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Interpretation of uncertainty expressions

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Timothy S. Douplik and Martin Richter

**Interpretation of Uncertainty Expressions:
A Cross-National Study**



Universität Potsdam
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INTERPRETATION OF UNCERTAINTY EXPRESSIONS: A CROSS-NATIONAL STUDY

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INTERPRETATION OF UNCERTAINTY EXPRESSIONS: A CROSS-NATIONAL STUDY

ABSTRACT

This study investigates the effect of culture and linguistic translation on the interpretation of verbal uncertainty expressions found in International Accounting Standards. Data are collected from U.S. Certified Public Accountants and German-speaking Wirtschaftsprüfer to test three hypotheses. One group of German speakers evaluated uncertainty terms expressed in German and another group in English. The results indicate significant differences in interpretation across the three groups. Some differences are attributed to a culture effect and others to a translation effect, with the culture effect being more pervasive. These results raise the question of whether International Accounting Standards can be applied consistently across language-cultures.

INTERPRETATION OF UNCERTAINTY EXPRESSIONS: A CROSS-NATIONAL STUDY

INTRODUCTION

Uncertainty and judgment are inherent in both the financial reporting and auditing domains. Auditing standards use verbal probability (uncertainty) expressions to establish thresholds for when sufficient evidence has been gathered and auditors frequently use and interpret such expressions (Amer, Hackenbrack, and Nelson, 1994). Financial reporting standards also use uncertainty expressions in establishing criteria for the recognition, measurement, or disclosure of items, and both accountants and auditors are required to attach meaning to those expressions. The expressions “remote”, “Areasonably possible”, and “probable” in the FASB's Statement of Financial Accounting Standards No. 5 are examples. Davidson and Chrisman (1994) identified some 33 different uncertainty expressions used in Canadian accounting and auditing standards. Even the basic elements of financial statements are defined in terms of probability as exemplified by the FASB's SFAC 6 definition of an asset as "probable future economic benefits obtained or controlled by a particular entity..." [SFAC 6, par. 25, emphasis added].

International Accounting Standards (IAS), developed for worldwide usage to enhance the comparability of financial reports across countries, also include a number of uncertainty expressions. Necessary conditions for cross-national comparability include the use of a single set of standards and consistent interpretation of those standards across countries. To the extent that uncertainty expressions used in IAS are interpreted differently by accountants and auditors in different countries, the cross-national comparability of financial reports will suffer. This study addresses the research question of whether interpretations of IAS uncertainty expressions by

professional accountants in the United States and in German-speaking countries have similar meaning. To our knowledge, this is the first study of uncertainty expressions to use professional accountants in more than one country.

Hypotheses based on cultural relativism and translation effects are tested using data gathered through a field experiment. The answer to the research question is important to the viability of using a single set of accounting standards worldwide. The selection of the United States and Germany as countries to study is relevant because these two countries are important for the process of worldwide harmonization. The study is also timely from a U.S. perspective as the Securities and Exchange Commission (SEC) debates whether foreign registrants should be allowed to use IAS in preparing financial statements without reconciliation to U.S. GAAP.

The remainder of this paper is organized into six sections. The first section provides a review of related studies in the psychology and accounting literatures, and includes a discussion of culture and linguistic relativism. The second section describes the uncertainty expressions examined in the study. The third section presents the specific research questions and hypotheses tested. The fourth section describes the research methodology, and the fifth section presents the analysis and results. The final section provides a summary and offers conclusions.

RELATED LITERATURE

Psychology Research

A considerable amount of research has been conducted and reported in the psychology literature investigating the quantitative meanings of verbal probability expressions (e.g., Simpson, 1963; Lichtenstein and Newman, 1967; Beyth-Marom, 1982; Budescu and Wallsten, 1985; Reagan, Mosteller, and Youtz, 1989). More than 280 different probability expressions

have been examined with only a small subset examined in any one study. The predominant method of assessing the meaning of a probability expression has been to ask subjects to provide a percentage from 0 to 100 that corresponds to it (Reagan, Mosteller, and Youtz, 1989). Results consistently show a large degree of between-subject variability (Budescu and Wallsten, 1985). This variability has been found to be inversely related to the distance from the center of the scale (Wallsten, *et al*, 1986). The variability has been found to be lower in groups from homogeneous backgrounds (Brun and Teigen, 1988), and expressions embedded in context exhibit more variability than those in isolation (Beyth-Marom, 1982).

Results reported in the psychology literature also show a lack of symmetry (Budescu and Wallsten, 1985). That is, probabilities assigned to mirror-image pairs such as "probable" and "improbable" do not sum to 100 percent (Lichtenstein and Newman, 1967). Negative probability expressions tend to be further away from the 50 percent midpoint than the related positive expressions (Reagan, Mosteller, and Youtz, 1989).

The variability in responses to uncertainty expressions can be due to (a) the vague meaning of the expressions or (b) the fact that the meaning of probability terms is not constant across individuals. The results of Wallsten, *et al* (1986) support the notion that non-numerical probability expressions convey vague uncertainties; the vagueness can be attributed to the use of a verbal expression and not to the perceived uncertainty. They suggest that people not only understand uncertainty expressions as representing amounts of probability but also as representing degrees of confidence in that probability.

Phillips and Wright (1975) introduced the notion that culture can influence the cognitive processes involved in probability assessment. They hypothesized that English people (who have

a “probabilistic” world-view) would make finer discriminations in degrees of uncertainty than would Chinese people (who have a “fatalistic” world-view) and that numerical assessments of probabilities would be more meaningful for the English than for the Chinese. Their experimental results generally support their hypotheses.

Accounting Research

Much of the research on uncertainty expressions in the accounting domain relates to the interpretation of the uncertainty expressions used in FASB Statement of Financial Accounting Standards (SFAS) No. 5 for determining when a contingency should be recognized or disclosed. SFAS 5 requires no disclosure when the contingent loss is “remote”, footnote disclosure when it is “reasonably possible”, and financial statement recognition when the contingent loss is “probable.”

