The language effect: Non-native language impacts on interpretation of uncertainty expressions and accounting judgement

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THE LANGUAGE EFFECT:
NON-NATIVE LANGUAGE IMPACTS ON
INTERPRETATION OF UNCERTAINTY EXPRESSIONS
AND ACCOUNTING JUDGEMENT

Yuqian Zhang

A thesis submitted in fulfilment of the requirements for the award of the degree of
Doctor of Philosophy

University of Wollongong
Faculty of Business
School of Accounting, Economics and Finance
May 2018
DECLARATION

I, Yuqian Zhang, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy (Integrated), in the School of Accounting, Economics and Finance, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Yuqian Zhang
Abstract

ABSTRACT

This thesis explores the Foreign-Language Effect (FLE) within the context of accounting. The original FLE suggests that people will be less biased in making an uncertainty judgement if the information is presented in their non-native language. While this proposition has been critically examined in the field of psychology, a similar investigation has not yet been conducted in an accounting context. The presence of the FLE in accounting has substantial implications given the prevalence of uncertainty expressions in accounting regulations and reporting and also due to the increasing number of multilingual accounting professionals in Australia.

This research examines two aspects of the FLE: its impact on interpretations of uncertainty expressions, and its impact on judgements related to uncertainty expressions. To test the presence of the FLE, the research instrument was developed in Chinese and English and data was collected from two Chinese universities and one Australian university.

The first experiment was a between-subject design, developed to examine the inter-personal variance of the FLE and found that participants in the foreign language group (a) interpreted uncertainty expressions differently to those in the native language group, (b) had less bias in relation to probabilistic estimation in the context of asset recognition, (c) had less directionality bias compared to those in the native language group in relation to asset recognition, and (d) were more inconsistent overall in relation to uncertainty judgements than those in the native language group. While the study found evidence to support three of its hypotheses, it was unable to find sufficient evidence to support the hypothesis that respondents in the foreign language group would provide a less biased risk judgement than those in the native language group.

The findings from the second experiment, which was conducted to examine the same issues as the first, but instead using a within-subjects design, were similar to the findings from experiment one, confirming the significance of the FLE for the interpretation of uncertainty expressions in an accounting context. The overall findings of this study, except for the proposed FLE on frame-manipulated risk judgements, therefore confirm and extend the findings of earlier studies on judgement and decision making.

Notwithstanding the relatively limited sample, this study offers valuable insights into the cross-lingual research of accounting. Despite its exploratory nature of research design, this study offers some insights into importance of the impact of the FLE on judgement and decision making in an accounting context.

Overall, this research strengthens the idea that multilingual accounting professionals may not maintain a consistent professional judgement due to the potential FLE. The impact of FLE in accounting should also be critically reviewed in other multilingual contexts such as corporate governance and accounting education. Future research in this field would contribute to our understanding of the impact of the use of native and non-native languages in accounting judgment and decision making, as well as provide valuable information to regulators as they seek to harmonise accounting standards globally.
ACKNOWLEDGEMENTS

This thesis has come about from the motivation and dedication from my supervisors, family and friends. It is my great pleasure to thank these people who supported and encouraged me during my PhD studies.

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Finally, I want to thank my father again for his words, which have been guiding me all the way: ‘Knowledge changes your destiny’. 知识改变命运.
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<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AASB</td>
<td>Australian Accounting Standards Board</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of variance</td>
</tr>
<tr>
<td>CAS</td>
<td>Chinese Accounting Standards</td>
</tr>
<tr>
<td>CMP</td>
<td>Communication-mode preference</td>
</tr>
<tr>
<td>CPA</td>
<td>Certified Public Accountant</td>
</tr>
<tr>
<td>CS</td>
<td>Consistency</td>
</tr>
<tr>
<td>DIR</td>
<td>Directionality</td>
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<tr>
<td>EBIT</td>
<td>Earnings before interest and taxes</td>
</tr>
<tr>
<td>FLE</td>
<td>Foreign Language Effect</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IAS</td>
<td>International Accounting Standards</td>
</tr>
<tr>
<td>IASC</td>
<td>International Accounting Standards Committee</td>
</tr>
<tr>
<td>IFRS</td>
<td>International Financial Reporting Standards</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>JCGM</td>
<td>Joint Committee for Guides in Metrology</td>
</tr>
<tr>
<td>LD</td>
<td>Limitations on research design</td>
</tr>
<tr>
<td>LS</td>
<td>Limitations on sampling</td>
</tr>
<tr>
<td>MBA</td>
<td>Master of Business Administration</td>
</tr>
<tr>
<td>MC</td>
<td>Methodological contributions</td>
</tr>
<tr>
<td>NMET</td>
<td>National Matriculation English Test</td>
</tr>
<tr>
<td>RI</td>
<td>Research implications</td>
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<tr>
<td>SCRs</td>
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CHAPTER 1 – INTRODUCTION

1.1. BACKGROUND AND MOTIVATIONS

In today’s multilingual world, communicating accounting information in a language (usually English) that differs to one’s first language\(^1\) has become a norm for many accounting students, academics, and practitioners. In 2015, according to CPA Australia, more than 39,000 international students enrolled in degrees with accounting majors (Bachelor and Masters) in Australia, and about 42 percent of Australia’s accounting professionals were born overseas (CPA Australia 2015). Many of these people are non-native English speakers\(^2\).

Non-native speakers of the language in which they are working as accounting professionals may encounter language problems in their daily organisational lives. A recent discovery from a psychological study has suggested that thinking in a non-native language may affect one’s judgement biases towards risks and uncertainties (Keysar, Hayakawa & An 2012). Such phenomenon is called the Foreign-Language Effect (FLE).

The concept of the FLE has prompted critical thinking in behavioural psychology (Corey et al. 2017; Costa, Vives & Corey 2017; Hadjichristidis, Geipel & Surian 2017; Hayakawa et al. 2017; Oganian, Korn & Heekeren 2016), in international business studies (Hadjichristidis, Geipel & Surian 2017; Piekkari, Oxelheim & Randøy 2015; Volk, Köhler & Pudelko 2014), and recently in accounting (Pan & Patel 2016). These studies share an emphasis on understanding the cognitive aspect of the language as essential to cross-lingual research.

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\(^1\) The current thesis adopts the definition of “foreign language” as a language acquired primarily in a classroom environment, “and not a language spoken in the learners’ community” (Caldwell-Harris 2014, p. 1).
\(^2\) According to Department of Educational and Training (2017), China, India, Nepal, Malaysia, and Brazil contributed more than 53% of international students’ enrolment in Australia in 2017.
Chapter 1 – Introduction

The current study is motivated by this perception in two ways. First, the author has experienced the double hurdle to non-native language communication: degree of language proficiency and the habitual language of thinking. According to the key construct of the FLE, this is manifest in the theory of linguistic relativity (see Section 2.2.3).

The second motivation comes from the author’s view on the new era of multilingual accounting. Globalisation has not only affected the language policy in multinational corporations (e.g. Boussebaa, Sinha & Gabriel 2014; Peltokorpi & Vaara 2012), but also changed the common language used in accounting. Similar to the management process in multinational corporations, many reporting entities provide accounting information in a single language, despite that information being initially reported to them in many languages (Jeanjean et al. 2015). According to the key proposition of the FLE, this multilingual reporting process may involve several judgement biases introduced by the usage of different languages.

1.2. AIMS OF THE RESEARCH

This thesis aims to explore the FLE in an accounting context. This investigation is broadly divided into the FLE on the interpretation of uncertainty expressions and the FLE on the judgement of uncertainty expressions. This division addresses two major issues in the accounting research: the linguistic issues inherent in uncertainty expressions and the misconceptions between interpretation and judgement in accounting (Section 2.3.2).

Uncertainty expressions are common in accounting information, such as accounting standards and financial reports (Section 2.4.5). Their wide use creates a critical linguistic issue in accounting: do uncertainty expressions exist equally and have equal meanings in all languages?
Chapter 1 – Introduction

This issue has been critically reviewed in the between-subject accounting research looking at the comparability of translations (e.g., Dahlgren & Nilsson 2012; Evans, L 2004; Huerta, Petrides & Braun 2013) and the impact of culture on interpretation (e.g., Doupnik & Riccio 2006; Doupnik & Richter 2004). However, between-subject research designs are inadequate when the users of accounting information are personally involved in the multilingual communication. There has been a lack of within-subject accounting research to explore how language affects an individual’s thinking process.

Uncertainty expressions also directly affect the process of accounting practice. In particular, the implications of misinterpreting or misjudging uncertainty expressions in an accounting context could result in significant consequences, such as the misstatement of materiality (Griffin 2014), variations in accounting estimates (Nelson & Kinney Jr 1997), or reduced comparability of accounting information (Laswad & Mak 1997; Zeff 2007). Despite the potential for negative consequences, investigation into the differences between interpretation and judgement of uncertainty expressions remains inadequate (Sections 2.4.5 and 2.5.4).

The notion of the FLE provides a framework to address these two issues in accounting research. As the FLE research suggests, thinking in a non-native language may lead to different cognitive processes in perceiving and judging uncertainties (Costa, Vives & Corey 2017); this study applies this theoretical approach to investigating the presence of a foreign-language effect in the interpretation and judgement of accounting uncertainty expressions.

1.3. RESEARCH QUESTIONS

Language, uncertainty expressions, and uncertainty judgement are rooted in different academic disciplines. The current study positions itself in the intersection of psycholinguistics and
Chapter 1 – Introduction

cognition, and contextualises them within the accounting discourse. Specifically, it aims to investigate the effect of non-native language in accounting from both the between-subject (inter-personal) and the within-subject (intra-personal) perspectives. To address this, this study proposes two research questions, each with two sub-questions:

RQ1: How does the use of non-native language affect the interpretation of uncertainty expressions in accounting?
   I. What is this effect at the between-subject (inter-personal) level?
   II. What is this effect at the within-subject (intra-personal) level?

RQ2: How does the use of non-native language affect the judgement of uncertainty expressions in accounting?
   I. What is this effect at the between-subject (inter-personal) level?
   II. What is this effect at the within-subject (intra-personal) level?

The first research question aims to provide an analysis comparable with prior studies on the interpretation of uncertainty expressions. It explicitly targets the interpretation of verbal expressions of uncertainties in accounting. Combining the results from the between-subject and within-subject experiments, this study could justify the FLE on interpretation. This will be addressed specifically in the discussion section, based on the findings of two separate experiments.

The second research question explores the FLE on the judgement of uncertainty expressions, which can be understood as a further step from the interpretation of uncertainty expressions. Previous accounting studies (e.g., Hu, Chand & Evans 2013) consider the uncertainty judgement to be the result of initial interpretations of uncertainty expressions, while others (predominately in the field of psychology) attempt to understand the disconnection between interpretation and judgment, and provide several theoretical models and experimental designs. For example, there has been common agreement on the variations between judgement and interpretations, and how these are affected by their contexts (Bilgin & Brenner 2013), words’
directionalities (Smithson et al. 2012; Teigen & Brun 1999), or differences among individuals (Butler & Ghosh 2015).

While the first research question intends to clarify the FLE on the interpretation of uncertainty expressions, the analytical results may not necessarily indicate how people may judge uncertainty expressions in different languages. As a further exploration from the first research question and its sub-questions, the second research question corresponds to the research aims (see Section 1.2) to investigate whether individuals’ judgement correlates to their interpretation, and how the FLE may affect their uncertainty judgement at both the between-subject (inter-personal) and within-subject (intra-personal) levels. This will be highlighted in the research design and the related analyses.

1.4. METHODOLOGY/RESEARCH DESIGN

This study uses a quantitative research methodology. Specifically, it develops research instruments to test the FLE on the interpretation and judgement of uncertainty expressions. It collects data from two separate experiments. The uniqueness of this approach is that it implements both between-subject and within-subject designs to measure the inter-personal and intra-personal variances; this approach has rarely appeared in the accounting literature (for an example, see Pan & Patel 2016).

The first experiment adopts a 2 x 2 between-subject design. The first “2” indicates the two language conditions of the survey questionnaire: Chinese and English. The second “2” refers to the two contexts of the survey questionnaire: asset context and liability context. These conditions generate four versions of the survey questionnaire: (1) English-Asset; (2) English-Liability; (3) Chinese-Asset; and (4) Chinese-Liability.
Chapter 1 – Introduction

This type of design is most commonly seen in accounting studies (e.g., Chand, Cummings & Patel 2012; Doupnik & Riccio 2006). In the experiment, participants were asked to complete the tasks in either their native or non-native language. The language allocation was random; therefore the aggregated responses can be divided into four groups: native-asset, native-liability, non-native-asset, and non-native-liability.

The second experiment employs a within-subject design by asking participants to complete specific tasks in both language conditions, using the same procedures as in the first experiment. After seven days, the same participants were invited for a follow-up experiment based on the same instrument but in the other language. Therefore, the aggregated responses can be divided into two groups: asset (native and non-native) and liability (native and non-native). To date, this approach has been very rare in cross-lingual accounting research (one exception is Pan & Patel 2016).

1.5. OUTLINE OF THE THESIS

This thesis comprises six chapters. Chapter 2 provides a literature review and details the related theoretical background. Specifically, it examines studies from four aspects: (1) psycholinguistic studies on FLE; (2) linguistic aspects of accounting; (3) behavioural psychology on uncertainty expressions; and (4) cognitive issues of uncertainty judgement.

Chapter 3 outlines four sets of hypotheses that address the research questions regarding FLE: (1) interpretation of uncertainty expressions; (2) probabilistic estimation; (3) directionality of expressions; and (4) risk framing.
Chapter 1 – Introduction

Chapter 4 describes the design of the experiments in response to the hypotheses developed in Chapter 3.

Chapter 5 explores the results of both experiments and discusses the research findings in detail.

Chapter 6 (the final chapter) provides an overall summary and limitations of the current research. This chapter also elaborates on three aspects of the research implications: (1) standardisation of uncertainty expressions; (2) multilingual corporate governance; and (3) accounting education regarding language.
CHAPTER 2 – LITERATURE REVIEW

2.1. INTRODUCTION

Chapter 1 provided an introduction to this thesis and established the motivations for the study. The aims of the research were outlined and the research questions were presented. The methodology and research design were briefly summarised and an outline of the remainder of the thesis was provided. In this chapter, relevant literature is reviewed from four perspectives. Section 2.2 explores the concept of FLE, reviewing its theoretical framework and the most recent empirical findings. Section 2.3 presents a critical review of research into accounting language, outlining three major challenges faced in such research, with particular emphasis on the uncertainty feature of accounting language. Sections 2.4 and 2.5 examine uncertainty expressions and uncertainty judgements, respectively. Both sections start from conception discussions and build on the relevant theoretical propositions in behavioural psychology. Finally, these sections are linked to accounting issues, highlighting both theoretical and empirical implications.
Chapter 2 – Literature Review

2.2. FOREIGN-LANGUAGE EFFECT

2.2.1. Introduction

Language plays a central role in human affairs. It is the chief means of human communication (Osgood 1963). Unique among communications within species, human language consists of patterns (e.g., symbols, words, and sounds) that are induced either by direct experience or communication from others (Mattson 2014).

