuasive evidence before making a judgment. In AU 230.9, this is stated as "the auditor should not be satisfied with less than persuasive evidence." With the standards stating that professional skepticism mandates gathering and objectively evaluating evidence throughout the audit, this supports the concept that judgments must be suspended until sufficient evidence is obtained. Mautz and Sharaf (1961, 22) discuss the attitudes involved in effective auditing and indicate that an auditor must arrive at judgments only after evaluating evidence that is reasonably available.

In psychology, this characteristic is most closely related to the inverse of the need for cognitive closure. The need for closure has been defined as "the desire for a definite answer on some topic, *any* answer as opposed to confusion and ambiguity" (Kruglanski 1989, 14; emphasis added). It represents a desire for a clear-cut answer on a topic that requires judgmental decision-making (Kruglanski et al. 1993, 861). This characteristic has been found to differ across individuals and across situations, and this stream of research suggests that different individuals have different abilities to function while suspending judgment (e.g., Kruglanski 1990; Webster and Kruglanski 1994).

Suspension of judgment is also a necessary ingredient of skeptical inquiry according to writings in philosophy (Hallie 1985; Kurtz 1992). McGinn (1989, 6) states, "The skeptic takes up a reflective stance compared to our ordinary practice of making and accepting knowledge claims." Bunge (1991, 131) indicates, "Skeptics do not accept naively the first things they perceive or think … they are critical; they want to see evidence before believing." Naess (1969, 5, 28) is even clearer, writing, "The corresponding psychological phase in the making of a mature skeptic is the gradual development of … a state of suspension of judgment … Suspension of judgment is the basic trait of the skeptic when confronted with dogmatic assertions. The question of how much, how often, and in what sense doubt must, or is likely to, accompany or precede the suspension of judgment is an open question." This research indicates that a skeptic is willing to form a judgment, but he or she is slow to do so, and this suspension of judgment motivates the next characteristic, a search for knowledge.

### Search for Knowledge

The characteristic, a "search for knowledge," differs from the characteristic of a questioning mind because a questioning mind has some sense of disbelief or doubt, while the search for

[2] Methodological skepticism is a specific type of skepticism that holds that by using the techniques of skepticism, an individual may arrive at a position of knowledge (Johnson 1978; Bunge 1991, 132).

knowledge is more of a sense of general curiosity or interest. Skeptics are interested in knowledge in general and are not necessarily motivated to search simply to verify a specific conclusion or obtain specific information. This aspect of skepticism is evident in philosophy. Johnson (1978, 14) characterizes skeptics as ones who seek knowledge for knowledge's sake, and Bunge (1991, 131) indicates that skepticism encourages a desire to investigate. Popkin and Stroll (2002, 36) state, "The skeptic is urging … scrutiny, asking that we look deep into and beyond the obvious." Naess (1969, 5) concurs, writing, "The mature skeptic is a seeker. He is prepared to investigate and evaluate any new argument in relation to any questions." Similarly, Mautz and Sharaf (1961, 19) indicate that auditing compels a driving curiosity and urge auditors to adopt an attitude of curiosity when performing audits.

The question of what stimulates an individual to search for more information is a question that also has been of interest to psychological researchers for over a century (Litman and Silvia 2006, 318). This desire for knowledge is usually discussed in terms of individual curiosity. Much of this research investigates curiosity as both a relatively stable individual difference and as a situationally dependent characteristic (e.g., Spielberger and Reheiser 2003; Litman and Silvia 2006). Curiosity is theorized to energize and stimulate one's interest, and also to drive exploration and discovery (Litman and Silvia 2006, 319).

### Interpersonal Understanding

These first three characteristics are associated with how an auditor evaluates evidence, but an important aspect of evaluating audit evidence is interpersonal understanding, which deals with understanding the motivation and integrity of the individuals who provide evidence. SAS No. 99 is explicit in identifying many incentives and opportunities available to client personnel to present misleading evidence or to commit fraud, and recommends recognizing the possibility for less than truthful communication (AU 316.87.A2–A3). In consumer behavior, Obermiller and Spangenberg (1998, 160) indicate that advertising skepticism consists not only of questioning the "literal truths of ad claims," but also of questioning the "motives of the advertisers." In psychology, research related to social competence (which is often described in terms of social skills and social interaction) seems to best capture this interpersonal aspect of professional skepticism (e.g., Helmreich and Stapp 1974).

Well-known philosophical writings on skepticism (Burnyeat 1983; Hallie 1985; Hookway 1990; Johnson 1978; Kurtz 1992; McGinn 1989; Popkin 1979) provide evidence that understanding people's motivations and behaviors is a fundamental component of skepticism. The philosophers suggest that it is only by understanding *people* that a skeptic can recognize and accept that different individuals have different perceptions of the same object or event. Individuals' motivations and perceptions can lead them to provide inaccurate, biased, or misleading information. Unless the skeptic understands people, it is difficult to recognize the potential for bias that exists in information given by people, and it is difficult to detect when people might be intentionally providing misleading information. Once an individual's assumptions or motivations are identified and understood, the skeptic has a basis for challenging or correcting mistaken assumptions.