Schultz and Reckers (1981) found that auditors' interpretations of SFAS 5 expressions were affected by the materiality of the potential loss, and that the variability of responses was reduced after individuals were involved in group processing of the disclosure issue. Jiambalvo and Wilner's (1985) results show considerable between subject variability in assignment of probability ranges to the words “remote,” “reasonably possible,” and “probable.” Subsequent analysis implied that the variability was due to different interpretations of the words rather than in an inability to express feelings in terms of probabilities. In contrast to Schultz and Reckers, they did not find materiality of loss to affect decisions regarding disclosure. Harrison and Tomassini (1989) examined auditors' interpretations of probability thresholds for “remote”, “reasonably possible,” and “probable” across different types of contingencies. They found little difference in thresholds across the various contingencies although there was less consensus about

the threshold between "remote" and "reasonably possible."

Chesley (1986) conducted two experiments with accounting students to address several questions related to the interpretation of uncertainty expressions. Consistent with results in the psychology literature, he found a low degree of group consistency for most expressions and a lack of symmetry in complementary words.

Reimers (1992) conducted an inter-group study to determine whether samples of auditors, engineering managers, marketing managers, and graduate students interpret 30 uncertainty expressions, including those of SFAS 5, in the same way. She found that many of the expressions were interpreted as synonyms. She also found that the range of probability covered by the three expressions in SFAS 5 indicates a range of uncertainty between "remote" and "reasonably possible" not covered by those expressions. Using both practicing accountants and accounting students, Davidson (1989) found similar results and he concluded that the SFAS 5 set of probability expressions is not optimal. He suggested that "reasonably possible," which is perceived as quite similar to "probable," should be replaced with a term such as "sometimes" that might better convey a level of probability that is closer to the midpoint between "remote" and "probable."

Amer, Hackenbrack, and Nelson (1994) asked auditing managers to provide numerical interpretations of 23 uncertainty phrases placed in an auditing context. They also found that multiple phrases have similar numerical interpretations. Similar mean results were obtained for six phrases common with Reimers, even though her study was not in context. Amer, Hackenbrack, and Nelson (1994) also found that the inter-subject variability inherent in assigning probability to uncertainty expressions decreased when moving from phrases that

communicate low probabilities to those that communicate high probabilities.

To test whether the mental representation of uncertainty phrases is affected by the language in which they are expressed, Davidson and Chrisman (1993) examined the interpretation of uncertainty expressions found in International Accounting Standards between Anglophone and Francophone accounting students in Canada. They suggested that differences in mental representations can exist in two ways. Either the mean probability associated with an uncertainty expression is not the same in each language, indicating a difference in the concept conveyed by the expression, or the degree of consensus on the probability associated with an uncertainty expression is not the same in each language, indicating a difference in the precision of the expression. Davidson and Chrisman (1993) compared mean probabilities assigned to the English original and French translation and found differences in 13 of 27 expressions examined. In addition, they found significant differences in the variance of the probabilities for 14 of the 27 expressions, with the English expressions generally having lower variance. The authors infer from this result that the English expressions convey a more precise meaning than the French equivalent. In a related study, Davidson and Chrisman (1994) found similar results for uncertainty expressions utilized in Canadian accounting and auditing standards.

The work of Davidson and Chrisman suggests that the translation of uncertainty phrases from one language to another can lead to non-similar interpretations by two different linguistic groups located in the same country. The current study addresses the related question of whether different linguistic groups in different countries interpret uncertainty expressions similarly. By including different nationalities in the study, national culture is introduced as an additional factor that could affect these interpretations. The following section considers literature in the areas of

culture and psycholinguistics to develop arguments as to why and how nationality might affect these interpretations.

Culture and Linguistic Relativism

National culture is thought to be an important environmental factor influencing a country's accounting system (Mueller, 1967; Violet, 1983; Harrison and McKinnon, 1986; Gray, 1988) and empirical studies show this to be generally true (Frank, 1979; Doupnik and Salter, 1995; Salter and Niswander, 1996; Zarzeski, 1996). Culture has also been shown to affect the design and/or effectiveness of management control systems (Harrison, 1993; Chow, Kato, and Merchant, 1996; Chow, Shields, and Wu, 1999). (See Harrison and McKinnon, 1999, for a review of the literature on management control systems and culture.) The issue at hand, however, is whether culture affects the interpretation by accountants of accounting standards, in general, and uncertainty expressions within those standards, in particular.

Riahi-Belkaoui and Picur (1991) developed a theoretical justification for the effect culture might have on the perception of accounting concepts. Using a cognitive orientation to culture, they suggest that national cultures act as networks of subjective meanings or frames of reference shared by members of the culture. As such, national culture could influence the way members of that culture perceive basic accounting principles such as "going concern" and "matching." Perceptions of accounting principles varied among samples of U.S., Canadian, and British auditors in their empirical tests.

Bagranoff, Houghton, and Hronsky (1994) suggested that cross-cultural differences may affect the meaning associated with, and hence judgment in applying, accounting standards. They found differences in cognitive structures related to the concept "extraordinary items" between

U.S. and Australian auditors.

These studies show that national membership can affect perceptions of accounting specific principles and concepts. These results do not necessarily imply, however, that national culture will affect interpretations of more general words and phrases commonly found in uncertainty expressions such as "probable" and "remote." The link between national culture and the perception of general concepts can be made by considering one very important aspect of culture--language.

Language and culture are interrelated. Sapir (1964) argues that the perfection of language is a prerequisite for the development of a culture as a whole, and that language is the verbal expression of a culture. Belkaoui (1989) suggests that language is indicative of the "metaphysics" of a culture which consist of "unstated premises which shape the perception and thought of those who participate in that culture and predispose them to a given mode of perception" (p. 283). Indeed, in previous accounting research, language has been used as a surrogate for culture (Frank, 1979; Nair and Frank, 1980).

Linguistic relativism relates to the role language plays in our understanding of the world. The grammatical forms and categories provided by a language are thought to affect the manner in which speakers of a given language interpret the world (Sapir, 1964; Whorf, 1956). In other words, a given language predisposes its users to a distinct belief (Belkaoui, 1989).

Monti-Belkaoui and Belkaoui (1983) tested the hypothesis derived from linguistic relativism that different languages result in different meaning being attached to basic accounting principles. Using Anglophone and Francophone students in Canada as subjects, their results support the notion that speakers of different languages perceive basic accounting concepts

differently, even though both groups were members of the same national culture. They also found that bilingual speakers of both languages were different from either unilingual group.

The theory of linguistic relativism suggests that a specific language could predispose its speakers to distinct interpretations of uncertainty expressions and that different languages could lead to different interpretations of uncertainty expressions. As language is intertwined with culture, this leads to the notion that members of different national cultures with different languages, i.e., different language-cultures, could differ in the meaning attached to uncertainty expressions.