One of the distinct features of human language is its ability to describe uncertainty information. People often construct and deliver uncertainty information with the help of uncertainty expressions, which can be framed either verbally or numerically.

Despite their familiarity with uncertainty expressions, people may still face challenges in making consistent interpretations and judgements when presented with uncertainty. The existing knowledge from behavioural psychology suggests that this is because people use a different thinking process in applying uncertainty expressions.

There is also a belief that the thinking process can be either objective, because of the inherent uncertainty of an event; subjective, because of a lack of knowledge of an event; or a mixture of objective and subjective (Einhorn & Hogarth 1985; Kahneman & Tversky 1982; Teigen 1988). Each thinking process can affect the quality and accuracy of the uncertainty communication.

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3 Some scholars refer to such process as likelihood-communication (e.g. Bonnefon & Villejoubert 2006; Juanchich, Sirota & Butler 2012).

4 This thesis uses the term “uncertainty expression” to refer to the subjective thinking process, which employs terms such as “probable” and “30% chance” to express different varieties and degrees of probability or uncertainty (Teigen 1988).
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According to the perspective of psycholinguistics, people would inevitably think differently when using a non-native language. This language impact is argued to occur in bilingual speakers (Pavlenko 2006). More critically, a growing body of evidence emerging from behavioural psychology shows that using a non-native language can affect individuals’ judgement biases regarding risk and uncertainties (Costa, Vives & Corey 2017; Hayakawa et al. 2017). This effect has been popularised as the Foreign-Language Effect by several prominent scholars (Costa, Vives & Corey 2017; Geipel, Hadjichristidis & Surian 2016; Hadjichristidis, Geipel & Surian 2017; Hayakawa et al. 2017; Keysar, Hayakawa & An 2012).

As more evidence of the FLE emerges from psychological studies, there is a need for accounting scholars to consider its potential implications for accounting research. Since the concept of the FLE is relatively new to many accounting scholars, this research responds to the opportunity to provide an in-depth exploration, both theoretically and methodologically.

This section, therefore, reviews both the theoretical and methodological development of the Foreign-Language Effect.

2.2.2. Origin of the FLE

The term “Foreign-Language Effect” (FLE) as it pertains to uncertainty judgements was recently proposed by Keysar, Hayakawa and An (2012, p. 661). The FLE is based on the idea that, when individuals use a foreign language, their judgement biases are reduced because of the additional cognitive loading imposed by the use of the foreign language (for review, see Costa, Foucart, Arnon, et al. 2014; Costa, Vives & Corey 2017; Geipel, Hadjichristidis & Surian 2016).
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One of the key research instruments in Keysar et al.'s (2012) study is based on Tversky and Kahneman’s (1981) paper on the Framing Effect (Section 2.2.3.2.1). Keysar and his colleagues conducted three sets of experiments with four pairs of language groups: English-Japanese, English-Korean, English-French, and English-Spanish. Based on the results, they reported that normative risk biases – risk-seeking in loss and risk-averse in gain – were significantly lower in the foreign-language condition. As a result, the authors proposed the FLE to describe the phenomenon of reduced judgemental biases in a foreign language.

2.2.3. Theoretical framework of the FLE

The FLE is built on two major theories: linguistic relativism and prospect theory (Figure 2.1).

![Figure 2.1 – Theoretical framework of FLE](image)

### 2.2.3.1. Linguistic-Relativism Theory

The Linguistic-Relativism Theory, also known as the Sapir-Whorf Hypothesis, argues that individuals’ spoken language determines and shapes their world view (Gumperz & Levinson 1991; Kay & Kempton 1984). This theory originated from the domain of anthropology and was progressed by Edward Sapir and his student Benjamin Whorf. In brief, this theory suggests that people from different language environments may perceive the world differently.
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The Linguistic-Relativism Theory has a profound impact on the development of psycholinguistics research, which can be broadly divided into three major paradigms: emotion, cognition, and memory.

2.2.3.1.1. Emotion

Emotion is embedded in the very root of daily language. It is not uncommon for individuals to experience emotional changes in the course of various conversations. People may feel sad when they hear unfortunate news, happy when they are complimented by others, or annoyed when they are listening to taboo words.

While people often experience these emotional processes naturally in their native language, some report a different emotional experience when conversing in a non-native language. One proposition in psycholinguistics is that people can be emotionally manipulated by language choices (for review, see Pavlenko 2012). A common finding is that people often feel stronger emotions when conversing in their first language than in their second or third (Caldwell-Harris 2014). Section 2.2.5.2 reviews a series of studies that found emotional variances between one’s native and non-native language. Theories to explain such phenomena vary. One view is the Emotional Context of Learning Theory proposed by Harris, Gleason and Ayçiçeği-Dinn (2006, p. 257). This theory suggests that people often experience their first emotional contexts during the acquisition of their native language; therefore, certain emotions are learned and stored within a context that includes that language.

Sociolinguist theory highlights the social dimensions of the relationship between language and emotion to explain the emotional differences between one’s native and non-native language. One example would be Koven’s (2006) study based on a six-month observation of a bilingual French-Portuguese speaker. The author observed that the subject’s emotional experiences
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differed distinctly between when she spoke in her home language (Portuguese) and her social language (French). The difference in emotionality was largely embodied in the subject’s sociolinguistic environment.

Another approach, the Emotional-Distance Theory, was popularised after Keysar et al.’s (2012) study and implemented in different experiments such as to make moral judgements between one’s native and non-native language (Cipolletti, McFarlane & Weissglass 2016; Costa, Foucart, Hayakawa, et al. 2014; Geipel, Hadjichristidis & Surian 2015). The theory is based on the psychology theory of cognition distance, where people think less systematically when they feel emotional (Lerner et al. 2015). This theory suggests that in a non-native language context, people often experience less emotional arousal (thus more distance from their emotions), especially when the issue relates to uncertainties.

The Emotional-Distance Theory also suggests the presence of a key mediator between one’s language and emotion: cognition. In Freeman, Shook, and Marian’s (2016, p. 285) words, a person’s emotional processing relates to typical instances or aspects of cognition, and “these aspects of cognition are filtered through and by language”. Indeed, emotion and language are highly integrated, yet their interplay is far more complex than can be expressed by current theoretical models.

2.2.3.1.2. Cognition
It is hard to deny that language shapes individuals’ perception and world view. People use written language (such as books) to educate themselves, and oral language (such as conversation) to persuade, convince, or motivate others. People are simultaneously the “sellers” and “consumers” of language. Language has a profound effect on cognition; as Ludwig Wittgenstein (1922) wrote, “The limits of my language means the limits of my world” (p. 68).
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The role of language in cognition has been attracting the attention of scholars for decades. Amongst numerous studies, the most common experimental design is the colour test. This can be exemplified in Kay and Kempton’s (1984) study, where participants from different language backgrounds (English and Tarahumara – the language of an indigenous tribe in Mexico) have different colour terminologies. For example, the English language has distinction between the colour categories “green” and “blue”, while the Tarahumara language has only one term that is used for both (Kay & Kempton 1984, p. 68). In this experiment, Kay and Kempton (1984) found that the English speakers’ subjective judgements of distance between green and blue colours were more distorted than the Tarahumara speakers.

Another approach to measure the effect of language on cognition is the time-conception test. Conceptions of time are specified in daily language, most often through metaphors (Boroditsky 2001). For example, English-speakers say that people are looking forward to an exciting future or that someone is falling behind the working schedule. Based on this idea, Boroditsky (2001) conducted experiments on the conception of time between English and Mandarin speakers. The results showed that English and Mandarin speakers conceptualise time differently: English expresses time horizontally (e.g., good times ahead of us), while Chinese expresses time vertically (e.g., shàng gè yuè – up/last month).

Scholars have also asserted that the effect of language on cognition can be manifested as the temporary decline of thinking ability. This is based on the assumption that the use of a non-native language would impose a heavier processing load, in terms of linguistic and cognitive processing, than the use of a native language (Takano & Noda 1993). To test this assumption, Takano and Noda (1993) conducted two experiments on English-Japanese and Japanese-
Chapter 2 – Literature Review

English bilinguals. They developed the research instrument with the combination of linguistic (general language questions) and thinking (calculations) tasks, and found that working in one’s non-native language could temporarily reduce the accuracy of thinking tasks. Clahsen and Felser’s (2006) study similarly found that processing non-native language information imposes an additional drain on working-memory resources, thereby resulting in cognition overload.

Overall, the theories of language on cognition suggest that language is a powerful tool in shaping one’s thoughts, with the native language in particular influencing one’s habitual thoughts. Meanwhile, processing a non-native language could constraint the habitual thoughts that people experience in their native tongue, leading them to think and react differently.

2.2.3.1.3. Memory
Another significant language effect is on individuals’ language-dependent autobiographical memory. Autobiographical memories are “episodes recollected from an individual’s life”, which are based on a combination of episodic (e.g., personal experience) and semantic (e.g., knowledge about the world) memory (Cohen & Conway 2007, p. 22).

One of the key assumptions when considering language-dependent autobiographical memory is that one’s memory is retrieved to various levels depending on the environmental context, including the linguistic context (Marian & Neisser 2000). According to this idea, one’s memories become more accessible when the linguistic environment at retrieval matches the linguistic environment at encoding.

Rather than treating emotion and cognition as separate paradigms, studies of the language effect on memory usually integrate them, as emotion has a great influence on the way memories are encoded and retrieved (D'Argembeau, Comblain & Van der Linden 2003), and memory is a
key dimension of cognition (Clahsen & Felser 2006). Similarly, processing information in a non-native language requires more effort than processing in a native language; therefore such cognition overload in a non-native language could impair one’s ability to recall important information (e.g., Miller & Keenan 2011).

Accordingly, the impact of language on memory can be described as follows: when using their native language, individuals feel and remember emotions more strongly, retrieve emotion-related information more successfully, and process emotional information more effectively than when they are using a non-native language (Marian & Neisser 2000).

In summary, the Linguistic-Relativism Theory asserts that people speaking different languages often think and perceive dissimilarly. The effect of language can be observed from three perspectives: emotion, cognition, and memory. As shown in Figure 2.1, it constitutes the key foundation of the FLE. Importantly, it suggests that before people make any uncertainty judgement, the impact of using a non-native language has already influenced their thinking processes. However, to understand the mechanisms of the FLE in the process of uncertainty judgement, one also needs to take account of the Prospect Theory.

2.2.3.2. *Prospect Theory*

Along with the Linguistic-Relativism Theory, the FLE is built on Prospect Theory (Figure 2.1), which proposes that people tend to be risk-averse in situations involving gains and risk-seeking in situations involving losses. The prospect is a combination of a proposed course of action and its expected outcome.
Prospect Theory was originally proposed by Kahneman and Tversky (1979), when the authors observed a certain patterns that contradicted the classic Expected Utility Theory (Section 2.5.3.1). The theory argues that decision-makers tend to be systematically biased, either risk-seeking when available options would result potential losses, or risk-averse when options would yield potential gain.

According to Kahneman and Tversky, the validity of Prospect Theory is supported by three observations. First, people often make judgements based on an anchor, which refers to a neutral reference or inflection point (Tversky & Kahneman 1974, p. 185). This reference point is normally the status quo, but it can also be the expected outcome to which one feels entitled (Kahneman 2011). For example, a company projects its sales revenue of $10 million. This $10 million projection is the anchor point. Any sales result that is higher than $10 million (the anchor or reference point) is a gain. If the sales result is lower than $10 million, then it is a loss.

Second, people have a diminishing sensitivity in the process of evaluating changes of wealth (Kahneman 2011). That is, people’s judgements do not distinguish significantly between large numbers. For example, the perceived difference between $9,000 and $10,000 is much smaller than the difference between $1,000 and $2,000.

Third, people commonly have an aversion to loss (Kahneman 2011). For instance, most individuals give more weight to unlikely events and less weight to very likely events than they deserve (Bell, Raiffa & Tversky 1988). In other words, the feeling associated with a loss is more intense than the feeling associated with a gain of the same magnitude.
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The empirical implications of Prospect Theory were further developed into what is known as the Framing Effect in uncertainty judgements (Tversky & Kahneman 1981, 1986) and the Dual-Process Systems in reasoning (e.g., Evans, JSBT 2008).

2.2.3.2.1. Framing Effect
The notion of the Framing Effect was first proposed by Tversky and Kahneman (1981), following on from their article on Prospect Theory. It argues that a person’s preference regarding uncertainties may change with alterations of the framing language. Specifically, it suggests that people are risk-seeking when options presented to them are framed negatively (e.g., loss version) and risk-averse when the options are framed positively (e.g., gain version) (Tversky & Kahneman 1981). Below is Tversky and Kahneman’s (1981, p. 453) example to illustrate the Framing Effect on decision-making:

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

Problem 1 (gain frame)
If Program A is adopted, 200 people will be saved.
If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
Which of the two programs would you favor?

Problem 2 (loss frame)
If Program C is adopted 400 people will die.
If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.
Which of the two programs would you favor?

In this example, Tverskey and Kahneman (1981) found that when the issue is framed with positive language (gain version), people are likely to be risk-averse and choose A. In contrast, when the issue is framed with negative language (loss version), people often react in risk-seeking ways and choose D.
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The proposition of the Framing Effect had a profound impact in behavioural psychology. It had been empirically evident that people tend to make systemically different judgements when information is framed positively or negatively (e.g., Chang, Cheng & Trotman 2008; Hong, Hossain & List 2015; Tian & Zhou 2015; Tversky & Kahneman 1981; Whitney, Rinehart & Hinson 2008). Such empirical findings can be explained in different ways. One explanation attributed the difference to the emotional mechanism of different framing languages stimulating people’s emotions in different ways. For example, evidence shows that people tend to make irrational decisions when problems are written in a way that stimulates high emotional reactions, such as under conditions of perceived risk and uncertainty (e.g., Alter et al. 2007; Gigerenzer & Gaissmaier 2011; Lerner et al. 2015). To illustrate this, De Martino et al. (2006) conducted a study to observe the reactions of human brain in decision-making. They found that individual’s emotional system can be affected by how the information is framed and presented, and that the framing effect was specifically associated with amygdala activity\(^5\), which controls the human emotional system and mediates decision biases. Based on this research, it appears that how uncertainty information is framed can affect people’s emotional reactions, thereby systematically shaping their judgement biases.