### Autonomy

AU 230.08 indicates that each auditor should objectively evaluate audit evidence to determine if the evidence is sufficient to render a judgment. This supports the characteristic of autonomy—when an auditor decides for him- or herself the level of evidence necessary to accept a particular hypothesis. Mautz and Sharaf (1961, 35) support the need for autonomy when discussing the need for an auditor to possess professional courage, stating, "[the auditor] must have the professional courage not only to critically examine and perhaps discard the proposals of others, but to submit

his own inventions to the same kind of detached and searching evaluations." They further indicate that "[t]he prudent practitioner will take all appropriate steps to remove from his own mind any doubtful impressions or unanswered questions" (Mautz and Sharaf 1961, 136). The skeptical auditor is concerned with his own determination of the veracity of claims and is less influenced by the beliefs or persuasion attempts of others.

Philosophers also indicate that professional skepticism involves individual autonomy (i.e., self-direction and moral independence). McGinn (1989, 6) identifies a skeptic as one who does not easily accept the claims of others. The skeptic identifies contradictions and fallacies present in the evidence or in the claims presented by others (Kurtz 1992, 22) and undertakes additional investigation and evidence until he or she is personally satisfied (Bunge 1991).

### Self-Esteem

Skepticism also necessitates a certain level of self-esteem. Hookway (1990, 234) recognizes the need for esteem in successful inquiry, and Lom (2001, 32) discusses this requisite self-esteem in terms of an inner calmness and a lack of disturbance or turmoil. In psychology research, self-esteem is characterized as feelings of self-worth and belief in one's own abilities. Self-esteem was found to be negatively related to persuasibility (McGuire 1968) and negatively related to susceptibility to normative influence (Clark and Goldsmith 2005). Boush et al. (1994, 167) indicate that those who are low in self-esteem lack the confidence to rely on their own judgments and suggest that self-esteem is called for to challenge persuasive attempts rather than simply accept what is presented. Self-esteem was also found to be positively correlated with advertising skepticism.

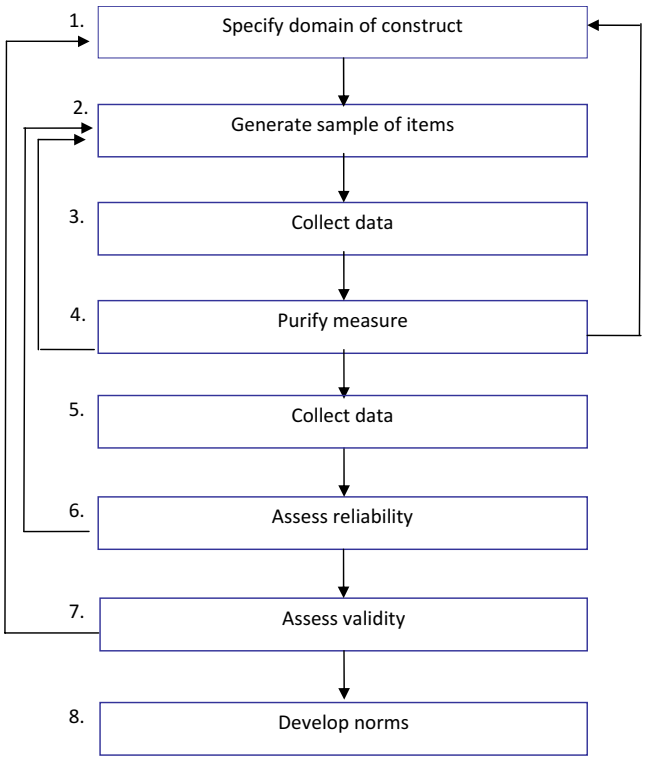
Self-esteem enables an auditor to resist persuasion attempts and to challenge another's assumptions or conclusions. This often necessitates face-to-face interactions and willingness on the part of the skeptic to explicitly identify and acknowledge explanations other than those offered by an evidence provider. Skepticism seems to entail some level of self-esteem that is necessary to take action to acquire sufficient evidence to assuage doubts or answer questions raised during the audit. Skeptics should possess a level of self-esteem that allows them to value their own insights at least as greatly as those of others (Linn et al. 1982).

Together, these six characteristics comprise trait skepticism and form the basis for developing a scale to allow researchers to identify auditors who possess more or less professional skepticism. The next section describes the standard scale development process (e.g., Churchill 1979; Clark and Watson 1998) I followed to create a scale to measure an individual's professional trait skepticism.

## PROFESSIONAL SKEPTICISM SCALE DEVELOPMENT

Figure 2 is a diagram of the iterative sequence of steps that Churchill (1979) suggests can be followed to develop a measure of specific constructs. Based on the theoretical foundation described above, I supplemented items identified from existing scales with items I wrote to create an initial pool of potential questions intended to capture each construct of professional skepticism. The 220 potential questions were examined to see if they translated back to the original constructs. I used this large initial group of questions in a pilot test to determine whether the items loaded on the hypothesized construct in a factor analysis. Based on the factor analysis results, I reduced the number of items and tested the remaining items again to see if the reduced set continued to load appropriately in a factor analysis. I also verified that the items captured all identified characteristics of professional skepticism and that the scale demonstrated inter-item reliability and temporal reliability. A more complete description of the process follows.