The countries selected in this study have different languages (English and German) and have been classified as being members of two distinctly different cultural areas (Anglo and Germanic) (Hofstede, 1980). The question arises whether the different language-cultures in which U.S. Certified Public Accountants (CPAs) and German-speaking Wirtschaftsprüfer (WPs) live and work affects their perception and interpretation of uncertainty expressions found in IAS. The IAS uncertainty expressions examined in the current study are described in the next section.

IDENTIFICATION OF UNCERTAINTY EXPRESSIONS

The official language of the IASC is English and IAS are published in that language. In 1997, the IASC produced an official German translation of the 33 extant IAS (Schäffer-Poeschel, 1998). This was the first and, at the time, only official translation of IAS into another language. An examination of these standards resulted in the set of 16 uncertainty expressions used in this study (see Table 1). Table 1 indicates that there is some difficulty in translating certain English expressions into German. For example, the single word "remote" is translated into the three-word phrase "Wahrscheinlichkeit äußerst gering" (literal translation = "probability extremely

small"). This apparent lack of direct equivalence of expressions in the two languages suggests that there may be a lack of equivalence in the underlying concepts.

[Insert Table 1 here]

There is also some lack of consistency in the translation to German with multiple expressions used to translate four of the English expressions. For example, the expression "likely" is translated as both "voraussichtlich" and "wahrscheinlich." This inconsistency could be attributed to two possible causes. One, the translators felt that these two German words convey similar meaning and may be used interchangeably. Two, one German expression was deemed to be more appropriate than the other within the context in which it was being used. It is possible that "voraussichtlich" and "wahrscheinlich" convey subtle differences in probability or degree of consensus that are lost by using the single term "likely."

Two different English expressions are translated into the same German word in two situations. "Likely" and "expected" are both translated as "voraussichtlich," and "likely" and "probable" are both translated as "wahrscheinlich." The interchangeability of these expressions suggests that the German translators believe that the English terms "likely," "expected," and "probable" have similar meaning, which indeed may be true.

The translation problems noted above suggests a possible source other than language-culture that could lead to differences in perceptions of IAS uncertainty expression between U.S. and German accountants, namely that translation into another language distorts the underlying meaning that the IASC wished to convey in the original English. For example, German WPs' perception of "Wahrscheinlichkeit äußerst gering" could differ from U.S. CPAs' perceptions of "remote" because the two expressions simply are not equivalent. Therefore, there are two

competing explanations for why interpretation of uncertainty expressions might differ between accountants from two different language-cultures: *culture* and *translation*.

RESEARCH QUESTIONS

The primary question addressed in this study is whether differences exist between U.S. and German accountants in the interpretation of uncertainty expressions found in IAS. If so, this could have negative consequences for the comparability of financial statements between these two countries even though those statements are prepared using a single set of standards. The first hypothesis examined is:

Hypothesis 1: Interpretations of uncertainty expressions differ between U.S. and German accountants because of differences in culture and/or because of linguistic translation.

If differences in the interpretation of uncertainty expressions exist, the second research question is what is the cause: Are differences due to the different language-cultures of the two groups or are differences due to the effects of translation or are differences due to both? Knowing whether culture or translation is the cause of differing interpretations could be important because one cause might be easier to overcome than the other in improving the comparability of financial statements. The second and third hypotheses examined in this study are:

Hypothesis 2: Interpretations of uncertainty expressions differ between U.S. and German accountants because of differences in language-culture.

Hypothesis 3: Interpretations of uncertainty expressions differ between U.S. and German accountants because of linguistic translation.

METHODOLOGY

Research Instrument

To examine the research questions, a mailed survey questionnaire was employed to obtain subjects' interpretations of the IAS uncertainty expressions listed in Table 1. The questionnaire was comprised of three parts and four versions of the questionnaire were developed: an all-English version (E), an all-German version (G), and two mixed-language versions (GE1 and GE2). The all-English language version of the questionnaire is provided in the Appendix.

Part 1 of the all-English questionnaire (E) contained the 16 expressions listed in Table 1. Subjects were asked to assign probabilities to the uncertainty expressions using a scale of 0 to 100. A non-accounting example was provided in the instructions to enhance understanding of the task. To mitigate an order effect, two versions of the questionnaire were created in which the uncertainty expressions were placed in different random arrangements. Part 2 of the questionnaire asked respondents to indicate the range of probabilities associated with 6 of the 16 expressions in Part 1. Pitz (1980) suggests that uncertainty expressions best describe a range of numerical probabilities rather than single values. Demographic information was collected in Part 3 of the questionnaire.

The all-German version was identical to the English version with the following exceptions. Due to there being two translations for "probable" and three for "no longer probable," the German version (G) of the questionnaire included 19 expressions corresponding to the 16 expressions in English. Additional demographic questions asked about English fluency and professional experience working in an English-speaking country. These questions were asked to examine whether exposure to the English language and/or the Anglo culture might influence

perceptions of uncertainty expressions.

Expressions in Parts 1 and 2 of the all-German questionnaire were presented in the same random order as in the English version. To ensure equivalence between the English and German versions of the questionnaire, the German version was prepared first and then translated into English by the researcher with English as his first language. German colleagues then checked the English version for consistency with the German version. One of the advantages of including the German language-culture in this study is that an official translation of IAS exists and any subjectivity introduced by a translation of the uncertainty expressions by the researchers could be avoided.

The third version of the questionnaire (GE1) was comprised of a combination of instructions and demographic questions from the all-German version, and uncertainty expressions taken from the all-English version. Subjects receiving this version of the questionnaire assigned probabilities to uncertainty terms expressed in English. In the fourth version of the questionnaire (GE2), Part 2 of the all German questionnaire (related to ranges) was replaced with the uncertainty expressions from Part 1 of the all English questionnaire. Thus, respondents to GE2 assigned probabilities to the same uncertainty terms expressed in both English and German.

Subjects

Questionnaire E was mailed to CPAs in the United States. The mailing list was obtained from the American Institute of Certified Public Accountants (AICPA) and the sample was randomly drawn from that subset of AICPA members who indicate that they work in public accounting and have auditing as their professional interest. Questionnaires G, GE1, and GE2

were mailed to WPs throughout Germany randomly drawn from the WP Directory published by the Institut der Wirtschaftsprüfer. In addition, to examine whether differences exist between different nationalities that speak the same language, questionnaire G was also sent to a sample of WPs in Austria and Switzerland.