More importantly, the accounting literature also provides sufficient evidence to support the Framing Effect in accounting. For instance, Sawers, Wright and Zamora (2011) reported that the framing of risk information could affect managers’\(^6\) risk-taking behaviour in the context of stock-option compensation. Similarly, Chang, Cheng and Trotman (2008) found that the framing language could affect managers’ self-serving biases and transfer-price expectations.

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\(^5\)The amygdala is a structure near the base of the brain that provides instant emotional signals in response to potential threats (Morse 2006). It is vital in reacting to aversive and threatening events (Phelps, Lempert & Sokol-Hessner 2014).

\(^6\)Arguably, Sawers, Wright and Zamora (2011) used MBA students instead of the actual managers as the subjects, although the students claimed to have an average of six years of work experience.
Although accounting scholars have yet to examine the Framing Effect in non-native language conditions, it has been shown in the accounting research to be valid. As a result, the current study integrates one of the experimental tasks on the Framing Effect in associating it with the FLE on uncertainty judgement (Section 4.2.4).

2.2.3.2.2.  *Dual-Process Systems*

The idea of the Dual-Process Systems describes two different modes of cognitive process: quick, unconscious, and automatic; and slow, conscious, and deliberative (Evans, JSBT 2008). Specifically, the Dual-Process Systems suggests that a person’s reasoning process is affected by two systems: intuitive thinking (heuristic), which is automatic and fast; and slow thinking (systematic), which is deliberate and effortful.

To distinguish these reasoning systems and simplify their names, scholars refer to them as System 1 and System 2 (for review, see Evans, JSBT 2008; Kahneman 2011). Table 2.1 presents a list of terms associated with the Dual-Process Systems.

<table>
<thead>
<tr>
<th>Term</th>
<th>System 1</th>
<th>System 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconscious</td>
<td>Conscious</td>
<td></td>
</tr>
<tr>
<td>Implicit</td>
<td>Explicit</td>
<td></td>
</tr>
<tr>
<td>Automatic</td>
<td>Controlled</td>
<td></td>
</tr>
<tr>
<td>Low effort</td>
<td>High effort</td>
<td></td>
</tr>
<tr>
<td>Rapid</td>
<td>Slow</td>
<td></td>
</tr>
<tr>
<td>High capacity</td>
<td>Low capacity</td>
<td>Inhibitory</td>
</tr>
<tr>
<td>Default process</td>
<td>Analytic, reflective</td>
<td></td>
</tr>
<tr>
<td>Holistic, perceptual</td>
<td>Rule based</td>
<td></td>
</tr>
<tr>
<td>Associative</td>
<td>Abstract</td>
<td></td>
</tr>
<tr>
<td>Contextualised</td>
<td>Egalitarian</td>
<td></td>
</tr>
<tr>
<td>Stereotypical</td>
<td>Universal</td>
<td></td>
</tr>
<tr>
<td>Universal</td>
<td>Independent of working memory</td>
<td>Limited by working memory capacity</td>
</tr>
</tbody>
</table>

* From Evans, JSBT (2008, p. 257)
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To illustrate the difference between the two systems, the following are examples of System 1:

Describe the stereotypical image of an accountant. (stereotypical)
What is 2 times 2? (low effort)

Similarly, the following are examples of System 2:

Describe the duties of an accountant. (egalitarian)
What is 45 times 38? (high effort)

The research on the Dual-Process Systems typically follows one of three paradigms. The first is the heuristic and biases paradigm, which focuses on judgement of uncertainty (e.g., Tversky & Kahneman 1974). The second concerns behaviour and neural functions (e.g., Tom et al. 2007). The third focuses on social and moral judgement (e.g., Greene 2007).

The heuristic and biases paradigm aim to distinguish the human reasoning process under uncertainties: people seldom act rationally when making an uncertainty judgement. Instead, they tend to think strategically by following certain heuristic rules (Tversky & Kahneman 1974). Gigerenzer and Gaissmaier (2011) noted that heuristics constitute efficient cognitive processing that ignores some information to make a quick decision (Section 2.5.3). However, this could result in the introduction of certain judgement biases (Gilovich, Griffin & Kahneman 2002). For example, a retailing analyst may predict customers’ next purchase behaviour by applying a simple heuristic rule:

Within three consecutive selling periods:
1) Customer A purchased at least one time (active customer).
2) Customer B didn’t purchase in either period (inactive customer).

In this case, the application of a heuristic rule will make the analyst favour Customer A for its next selling strategy over Customer B. This rule is also known as the recency-of-last purchase rule (Wübben & Wangenheim 2008). Based on this rule, the analyst may benefit from the
heuristic approach, which is also referred as the less-is-more effect (Gigerenzer & Gaissmaier 2011).

The behaviour and neural function paradigm aims to understand the neural correlations between the two systems. The conventional view is that human neural systems related to judgement are controlled by certain regions in the brain (Bechara et al. 1994). This view was inspired by Bechara et al.’s (1994) findings that patients who suffered from a brain injury in the ventromedial prefrontal cortex area were insensitive to the context of uncertainty judgement. Such findings motivated neuroscientists to further explore the Dual-Process Systems in the human brain. Similar studies can also be found in the journal Science (De Martino et al. 2006; Tom et al. 2007).

The social and moral judgement paradigm concerns the automatic and unconscious processing of social information. In contrast to the prior two research paradigms, social and moral judgement research focuses on issues concerning consciousness and the implications for individuals’ moral responsibility (Evans, JSBT 2008). For example, social psychologists have proposed that people may have both implicit and explicit attitude on social stereotypes, such as gender stereotypes (Wilson, Lindsey & Schooler 2000).

Based on the three paradigms above, Dual-Process Systems is highly integrated into people’s daily lives, from aspects of cognition to neural activity and social interaction. However, research in this field to date appears to have neglected one key factor: the judgement process in one’s non-native language. Until recently, Dual-Process Systems has rarely been incorporated into the cross-lingual study of uncertainty judgement. Keysar’s (2012) study provides a pathway that considers the validity of Dual-Process Systems in a new paradigm.
The Framing Effect and Dual-Process Systems, both derived from Prospect Theory, are established constructs for explaining the characteristics of judgement biases. When individuals are dealing with a situation of uncertainty, they may be systematically affected by the frames of language (e.g., risk-seeking in situation of loss or risk-aversion in situations of gain). Meanwhile, the situation itself could also lead them to choose either a heuristic or systematic strategy for judgement.

When linked to the theory of Linguistic Relativism and its key constructs – emotion, cognition and memory – there may be distortions in the conventional findings from Prospect Theory. In other words, when judgement is exercised in one’s non-native language, emotion, cognition, and memory may be altered to the extent that the principles of Prospect Theory do not hold. However, as a combination of Linguistic Relativism and Prospect Theory, the FLE offers a unique explanation for uncertainty judgement in the presence of non-native language conditions. To understand its mechanism, the next section further explores the main propositions of the FLE.

### 2.2.4. Propositions of the FLE

As noted in the previous section, the main constructs of the FLE are derived from Linguistic Relativism and the Prospect Theory. However, the combination of these two theories to form the FLE framework necessitates further empirical and theoretical review in terms of cross-lingual judgement research. This section, therefore, reviews two major propositions derived from FLE research.
2.2.4.1. Proposition 1 – processing difficulty

Research investigating the impact of the FLE proposes that people using a foreign language process information less fluently than when they use their native language. The main assertion is that people are often less proficient when using a foreign language; therefore processing-related information requires more effort in a foreign language than in one’s native tongue (see Costa, Vives & Corey 2017, for a review). Because information is processed less fluently, using a foreign language prompts people to think more deliberately and less heuristically (Section 2.2.3.2).

This proposition has inspired discussions in multiple fields, including empirical study in behavioural psychology (e.g., Gao et al. 2015) and theoretical modelling in international business (e.g., Hadjichristidis, Geipel & Surian 2017; Volk, Köhler & Pudelko 2014). One typical example is the reduced strength of the hot-hand fallacy7 in one’s non-native language. This study was conducted by Gao et al. (2015), where the native Chinese speakers made significantly fewer attempts in an even-probability gamble in the non-native (English) language condition. This study justifies the FLE proposition on processing difficulty in that its results suggest that lower fluency in a non-native language prompts more-deliberate thinking and behaviour (also see Section 2.2.5.3).

From the field of international business studies, Volk, Köhler and Pudelko (2014) developed a Brain Drain Model to describe the intrapersonal effects of foreign-language processing (Figure 2.2). This model was partially inspired by Keysar, Hayakawa and An (2012) FLE and displayed a certain resemblance to the Dual-Process Systems. A review of this theoretical model was

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7 The hot-hand fallacy refers to a psychological bias that people who experience success with a random trials believe there will be a greater probability of successful outcomes in future trials (See the original study: Gilovich, Vallone & Tversky 1985).
Conducted by Hadjichristidis, Geipel and Surian (2017), who highlighted that foreign language processing reduces attention to tempting stimuli and affects memory retrieval due to the increase of memory load.

Notably, evidence for the greater difficulty of foreign-language processing had been reported long before Keysar, Hayakawa and An (2012) formalised the notion of the FLE. One example comes from Takano and Noda’s (1993) study, where the authors targeted subjects using the English and Japanese languages. They conducted two experiments to test participants’ thinking ability in the selected language settings (native or foreign) and reported a temporary decline of thinking ability when participants were using the foreign language.

**2.2.4.2. Proposition 2 – reduction of emotion**

The FLE also proposes that people feel less emotionally attached to arguments and outcomes when using a foreign language than when using their native language. This proposition leads to the view that in foreign-language contexts, people may react differently than if the same
situation was experienced in a native-language setting. Advocates of the FLE have predicted that, due to this increased emotional distance, the use of a foreign language would encourage people to make uncertainty judgements that are more analytical and less heuristic (Cipolletti, McFarlane & Weissglass 2016; Geipel, Hadjichristidis & Surian 2015, 2016; Hadjichristidis, Geipel & Savadori 2015; Hayakawa et al. 2016).

The key argument is that people normally acquire their native language in emotionally rich contexts, such as in daily lives; whereas they tend to learn a foreign language in emotionally neutral environments, such as in a classroom (Ivaz, Costa & Duñabeitia 2016). As Caldwell-Harris (2015) explained, people feel more emotional and prefer to express emotions in a language that was acquired naturalistically. This is because the words and phrases are “emotionally grounded” and experienced in a social context (Caldwell-Harris 2015, p. 216). In reflecting on daily life, people may feel more comfortable discussing potentially embarrassing topics in their foreign language than in their native language (e.g., Bond & Lai 1986). Similarly, people may feel less intimidated talking about taboo issues in a foreign language than in a native language (e.g., Caldwell-Harris & Ayçiçeği-Dinn 2009).

According to this stream of research, people tend to express their feelings less emotionally in a foreign language, which leads to their uncertainty judgement potentially less biased than when they are using their native language.

2.2.5. Empirical findings regarding the FLE

Inspired by Keysar, Hayakawa and An (2012) study, several scholars extended the FLE to different empirical contexts, such as moral judgement (e.g., Cipolletti, McFarlane & Weissglass 2016; Costa, Foucart, Hayakawa, et al. 2014; Geipel, Hadjichristidis & Surian 2015, 2016),
emotional reasoning (Caldwell-Harris 2014, 2015; Hadjichristidis, Geipel & Surian 2017; Swain 2013), and risk judgement (Hadjichristidis, Geipel & Savadori 2015). Most of these studies agree on the existence of the FLE on uncertainty judgement.

Notably, at least two studies have replicated the original Keysar, Hayakawa and An’s (2012) study but reported inconsistent results (see: Costa, Foucart, Arnon, et al. 2014; Oganian, Korn & Heekeren 2016). The results of Costa, Foucart, Arnon, et al. (2014) showed no significant variations for Spanish-speaking participants when judgement was based on the loss frame in the English-language condition. Similarly, Oganian, Korn and Heekeren (2016) found that German-speaking participants showed no differences between their native and non-native languages in responding to the framing tasks. Such mixed findings on FLE indicate the complex nature of uncertainty judgement\(^8\) and a need to consider different approaches on research design\(^9\). These conflicting findings, however, do not dwarf the significance of the FLE that other experiments have demonstrated. The following sections outline these empirical findings from three aspects: moral judgement, emotionality, and risk perception.

### 2.2.5.1. Moral judgement

The research of foreign language effect on moral judgement tests how people solve the same moral dilemma in either a native or foreign language. The motivation of this research is that if a foreign language can influence a person’s judgemental biases and emotional reactions, then it can also influence that person’s judgement on moral issues. Several studies have claimed that individuals would be more likely to endorse a utilitarian decision when using a foreign language

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\(^8\) Polonioli (2018) suggests that there is a ‘blind spot’ in research on FLE due to the different perspectives on human judgement and decision-making.

\(^9\) In Oganian, Korn and Heekeren’s (2016) study, the authors designed the language switch experiment, which was different from the between-subject research design in prior FLE studies.
than when using their native language (Cipolletti, McFarlane & Weissglass 2016; Costa, Foucart, Hayakawa, et al. 2014; Geipel, Hadjichristidis & Surian 2015, 2016; Hayakawa et al. 2017). In this context, a utilitarian decision is one that leads to the maximisation of a positive outcome. Relevant studies have been applied with native English, Hebrew, and Korean speakers who use French, Spanish, or English as a foreign language.