**FIGURE 2**
**Churchill's (1979) Suggested Procedure of Developing Better Measures**




## Developing an Initial Item Pool

Both Churchill (1979) and Clark and Watson (1998) suggest that after a theoretical basis for a scale is identified, existing literature should be reviewed to determine how others have assessed the same or closely related constructs. I reviewed available psychological scales for items designed to measure constructs closely related to each of the six characteristics of skepticism and identified over 170 individual items. Some elements of professional skepticism did not correspond well to items from existing scales, so I wrote an additional 50 items, creating an initial item pool of 220 questions. All the items were written or rewritten with a six-point[3] Likert-type scale anchored by "strongly agree" and "strongly disagree."

One of the major threats to construct validity is construct under-representation, which occurs when a researcher's assessment of a construct is too narrow and fails to include important dimen-

[3] There is considerable discussion in the scale development literature about whether an odd or even number of response points is preferable (e.g., Moser and Kalon 1972, 344). With an odd number of response alternatives, the subjects are offered a neutral middle. I used an even number to avoid the issue of subjects simply selecting the mean value. This is consistent with the recommendation of Converse and Presser (1990, 37) who indicate, "Do not explicitly provide the middle category and thereby avoid losing information about the direction in which some people lean." They further suggest measuring intensity by anchoring with words such as "strongly agree" and "strongly disagree," as was done in this scale.

sions (Messick 1998). To minimize this likelihood, and to determine if my theoretical view of professional skepticism differed from the view of practicing accountants, I solicited written comments on skepticism from 25 professional accountants, all of whom had at least 15 years experience, were CPAs, and had worked at one or more international accounting firms. The majority of these accountants (19) had a Master's degree, and 12 were current partners in a CPA firm. I asked these individuals to answer open-ended questions about what they believed comprised professional skepticism and what they believed would be its opposite. I compared these comments to both the theorized constructs and to the individual scale items. This review did not identify any dimensions or definitions of professional skepticism beyond the six I have previously discussed. Table 1 shows a selection of the professionals' comments categorized by the subconstruct to which they relate; it also lists the scales initially examined for sample items.

### Pretesting the Scale

DeVellis (1991) recommends that experts review the scale for content validity. Three accounting faculty members with professional backgrounds and education in auditing served as experts and reviewed the scale items for relevance and classification regarding the items' subconstruct. I eliminated items identified by the experts as irrelevant or inconsistent and began pretesting and testing the instrument. Table 2 describes each iteration of the testing process, the number of items on the scale, and the number and type of subjects who completed the scale.

Based on the expert panel feedback, I reduced the number of potential scale items to 49 and administered the instrument to 89 graduate and undergraduate business students in what Converse and Presser (1990) describe as a "developmental pretest." Because this scale is designed to be used with business students as well as with professional accountants, the use of a business student subject pool for this pretest is reasonable.

I examined the results of the pretest using factor analysis to assist in identifying items that did not load on expected constructs. My initial examination of the correlation matrix indicated that many items were significantly correlated (which is expected, given that the six subconstructs are designed to measure the single construct of professional skepticism); therefore, I used oblique rotation (direct oblimin), which relaxes the assumption of orthogonal factors. After eliminating items that did not load on any of the hypothesized factors, 23 items remained. The 23 items loaded on the six theoretical factors with item factor-loadings generally of 0.70 or higher; factor loadings above 0.50 are considered acceptable (DeVellis 1991). Cronbach's alpha, which gives an indication about whether the questions in the scale are measuring the same construct, was 0.82 for the entire scale.[4]

Based on the pretest results, I generated a number of new questions for the constructs where some items had been confusing to the subjects and wrote or revised additional items with the goal of obtaining an equal number of items (five) for each of the six factors. Because there is no theoretical basis for assuming that any single aspect of skepticism is more important than another, developing a scale with equal weighting for all factors seemed most appropriate. The writing/rewriting process at this stage resulted in a 40-item scale for the pilot test. The pilot test had more items than is desired for the final scale to allow for the possibility of invalid questions.

### Pilot and Reliability Testing

The 40-item scale was administered to 250 undergraduate business students; useable responses were received from 247 students. Analysis of the data revealed no significant differences

[4] DeVellis (1991) indicates the following acceptable ranges for Cronbach's alpha: "between .80 and .90 is very good; between .70 and .80, respectable; between .65 and .70 minimally acceptable."