Sample sizes, response rates, and respondent demographics are reported in Table 2. For subsequent analysis, respondents with internally inconsistent responses were removed from the data set. Inconsistent responses were identified by comparing responses to those uncertainty expressions that are direct opposites of each other, such as, “likely/unlikely” and “wahrscheinlich/nicht wahrscheinlich.” Those respondents assigning a probability to the second expression in the pair greater than the probability assigned to the first expression were removed from the data set. These respondents apparently did not correctly understand the task.

[Insert Table 2 here]

The German WPs’ response rates to questionnaires GE1 and to Part 2 of GE2 were well below the German WPs’ response rates for questionnaire G, probably because German speakers were being asked to respond to uncertainty expressions in English.

The most interesting result from the demographic questions is the extent to which the different groups are familiar with and refer to IAS in their work. The majority of U.S. CPAs indicated that they are not familiar and that they never refer to IAS, whereas only relatively small percentages of the various German-speaking WP groups indicated the same. Although this difference has no direct bearing on the current research, it is somewhat surprising to discover that U.S. CPAs have so little contact with IAS.

To examine whether nationality alone, controlling for language-culture, affects interpretation of uncertainty expressions, the responses to questionnaire G made by German WPs were compared with responses to questionnaire G made by Austrian and Swiss WPs. To test whether interpretations of uncertainty expressions differ between U.S. CPAs and German-speaking WPs (Hypothesis 1), the mean responses to Part 1 of questionnaire E (CPA) were compared with the mean responses to Part 1 of questionnaire G (WP/German). To test the effect of language-culture (Hypothesis 2), controlling for any translation effect, responses to questionnaire E (CPA) were compared with the combined responses to questionnaire GE1 and the English part of GE2 (WP/English).

To test the effect of translation (Hypothesis 3), controlling for culture, the responses to Part 1 of questionnaire G (WP/German) were compared to the responses to Part 1 of GE1 (WP/English)—a between subjects comparison. Hypothesis 3 was also tested by comparing the responses to GE2-Part 1 (WP/German) with the responses to GE2-Part 2 (WP/English)—a within person comparison. A comparison of WPs' perceptions of those expressions where two different German words have been used for one English word provides additional insight into the effect translation has on the interpretation of IAS.

Responses to Part 2 of questionnaires E, G, and GE1 were also compared across the three groups (CPA, WP/German, and WP/English) to test for overall, culture, and translation effects with regard to the range of probabilities assigned to uncertainty expressions.

ANALYSIS AND RESULTS

Point Estimate Probabilities

The first step in the analysis was to test for differences in the point-estimate

interpretations (Part 1 of the questionnaire) of uncertainty expressions made by the German respondents and those made by the Swiss and Austrian respondents. One-way ANOVA found only one expression (“mit der Aussicht”) for which a significant difference exists. Post hoc comparisons show a significant difference between the German and Austrian groups of WPs on this expression. Because of the small number of Austrian respondents (n=8), treating the Austrians as a separate group in ANOVA is tenuous. Therefore, the Austrian and Swiss responses were combined and compared with those of the German group. There was only one significantly different mean response between these two groups (“erwartet”). When the Austrian and German groups were combined and compared with the Swiss group, no significant differences were found. The general lack of significant differences between these three groups of German-speaking WPs allows us to conclude that nationality alone does not cause differences in interpretation of uncertainty expressions. Indeed, there appears to be a common interpretation among German-speaking WPs regardless of nationality. Because of this, the responses of these three groups are combined for subsequent hypothesis testing. This combined group is referred to as WP/German (n=109).

Part 1 of questionnaire GE1 and part 2 of questionnaire GE2 were the same. In both cases, German-speaking WPs were asked to assign point estimate probabilities to English expressions. A comparison of the results of these two groups resulted in no significant differences in means across the 16 expressions. The responses to these two questionnaires are combined into a group referred to as WP/English (n=62) for subsequent testing.

Table 3 reports the mean probability assigned to each English uncertainty expression by the CPA and WP/English groups (Columns 3 and 4), and to the German translations by the

WP/German group (Column 5). Several expressions included in this study have been examined repeatedly in previous research involving U.S. subjects. The mean CPA responses to “probable” (71.37%) and “likely” (70.89) are similar to the responses to these terms in prior studies.¹ In addition, as appears to be the case in the current study, several studies have found these two terms to be synonyms. The mean probability associated with “remote” (16.38%) in the current study is higher than has been found in previous accounting studies. Reimers’ (1992) had a mean of 9.4% for her auditor group and Amer, Hackenbrack, and Nelson (1994) had a mean of 12.33% for their in-context study.

[Insert Table 3 here]

The CPA responses also exhibit more symmetry with regard to mirror-image pairs than has been found in previous research reported in the psychology literature. The mean probabilities assigned to “probable” and “not probable” sum to 104 percent, and “likely” and “unlikely” sum to 98 percent, as compared with sums of approximately 85 percent in other studies. The negative expressions in the pairs are assigned probabilities much closer to the 50 percent midpoint than has been found in previous studies.

As has been found in prior research, there is considerable between-subject variability in the CPA responses. Standard deviations range from 9.70 (“reasonable assurance”) to 23.54 (“no longer probable”). Standard deviations are much smaller for the positive expressions (those with a mean probability > 50%) (average 13.79) than for the negative expressions (average

¹ Reagan, Mosteller, and Youtz (1989) reported that, across seven prior studies, the range of mean probabilities assigned to “probable” was 70-77% and to “likely” was 67-75%.

20.91). This is consistent with results found by Amer, Hackenbrack, and Nelson (1994).

To determine whether familiarity with IAS influences interpretation of uncertainty expressions used in IAS, respondents in each of the WP/German and WP/English groups were split into two groups (high = very familiar or familiar, and low = somewhat familiar or not familiar).² No significant differences were found between the high and low groups for the WP/German respondents. However, the high IAS familiarity group for the WP/English respondents assigned significantly higher mean probabilities than the low familiarity group on three uncertainty expressions: “not probable,” “no longer probable,” and “remote.”

The WP/English respondents were also split into two groups based on their level of English comprehension (high = excellent or good, low = satisfactory or rudimentary). No significant differences were found between these two groups in mean probabilities assigned to the 16 English expressions to which they responded. Level of English comprehension did not affect their responses to the uncertainty expressions in English. Similarly, there were no significant differences in mean responses between those WP/English respondents with audit experience in English-speaking countries and those without.