Most of the studies apply the moral-dilemma case on the basis of the classic Trolley Problem. The original Trolley Problem (Table 2.2) was proposed by Philippa Ruth Foot and modified by Judith Jarvis Thomson (Thomson 1976).
Table 2.2 – Moral-dilemma tests

<table>
<thead>
<tr>
<th>Original Trolley Problem</th>
<th>Thomson (1976, p. 206)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edward is the driver of a trolley, whose brakes have just failed.</td>
<td></td>
</tr>
<tr>
<td>One the track ahead of him are five people; the banks are so steep that they will not be able to get off the track in time.</td>
<td></td>
</tr>
<tr>
<td>The track has a spur leading off to the right, and Edward can turn the trolley onto it.</td>
<td></td>
</tr>
<tr>
<td>Unfortunately there is one person on the right-hand track. Edward can turn the trolley, killing the one; or he can refrain from turning the trolley, killing the five.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footbridge dilemma</th>
<th>Costa, Foucart, Hayakawa, et al. (2014, pp. 2-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A small oncoming train is about to kill five people.</td>
<td></td>
</tr>
<tr>
<td>The only way to stop it is to push a heavy man off the footbridge in front of the train.</td>
<td></td>
</tr>
<tr>
<td>This will kill him, but save the other five people.</td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th>Trolley-switch dilemma</th>
<th>Cipolletti, McFarlane and Weissglass (2016, p. 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A trolley is headed toward five men.</td>
<td></td>
</tr>
<tr>
<td>The only way to stop it is to switch the trolley to another track.</td>
<td></td>
</tr>
<tr>
<td>This will kill only one man, but save the other five people.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Button case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>An unoccupied runaway train is going down the tracks toward five innocent people.</td>
<td></td>
</tr>
<tr>
<td>If the train continues on its present course, it will kill all of these people.</td>
<td></td>
</tr>
<tr>
<td>You notice that there is a button nearby which will direct the train to a sidetrack. On the sidetrack, the train will kill only one innocent person instead of the five people on the original track.</td>
<td></td>
</tr>
<tr>
<td>Morally speaking, should you push the button to direct the train to the sidetrack?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bridge case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>An unoccupied runaway train is going down the tracks toward five innocent people.</td>
<td></td>
</tr>
<tr>
<td>If the train continues on its present course, it will kill all of these people.</td>
<td></td>
</tr>
<tr>
<td>You are on a bridge over the tracks, between the approaching train and the five people.</td>
<td></td>
</tr>
<tr>
<td>The only way to save the lives of the five people is to push an innocent person that you do not know off of the bridge and onto the tracks. This person will die, but this will stop the train before it gets to the five people.</td>
<td></td>
</tr>
<tr>
<td>Morally speaking, should you push this person onto the tracks below?</td>
<td></td>
</tr>
</tbody>
</table>
Costa, Foucart, Hayakawa, et al. (2014) found that people using a foreign language are likely to make utilitarian decisions when judging moral dilemmas. They conducted two experiments based on the footbridge dilemma (Table 2.2) across the English, Spanish, French, and Hebrew languages. In the first experiment, they reported that people in a foreign-language condition are more likely to choose to “kill one and save five” – the utilitarian choice. However, this result could also be attributed to cultural variances between the Spanish-speaking societies (more collectivism) and the English-speaking societies (more individualism) (Goodwin & Hernandez Plaza 2000). To rule out the cultural factor in moral judgement, Costa, Foucart, Hayakawa, et al. (2014) conducted the second experiment by examining both native English speakers in a Spanish-language context and native Spanish speakers in an English-language context. The results resembled those of the first experiment, showing a significant FLE for both groups in making a dilemma judgement. Overall, their study supports the view that language contribute to shaping one’s moral judgement.

Cipolletti, McFarlane and Weissglass (2016) made a similar investigation on the basis of the Trolley Problem. This time, they modified the original Trolley Problem to produce the Button Case and the Bridge Case and tested the dilemmas on English-Spanish bilingual students.

The findings suggested that the presentation language had no influence on the judgement of the Button Case, with over 80% of responses from both the native and non-native language groups favouring the Yes option (that is, to push the button to kill one and save five). In contrast,

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10 The original article contains some typos. On page 29, the second last paragraph, “In total, 73 native English speakers and seven native Spanish speakers received the button case and 73 native English speakers and seven native Spanish speakers received the button [should be bridge] case”. In page 30, the second last paragraph, “The majority of these participants responded that one should push the button to divert the trolley [should be train]....”
in the Bridge Case, non-native language participants favoured the Yes option (47.8%) significantly more than their native language peers (20.6%).

The overall results from both experiments partially supported the FLE. Cipolletti, McFarlane and Weissglass (2016) explained that the Button Case (push the button) may induce less emotional reaction than the Bridge Case (push a person), which may lead to less heuristic and more systematic thinking (utilitarian judgement on kill one and save five).

In the same vein, Geipel, Hadjichristidis and Surian (2015) extended the scope of the FLE on moral judgement further by testing different moral scenarios: eating dog meat, consensual incest, cheating in examinations, inappropriate usage of a national flag, and unfair bonus allocation. German and Italian university students participated in the study. The findings suggested that people using a foreign language (in this case, English) made milder moral judgements. For example, participants in the non-native-language group judged eating dog meat less harshly than those in the native-language group. Geipel, Hadjichristidis and Surian (2015) also reported that the use of a foreign language induced people to feel less confident and less emotional when making moral evaluations. Overall, this study complemented the traditional moral-judgement design and provided additional evidence to support the FLE.

In an extension of their previous study, Geipel, Hadjichristidis and Surian (2016) further argued that non-native language use would prompt judgements weighted more heavily toward outcomes than intentions. They again conducted two experiments with participants from German and Italian universities. The first experiment consisted of three moral scenarios that were described with positive outcomes and dubious intentions, and two control scenarios. The second experiment presented two moral cases in the context of negative outcomes with positive
intentions. Participants were asked to judge the moral goodness from 0 (not at all good) to 9 (extremely good) and self-rate their language proficiency following each scenario. The results showed that in the context of dubious intentions with positive outcomes, the use of a non-native language promoted more-positive moral judgement than the native language; whereas in the context of positive intentions with negative outcomes, the use of a non-native language promoted less-positive moral judgement than the native language. This indicated a potential effect of the foreign language on heuristic or intuitive judgement. As Geipel, Hadjichristidis and Surian (2016) suggested, this is consistent with the FLE assumption that when using a foreign language, people experience weakened emotional and cognitive reasoning.

2.2.5.2. Emotionality

There are several methods for examine the FLE on emotions. One common approach is to identify the emotional differences between languages. The measurement can be based on the variation of reaction time between emotional and non-emotional bonded words. For example, Ivaz, Costa and Duñabeitia (2016) conducted experiments using a programmed device to test subjects’ self-bias\(^{11}\) between Spanish and English. They designed the research instrument by associating geometric shapes (e.g. \(\bigcirc\), \(\square\), \(\triangle\)) with linguistic tags (you, a friend, other) and analysed the reaction time in both language conditions. They reported that subjects who provided correct matching (geometric shapes with linguistic tags) responded faster for self-related than self-unrelated stimuli in both native- and foreign-language conditions. However, the size of the self-bias was significantly smaller in the subjects’ foreign language.

\(^{11}\) The theory behind self-bias is that people perceive self-related issues as more salient than self-unrelated issues (Sui et al. 2014). As the authors argued, self-bias reflect subjects’ differences in their emotional bonds to self-related versus self-unrelated issues.
Similarly, a person’s affective processing\(^\text{12}\) of emotional words can be measured. For example, Ponari et al. (2015) conducted an experiment to measure subjects’ reaction time in identifying correct versus incorrect spelling words. However, while they found a significant difference in affective processing between emotional (positive and negative) and neutral words in native- and foreign-language conditions, they found no FLE on subjects’ affective processing of valence words.

Another approach to measure the FLE on individual’s emotion is based on the neuroscience technique of skin-conductance response (SCR). The SCR technique measures the electrical conductivity of a person’s skin in response to internal or external stimuli. It is a popular method to measure an individual’s emotional changes. For example, Caldwell-Harris and Ayçiçeği-Dinn (2009) used SCRs to measure the different emotional reactions in subjects’ native (Turkish) and foreign (English) languages. The first experiment tested their emotional reactions to four types of phrases: neutral, insult, reprimand, and endearment. They found that subjects had overall stronger autonomic responses to phrases expressed in the native language. The second experiment tested emotional differences in lying; however, they found conflicting results between SCR testing and self-rating on emotions. Participants’ self-rated reports showed that they felt a stronger emotional response to lies expressed in their native language than in the foreign language, which contradicted the SCR results.

Studies examining the FLE on emotionality, however, do not agree with the corresponding psychological studies. For example, several studies have found that subjects showed no significant emotional differences between native- and foreign-language processing emotion-

\(^{12}\) The theory behind affective processing is that words with affective or valence feature (such as positive and negative) are processed differently to neutral words (Ponari et al. 2015).
related words (Ponari et al. 2015) or recalling emotional words (FerrÉ, SÁNchez-Casas & Fraga 2013), as measured by SCR (Eilola & Havelka 2010).

In summary, these studies provide empirical evidence about the FLE on emotionality. An overall implication is that individuals’ non-native language often induces less emotion than their native language. The next section provides another aspect of FLE: its effect on risk perception.

2.2.5.3. Risk perception

As indicated in the previous section, the use of language can shape one’s emotional response. Based on such findings, scholars have also extended the FLE to risk judgement. The research of FLE on risk judgement tests individuals’ perception of risk in different language conditions. The current knowledge suggests that people are more willing to take risks when making judgements using a foreign language.

To examine whether people using a foreign language would have different perceptions towards risk, Hadjichristidis, Geipel and Savadori (2015) designed an experiment that asked participants to judge the risk and benefit of selected phrases in English and Italian. The authors conducted two experiments: one in-class survey and one online survey, both in Italy. The experiments required participants to provide judgements on 26 phrases, such as “food preservatives”, “travelling by airplane”, and “solar energy”, from the risk and benefit perspectives. The results showed that using a foreign language induced lower judgement of risk and higher judgement of benefit. In a separate analysis, the authors also found that people thinking in a foreign language reported reduced negative feelings and increased positive feelings. This study implies
that the use of a foreign language in risk judgement would reduce the perception of risk and increase the perception of benefit.

To investigate whether providing feedback in different languages would affect people’s risk judgement, Gao et al. (2015) designed an experiment based on the concept of the hot-hand fallacy. The authors conducted an even-probability gambling experiment using Chinese-English bilingual students (Chinese as their native language) and found that participants reduced their risk-taking behaviour and had slower responses when the feedback of each “gamble” was given in the non-native language. This result supports the view that people may make different risk judgements if information is provided in a foreign language.

To justify the relevance and significance of the FLE in accounting, the following sections review three bodies of literature: accounting language, uncertainty expressions, and uncertainty judgement.

2.3. ACCOUNTING LANGUAGE

2.3.1. Introduction
Accounting has long been regarded as a language (e.g., Avery 1953). Some scholars view accounting as a language of business, because communicating accounting information requires sophisticated lexical and grammatical rules (Bloomfield 2008; Riahi-Belkaoui 1978). Others have asserted that accounting is a language for a specific purpose because it has a unique collection of vocabularies – similar to a dialect in natural languages (Evans, L 2010; Evans, L, Baskerville & Nara 2015).
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In language settings, the communication of uncertainty is unavoidable. Like a natural language, accounting has a substantial number of uncertainty expressions in its vocabulary. These expressions can be found in accounting standards, as well as internal and external reports. The most common form of uncertainty expression in accounting is found in verbal (versus numerical) expressions. For example, the IFRS conceptual framework requires that assets should be recorded “when it is probable that the future economic benefits will flow to the entity”. In this phrase, the word “probable” is a verbal expression of uncertainty.

A good understanding of accounting language is important not only for business communication, but also for the efficiency and quality of accounting judgements and decision-making. Thus, this section focuses on the language features of accounting. It explores a typical language issues on uncertainty communication by reviewing the translation, interpretation, and application of uncertainty expressions. Additionally, a comprehensive list of accounting uncertainty expressions has been provided in Appendix A.
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2.3.2. Accounting as a language

Over the last century, the accounting has been formally discussed in terms of its functioning as a language (Avery 1953), a business language (Lavoie 1987), and a language for a specific purpose (Evans, L 2010).

In the early 1950s, Avery (1953) initiated a discussion on accounting as a language, arguing that a language must be based on a common purpose and a positive set of rules. These purpose and rules should be useful, reasonable, and consistent with the facts. In Avery’s (1953) view, accounting has been developed as an art or a department of scientific knowledge, which leads to the formation of a language.

In the same vein, Riahi-Belkaoui (1978) discussed the lexical and grammatical aspects of accounting information, and asserted that accounting satisfies the characteristics of a language. In addition, Riahi-Belkaoui (1978, 1980) incorporated a psycholinguistic view – linguistic relativity – to argue that accounting as a language affects people’s perception and behaviour.

The discussions about accounting shifted from its linguistic features to its linguistic functions in the 1980s. Lavoie (1987) proposed that accounting is the language of business and could affect professional judgement and decision-making. This potential, Lavoie (1987) emphasised, is largely determined by how people use and interpret the language. Four decades later, the ideology of accounting as a language persists. Bloomfield (2008, p. 433) wrote a short article arguing that accounting remains the language for “business communication about financial state and performance”.
Recent discussions about accounting as a language have considered it to be a language with a specific purpose. Evans, L (2010) formally proposed this notion, pointing out that the accounting language is a highly specialised dialect of business language because it has a unique collection of vocabularies. For example, there are expressions or terminologies specially designed by and attributed to accounting, such as “EBIT” and “fair value”; and some expressions are adopted from daily language with a different meaning, such as “recognition”, “outstanding”, and “credit” (for review, see Evans, L, Baskerville & Nara 2015).

Accounting, while critical to business communication, faces several challenges to its functioning as the language of business. These challenges, which relate to the translation, interpretation, and application of accounting terminology, are reviewed in the following sections.

2.3.2.1. Challenges of translation
Translation plays a vital role in the development of a global accounting language. From the inception of the International Accounting Standards Committee (IASC) in 1973, regulators have laboured to prepare a single set of accounting standards that could be used by companies around the world for financial-reporting purposes. These standards are embodied in the International Financial Reporting Standards (IFRS), and appropriate translation of these standards into more than 20 languages has been a key concern for regulators (IFRS Foundation 2016).

According to Paul Pacter (a former member of the IASB), translation is critical for accommodating differences between countries, regions, and languages in global businesses (Pacter 2017). In its Translation, Adoption & Copyright Policy, the IFRS Foundation stresses
that translation could affect the global implementation of international accounting standards (IFRS Foundation 2013). Although IFRS has achieved a wide range of endorsement globally, there are still two major limitations inherent in its translation: (1) the purpose of translation and (2) the legitimacy of translation.

First, IFRS defines its process of translation differently to traditional understandings of translation. The IFRS Foundation states that the purpose of its translation is to “render the English text into another language”, rather than to simply “translate or explain” (IFRS Foundation 2013, Section 3.3). It is the “rendering” process that is of note in this process. The Foundation’s professional translation team first makes a direct translation of the text, which is then reviewed by a committee of accounting experts (IFRS Foundation 2013, Section 3.1). The committee members are required to be native speakers of the target language, with a very good knowledge and understanding of English (IFRS Foundation 2013, Section 3.8). “Rendering” is the term used to ensure that the specific, nuanced accounting meanings contained in the English version of the text are captured in the target (translated) version of the text, which may not be achievable by direct translation.