**TABLE 1**

**Characteristics of Skepticism[a]**

| Characteristics of Skeptics | Comments from Professional Accountants on Their Definition of Skepticism and its Opposite | Scales Examined for Initial Item Pool for this Sub-Construct |
|---|---|---|
| Questioning Mind | "The attitude to look below the surface and see if the numbers, situation, facts or people look out of place, can be questioned further or just don't look or feel right." | State-Trait Personality Inventory (STPI) (Spielberger 1995) |
| | "Question enough to feel comfortable that what is on the surface tells the whole story." | Interpersonal Trust, Trustworthiness and Gullibility Scale (Rotter 1980) |
| | "Skepticism does not presume guilt or innocence, right or wrong, but it does question the reasonableness of client statements and observations." | |
| | "Viewing an issue with a degree of questioning. | |
| | Opposite of Professional Skepticism<br>"Faith. Grabbing your ankles."<br>"Blind acceptance"<br>"Acceptance of all information without question or reservation." | |
| Suspension of Judgment | "The characteristic of withholding a conclusion on a matter until sufficient evidence to form a basis for a reasonable conclusion has been obtained." | Tolerance of Ambiguity (MacDonald 1970) |
| | Opposite of Professional Skepticism<br>"Performing a task with a predetermined or assumed conclusion in mind."<br>"Assuming everything is wrong."<br>"Having a bias or a pre-disposed outcome." | Need for Cognitive Closure (Kruglanski 1990) |
| Search for Knowledge | "Ability to ask questions beyond the obvious (or what appears to be obvious) answer." | Melbourne Curiosity Inventory (MCI) (Naylor 1981) |
| | "Continuous consideration of facts relative to circumstances of the situation." | State-Trait Personality Inventory (STPI) (Spielberger 1995) |
| | "The need/desire to validate facts with collaborating information" | |
| | "Ability to detect, find problems." | |

*(continued on next page)*

**TABLE 1 (continued)**

| Characteristics of Skeptics | Comments from Professional Accountants on Their Definition of Skepticism and its Opposite | Scales Examined for Initial Item Pool for this Sub-Construct |
|---|---|---|
| | Opposite of Professional Skepticism<br>"Suspicion."<br>"Accepting data that is not verified" | |
| **Characteristics of Skeptics** | **Comments from Professional Accountants** | **Scales Examined for Initial Item Pool** |
| Interpersonal Understanding | "Not placing inappropriate degree of trust in people, processes, controls and data." | Melbourne Curiosity Inventory (MCI) (Naylor 1981) |
| | "Recognize that everyone presents information in a manner to best present their own position or personal interests." | State-Trait Personality Inventory (STPI) (Spielberger 1995) |
| | Opposite of Professional Skepticism<br>"Total trust in someone" | |
| Self-Esteem | "Someone who when he/she uncovers a questionable activity would be unafraid to pursue a resolution." | Dimensions of Self Esteem (Forsman and Johnson 1996; Helmreich and Stapp 1974) |
| | | Dimensions of Self Esteem II (Fleming and Courtney 1984) |
| | | Texas Social Behavior Inventory (Helmreich and Stapp 1974) |
| Autonomy | "Taking a step back from an issue, position, or posture and asking, "Does this make sense to me?"" | Locus of Control (Rotter, 1966) |
| | "Using analytical thought to analyze results obtained through testing. Do the results make sense to me?" | |
| | "Applying an independent set of criteria to an alleged fact pattern. Then, reach a conclusion regarding whether the alleged fact pattern conforms to the criteria." | |

a In many instances, I believed that individual items from an existing scale might map to more than one subconstruct. This splitting of items from existing scales is due to subconstructs within the original scale. For example, items in the Melbourne Curiosity Inventory (MCI) that dealt with general curiosity were initially rewritten as potential items for "questioning mind," while those items that dealt with curiosity about people were rewritten as potential "interpersonal understanding" items. This results in the same scale being listed under different constructs in Table 1.

in skepticism scores related to any demographic information such as gender, GPA, class standing, class where the instrument was administered, native English speaker, or age.

**TABLE 2**

**Iterations in Scale Testing**

| Testing Phase | Number of Subjects | Type of Subjects | Number of New Questions Written | Number of Items Initially | Number of Items after Analysis |
|---|---|---|---|---|---|
| Developmental Pre-Test | 89 | Graduate and Undergraduate Business Students | | 49 | 23 |
| Pilot | 247 | Graduate and Undergraduate Business Students | 17 | 40 | 25 |
| Re-test | 147 (92 matched sets were obtained) | Graduate and Undergraduate Business Students | 15 | 40 | 30 |
| Professional Subjects | 200 (57% response rate from 350 initial requests) | Professional Accountants | | 30 | 30 |
| Professional Subjects—Re-test | 88 | Professional Accountants | | 30 | 30 |

The rotated-factor analysis indicated that the majority of items loaded on the six theoretical factors. I eliminated items that loaded on constructs other than those anticipated (primarily with new or reversed items), which resulted in a 25-item scale. Cronbach's alpha for the entire scale was 0.85. I again wrote additional questions to ensure that there were an equal number of questions for each construct.

Intra-subject test-retest reliability measures the stability of an individual's responses over time. The test-retest method is recommended when developing a measure that cannot be validated using known group validation[5] techniques, or when developing a measure with subconstructs that preclude using split-half reliability[6] (DeVellis 1991; Fink 1995; Litwin 1995). Additionally, temporal stability of subjects' scale scores is important if ongoing studies of professional skepticism are to occur.