Tests of Hypotheses

The ANOVA results in Table 3 indicate significant differences across the three groups for 14 of the 21 uncertainty expression comparisons (Column 6). To test Hypothesis 1 (overall effect), the mean point-estimates for the CPA and WP/German groups were compared. Bonferroni post-hoc comparison tests indicate significant differences for 8 of 21 comparisons

(shown in Column 7 of Table 3). Differences are not concentrated on either side of the probability scale. Three of the expression-pairs with significant differences have mean probabilities greater than 50% and five have means less than 50%. Differences exist between the CPAs and WPs in the evaluation of “expected” and both German translations of “expected” (“voraussichtlich” and “erwartet”), and in the evaluation of “not expected” and “nicht erwartet”. There is also a difference between “not probable” and “nicht wahrscheinlich” and “no longer probable” and two translations of this expression (“nicht mehr erwartet” and “nicht mehr wahrscheinlich”). However, no overall difference arises when “no longer probable” is translated as “voraussichtlich nicht mehr.” Differences also exist between the CPAs’ assessment of “assurance” and the WPs’ assessment of “Gewissheit,” with the WPs attaching a much higher probability to the German term, and between “seriously in question” and “sehr zweifelhaft,” where the WPs attach a much lower probability to the German expression.

To test Hypothesis 2 (culture effect), the mean point-estimates for the CPA and WP/English groups were compared. Post-hoc comparison tests show that means are significantly different for nine of 16 comparisons (Table 3, Column 8).³ For all but two of these items (“assurance” and “remote”), the WPs’ mean responses were lower than those for the CPAs. WPs assign a significantly higher probability to “assurance” (the highest probability for WPs) and do not assign as low a probability to “remote” as do the CPAs (the lowest probability for CPAs). Because both groups were evaluating uncertainty expressions in English, these differences can be

² There was an insufficient number of CPAs indicating a high level of familiarity with IAS to warrant a similar test for this group.

³ A significant difference exists for 12 of 21 items in Column 8. However, three of these significant items are duplicates (“expected” is translated into two German expressions, “no longer probable” is translated three different ways), thus there are really only nine

attributed to differences in language-culture, and not to translation.

To test Hypothesis 3 (translation effect), the responses from the WP/English and WP/German groups were compared. Means are significantly different for four expression-pairs (see Table 3, Column 9). The four German expressions in these pairs are the two extreme high probabilities (“Gewissheit” 96.73% and “so gut wie sicher” 91.87%) and the two lowest probabilities (“Wahrscheinlichkeit ausserst gering” 11.46% and “sehr zweifelhaft” 13.05%). In all four cases, the German expression is assigned a probability that is more extreme than the English expression it translates.

To further test for a translation effect, the WPs’ responses to Part 1 (German expressions) and to Part 2 (English expressions) of questionnaire GE2 were compared for those individuals who responded to both parts. (A total of 33 responded to both parts, but two were eliminated because of inconsistent responses in Part 1.) The results of paired samples t-tests reported in Table 4 indicates eight expression-pairs with significant differences. The four extreme (two highest and two lowest) expression-pairs were again different, with the German expression having the more extreme probability. In addition, significant differences were found for the two translations of the word “probable” (“wahrscheinlich” and “hinreichend wahrscheinlich”), the translation of “not probable” (“nicht wahrscheinlich”), and one of the translations of “no longer probable” (“nicht mehr wahrscheinlich”). In each of these cases, the WPs assigned a more extreme probability to the German expression than to its English equivalent.

[Insert Table 4 here]

Comparing the culture and translation effects with the overall effect results in Table 3, it appears that the culture and translation effects cancel out for two expression pairs. CPAs assign a mean value of 91.75% to “virtually certain,” whereas WPs assign a significantly lower value of only 86.24% to that expression (evidence of a culture effect). Although WPs assign a mean value of 86.24% to “virtually certain,” they assign a significantly higher value of 91.87% to its translation “so gut wie sicher” (translation effect). The direction and magnitudes of the two effects offset such that there is no difference between the CPAs assessment of “virtually certain” (91.75%) and the WPs assessment of “so gut wie sicher” (91.87%). A similar phenomenon arises for the expression pair “remote/Wahrscheinlichkeit ausserst gering.”

To summarize, of the eight significant differences between CPA and WP/German responses (Table 3, Column 7), six are the result of a culture effect alone, but these six differences relate to only three different expressions (“expected,” “not probable,” and “no longer probable”). One difference is the result of a translation effect alone (“seriously in question/sehr zweifelhaft”), and one is the result of both culture and translation effects (“assurance/Gewissheit”).

As noted earlier, several English expressions (“expected,” “probable,” “likely,” and “no longer probable”) were translated into German in two or three different ways. The comparison of the CPA and WP/German responses indicated no significant difference for either of the two different translations for “probable” and “likely” or for one of three translations of “no longer probable.” On the other hand, the interpretation of two translations of “no longer probable”

were significantly different between the CPA and WP/German groups, as were both translations for “expected.”

To investigate whether different translations of a single English expression were assigned similar probability estimates by the German-speaking WPs, paired-samples t-tests were conducted on responses provided by the WP/German group. The results in Table 5 indicate that the two different translations of “expected” and “probable” are interpreted as equivalent by the German WPs. However, the translations for “likely” and “no longer probable” are interpreted differently.

[Insert Table 5 here]

Combining the results from the CPA vs. WP/German comparison in Table 3 (Column 7) and the results in Table 5, the following conclusions can be reached. German WPs interpret “erwartet” and “voraussichtlich” to have similar meaning but different from the meaning CPAs attach to the word “expected.” German WPs interpret “voraussichtlich” and “wahrscheinlich” differently, but neither is significantly different from the interpretation CPAs give to “likely.” The three translations of “no longer probable” are interpreted differently by the German WPs and two of these are significantly different from the interpretation given to the original English by the CPAs. Only the translation “voraussichtlich nicht mehr” captures the same level of probability as the phrase “no longer probable.” For this particular uncertainty expression, the specific translation from English to German could affect the manner in which the related standard is applied.