Second, finding equivalent texts between languages is a common problem for any translation task. For example, Evans, L, Baskerville and Nara (2015) compared the translation issues across multiple disciplines, such as law, advertising, and medicine, and raised concerns about the equivalent implementation of IFRS from one national context to another. There are also occasions where the target language does not have the original terms in its vocabulary, and the translators need to create new terms. For example, the Chinese translation of “fair value” (公允– yún) did not previously exist in the daily vocabulary of modern Chinese. Additionally, Baskerville and Evans (2011) noted that IFRS translation can be less meaningful when an
accounting concept does not belong to the culture of the target country. For example, one response from Baskerville and Evans’s (2011, p. 47) report was: “It is quite impossible when you write for English-speaking people to make a literal translation, because you have to integrate their mental and cultural framework.”

Both examples demonstrate the challenges inherent in the accounting translation. Beyond these inherent challenges, people communicating accounting information also face issues such as interpretation. The next section outlines this issue in detail.

### 2.3.2.2. Challenges of interpretation

Users and preparers of accounting information generally differ widely with respect to interpretations of accounting concepts. An example of this can be found in a recent book, The End of Accounting:

Accounting information is generally believed to be factual (the company purchased 500 units), but nothing could be further from the truth. Accounting items—like revenues, expenses, and assets—are increasingly based on managers’ subjective estimates and projections, which sometimes amount to sheer guesses (Lev & Gu 2016, p. 94).

One typical issue of interpretation relates to the uncertainty expressions used in accounting language. To illustrate, the expressions “probable” and “reliably” have been integrated into the Conceptual Framework to define asset recognition:

…when it is probable that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably (International Financial Reporting Standards Conceptual Framework).
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There are further interpretation dilemmas when an IFRS that uses an uncertainty expression is used to explain another uncertainty expression. For example, IFRS 5.A contains these definitions:

Probable: more likely than not  
Highly probable: significantly more likely than probable

These examples demonstrate that communicating in accounting language may deliver multiple layers of information, which are subject to varied interpretations. As Laswad and Mak (1997) stressed, variation in interpretation reduces the communication efficiency between users of accounting information. Similarly, if accountants interpret uncertainty expressions differently due to the nature of language, there is a risk to comparability when preparing financial reports (Doupnik & Richter 2003).

When considering the interpretation issue in a multilingual context, the potential impact on accounting communication is likely to be of even greater significance. For example, Zeff (2007) stressed that the language-related variance in interpretation would overwhelm the ongoing convergence between the IASB and the FASB. Hu, Chand and Evans (2013) argued that inconsistent interpretation would impair the usefulness of financial reports. In the view of Wehrfritz and Haller (2014), if IFRS cannot ensure comparable financial reporting because of cross-national factors (including language), the goal of IFRS harmonisation will be in doubt.

Interpretation challenges in accounting also correlate to the current research question (Section 1.3). These challenges drive this study to investigate the accounting interpretation of uncertainty expressions in the non-native language condition. Meanwhile, the research question also outlines concerns about the application of accounting language. Therefore, the next section discusses the application challenges of accounting language.
2.3.2.3. Challenges of application

Applying accounting language in business communication often involves different types of judgement. In particular, preparing and reporting accounting information requires extensive uncertainty judgements. Hronsky and Houghton (2001) noted that financial reports are the result of numerous accounting judgements and decisions. This can also be exemplified in IAS 08 – Accounting Policies, Changes in Accounting Estimates and Errors, which states:

As a result of the uncertainties inherent in business activities, many items in financial statements cannot be measured with precision but can only be estimated (IAS 08 Paragraph 32).

IFRS offers great discretion to accountants in exercising professional judgement, especially when the measurement of accounting elements pertains to an estimate. As IAS 08 further states, many accounting items require accountants to exercise professional judgement to determine an estimated figure, such as bad debts, inventory obsolescence, fair value, the useful lives of depreciable assets, and warranty obligations (IAS 08, Paragraph 32).

From the psycholinguistic perspective, the use of language determines a person’s world view. Language has been described as an “index of meaning”\(^\text{13}\), and individuals’ behaviour in a given situation depends on what that situation means or signifies to them (Osgood, Suci & Tannenbaum 1957, p. 18).

The challenges of applying accounting language can also be explained by linguistic relativism, which asserts that the application of different languages affects how people construct perceptions and beliefs, thereby affecting judgement and decision (Riahi-Belkaoui 1978, 1995).

\(^{13}\) “Meaning” is a relational or process concept that can refer to either sociological meaning or linguistic meaning (Osgood, Suci & Tannenbaum 1957).
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For example, Holthoff, Hoos and Weissenberger (2015) found that German participants made significantly different accounting judgements\textsuperscript{14} based on whether they were reading “IAS 24 Related Party Disclosures” in German or English. In the same vein, Pan and Patel (2016) reported that accounting students using a non-native language were likely to be more aggressive in the judgement of financial reporting than those using their native language. Relate to the linguistic relativism theory, a person’s native language would affect his emotion, cognition and memory (Section 2.2.3.1), while such impacts may not display as the same in that person’s non-native language. As a result, the linguistic relativism theory can explain the above examples between German (native language) and English (non-native language), and Chinese (native language) and English (non-native language).

Given the importance of uncertainty expression to accounting judgement, the next section further explores the nature and key characteristics of uncertainty expressions.

2.4. UNCERTAINTY EXPRESSIONS

2.4.1. Introduction

People often communicate uncertainty information using different modes of expression. In general, there are two modes of uncertainty expressions (Erev & Cohen 1990): verbal probabilities and numerical probabilities (Table 2.3). Each mode has several sub-categories. For example, verbal probability can be either a single word (e.g., probable), a single word with a prefix (e.g., unlikely – “un” as a prefix), or a phrase with a modifier (e.g., highly probable –

\textsuperscript{14} Holthoff, Hoos and Weissenberger (2015) claim to test the ‘decision-making quality’ by comparing subjects’ judgment against professional auditors’ judgment. The current author believes; however, such definition is not appropriate since accounting experts (standard setters, accountants, auditors) also varies in their judgment.
“highly” as a modifier). A numerical probability might be a percentage term (e.g., 50%), a frequency term (e.g., 5/10), or a p-value term (e.g., 0.5).

Table 2.3 – Modes of uncertainty expressions

<table>
<thead>
<tr>
<th>Verbal probability</th>
<th>Numerical probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single word</td>
<td>Percentage (or with range)</td>
</tr>
<tr>
<td>e.g., probable; likely; possible</td>
<td>e.g., 50.0%; 35.2% to 89.8%;</td>
</tr>
<tr>
<td>Modifier + word</td>
<td>Frequency (or with range)</td>
</tr>
<tr>
<td>e.g., very likely; highly probable; less likely</td>
<td>e.g., 4/10; 3/13 to 8/13</td>
</tr>
<tr>
<td>Prefix +word</td>
<td>P-value (or with range)</td>
</tr>
<tr>
<td>e.g., unlikely; improbable; impossible</td>
<td>e.g., 0.25; 0.3 to 0.5</td>
</tr>
</tbody>
</table>

The use of these types of uncertainty expressions is pervasive. From public news reports to the official accounting standards, these modes of uncertainty expressions are seamlessly integrated into daily conversations and form the basis of many people’s conscious and subconscious judgements. For example, in responding to public concerns about the Australian economy, the Reserve Bank of Australian has reported:

It is highly unlikely that Australia’s economy entered a recession over the second half of last year, the Reserve Bank has concluded in its latest economic update (ABC News 2017a).

Similarly, after several terrorism incidents occurred domestically and globally in 2017, the Australian government15 announced that:

Australia’s terror threat level remains at probable (ABC News 2017b).

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15 In fact, the Australian government only uses a five-level scale to advise on the likelihood of a terrorist action in Australia, all of which are verbal probabilities: Not expected, Possible, Probable, Expected and Certain (Australian National Security 2017). Interestingly, that report provides no numerical definition or scales for these verbal expressions.
There are also occasions when both modes of uncertainty expression (words and numbers) are used in the same message. As shown below, the statement provides two types of numerical probabilities (range probability: 30-40%; frequency: 1-in-2 chance) to correlate with one verbal probability (reasonably high).

...“reasonably high” chance AAA rating will be lost before Christmas – Australia has almost a one-in-two chance of being downgraded next week...with a slowing economy and widening budget deficit, he sees a “reasonably high” 30 to 40 per cent chance of Australia being downgraded... (ABC News 2016).

This mixture of usage, as shown above, illustrates a critical issue in the application of uncertainty expressions. The example above clearly violates the precision of meaning with each uncertainty expression. The two numerical probabilities (one-in-two chance and 30 to 40 per cent) are statistically different. The verbal term “reasonably high” also does not necessarily correlate to either of these two numerical probabilities. The result is that the expressions used in this message appear subjective and inconsistent.

Continuing from the previous discussion on the linguistic issue of accounting, the following sections critically reviews the literature on uncertainty expressions. It starts with the definition of uncertainty and then systematically reviews both theoretical and empirical research on verbal and numerical probabilities.

2.4.2. Uncertainty definition

Before specific features of uncertainty expressions are explored, this section considers uncertainty as a concept. A clear definition for the term “uncertainty” is important because many accounting scholars have associated the term with other related terms such as “risk” and “ambiguity”. For instance, some accounting scholars have characterised uncertainty
expressions as either uncertain (Chesley 1986; Doupnik & Richter 2003), risky (Juanchich, Sirota & Butler 2012), or ambiguous (Nelson & Kinney Jr 1997).

These characterisations of risk or ambiguity as synonymous with notions of uncertainty may lead to research flaws because some of the unique characteristics of uncertainty expressions are overlooked. For example, an uncertainty expression may be the result of, or may contribute to, ambiguity. However, an uncertainty expression needs not necessarily be related to ambiguity at all, particularly if, for example, presented to an accountant trained to manage these types of scenarios. Accordingly, there is a need to clarify the meaning of uncertainty, risk, and ambiguity.

According to the Oxford English Dictionary (2002), uncertainty, risk and ambiguity are different in terms of both definition and application (Table 2.4).

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Uncertainty | • The quality of being uncertain in respect of duration, continuance, occurrence; the quality of being indeterminate as to magnitude or value; the amount of variation in a numerical result that is consistent with observation.  
  • The state of not being definitely known or perfectly clear; doubtfulness or vagueness.  
  • The state or character of being uncertain in mind; a state of doubt; want of assurance or confidence; hesitation, irresolution. |
| Risk      | • Involving the possibility of injury, loss, or other adverse or unwelcome circumstance; a chance or situation involving such as possibility.  
  • The error of an observation or result considered without regard to sign; the probability of error. |
| Ambiguity | • Subjectively: Wavering of opinion; hesitation, doubt, uncertainty as to one's course.  
  • Objectively: Capability of being understood in two or more ways; double or dubious signification, ambiguousness. |

The psychology literature similarly considers these terms distinct. Discussions on their differences can be traced to as early as the 1920s, when Frank Knight\(^\text{16}\) asserted that uncertainty can be either measurable or unmeasurable. Measurable uncertainty is referred to as risk, and

\(^{16}\) Frank Knight, an economist from the University of Chicago, was best known as the author of the book *Risk, Uncertainty and Profit*. He was also the doctoral advisor of Nobel laureates George Stigler and James Buchanan.
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can be represented by numerical probabilities (see reviews on: Ellsberg 1961). Ellsberg (1961) extended this statement and argued that some uncertainties are not risk because people do not necessarily behave in accordance with precise numerical estimations. This view leads to the famous Ellsberg Paradox: people’s decisions can violate the postulate of subjective expected utility (Segal 1987). In the same article, Ellsberg added another dimension of uncertainty, which he called ambiguity, that indicates the quality of information as determined by its amount, type and reliability.

2.4.3. Two modes of expressions

The introduction section of this chapter outlined and gave examples of two modes of uncertainty expressions: verbal probability and numerical probability. A concern was raised in the section over the use of uncertainty expressions in accounting. This concern was further elaborated in the previous section, as accounting scholars were shown to have overlooked the unique characteristics of uncertainty.

The current section aims to review the characteristics of uncertainty expressions in detail and addresses scholars’ views on their application to uncertainty information.

2.4.3.1. Verbal probability

Verbal probabilities are words or phrases that people use intuitively to express the likelihood of an event (Lichtenstein & Newman 1967). They can be either as a single word, such as “likely”, or a phrase that includes a modifier, such as “highly likely”. In some cases, verbal probability represents a “qualitative expression” (Mosteller & Youtz 1990, p. 2).
There are three major paradigms in the verbal probability research: translation, semantic, and pragmatic (Teigen & Brun 1999). The translation paradigm focuses on finding the most effective method to translate verbal probabilities into numbers. Reagan, Mosteller and Youtz (1989, p. 433) refer such translation processes as “word-to-number” conversion. A general approach of word-to-number conversion is to provide a percentage from 0 to 100 that corresponds to the verbal phrases. Another similar approach is to judge the degree of uncertainty over the [0, 1] scale or p value, which has been referred as the membership function (Wallsten, Fillenbaum & Cox 1986).

**Example**
Please indicate the probability in percentage terms that best corresponds, in your opinion, to the following expression:

Reasonably likely _____%  

From Doupnik and Richter (2003, p. 32)

The semantic paradigm targets the inherent meaning of verbal expressions that may not captured by numerical expressions. One typical example is the directional features of verbal probability (Teigen & Brun 2003a). For instance, when deciding options for a business strategy, “Strategy A’s success is somewhat possible” directs one to anticipate a positive outcome; whereas “Strategy B’s success is uncertain” directs one to anticipate a negative outcome. However, a word-to-number interpretation of expressions may not reveal the impact of directional phrasing on individuals’ thinking processes.

Another example of semantic issues relates to the usage of linguistic modifiers. For example, adding the modifier “very” to the verbal probabilities “likely” and “uncertain” (“very likely” and “very uncertain” versus “likely and uncertain”) would shape the meanings of both expressions.
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The pragmatic paradigm aims to understand the effect of verbal probabilities in one’s judgement and decision-making. This paradigm has been fruitful in experimental psychology, shaping the development influential theories such as the Framing Effect (Tversky & Kahneman 1981), the Communication Mode Preference (CMP) Paradox (Erev & Cohen 1990), and Politeness Theory (Juanich & Sirota 2013). For example, the CMP Paradox describes an individual’s preference bias in choosing between verbal and numerical probabilities. Specifically, people who prepare the uncertainty information prefer to use verbal probabilities because they allow a certain degree of flexibility and subjectivity. In contrast, people who make decisions based on uncertainty information prefer to describe the uncertainty in numbers, as they are less subjective and less likely to induce judgement biases. In short, people prefer to provide verbal expressions but resist receiving them in uncertainty communication.

Because of its significance on uncertainty judgement, research based on the pragmatic paradigm has been extended to multiple fields, including behavioural psychology (Brun & Teigen 1988), medical practice (Timmermans 1994), economic decisions (Keren & Teigen 2001), and climate prediction (Budescu, David V et al. 2014).