After an approximately eight-week delay, the 250 subjects were asked to complete the professional skepticism instrument for a second time.[7] Responses were received from 147 subjects, but because of incomplete information I was able to match only 92 sets of responses. The correlation between the total skepticism score (sum of the original 25 items) on the first and second test was significant; $r = 0.89$, $p < .001$. Litwin (1995) indicates that in reliability testing, "r values are considered good if they equal or exceed .70," while Fink (1995) suggests "a conservative rule of thumb: over .75 is a very good to excellent relationship." Cronbach's alpha for the combined test-retest was 0.95.

The 15 "new" items were examined to verify that questions loaded on the appropriate factor. From this analysis, I constructed a 30-item test with an equal number of items for each construct.[8] The final 30-item scale with administering and scoring instructions is located in the Appendix. On this 30-item instrument, the student subjects had a mean score of 132.7 with a standard deviation of 15.9, and scores ranged from 77 to 175.[9]

### Testing with Professional Auditors

I received permission from a major international auditing firm to administer the professional skepticism scale to members of the firm. Managing partners at 13 U.S. offices of this firm agreed to provide email addresses for their staff members[10] and also agreed to send a memo to those individuals encouraging them to respond to my email. I emailed 350 auditors and asked them to participate in a two-part study. The email included the URL for a website that contained the professional skepticism instrument and demographic questions. To increase the response rate, I sent two follow-up emails during the next two months.

Two hundred auditors completed the questions at the designated URL, a 57 percent response rate. Tests of differences between early and late responders did not reveal any significant differences between the groups. Demographics on the auditors are presented in Table 3. The professional auditors' mean score on the scale was 138.6, with a range from 111 to 173 (of 180 points

[5] Known group validation involves administering the instrument to a group of subjects known to have the characteristic that the scale is designed to measure. Because there is not a "known group" that has been determined to possess trait professional skepticism, this preferred validation technique cannot be used.

[6] A scale with an odd number of questions for each construct precludes use of split-half reliability testing.

[7] Although I added questions to the scale to bring the total number of questions to 40, these additional questions were not included in the test-retest analysis.

[8] Six of these 30 items were based on items originally drawn from the STPI (Spielberger 1995) or the MCI (Naylor 1981).

[9] For a more intuitive understanding of what the scale scores mean, a user may wish to transform the scores to a 100-point scale by dividing the original scale score by 180, the maximum scale score. On that scale, the student subjects had a mean of 73.7, and scores ranged from 42.8 to 97.2.

[10] The partners were asked to supply email addresses for individuals with four or more years of audit experience as part of an experimental study that was also conducted at this time.

**TABLE 3**
**Demographics on Professional Accounting Respondents**

| | Male n = 112 | Female n = 87 | Declined to Respond n = 1 | Total n = 200 |
|---|---|---|---|---|
| Months of professional experience | | | | |
| Mean | 60 | 57 | 75 | 58.4 |
| Standard Deviation | 26 | 21 | | 24 |
| Age | | | | |
| Mean | 28.7 | 27.8 | 30 | 28.3 |
| Standard Deviation | 3.3 | 3.0 | | 3.2 |
| Education | | | | |
| Bachelor's Degree[a] | 90 | 72 | | 162 |
| Advanced Degree | 22 | 14 | 1 | 37 |
| Certifications Held | | | | |
| CPA | 99 | 79 | 1 | 179 |
| Other | 6 | 2 | | 8 |

a One subject did not complete the information on education.

possible) and a standard deviation of 12.6.[11] There was no significant correlation between a subject's score on the scale and any of his or her demographics (e.g., age, amount of experience, or gender). The mean experience level of the auditors was 58 months, so all of the subjects should be familiar with the requirement for professional skepticism. However, the purpose of the scale was not disclosed to the subjects in order to lessen the likelihood of subjects responding in a manner that they believed was "correct."

The internal consistency coefficient for this administration of the 30-item scale using Cronbach's alpha is 0.86. As with previous administrations of the instrument, and as expected for a scale designed to measure a single construct, the correlation matrix indicated that many of the items were significantly correlated; therefore, oblique rotation was used in the factor analysis of the responses. As shown in Table 4, the questions loaded on the six theorized factors, but two questions did not load on the construct they were theorized to measure, and one of these items loaded at only 0.49, below the 0.50 minimum suggested by DeVellis (1991).[12] Because this scale is designed to provide a single score for professional skepticism and the internal consistency of the questions is appropriate, this shift in where the two questions loaded might simply be a function of the sample population. It does not indicate that the scale, taken as a whole, has internal consistency problems.

To examine the scale's test-retest reliability (temporal stability), subjects were again emailed and asked to complete an unrelated task, answer a few questions, and then retake the professional skepticism scale. The mean elapsed time between completion of the first and second scale was 22 days, with a range of two days to 56 days and a mode of 15 days. Scores on the repeated

[11] When I transform these scores to a 100-point scale, the transformed mean score is 77, with a range from 61.7 to 91.1.
[12] I reran the analysis using the combined first and second scores of the subjects, and all items loaded on the appropriate constructs with loadings above 0.50, providing some support that the questions moving to another subconstruct was a function of this particular population.