Range of Probabilities

In Part 2 of questionnaires E, G, and GE1, respondents indicated the range of probabilities they associated with six of the uncertainty expressions from Part 1. ANOVA results to test for differences in mean probability ranges are reported in Table 6. Of 329 respondents to questionnaires E, G, and GE1, 21 were eliminated from this analysis either because they did not respond to this part of the questionnaire (n=7), they had one or more negative ranges (n=3), or they provided logically inconsistent responses (n=11). Inconsistency was defined as the lower range value for “not probable/nicht wahrscheinlich” being greater than the upper range value for “probable/wahrscheinlich.”

[Insert Table 6 here]

For the most part, probability ranges assigned to the various uncertainty expressions did not differ across the three respondent groups (CPA, WP/English, and WP/German). Significant differences in mean probability range exist only for “virtually certain/so gut wie sicher” and “probable/wahrscheinlich.”

Bonferroni post-hoc comparison tests show that there is a significant difference in probability ranges assigned by the WP/English and WP/German groups on “virtually certain/so gut wie sicher” (translation effect). There is also a significant difference between the CPA and WP/English groups on “probable” (culture effect). But there is no overall effect for either expression pair. In other words, although there is a broader range of probability associated with “virtually certain” by the WPs than by the CPAs, there is no difference in the probability range associated with “virtually certain” by the CPAs and “so gut wie sicher” by the WPs. Similarly, there is no significant difference in the range of probability associated with “probable” by CPAs

and with “wahrscheinlich” by WPs. This result argues for translation of IAS into the foreign language rather than asking non-English speaking accountants to interpret the English expressions.

The magnitudes of the mean ranges suggests that the expressions “probable” and “not probable” convey less precise concepts of probability than do expressions such as “reasonable assurance” and “remote.” The same is true for the German translations of these expressions.

SUMMARY AND CONCLUSIONS

This study has finds that nationality alone (at least among German-speaking countries) does not result in significant differences in probabilities assigned to uncertainty expressions used in International Accounting Standards. However, significant differences exist between English-speaking U.S. CPAs and German-speaking WPs for a large number of the uncertainty expressions included in the study. The results indicate that for some expressions, the difference in mean probability assignments can be attributed to a difference in the language-culture of the respondent groups. The greatest difference is for the expression “assurance,” which connotes a much higher level of probability to the German speakers than to the U.S. CPAs.

Results also indicate that for extreme probability expressions (highest and lowest), the translation from English to German results in significant differences in interpretation. This raises the question whether this effect is a result of poor translation or whether the English expression has no direct counterpart in German. For example, is “sehr zweifelhaft” not the best translation of “seriously in question” or is there no direct linguistic mapping of “seriously in question” into German? Results related to the various German translations of the phrase “no longer probable” indicate that, at least for this uncertainty expression, some translations are better than others. The

choice from among several possible translations can affect cross-cultural comparability.

The culture effect is more pervasive than the translation effect. This presents a more serious problem for the cross-country application of IAS than if the opposite were true. Further research should be conducted to determine whether this effect holds for other language-cultures. If so, then true harmonization of accounting may require the IASC to avoid the use of vague uncertainty expressions in developing International Accounting Standards.

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Table 1
Source of Uncertainty Expressions

| <u>English</u> | <u>German</u> | <u>IAS (No.- Para.)</u> |
|------------------------|---|---|
| virtually certain | so gut wie sicher | 10-17 |
| reasonable assurance | angemessene Sicherheit | 20-7 |
| assurance | Gewissheit | 16-10 |
| expected | 1. erwartet | 9-19; 11-22, 36; 16-7 |
| | 2. voraussichtlich | 4-4, 7* |
| sufficient certainty | hinreichende Sicherheit | 16-10 |
| reasonably likely | nach vernünftigen Annahmen wahrscheinlich | 22-48 |
| probable | 1. wahrscheinlich | 9-17; 10-8, 16; 11-11, 23, 24, 32, 36; 12-24, 34; 16-8,24; 22-27, 52, 55, 58 |
| | 2. hinreichend wahrscheinlich | 18-14, 20, 29, 34 |
| likely | 1. voraussichtlich | 4-11* |
| | 2. wahrscheinlich | 11-34 |
| with the prospect | mit der Aussicht | 9- 6 |
| insufficient certainty | unzureichende Sicherheit | 9-18 |
| not probable | nicht wahrscheinlich | 11-34 |
| no longer probable | 1. nicht mehr wahrscheinlich | 12-56 |
| | 2. nicht mehr erwartet | 22-47 |
| | 3. voraussichtlich nicht mehr | 9-25 |
| unlikely | aller Wahrscheinlichkeit nach nicht | 12-36 |
| not expected | nicht erwartet | 16-61 |
| seriously in question | sehr zweifelhaft | 11-34 |
| remote | Wahrscheinlichkeit äußerst gering | 10-9 |

* Note that "voraussichtlich" is used consistently in IAS 4; "expected" and "likely" are used interchangeably.

Table 2
Sample Size, Response Rates, and Profiles of Respondents

| Nationality | U.S. | German | Swiss | Austrian | German | German |
|---------------------------|-------|--------|-------|----------|--------|--------|
| Questionnaire | E | G | G | G | GE1 | GE2 |
| Sample size | 500 | 206 | 150 | 150 | 217 | 211 |
| Number of responses | 157 | 84 | 41 | 10 | 37 | 60 |
| Response rate | 31.4% | 40.8% | 27.3% | 6.7% | 17.1% | 28.4% |
| Did not respond to Part 1 | 0 | 0 | 0 | 1 | 2 | 19* |
| Inconsistent respondents | 29 | 14 | 10 | 1 | 6 | 8 |
| Usable responses | 128 | 70 | 31 | 8 | 29 | 33 |
| Usable response rate | 25.6% | 34.0% | 20.7% | 5.3% | 14.3% | 15.6% |

* Number who did not evaluate English expressions (Part 2).

| | | | | | | |
|--------------------------|------|------|------|------|------|------|
| Experience in mean years | 16.8 | 13.9 | 14.0 | 11.3 | 11.1 | 10.9 |
|--------------------------|------|------|------|------|------|------|

Primary specialty

| | | | | | | |
|------------|-------|-------|-------|-------|-------|-------|
| Audit | 54.8% | 54.3% | 72.4% | 25.0% | 50.0% | 59.4% |
| Tax | 34.9% | 35.7% | 0% | 75.0% | 39.3% | 34.4% |
| Consulting | 4.8% | 8.6% | 13.8% | 0% | 3.6% | 6.3% |
| Other | 5.6% | 1.4% | 13.8% | 0% | 7.1% | 0% |