2.4.3.2. Numerical probability

Numerical probability can be expressed in different modes: a percentage (e.g. 60%), a frequency (e.g. 30/50), or a p value (e.g. 0.6). In most cases, these modes are interchangeable. For example, a 20% chance of having bad debts is the same as saying that bad debts should occur, on average, in 2 out of 10 accounts receivables.
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Numerical probabilities are also a vital form of expression to describe the meaning of uncertainty. For psychologists, the numerical probability can be the numerical translation (Beyth-Marom 1982) or quantitative meaning (Reagan, Mosteller & Youtz 1989) of verbal probabilities.

The most significant advantage of using numerical probabilities is their ability to indicate an uncertainty level. For example, the occurrence of an event is at high uncertainty level (thus less certain) when its numerical probability is a 50-50 chance (also see: Beyth-Marom 1982, pp. 266-7); whereas at low uncertainty level (thus more certain), its numerical probability is either extremely small (e.g. 5%) or extremely large (e.g. 95%).

A bell-shaped normal distribution, in which the Y-axis represents the level of uncertainty (in verbal terms) and the X-axis represents the numerical probability, can illustrate this (Figure 2.3). The middle part of the bell curve represents high uncertainty because the chances of the outcome in question are around 50-50; whereas the two tails both represent low uncertainties, as their numerical probabilities are either extremely low or extremely high.

![Figure 2.3 – graphic of uncertainty level with numerical probability](image_url)
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Uncertainty level can also be framed with range probabilities (such as 30% ± 20%); the higher the uncertainty, the broader the probability range. For example, Mosteller and Youtz (1990) surveyed science writers and found that verbal expressions corresponding to numerical percentages close to 50% usually vary more broadly.

Despite the clear distinctions between verbal and numerical probabilities, scholars’ views on their practical implications differ. The following section outlines several critics of each mode of uncertainty expression.

2.4.3.3. Proponents versus opponents

Both modes of expression have both supporters and critics. Supporters of verbal probability (e.g., Teigen & Brun 2003a) argue that it eases conversations about uncertainties. Such ease of usage allows people to discuss uncertainties even when they are not confident about the probability information. For example, a person can forecast the weather by saying “it is very likely to rain today”, even though this statement may not be grounded in specific statistic information. Other researchers (Olson & Budescu 1997) suggest that verbal probability statements provide flexibility in judgement because they are naturally present in daily conversation and easy to use, especially when communicating imprecise uncertainty information.

In contrast, critics contend that verbal probability is subjective, and that such flexibility results in interpretations of verbal probabilities that vary widely among individuals (Juanchich & Sirota 2013). For example, Beyth-Marom (1982) comments that verbal probability is a poor tool to convey one’s confidence in a forecast because decision-makers (users of information)
may interpret the expressions very differently to the intention of the forecaster (provider of information).

Another critique of the use of verbal probability is its lack of credibility in decision-making. This critique has four aspects. First, people perceive words’ meaning differently and even inconsistently over time (e.g., Karelitz & Budescu 2004). Second, the meaning of verbal probability depends greatly on context (e.g., Teigen & Brun 2003b). Third, verbal probabilities could affect a person’s biases in risk behaviour, such as risk-seeking and risk-avoidance (e.g., Juanchich & Sirota 2013). Finally, verbal probabilities differ in their degree of vagueness. Some extreme expressions such as “absolutely impossible” or “absolutely certain” have much narrower range of vagueness than moderate expressions such as “uncertain” (Hamm 1991).

Supporters of numerical probability argue that it allows for greater transparency in understanding the degree of certainty. For example, numerical probabilities have been arguably superior in the field of intelligence analysis (e.g., Barnes 2016). Additionally, using numerical probabilities for judgement and decision-making can reduce certain biases because numbers are direct and precise in delivering the uncertainty information (Hamm 1991).

Critics of numerical probability contend that their main drawback is that most people cannot efficiently process the numbers. For example, Siegler and Lortie-Forgues (2017) stressed that a large proportion of the US population have difficulties understanding the calculation of rational number (all numbers that can be expressed as \( \frac{a}{b} \), including fractions, decimals, percentages, and wholes). Based on their observation, from 1978 to 2014, the performance of students’ rational-number arithmetic had improved only slightly (correct rate of 27% in 2014
and 24% in 1978); this implies that understanding numerical information could be challenging for many people.

Despite these criticisms, verbal and numerical probabilities are still highly correlated. The most practical and efficient way to use uncertainty information is through interpreting, converting, or judging uncertainty expressions. For example, in determining the uncertainty level of a legal dispute, one with an equal chance of each party losing or winning (50% probability) should be more unpredictable and uncertain than one in which one party has a remote chance of winning (5% probability) and the other an almost certain chance (95% probability).

This has important implications for the analysis of uncertainty expressions in accounting. As discussed above, accounting language includes a large proportion of uncertainty expressions. A notable feature is that standard-setters and report-preparers frequently use verbal probabilities, whereas the users of information generally attempt to convert them into numerical terms.

Therefore, understanding the character and meaning of uncertainty expressions has important implications for accounting research, and for the quality of information users’ judgements and decisions.

The next section reviews the underlying theories of uncertainty expressions and their implication in uncertainty judgement.

2.4.4. Theoretical propositions

As noted, uncertainty expressions are often expressed in two modes: numerical probability and verbal probability. Of the many theories describing the impact of uncertainty expression on
uncertainty judgement, three theories appear to describe this impact more accurately: directionality, the modifier effect, and communication-mode preference (CMP).

2.4.4.1. Directionality

In the field of behavioural psychology, scholars emphasise that verbal probabilities often carry more directional information than do numerical probabilities. The key feature of directional information is that it can communicate a double message: an event may or may not occur (Teigen & Brun 2003b). Specifically, Teigen and Brun (1999, 2003b) suggest that verbal probabilities can be categorised into positive (e.g., “probable”) and negative (“uncertain”) terms (Table 2.5).

<table>
<thead>
<tr>
<th>Positive expressions</th>
<th>Negative expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probable</td>
<td>Improbable</td>
</tr>
<tr>
<td>Very probable</td>
<td>Highly improbable</td>
</tr>
<tr>
<td>Somewhat probable</td>
<td>Rather improbable</td>
</tr>
<tr>
<td>Quite probable</td>
<td>Quite improbable</td>
</tr>
<tr>
<td>Likely</td>
<td>Unlikely</td>
</tr>
<tr>
<td>Highly likely</td>
<td>Somewhat unlikely</td>
</tr>
<tr>
<td>Possible</td>
<td>Impossible</td>
</tr>
<tr>
<td>Entirely possible</td>
<td>Almost impossible</td>
</tr>
<tr>
<td>Certain</td>
<td>Uncertain</td>
</tr>
<tr>
<td>Almost certain</td>
<td>Somewhat uncertain</td>
</tr>
</tbody>
</table>

*Excerpt from Teigen and Brun (2003a, p. 133)

In the process of uncertainty judgement, positive expressions often indicate the occurrence of a target outcome; whereas negative expressions lead to a judgement that it will not occur. In contrast, numerical probabilities appears to be less directional in the process of judgement and decision-making (Teigen & Brun 1999).
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The directionality feature of verbal probability can be explained in terms of their interpretation. First, words can carry multiple layers of meanings within different contexts, allowing people to use and interpret them more flexibly than numbers. For example, the same event chance of winning a lottery ticket might be interpreted as possible by an optimistic person and unlikely by a pessimistic person, yet the statistical probability remains identical. This is because verbal probabilities are interpreted according to people’s expectations, whereas the numerical probabilities are less subjective. For instance, when deciding among options for a medical treatment, describing Treatment A’s success as “somewhat possible” might direct thinking in a positive light, whereas describing Treatment B’s success as “quite uncertain” has a negative connotation, even though the numerical probability inferred by these two expressions is similar (Teigen & Brun 1999, p. 155).

2.4.4.2. Modifier effect

The modifier effect refers to changes in numerical interpretations when adding adverb modifiers (e.g., very) to verbal expressions (e.g., probable). For example, very probable is interpreted as more likely than probable (80% versus 60%). Thus, adverbs provide a modifier effect on the original uncertainty expressions.

Mosteller and Youtz (1990, p. 8) proposed three types of modifiers, each of which has different effects on uncertainty expressions.

1) Modifiers that reduce a probability when the original probability is less than 50%.
2) Modifiers that increase the probability when the original probability is larger than 50%.
3) Modifiers or prefixes (not, in-, im-, un-) that change an expression from greater than 50% to less than 50%, or vice versa.
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Such relations can be viewed mathematically. If \( E_1 \) is an expression with probability \( (p_1) \) greater than 50\% (“probable”), \( E_2 \) is that expression with probability \( (p_2) \) less than 50\% (“rare”). \( M \) is the modifier (“very”), \( x \) is the modified value, and \( P \) is the prefix. Thus, the estimated relations for the three expressions are:

1) \( ME_1 > E_1 \ (x > 1, \ 0.5 < p_1 < 1) \) [e.g. very probable > probable]
2) \( ME_2 < E_2 \ (0 < x < 1, \ 0 < p_2 < 0.5) \) [e.g. very rare < rare]
3) \( PE_1 < 0.5 \) [e.g. improbable < 0.5, probable > 0.5]; \( PE_2 > 0.5 \) [e.g. not-rare > 0.5, rare < 0.5]

Teigen and Brun (1999) have investigated the modifier effect on the directionality judgement of verbal expressions and proposed three categories of modifiers:

1) Strong modifiers, such as very
2) Weak modifiers, such as quite or somewhat
3) Negative adverbs, such as not

Budescu, David V, Karelitz and Wallsten (2003) conduct a study based on the above category of modifier and provide a certain evidence that the strong modifier on verbal probabilities induce more extreme numerical interpretations. However, the authors also conclude that the directionality judgement of uncertainty expressions is invariant under the effect of modifier adverbs.

The modifier effect is not always given weight in the study of uncertainty judgement. For example, Barnes (2016) argues that modifiers in verbal phrases rarely improve the precision of numerical interpretation, and that, in fact, they may reduce people’s understanding of the judgement.
Appendix C summarises current relevant psychology and accounting research on the modifier effect of uncertainty expressions.

2.4.4.3. Communication-Mode Preference (CMP)

A growing body of literature is investigating people’s preferences for using verbal and numerical probabilities. This literature commonly assumes that numerical and verbal probabilities affect individuals’ systems of reasoning differently. Some researchers believe that verbal probabilities are more affected by context than are numerical probabilities (e.g., Karelitz & Budescu 2004; Teigen & Brun 1999; Teigen & Brun 2003a). Additionally, Windschitl and Wells (1996) and Windschitl (2000) asserted that numerical probabilities often promote analytical reasoning, whereas verbal probabilities are usually associated with intuitive thinking. Therefore, in practice, people use different forms of probability expressions to effectively communicate likelihood.

Erev and Cohen (1990) developed a theory called Communication-Mode Preference (CMP) to address this paradox in expressing probabilities. The CMP asserts that verbal probability is spontaneous and easy to understand, and thus efficient in expressing uncertainty information, while numerical probability is controlled (effortful) and accurate, and thus efficient in interpreting uncertainty information).

In Erev and Cohen’s (1990) study, the authors conducted an experiment involving prediction of the results of sporting events. The experiment consisted of two phases. In the first, experts provided their probability judgements on the results; in the second, decision-makers gambled based on the experts’ opinions. The results reported that 87% of the decision-makers preferred
to receive information numerically, while 68% of the experts preferred to provide advice using verbal probabilities.

In a similar study, Wallsten et al. (1993) surveyed 442 university students, asking their preferences regarding verbal and numerical probability communications. The survey results showed that participants preferred to receive information numerically and to convey it verbally. Such results corresponded with Erev and Cohen’s (1990) study, where a strong CMP was observed in uncertainty communication.

The CMP paradox has also been shown to exist in the Chinese language condition. In Xu, Ye, and Li’s (2009) study, the authors replicated Wallsten et al. (1993) survey and added extra context on weather forecasting to evaluate participants’ preferences in uncertainty communication. Out of the 370 native Chinese speakers surveyed, more than half demonstrated a strong CMP in their responses.

In summary, this section has systematically reviewed three theories of uncertainty expressions. The directionality theory suggests that verbal probabilities can be directional and introduce a bias in people’s uncertainty judgements. The modifier-effect theory asserts that the meaning of verbal expressions can be distorted by the linguistic structure (modifier). The CMP theory presents a common paradoxical phenomenon in people’s choices of uncertainty expressions. Taken together, these theories highlight the complexity of uncertainty expressions research, which is also evident in the accounting field. The next section reviews studies of uncertainty expressions in accounting.
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2.4.5. Uncertainty expressions in accounting

2.4.5.1. Use of uncertainty expressions

As noted above, accounting language consists of uncertainty expressions, which are predominantly expressed in verbal terms. Appendix A provides a comprehensive list of uncertainty expressions used in IFRS and IAS.

Using uncertainty expressions does provide benefits for accounting communication: they facilitate professional judgement and allow adjustments between different jurisdictions (e.g., countries) with different economic and cultural scales (Weiss 2008; Zeff 2007). However, such usage also causes several concerns.

One of the lengthy debates in accounting links to the interpretation of verbal probabilities. The main argument is that the expressions themselves do not have consistent meanings. For example, Windschitl and Wells (1996) argued that verbal uncertainty expressions encourage an individual’s associative and intuitive thinking. Piercey (2009) conducted an experiment on valuation judgement in the life-insurance field and found variations between verbal and numerical probabilities.

Research outside the accounting field in English (Chesley 1986), but also in other languages including French (Davidson, Ronald A. & Chrisman 1994), German (Doupnik & Richter 2003), Chinese (Chand, Cummings & Patel 2012), and Spanish (Huerta, Petrides & Braun 2013), has

17 Notably, evidence also shows that some uncertainty expressions do share similar meanings amongst accounting-information users. For example, Reimers (1992) found that expressions such as “almost certain”, “expected”, and “improbable” are interpreted similarly amongst auditors, engineering managers, marketing managers, and MBA students. The current study has also provided a comparable table for the expressions used in the experiments (Section 6.5.1).
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reported similar results. Appendix B summarises the results of accounting investigations on uncertainty expression.

Recent research into the variance of uncertainty-expression interpretation has been dominated by a debate between proponents of cultural and linguistic relativism. The following sections review some major findings for each paradigm.

2.4.5.2. Cultural relativism

The main argument of cultural relativism is that individuals’ culture, values, and background affect how they interpret uncertainty expressions. This stream of research has gained some advocates in the accounting discipline.