**TABLE 4**

**Rotated Component Matrix Responses to the Skepticism Scale—Professional Subjects**

| Factor | | | | | | Scale $\alpha$ = .86; n = 200 |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | Item ("R" = reversed item) |
| | | | | | | Search for Knowledge ($\alpha$ = .88) |
| .91 | .09 | .15 | .21 | .26 | −.14 | I think that learning is exciting. |
| .83 | .07 | .18 | .25 | .21 | −.22 | I relish learning. |
| .83 | .07 | .07 | .20 | .28 | −.11 | Discovering new information is fun. |
| .82 | .16 | .20 | .25 | .32 | −.10 | I like searching for knowledge. |
| .77 | .03 | .17 | .08 | .28 | −.12 | The prospect of learning excites me. |
| .55 | .22 | .18 | .34 | .27 | −.45 | I enjoy trying to determine if what I read or hear is true.[a] |
| | | | | | | Suspension of Judgment ($\alpha$ = .83) |
| .07 | .82 | −.06 | .18 | −.01 | −.14 | I take my time when making decisions. |
| .03 | .80 | .14 | .22 | .02 | −.16 | I don't like to decide until I've looked at all of the readily available information. |
| .03 | .77 | −.03 | .08 | −.22 | −.25 | I dislike having to make decisions quickly. |
| .17 | .76 | .23 | .12 | .09 | −.13 | I like to ensure that I've considered most available information before making a decision. |
| .11 | .69 | .01 | .06 | −.14 | .02 | I wait to decide on issues until I can get more information. |
| | | | | | | Self-Determining ($\alpha$ = 76) |
| .07 | .07 | .76 | .07 | .25 | −.37 | I tend to immediately accept what other people tell me. (R) |
| .12 | .19 | .76 | .11 | .06 | −.25 | I usually accept things I see, read, or hear at face value. (R) |
| .13 | −.03 | .74 | .07 | .22 | −.37 | I often accept other people's explanations without further thought. (R) |
| .12 | .08 | .64 | .10 | .29 | −.57 | It is easy for other people to convince me. (R) |
| .08 | −.03 | .56 | −.03 | .12 | .05 | Most often I agree with what the others in my group think. (R) |
| .25 | .11 | .49 | .05 | .17 | −.11 | I usually notice inconsistencies in explanations.[a] |

*(continued on next page)*

**TABLE 4 (continued)**

| Factor | | | | | | Scale $\alpha$ = .86; n = 200 |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | Item ("R" = reversed item) |
| | | | | | | Interpersonal Understanding ($\alpha$ =90) |
| .28 | .19 | .10 | .90 | .13 | −.21 | I like to understand the reason for other people's behavior. |
| .22 | .19 | −.00 | .88 | .06 | −.18 | I am interested in what causes people to behave the way that they do. |
| .33 | .12 | −.04 | .88 | .02 | −.10 | The actions people take and the reasons for those actions are fascinating. |
| .14 | .06 | .17 | .79 | .08 | −.03 | I seldom consider why people behave in a certain way. |
| .05 | .12 | −.02 | .75 | .11 | .14 | Other people's behavior doesn't interest me. |
| | | | | | | Self-Confidence ($\alpha$ = 91) |
| .29 | −.10 | .17 | .02 | .90 | −.06 | I have confidence in myself. |
| .25 | −.03 | .25 | .11 | .87 | −.07 | I don't feel sure of myself. |
| .34 | −.01 | .23 | .14 | .87 | −.12 | I am self-assured. |
| .22 | −.01 | .11 | .11 | .84 | −.15 | I am confident of my abilities. |
| .24 | −.08 | .18 | .04 | .81 | .06 | I feel good about myself. |
| | | | | | | Questioning Mind ($\alpha$ = .67.) |
| .23 | .06 | .21 | .11 | .07 | −.85 | My friends tell me that I often question things that I see or hear. |
| .32 | .07 | .46 | .12 | .17 | −.78 | I frequently question things that I see or hear. |
| .00 | .31 | .21 | −.02 | .01 | −.60 | I often reject statements unless I have proof that they are true. |

a Items included as part of the "questioning mind" construct which loaded on other constructs.

professional skepticism scale were collected from 88 subjects. Their mean score on the second test was 135.4, with a range of 105 to 177 and a standard deviation of 14.7.[13] This compares favorably with these subjects' scores on the previously reported first administration of the scale. The correlation between the first and second test scores was 0.85, which is significant at the 0.01 level. Cronbach's alpha, measuring internal consistency between the two total scores, was 0.91. These results provide preliminary evidence that the skepticism scale is a valid instrument with appropriate inter-item and temporal stability. As such, it provides accounting firms and researchers with the first instrument theoretically designed to measure professional skepticism.

## DISCUSSION, LIMITATIONS, AND RECOMMENDATIONS

### Discussion and Implications

Researchers studying auditor behavior have often used professional skepticism as a motivation for their research or as an explanation for results, but an *a priori* measure of trait professional

[13] Transformed scores: mean 75.2, with a range of 58.3 to 98.3.

skepticism did not exist. In this paper, I reviewed the literature on both auditor professional skepticism and skepticism as it is discussed in other disciplines. All of these literatures provide support for professional skepticism as a multi-faceted construct. Based on this review, I developed a set of characteristics that underlie professional skepticism. Professional accountants also provided me with definitions and "opposites" of professional skepticism, and these comments indicated that a multi-dimensional view is appropriate. From the theoretical underpinnings and the characteristics, I developed a 30-item scale designed to measure professional skepticism.