Size of firm/# CPAs (WPs)

| | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|
| 1-5 | 41.3% | 61.4% | 31.0% | 42.9% | 37.0% | 48.5% |
| 6-20 | 24.6% | 15.7% | 13.8% | 28.6% | 14.8% | 6.1% |
| 21-100 | 11.1% | 1.4% | 6.9% | 28.6% | 3.7% | 0% |
| over 100 | 23.0% | 21.4% | 48.3% | 0% | 44.4% | 45.5% |

Familiarity with IAS

| | | | | | | |
|-------------------|-------|-------|-------|-------|-------|-------|
| Very familiar | .8% | 10.0% | 13.3% | 12.5% | 3.6% | 0% |
| Familiar | 6.3% | 38.6% | 36.7% | 50.0% | 53.6% | 46.9% |
| Somewhat familiar | 23.8% | 44.3% | 46.7% | 25.0% | 39.3% | 50.0% |
| Not familiar | 69.1% | 7.1% | 3.3% | 12.5% | 3.6% | 3.1% |

Refer to IAS

| | | | | | | |
|--------|-------|-------|-------|-------|-------|-------|
| Often | .8% | 22.9% | 30.0% | 37.5% | 21.4% | 18.2% |
| Seldom | 31.7% | 61.4% | 60.0% | 50.0% | 67.9% | 60.6% |
| Never | 67.5% | 15.7% | 10.0% | 12.5% | 10.7% | 21.2% |

English comprehension

| | | | | | | |
|-----------|-----|-------|-------|-------|-------|-------|
| Excellent | N/A | 15.7% | 16.7% | 25.0% | 14.3% | 12.1% |
| Good | | 31.4% | 43.3% | 50.0% | 46.4% | 39.4% |

| | | | | | |
|--|-------|-------|--------|-------|-------|
| Satisfactory | 44.3% | 33.3% | 25.0% | 35.7% | 39.4% |
| Rudimentary | 8.6% | 6.7% | 0% | 3.6% | 9.1% |
| Audit experience in English-speaking country | N/A | | | | |
| Yes | 18.8% | 20.0% | 0% | 21.4% | 21.2% |
| No | 81.2% | 80.0% | 100.0% | 78.6% | 78.8% |
| Mean years | 5.9 | 2.0 | N/A | 8.5 | 5.8 |

Table 3
Point Estimate Probabilities

| Col. 1 English Expression | Col. 2 German Expression | Col. 3 CPA n=128 | | Col. 4 WP/English n=62 | | Col. 5 WP/German n=109 | | Col. 6 ANOVA | | Col. 7 Post Hoc Comparisons (Sig. 2-tailed) | | | Col. 9 WP/English (translation) |
|------------------------------|--|------------------------|-------|------------------------------|--------|------------------------------|-------------------|------------------------|---------------------------------------|--|--|--|---------------------------------------|
| | | Mean | Mean | Mean | Mean | F | Sig. (2-sided) | WP/German (overall) | CPA vs. WP/English (culture) | CPA vs. WP/English (translation) | | | |
| virtually certain | so gut wie sicher | 91,75 | 86,24 | 91,87 | 5,498 | 0,005 * | 1,000 | 0,008 * | 0,009 * | | | | |
| reasonable assurance | angemessene Sicherheit | 81,38 | 77,35 | 81,48 | 3,497 | 0,032 ** | 1,000 | 0,050 ** | 0,051 | | | | |
| expected | erwartet | 80,16 | 72,95 | 72,88 | 7,290 | 0,001 * | 0,002 * | 0,004 * | 1,000 | | | | |
| expected | voraussichtlich | 80,16 | 72,95 | 71,99 | 10,905 | 0,000 * | 0,000 * | above * | 1,000 | | | | |
| assurance | Gewissheit | 79,46 | 90,18 | 96,73 | 59,514 | 0,000 * | 0,000 * | 0,000 * | 0,003 * | | | | |
| sufficient certainty | hinreichende Sicherheit | 78,17 | 80,86 | 81,77 | 2,330 | 0,099 | 0,106 | 0,544 | 1,000 | | | | |
| reasonably likely | nach vernünftigen Annahmen wahrscheinlich | 71,97 | 67,92 | 72,3 | 2,101 | 0,124 | 1,000 | 0,218 | 0,168 | | | | |
| probable | hinreichend | 71,37 | 67,15 | 70,49 | 1,635 | 0,197 | 1,000 | 0,186 | 0,508 | | | | |
| probable | wahrscheinlich | 71,37 | 67,15 | 68,14 | 2,319 | 0,100 | 0,268 | above | 1,000 | | | | |
| likely | voraussichtlich | 70,89 | 67,27 | 71,99 | 2,213 | 0,111 | 1,000 | 0,331 | 0,118 | | | | |
| likely | wahrscheinlich | 70,89 | 67,27 | 68,14 | 1,675 | 0,189 | 0,452 | above | 1,000 | | | | |
| with the prospect | mit der Aussicht | 53,28 | 59,27 | 58,17 | 3,202 | 0,042 ** | 0,117 | 0,098 | 1,000 | | | | |
| insufficient certainty | unzureichende Sicherheit | 42,60 | 40,84 | 44,64 | 0,560 | 0,572 | 1,000 | 1,000 | 0,907 | | | | |
| not probable | nicht wahrscheinlich | 32,61 | 21,60 | 21,76 | 13,415 | 0,000 * | 0,000 * | 0,000 * | 1,000 | | | | |
| no longer probable | voraussichtlich nicht mehr | 29,38 | 19,66 | 24,75 | 4,473 | 0,012 ** | 0,300 | 0,003 * | 0,412 | | | | |
| no longer probable | nicht mehr wahrscheinlich | 29,38 | 19,66 | 19,59 | 9,201 | 0,000 * | 0,000 * | above * | 1,000 | | | | |
| no longer probable | nicht mehr erwartet | 29,38 | 19,66 | 15,51 | 16,507 | 0,000 * | 0,000 * | above * | 0,506 | | | | |
| unlikely | aller Wahrscheinlichkeit nach nicht | 27,13 | 18,34 | 24,93 | 4,094 | 0,018 ** | 1,000 | 0,014 * | 0,117 | | | | |
| seriously in question | sehr zweifelhaft | 23,96 | 19,77 | 13,05 | 11,378 | 0,000 * | 0,000 * | 0,372 | 0,049 ** | | | | |
| not expected | nicht erwartet | 23,79 | 16,58 | 16,83 | 5,186 | 0,006 * | 0,015 ** | 0,039 ** | 1,000 | | | | |
| remote | Wahrscheinlichkeit äußerst gering | 16,38 | 27,07 | 11,46 | 9,994 | 0,000 * | 0,089 | 0,017 * | 0,000 * | | | | |