Arguably, the first attempt to investigate the impact of culture on uncertainty expressions was made by Doupnik and Richter (2003). The authors listed 16 uncertainty expressions and developed four versions of questionnaires: all-English, all-German, and two mixed versions with English and German. They asked participants (certified accountants from the US and Germany) to provide numerical opinions. Their study showed that interpreting uncertainty expressions varied between German and US accountants and attributed such differences to language, cultural, and translation factors.

In a similar study, Doupnik and Richter (2004) found that German accountants were more conservative than US accountants in their interpretation of uncertainty expressions. In the same vein, Doupnik and Riccio (2006) suggested that Brazilian accountants were more secretive than US accountants. Recently, Wehrfritz and Haller (2014) claimed that German accountants were more conservative than British in the process of recognising a provision.
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The effect of culture on uncertainty expressions has been demonstrated in accounting students. For example, Hu, Chand and Evans (2013) showed that Chinese accounting students were more conservative than Australian accounting students in responding to uncertainty expressions. Importantly, the study highlighted contextual factors, such as national culture, language, and education. While this stream of accounting research attempts to show a language factor in verbal probability translations, research has yet to investigate how language affects accounting judgement. Particularly, the impact of non-native language on accounting judgement remains unexamined.

2.4.5.3. Language relativism

The key assumption of language relativism is that language determines people’s world view, and therefore also affects their interpretations of uncertainties (Belkaoui 1984; Riahi-Belkaoui 1978).

Several empirical studies in accounting have found that participants from different language backgrounds interpret uncertainty expressions differently (e.g., Davidson, Ronald A. & Chrisman 1994; Doupnik & Riccio 2006). The instrument design is based on word-to-number conversion (Section 2.4.3.1 contains a review of the literature on this topic). Subsequent studies have suggested that non-native language users’ education (Chand, Cummings & Patel 2012) and culture (Hu, Chand & Evans 2013) also lead to dissimilar interpretations.

Based on these findings, some scholars suggest that whether information users are employing their native or non-native language does affect their interpretation of uncertainty expressions. Specifically, this effect is demonstrated by discrepancies in the word-to-number conversion of
probability expressions amongst subjects using different languages. Tables 2.6 and 2.7 list relevant studies in accounting.

Table 2.6 – Variations in interpretations (mean probabilities) of accounting standards

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>German</td>
<td>Portuguese</td>
<td>English</td>
</tr>
<tr>
<td>likely</td>
<td>67.18</td>
<td>70.89</td>
<td>68.14</td>
<td>-</td>
</tr>
<tr>
<td>no longer probable</td>
<td>33.47</td>
<td>-</td>
<td>19.66</td>
<td>42.96</td>
</tr>
<tr>
<td>possible</td>
<td>65.80</td>
<td>71.37</td>
<td>67.15</td>
<td>73.58</td>
</tr>
<tr>
<td>probable</td>
<td>7.06</td>
<td>16.38</td>
<td>27.07</td>
<td>12.67</td>
</tr>
<tr>
<td>remote</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2.6 summarises the key findings from accounting-based studies of cultural and linguistic relativism. As discussed in Section 2.4.5.2, significant variations in the interpretations of accounting standards were found in several studies, most notably for the expression “probable”, with all studies reporting significance for this construct.

Table 2.7 – Applied translations

<table>
<thead>
<tr>
<th>English</th>
<th>German</th>
<th>Portuguese</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely</td>
<td>Wahrscheinlich</td>
<td>-</td>
<td>Susceptible</td>
</tr>
<tr>
<td>No longer probable</td>
<td>Nicht mehr wahrscheinlich</td>
<td>Não seja provável</td>
<td>-</td>
</tr>
<tr>
<td>Possible</td>
<td>-</td>
<td>-</td>
<td>Possible</td>
</tr>
<tr>
<td>Probable</td>
<td>Hinreichend wahrscheinlich</td>
<td>Provável</td>
<td>Vraisemblable</td>
</tr>
<tr>
<td>remote</td>
<td>Wahrscheinlichkeit äußerst</td>
<td>Remoto</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2.7 outlines the applied translations between English and German, Portuguese, and French. These translations on uncertainty expressions were largely based on the back-translation method with the help of bilingual speakers. Inevitably, a lack of standardised translation may correspond with the challenges of accounting language addressed in Section 2.3.2.1.

In short, the language-relativism approach has signalled an important issue in the study of uncertainty expressions. For a comparable or consistent accounting practice in the multilingual context, accounting practitioners must ensure their interpretations of uncertainty expressions
are not biased by the use of language (Dahlgren & Nilsson 2012; Evans, L 2004; Huerta, Petrides & Braun 2013).

In summary, this section has addressed the interpretation of uncertainty expressions. It urges a careful selection of uncertainty expressions in accounting information to minimise the effect of their use on the uncertainty judgement of accounting information. The following section reviews the literature on uncertainty judgement associated with the use of uncertainty expressions.

2.5. UNCERTAINTY JUDGEMENT

2.5.1. Introduction
People often face challenges in making judgements because of the uncertainty that often arises from their imperfect knowledge about how choices lead to outcomes, or the objective nature of the unknown outcomes. For example, patients might be uncertain in judging the options between different medical treatments because they have (subjectively) imperfect knowledge of medicine. Also, people choosing numbers for a lottery ticket are objectively uncertain about their judgement regarding the numbers they choose. Uncertainty judgement pervades almost all daily thinking processes.

Despite daily experiences with uncertainty, understanding how a person makes an uncertainty judgement is a complicated task. In many instances, the execution of rational thinking does not reflect people’s uncertainty judgements. Instead, people who aim to take a rational approach to uncertainty judgement often end up acting irrationally (Gigerenzer & Gaissmaier 2011; Strough, Karns & Schlosnagle 2011; Tversky & Kahneman 1974).
The puzzle of rationality versus irrationality in uncertainty judgement has fascinated behavioural psychologists for many decades (e.g., Kahneman 2003; Simon 1956; Tversky & Kahneman 1986). Over the years, theories and empirical findings have emerged, with several Nobel laureates in economics, including Daniel Kahneman and Richard Thaler, recognised for their theoretical contributions to research into uncertainty judgement. In the early 20th century, scholars largely followed Bayes’s theorem, which described uncertainty estimation as a subjective matter. Later, Herbert Simon (1972) proposed bounded rationality, highlighting human constraints (e.g., complex circumstances, limited time, and inadequate mental power in calculation) on making uncertainty judgements. Contrary to Simon’s (1972) assumptions about rational decisions, Daniel Kahneman and Amos Tversky (1979) proposed the Prospect Theory, which highlighted factors that cause people to make uncertainty judgements against their rational economic choices. Consistent with the prospect theory, some scholars, including Daniel Kahneman, further developed the Dual-Process Systems, which demonstrated a much simpler model of human cognition (e.g., Evans, JSBT 2008).

The paradox of uncertainty judgement has also puzzled accounting scholars. Studies on uncertainty judgement cover almost all accounting topics (for review, see Trotman, Tan & Ang 2011). Importantly, research on uncertainty judgement in accounting contexts is undeniably vital, due to (1) the multiperiod/multiperson nature of the judgement, (2) the significant financial consequences involved, (3) the presence of markets, and (4) important institutional considerations (Ashton & Ashton 1995, p. 6).

18Examples of Nobel laureates in economics are: Herbert Simon (1978) on the decision-making process within economic organisations, Daniel Kahneman (2002) on human judgement and decision-making under uncertainty, and, most recently, Richard Thaler (2017) on the consequences of limited rationality and social preferences on individuals’ decision-making.
With a new paradigm shifting from traditional monolingual uncertainty judgement to multilingual uncertainty judgement, many more issues remain for accounting research to explore. Thus, this section addresses the main research paradigms and discusses key characteristics of uncertainty judgement.

2.5.2. Research paradigms

There are three common research paradigms for uncertainty-judgement research: normative, descriptive, and prescriptive (Bell, Raiffa & Tversky 1988). Normative research focuses on how rational people should make decisions according to a set of well-defined criteria (Kleindorfer, Kunreuther & Schoemaker 1993); it often appears in disciplines such as statistics, mathematics, and economics. Descriptive research aims to describe how people make decisions (Kleindorfer, Kunreuther & Schoemaker 1993); it generally appears in psychology and behavioural-science research. Prescriptive study concerns issues of how to improve the quality of decision-making in practice; it often appears in management-science research (Bell, Raiffa & Tversky 1988).

Research on uncertainty judgement also extends to other disciplines such as neuropsychology. For example, neuroscientists using the lesion method suggested that the human brain is not always wired to make an optimal choice because of the influences of mood, emotion, and feelings (Ma & Jazayeri 2014; Phelps, Lempert & Sokol-Hessner 2014; Tom et al. 2007). Similar approaches to uncertainty can even be found in studies involving animals such as monkeys (Heilbronner & Hayden 2013).

2.5.3. Theoretical propositions

In the Dictionary of Psychology, Colman (2015) defines “rational” as the action of thinking or behaving reasonably or logically. A rational judgement can mean that the decision-maker is
acting in the best interest of stakeholders, provided that sufficient information is available at the time of the decision (Colman 2015).

In some circumstances, people may act irrationally under situations involving uncertainty. For example, a person may buy a lottery ticket in the hope of making a large, but unlikely, gain, while at the same time paying for insurance to protect against a (relatively) smaller, and less likely, loss (Platt & Huettel 2008).

People who behave irrationally can be affected by factors such as emotion, beliefs, the framing of language, or, according to some researchers, even the weather (Mellers, Schwartz & Cooke 1998; Murray et al. 2010; Schwarz 2000; Smith, Benson & Curley 1991). Judgement research has found, for example, that weather can affect consumers’ purchasing judgments in that people tend to spend more on sunny days (e.g., Murray et al. 2010). The sections below summarise several classic theories of uncertainty judgement.

2.5.3.1. Expected Utility theory

Studies of the term “rational” have given rise to several theories. One of the classic theories is the Expected Utility theory: a normative theory about how people should make optimal decisions under conditions of risk and uncertainty (Fishburn 1988). It often applies in the scenario where risk can be framed with known probabilities. For example, choosing strategy A to make a $1 million profit over strategy B with a 50% success rate of making a $3 million profit is a risk decision. There are also applications in the scenario of uncertainty, where the outcome is framed with unknown probabilities. For instance, choosing a business strategy that is reasonably possible to make a profit of $1 million profit is an uncertainty decision.
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2.5.3.2. Bayes’s Theorem

From the perspective of psychology, individuals’ judgement can be greatly affected by their beliefs about uncertainty. Scholars often summarise Bayes’s Theorem as asserting that judgement reflects an individual’s beliefs (e.g., Bonner 1999). The core argument of Bayes’s Theorem is that belief is a subjective probability, representing individuals’ knowledge of probabilistic information that links to a state of the world, the body, and the mentality on a particular issue (Ma & Jazayeri 2014). According to Bayes’s Theorem, the computation of a subjective probability is:

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \times P(B|A)}{P(B)} \]

where \( P(A) \) is the probability of A occurring, \( P(B) \) is the probability of B occurring, \( P(A|B) \) is the conditional probability of A given that B has happened, and \( P(A \cap B) \) is the probability of both A and B occurring.

The example below (Gigerenzer & Hoffrage 1995, p. 685) illustrates this:

The probability of breast cancer is 1% for women at age 40 who participate in routine screening.

If a woman has breast cancer, the probability is 80% that she will get a positive mammogram. If a woman does not have breast cancer, the probability is 9.6% that she will get a positive mammogram.

A woman in this age group had a positive mammogram in a routine screening. What is the probability that she actually has breast cancer? ____%

To calculate the probability, the first step to consider the probability that someone who has breast cancer (80%) will receive a positive mammogram (1%). This gives a calculation of 80%*1% = 0.8%. The probability that someone who does not have breast cancer (99%) will receive a positive mammogram (9.6%) is 9.6%*(1-1%) = 9.5%. This provides an overall probability of receiving a positive mammogram as 0.8%+9.5% = 10.3%.
Therefore, the proportion of cases of breast cancer and positive mammograms (0.8%) amongst all mammograms (10.3%) is 0.8%/10.3% = 7.7%

2.5.3.3. The Economic Man

In the field of economics, the concept of rationality has often been applied in the notion of the Economic Man. Simon (1955, p. 99) described the Economic Man as a “rational” being who has a certain degree of knowledge, a well-organised and stable system of preferences, and skills in the computation of alternatives.

Similar to the Expected Utility theory, the concept of the Economic Man assumes that people are logical and capable of dealing with complicated uncertainty issues. However, Simon (1955) also criticised the traditional model of rational choice as impractical because most individuals’ mental power, such as the ability to compute complex equations, is rather limited. As a result, Simon later proposed an alternative theory, called Bounded Rationality, which asserts that people act and judge in accordance to the limitations imposed by their environment (Simon 1972).

The following example excerpt from Simon’s (1972) hypothetical case on selling a house illustrates this. The house seller sets the acceptable selling price at $15,000 and would feel satisfied to receive offer at either $16,000 or $25,000. A rational seller would prefer to sell at the higher price, which in this case is $25,000. However, this rational preference may fail to work when the seller receives a sequence of offers and must decide to accept or reject each offer before receiving the next.
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2.5.3.4. Heuristics and emotion

Heuristics is an efficient cognitive process that ignores a portion of the available information (Gigerenzer & Gaissmaier 2011). Heuristic judgement has often been compared with rational judgement, where the reasoning process relies on logic and statistics. For example, an experienced manager will use a simple rule to classify a customer as inactive if the customer has not been active in purchasing within the past few months (e.g., Wübben & Wangenheim 2008). Compared to statistically sophisticated methods, such as analysing a database that contains all customers purchase records to make a sound judgement, this heuristic process can often achieve a more accurate decision with less effort and expenditure (Gigerenzer & Gaissmaier 2011).

Emotion has multiple layers of meanings. Lerner et al. (2015) view emotion as biologically mediated simultaneous reactions regarding survival-relevant events. These reactions can simultaneously be experiential, cognitive, behavioural, or expressive. In general terms, emotion can be defined as:

An affective state of consciousness in which joy, sorrows, fear, hate, or the like, is experienced. (Macquarie Dictionary)

Many scholars view emotion as a dominant driver of judgements and decisions. This includes the perception that people make decisions to avoid negative feelings (e.g., regret) or increase positive feelings (e.g., happiness) (for reviews, see Lerner & Keltner 2000).

Additionally, the relationship between emotions and uncertainty judgement can be bidirectional. That is, a person’s emotional state may directly affect a judgement of the uncertainty of a future event, much as contemplating various outcomes of that judgement can affect a person’s
emotions (Schwarz 2000). In some studies, the emotional state arising from a decision at hand is called the integral emotion, whereas the emotional state carried over from one situation to another but no longer relevant for decision-making is called the incidental emotion (for reviews, see Lerner et al. 2015).