In this paper I focused on the multi-dimensional characteristics of skeptics which combine to determine one's level of *trait* skepticism, which, in turn, influences one to behave in certain ways. Our understanding of professional skepticism will remain incomplete, however, until we begin to address the issues of *state* professional skepticism and skeptical behaviors. The PCAOB's Inspection Reports have consistently cited a lack of due care and professional skepticism when describing absent behaviors. The background literature in philosophy also suggests four behaviors that are expected of skeptics: increased information search, increased contradiction detection, increased alternative generation, and expanded scrutiny of interpersonal information (Annas and Barnes 1985; Bunge 1991; Kurtz 1992; McGinn 1989; Popkin 1979). Table 5 shows the behaviors predicted from the philosophical literature and the professional audit literature. Evidence from a workpaper review experiment (Hurtt et al. 2009) indicates that the professional skepticism scale described here does differentiate and that some of these skeptical behaviors were more evident among auditors who were identified by the scale as possessing more trait skepticism. Further evidence regarding the validity of the instrument will be able to be addressed as the scale is used by other researchers.

**TABLE 5**

**Philosophical and Professional Skeptical Behaviors**

| Philosophically Predicted Skeptical Behavior | Behavior Required by Auditing Standards |
|---|---|
| Expanded Information Search | "Sufficient competent evidential matter is to be obtained through inspection, observation, inquiries, and confirmations" SAS No.1. SAS No. 82 indicates that with an increased risk of material misstatement, the nature of audit procedures may need to be changed to obtain additional or more reliable information (i.e., expand testwork). |
| Increased Contradiction Detection | AU 329 requires an auditor to develop specific expectations (before performing analytical review procedures) and compare those to recorded results to identify unexpected differences. |
| Increased Alternative Generation | AU 329 requires an auditor to develop specific expectations (before performing analytical review procedures) and compare those to recorded results to identify unexpected differences. Auditors are then required to understand or explain the differences. This requires an understanding of both the plausibility of management's explanations and corroborating evidence other than such explanations. |
| Increased Scrutiny of Source Reliability | "A sufficient understanding of the internal control structure is to be obtained…" SAS No.1. SAS No.82 paragraph 16, indicates that management's characteristics such as their abilities, pressures, style, and attitudes must be assessed. |

The relationship between trait skepticism and these four behaviors may prove to be a very fertile area for future audit research. For example, expanded information search behavior is consistent with the SAS No. 1 requirement that auditors obtain a sufficient level of evidence prior to forming an audit opinion. Similarly, SAS No. 82 and SAS No. 99 recognize the relationship between risk and the expanded need for audit evidence. However, expanded information search due to higher levels of trait skepticism may result in over-auditing, which raises the question, "Can an auditor be too skeptical?" It also raises a related question, "Do all members of an audit team need to have a high level of trait skepticism, or is there a minimum level of trait skepticism that is necessary for professional audit work?"

During an audit, an auditor is expected to develop specific expectations and to compare these expectations to actual audit findings to identify differences. Identification of these differences or contradictions is necessary for an effective audit. Research into the amount and nature of the contradictions detected might help determine the impact of trait professional skepticism in critical audit areas such as fraud detection.

The area of hypothesis generation has generated significant auditing research; however, studies have not linked it with the participants' trait skepticism level. In an audit setting, expanded scrutiny of interpersonal information may cause a skeptical auditor to question not only the information that is provided by a client, but also the various motivations that the client has in providing that information. The skeptical auditor may also be concerned about the reliability and independence of systems that provide information and be aware of the need for corroboration and support. Research into any audit efficiencies or changes in audit effectiveness that might result from auditors' trait skepticism will be an area of possible interest to the firms and audit researchers.

**Limitations and Recommendations**

While the scale was created and validated using rigorous development procedures, it is only after repeated use that researchers will begin to have assurance that the scale is actually capturing trait skepticism. Future research in auditing will serve to provide additional validation or indicate the need for revision of the scale. Furthermore, although this scale was developed assuming equal importance and equal weighting of all of the subconstructs, this may not be a valid assumption. It may be determined that specific subconstructs are most useful in predicting auditor behavior and a more parsimonious scale may be developed. In addition, I explicitly assumed a compensatory model for developing this scale (i.e., scoring higher on one aspect of the scale compensates for scoring lower on another). This may prove to be an unwarranted assumption, and further research could indicate that a noncompensatory combination of characteristics is required for trait skepticism.

This scale was validated using auditors from one major accounting firm and was validated prior to passage of the Sarbanes-Oxley Act of 2002. As the scale is intended to measure trait skepticism, a relatively stable characteristic, there is no theoretical basis for concluding that the Act's passage would influence an auditor's score on this instrument. It does not appear that the characteristics of professional skepticism should be firm-related; however, future substantiation using a wider range of auditors is important for full validation of the scale.