* .01 level

** .05 level

Table 4
Within Subject Comparisons
WP/German vs. WP/English

| <u>Col. 1</u> | <u>Col. 2</u> | <u>Col. 3</u> | <u>Col. 4</u> | <u>Col. 5</u> | |
|----------------------------|------------------------|---------------------------|----------------------------|---------------|--------------------|
| German Expression | English Expression | WP/German n=31 Mean | WP/English n=31 Mean | t-test | |
| | | | | t | Sig. (2-tailed) |
| Gewissheit | assurance | 95,77 | 89,50 | 2,731 | 0,011 ** |
| so gut wie sicher | virtually certain | 91,42 | 87,00 | 5,498 | 0,029 ** |
| hinreichende Sicherheit | sufficient certainty | 80,55 | 79,06 | 0,802 | 0,429 |
| angemessene Sicherheit | reasonable assurance | 76,32 | 77,00 | 0,463 | 0,646 |
| erwartet | expected | 70,48 | 71,48 | 0,403 | 0,690 |
| wahrscheinlich | likely | 70,39 | 68,10 | 1,325 | 0,195 |
| wahrscheinlich | probable | 70,39 | 65,52 | 2,761 | 0,010 * |
| hinreichend wahrscheinlich | probable | 69,48 | 65,52 | 2,227 | 0,034 ** |
| voraussichtlich | likely | 69,42 | 68,10 | 0,491 | 0,627 |
| voraussichtlich | expected | 69,42 | 71,48 | 0,699 | 0,490 |
| nach vernünftigen | reasonably likely | 68,90 | 66,48 | 1,089 | 0,285 |
| Annahmen wahrscheinlich | | | | | |
| mit der Aussicht | with the prospect | 56,84 | 60,19 | 1,278 | 0,211 |
| unzureichende Sicherheit | insufficient certainty | 37,68 | 38,19 | 0,162 | 0,873 |
| voraussichtlich nicht mehr | no longer probable | 21,00 | 18,58 | 0,687 | 0,498 |
| nicht mehr erwartet | no longer probable | 15,84 | 18,58 | 0,703 | 0,487 |
| nicht wahrscheinlich | not probable | 13,84 | 22,06 | 2,606 | 0,014 ** |
| nicht mehr wahrscheinlich | no longer probable | 11,97 | 18,58 | 2,622 | 0,014 ** |
| nicht erwartet | not expected | 11,61 | 14,16 | 1,138 | 0,264 |
| aller Wahrscheinlichkeit | unlikely | 10,63 | 15,73 | 1,988 | 0,056 |
| nach nicht | | | | | |
| sehr zweifelhaft | seriously in question | 9,32 | 18,48 | 2,468 | 0,019 ** |
| Wahrscheinlichkeit äußerst | remote | 9,24 | 22,45 | 2,986 | 0,006 * |
| gering | | | | | |

* .01 level

** .05 level

Table 5
Paired Samples Test

| <u>Col. 1</u> | <u>Col. 2</u> | <u>Col. 3</u> WP/German n=109 Mean | <u>Col. 4</u> t-test Sig. (2-tailed) | |
|---------------------------|---------------------------|---|---|---------|
| <u>English Expression</u> | <u>German Translation</u> | | t | |
| expected | erwartet | 72,88 | | |
| | voraussichtlich | 71,99 | 0,564 | 0,574 |
| probable | hinreichend | 70,49 | | |
| | wahrscheinlich | 68,14 | 1,824 | 0,071 |
| likely | voraussichtlich | 71,99 | | |
| | wahrscheinlich | 68,14 | 2,920 | 0,004 * |
| no longer probable | voraussichtlich nicht | 24,75 | | |
| | nicht mehr | 19,59 | 2,982 | 0,004 * |
| no longer probable | nicht mehr | 19,59 | | |
| | nicht mehr erwartet | 15,51 | 3,279 | 0,001 * |
| no longer probable | voraussichtlich nicht | 24,75 | | |
| | nicht mehr erwartet | 15,51 | 4,518 | 0,000 * |

* .01 level

** .05 level

Table 6
Range of Probabilities

| Col. 1 | Col. 2 | Col. 3 | Col. 4 | Col. 5 | Col. 6 | Col. 7 | Col. 8 | Col. 9 |
|----------------------|---------------------------------------|----------------------|----------------------------|----------------------------|--------------------------|-------------------------------------|---------------------------------------|--|
| English Expression | German Expression | CPA n=148 Mean | WP/English n=34 Mean | WP/German n=126 Mean | ANOVA F (2-tailed) | CPA vs. P/German (overall) | CPA vs. WP/English (culture) | WP/English vs. WP/English (translation) |
| virtually certain | so gut wie sicher | 8,59 | 11,44 | 7,41 | 3,737 0,025 ** | 0,626 | 0,156 | 0,021 ** |
| reasonable assurance | angemessene Sicherheit | 12,18 | 14,15 | 11,95 | 1,402 0,248 | 1,000 | 0,406 | 0,302 |
| sufficient certainty | hinreichende Sicherheit | 12,72 | 13,76 | 10,90 | 2,838 0,060 | 0,105 | 1,000 | 0,247 |
| probable | wahrscheinlich | 15,93 | 22,41 | 16,84 | 3,729 0,025 ** | 1,000 | 0,021 ** | 0,066 |
| not probable | nicht wahrscheinlich | 16,58 | 19,24 | 15,67 | 0,911 0,403 | 1,000 | 0,930 | 0,539 |
| remote | Wahrscheinlichkeit ausserst gering | 11,68 | 13,76 | 10,90 | 1,660 0,192 | 1,000 | 0,554 | 0,218 |

* .01 level

** .05 level

Bisher sind in dieser Reihe die folgenden Beiträge erschienen:

- Nr. 1 Martin Richter: Die Kommunale Rechnungsprüfung als Interne Revision?, Juni 1997

- Nr. 2 Timothy S. Doupnik / Martin Richter: Interpretation of Uncertainty Expressions: A Cross-National Study, Mai 2000