This scale was developed to measure *trait* skepticism, but there is great interest in a rigorously developed instrument that is able to measure *state* skepticism. Many researchers are interested in knowing whether various audit situations evoke a *state* of professional skepticism in auditors. Currently researchers must rely on behavioral changes or awareness of experimental manipulations to make assumptions about the presence or absence of *state* professional skepticism. I recommend that further research be conducted to develop an instrument to measure *state* skepti-

cism, as many questions rest on determining whether an auditor's state skepticism is aroused by situational variables and how that arousal influences his/her behavior. It is possible that the difference between the neutral and presumptive doubt perspectives on professional skepticism identified by Nelson (2009) may be explained by a trait and state view of professional skepticism. Trait skepticism may relate to the neutral perspective and the six characteristics identified here; however, when an auditor's state skepticism is aroused, it may be that he or she moves to a position of presumptive doubt.

Given the importance of professional skepticism and its basis as the foundation of the auditing profession, continuing research in this area is needed. Until the development of a trait skepticism scale, audit researchers were hampered in their ability to *a priori* determine auditors who are more and less skeptical. The ability to ascertain trait skepticism levels should provide researchers with an important tool in determining behavioral responses of more and less skeptical auditors in a variety of audit circumstances.

## APPENDIX
## SKEPTICISM SCALE AND INSTRUCTIONS FOR ADMINISTRATION

Statements that people use to describe themselves are given below. Please circle the response that indicates how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement.

| | **Strongly Disagree** | | | | | **Strongly Agree** |
|---|---|---|---|---|---|---|
| I often accept other people's explanations without further thought. | 1 | 2 | 3 | 4 | 5 | 6 |
| I feel good about myself. | 1 | 2 | 3 | 4 | 5 | 6 |
| I wait to decide on issues until I can get more information. | 1 | 2 | 3 | 4 | 5 | 6 |
| The prospect of learning excites me. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am interested in what causes people to behave the way that they do. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am confident of my abilities. | 1 | 2 | 3 | 4 | 5 | 6 |
| I often reject statements unless I have proof that they are true. | 1 | 2 | 3 | 4 | 5 | 6 |
| Discovering new information is fun. | 1 | 2 | 3 | 4 | 5 | 6 |
| I take my time when making decisions. | 1 | 2 | 3 | 4 | 5 | 6 |
| I tend to immediately accept what other people tell me. | 1 | 2 | 3 | 4 | 5 | 6 |
| Other people's behavior does not interest me. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am self-assured. | 1 | 2 | 3 | 4 | 5 | 6 |
| My friends tell me that I usually question things that I see or hear. | 1 | 2 | 3 | 4 | 5 | 6 |
| I like to understand the reason for other people's behavior. | 1 | 2 | 3 | 4 | 5 | 6 |

*(continued on next page)*

| | **Strongly Disagree** | | | | | **Strongly Agree** |
|---|---|---|---|---|---|---|
| I think that learning is exciting. | 1 | 2 | 3 | 4 | 5 | 6 |
| I usually accept things I see, read, or hear at face value. | 1 | 2 | 3 | 4 | 5 | 6 |
| I do not feel sure of myself. | 1 | 2 | 3 | 4 | 5 | 6 |
| I usually notice inconsistencies in explanations. | 1 | 2 | 3 | 4 | 5 | 6 |
| Most often I agree with what the others in my group think. | 1 | 2 | 3 | 4 | 5 | 6 |
| I dislike having to make decisions quickly. | 1 | 2 | 3 | 4 | 5 | 6 |
| I have confidence in myself. | 1 | 2 | 3 | 4 | 5 | 6 |
| I do not like to decide until I've looked at all of the readily available information. | 1 | 2 | 3 | 4 | 5 | 6 |
| I like searching for knowledge. | 1 | 2 | 3 | 4 | 5 | 6 |
| I frequently question things that I see or hear. | 1 | 2 | 3 | 4 | 5 | 6 |
| It is easy for other people to convince me. | 1 | 2 | 3 | 4 | 5 | 6 |
| I seldom consider why people behave in a certain way. | 1 | 2 | 3 | 4 | 5 | 6 |
| I like to ensure that I've considered most available information before making a decision. | 1 | 2 | 3 | 4 | 5 | 6 |
| I enjoy trying to determine if what I read or hear is true. | 1 | 2 | 3 | 4 | 5 | 6 |
| I relish learning. | 1 | 2 | 3 | 4 | 5 | 6 |
| The actions people take and the reasons for those actions are fascinating. | 1 | 2 | 3 | 4 | 5 | 6 |

**Skepticism Scale Instructions (for the researcher administering the scale)**

This is a 30-item scale that normally takes less than five minutes for individuals to complete. I normally explain that the scale is used to measure differences in individual characteristics and that there are no right or wrong answers.

Items 1, 10, 11, 16, 17, 19, 25, 26 are reverse scored. (Subtract the score from 7 and use the reversed number in summing the total score.)

Scale scores can range from 30 to 180. Student scores have tended to fall within the 90 to 150 range and higher scores equate to greater skepticism. Researchers may wish to transform the scale by dividing the individual's score by 180 to put the score on a 100-point scale. In the event of this transformation, an individual scoring 100 would have scored the maximum on the scale. The transformed mean among the professional auditors was 75 on one administration and 77 on another.

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