In recent years, the emotional effect on uncertainty judgement has become a subject of neuroscience research. Neuroscientists use the lesion method to observe how brain-damaged patients differ from healthy people in how they make uncertainty judgements (e.g., Bechara, Damasio & Damasio 2000; Bechara et al. 1999).

In summary, the prevalence of emotion in individuals’ uncertainty judgement has been identified by scholars from various theoretical and empirical perspectives.

2.5.4. Uncertainty judgment in accounting

For much of its recent history, uncertainty-judgement research in accounting has focused on four groups of stakeholders: preparers, internal users, external users, and auditors. Table 2.8 below provides an overview of the research paradigm drawn from the work of Trotman, Tan and Ang (2011).
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Table 2.8 – Overview of accounting judgement and decision-making research paradigm

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Examples of judgement issues</th>
<th>Disciplines</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparers</td>
<td>What to include</td>
<td>Financial accounting</td>
<td>Anchoring</td>
</tr>
<tr>
<td></td>
<td>What accounting treatment to use</td>
<td></td>
<td>Materiality</td>
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<tr>
<td></td>
<td>Accounting estimate</td>
<td></td>
<td>Interpretation</td>
</tr>
<tr>
<td></td>
<td>The likelihood of a future event</td>
<td></td>
<td>Probabilistic judgement</td>
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<td></td>
<td>Future earnings</td>
<td></td>
<td>Cognitive biases</td>
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<td></td>
<td>Future cash flows</td>
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<td></td>
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<tr>
<td></td>
<td>Investment decisions</td>
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<td></td>
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<td></td>
<td>Lending decisions</td>
<td></td>
<td></td>
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<tr>
<td>External users</td>
<td>Business planning</td>
<td>Managerial accounting</td>
<td>Information overload</td>
</tr>
<tr>
<td></td>
<td>Performance evaluation</td>
<td></td>
<td>Outcome biases</td>
</tr>
<tr>
<td></td>
<td>Resource allocation</td>
<td></td>
<td>Recognition</td>
</tr>
<tr>
<td>Internal users</td>
<td>Changes in accounting standards</td>
<td></td>
<td>Uncertainty information</td>
</tr>
<tr>
<td></td>
<td>Internal control</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Fair value</td>
<td></td>
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<tr>
<td></td>
<td>Financial-statement error</td>
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<tr>
<td>Auditors</td>
<td>Changes in accounting standards</td>
<td>Auditing</td>
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<td>Internal control</td>
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<td>Fair value</td>
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<td></td>
<td>Financial-statement error</td>
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</tbody>
</table>

Perspectives on uncertainty judgement research in accounting vary across academic and professional disciplines. For example, in managerial accounting, uncertainty judgements often relate to determining product price, types and quantities of inputs or outputs, and operational controls. The most crucial task for managerial accountants is to judge options’ cost and benefit.

In contrast, uncertainty judgements relating to financial accounting normally focus on external users, who can be broadly categorised as investors and creditors. Investors include non-professional investors, professionals who offers investment advice to others, or professionals who help manage investment portfolios for institutions. Creditors include bank loan officers or bond-rating agencies who provide capital to various forms of organisations (for review, see Ashton & Ashton 1995).

Given the broad application of uncertainty judgement in accounting, the following sections select two relevant issues from the literature: materiality and anchoring.
Chapter 2 – Literature Review

2.5.4.1. Materiality

“Materiality” is an accounting term. Accounting scholars have described it as “the wisdom of life” (e.g., Bernstein 1967): if something is not important, then there is no need to be concerned. In plain language, materiality means “If it doesn’t really matter, don’t bother with it” (Hicks 1964, p. 158).

This thesis proposes materiality as a main construct of its framework for two reasons: the subjectivity that it implies is inherent in accounting practices, and its relevance in the interpretation of uncertainty expressions and the process of accounting judgement.

More than half a century ago, materiality was defined as “[a] characteristic attaching to a statement, fact, or item whereby its disclosure or the method of giving it expression would be likely to influence the judgment of a reasonable person” (Kohler 1963, p. 317).

The definition of materiality as it applies to accounting has been gradually refined over the years. In FASB, materiality is:

The magnitude of an omission or misstatement of accounting information that, in the light of surrounding circumstances, makes it probable that the judgment of a reasonable person relying on the information would have been changed or influenced by the omission or misstatement (Financial Accounting Standards Board 1980, p. 10).

IFRS states that “[i]nformation is material if omitting it or misstating it could influence decisions that users make on the basis of financial information about a specific reporting entity” (International Financial Reporting Standards 2016, QC11).
Chapter 2 – Literature Review

A considerable amount of literature on this topic has been published in accounting journals. Some empirical implications can be evident in determining the quantitative guidelines for materiality items. For example, Boatsman and Robertson (1974) proposed a 4% rule (4% of the current year’s net income) and found that it could correctly predict 65% of the materiality judgement made by CPAs and securities analysts. A more comprehensive materiality study conducted recently by Eilifsen and Messier (2014) examined the quantitative benchmarks on materiality from eight of the largest US public accounting firms.

More recent attention has focused on the cognitive issue of materiality judgement. Some studies suggest that one’s judgement of materiality can be highly subjective. Such subjectivity could relate to one’s cognition and the perception of pressure. For example, Griffin (2014) found that auditors have a low tolerance of material misstatement when the uncertainty level of fair-value estimation is high. Such a finding is very similar to the Prospect Theory on risk-seeking and risk-aversion. In another study, DeZoort, Harrison and Taylor (2006) tested the accountability pressure on auditors’ materiality judgement, implementing a between-subject design on 160 auditors. They found that a high level of accountability pressure, such as justification and feedback, leads to a more conservative and consistent materiality judgement than similar tasks in conditions of low accountability pressure. These studies suggest that individuals’ perception of uncertainty and pressure could affect how they judge materiality.

These empirical findings lead to one assumption: that people interpret uncertainty expressions on the basis of the importance of the subject matter. For example, a small to medium-sized company may have a higher tolerance for material misstatement in the case of low-value assets (e.g., $1,000) than the high-value assets (e.g., $10,000,000). One criterion in IFRS for
recognising an asset is the judgement on “probable”\(^9\). A rational interpretation of “probable” may yield higher numerical figures for high-value assets (e.g., probable = 78\%) than for low-value assets (e.g., probable = 51\%).

If the FLE is considered in uncertainty judgement, this introduces another assumption. As discussed in Chapter 3.2, thinking in a foreign language can affect decision-makers’ emotional reactions and risk perception such that they have a less emotional reaction and less biased perception in making an uncertainty judgement. Therefore, the involvement of the FLE would lead to another assumption: that people make consistent probability judgements between assets of small ($1,000) and large ($10,000,000) value.

The examples of materiality with the FLE described above provide a basis for hypothesising that one’s interpretation and judgement of materiality will be systematically different in different language settings. Each of these language settings and the expected language effect are described in Chapter 4.3.

### 2.5.4.2. Anchoring

People follow a number of heuristic rules to reduce the complexity of probability assessment; anchoring is one of these rules. As noted in Section 2.2.3.2, the anchor is the initial value or starting point when a person is making an estimation (Tversky & Kahneman 1974). Tversky and Kahneman (1974) discussed that the anchor value may be derived from how the question is framed or based on a partial computation. Kinney Jr and Uecker (1982) added that anchoring

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\(^9\) IFRS requires that an asset is recognised in the balance sheet when it is *probable* that future economic benefits will flow to the entity, and the asset has a cost or value that can be measured reliably.
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may be also based on personal experience or external sources. In short, the anchor value can be either objective or subjective.

The anchoring effect is a heuristic bias in the process of numerical estimation. The anchoring effect suggests that people with different anchor values will make dissimilar estimations, which are biased toward the initial values (Tversky & Kahneman 1974).

However, the anchor, or initial value, can be provided internally or externally. People often have their own preloaded subjective belief on certain issues. For example, individuals may have their own ideal weight figure based on their personal experience and feeling. In contrast, an anchor can be the external information provided to that person. For example, when individuals are asked to estimate a developed country’s GDP, if they are given the average of developed nations’ GDP, they may make their estimation based on that external anchor.

Uncertainty judgement related to anchoring often refers to a base point or reference point, around which all related issues should be judged. However, judgement often involves the interaction between individuals’ internal and external anchors. In other words, any judgement that relates to personal option is likely to be affected their internal anchor.

2.6. SUMMARY

This chapter has highlighted several cognitive aspects of language from behavioural psychology. It starts with a systematic exploration of the Foreign Language Effect, which was first proposed by Keysar, Hayakawa and An (2012), and which provides a unique view of the language effect on uncertainty judgement.
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One implication of the FLE is its relevance to cross-lingual accounting research. Based on the key propositions of the FLE, this chapter has critically reviewed the challenges faced in accounting language research. Two critical topics have been thoroughly reviewed. The first is uncertainty expressions, which can be either numerical or verbal expressions. Uncertainty expressions are also widely used in accounting. Opinions on the effect of usage vary. Some scholars have asserted that using uncertainty expressions in IFRS is plausible due to the nature of principle-based accounting standards and the inherent duty of professional judgement; many others are concerned about the negative impacts of using uncertainty expressions, such as reduced comparability and consistency in accounting practice.

The second critical topic extends the concerns regarding uncertainty expressions to uncertainty judgement. The chapter has discussed the conventional knowledge of uncertainty judgement in the monolingual condition before discussing two typical uncertainty-judgement issues in accounting.

Overall, this chapter has aimed to construct the possibility of FLE research in accounting. If the FLE is empirically sound in the accounting context, it will have a profound impact on accounting-judgment, as this implies that accounting professionals confronted with risk and uncertainty issues can potentially make less biased decisions by thinking in a non-native language. Therefore, Chapter 3 develops hypotheses related to the effect of the FLE in accounting.
CHAPTER 3 – DEVELOPMENT OF HYPOTHESES

3.1. INTRODUCTION

Continuing from the literature review, this chapter aims to develop several propositions to address the main research question: what are the potential foreign language effects in accounting judgement with regards to the use of uncertainty expressions? This leads to two research questions:

RQ1: How does the use of non-native language affect the interpretation of uncertainty expressions in accounting?

RQ2: How does the use of non-native language affect the judgement of uncertainty expressions in accounting?

Specifically, this research aims to understand four issues: (1) the impact of the FLE on the interpretation of uncertainty expressions; (2) the impact of the FLE on the judgement of probabilistic estimations; (3) the impact of the FLE on the judgement of directionality; and (4) the impact of the FLE on the judgement of risk framings.

Each research question consists of two sub-questions: one from the inter-personal perspective and one from the intra-personal perspective (Section 1.3). The inter-personal aspect hypotheses are tested in between-subject experiment and the intra-personal aspect hypotheses are tested in within-subject experiment.
Figure 3.1 – Structure of research instrument and testing of hypotheses

As shown in Figure 3.1., the between-subject experiment tests the inter-personal level of the FLE (i.e., between Groups A and B); the within-subject experiment tests the intra-personal level of the FLE (i.e., within Person C):

I. Hypotheses based on the between-subject research experiment (at the inter-personal level)
II. Hypotheses based on the within-subject research experiment (at the intra-personal level)

As such, this chapter proposes four sets of hypotheses, with each set consisting of two sub-hypotheses. The overall construct of the hypotheses is listed in Table 3.1.
### Table 3.1 – Research questions and hypotheses

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Main Hypotheses</th>
<th>Sub-hypotheses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ1</strong>: How does the use of non-native language affect the interpretation of uncertainty expressions in accounting?</td>
<td><strong>H1</strong>: The FLE exists in the interpretation of uncertainty expression in accounting.</td>
<td><strong>H1a</strong>: In the between-subject experiment, subjects in the non-native-language group would interpret accounting uncertainty expressions differently to those in the native-language group.  &lt;br&gt; <strong>H1b</strong>: In the within-subject experiment, subjects’ interpretation of uncertainty expressions would significantly differ between when they used their native and non-native languages.</td>
</tr>
<tr>
<td><strong>RQ2</strong>: How does the use of non-native language affect the judgement of uncertainty expressions in accounting?</td>
<td><strong>H2</strong>: The FLE exists in the process of uncertainty judgement on probabilistic estimations.</td>
<td><strong>H2a</strong>: In the between-subject experiment, subjects in the non-native-language group would provide a less biased probabilistic estimation than those in the native-language group.  &lt;br&gt; <strong>H2b</strong>: In the within-subject experiment, subjects’ responses on the probabilistic estimation task would be less biased in the non-native-language condition than in the native-language condition.</td>
</tr>
<tr>
<td><strong>H3</strong>: The FLE exists in the process of uncertainty judgement on directionality.</td>
<td><strong>H3a</strong>: In the between-subject experiment, subjects in the non-native-language group would provide a less biased directionality judgements than those in the native-language group.  &lt;br&gt; <strong>H3b</strong>: In the within-subject experiment, subjects’ responses on the directionality-judgement task would be less biased in the non-native-language condition than in the native-language condition.</td>
<td></td>
</tr>
<tr>
<td><strong>H4</strong>: The FLE exists in the process of uncertainty judgement on risk framing.</td>
<td><strong>H4a</strong>: In the between-subject experiment, subjects in the non-native-language group would provide a less biased risk judgement than those in the native-language group.  &lt;br&gt; <strong>H4b</strong>: In the within-subject experiment, subjects’ responses for the risk-judgement task would be less biased in the non-native-language condition than in the native-language condition.</td>
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</tbody>
</table>
3.2. HYPOTHESIS DEVELOPMENT

As discussed in the prior chapter, one of the classic issues in accounting judgement is relating to the usage of uncertainty expressions. Such issues can be broadly divided into the interpretation and the judgement of uncertainty expressions.

This study explores interpretation by following the word-to-number conversion approach and explores judgement by investigating three aspects: (1) probabilistic estimation, (2) directionality, and (3) risk framing.

A number of accounting studies have attempted to investigate the variance of interpretation or judgement in the cross-lingual context, most of which have focused on inter-personal variance due to their between-subject design approach. However, the idea of the FLE is to understand whether subjects’ language plays an influential role in their judgement process; therefore, any attempt to answer this question should include an intra-personal investigation (e.g., Pan & Patel 2016). Accordingly, the current study added an additional experiment based on a within-subject design.

The next section discusses the distinctions of between-subject and within-subject design.

3.2.1. Between-subject versus within-subject design

The between-subject design asks each participant to complete a survey questionnaire in only one language: either their native or non-native language. For example, Doupnik and Riccio (2006) conducted a study to identify the variance in the interpretation of uncertainty expressions between Anglo and Latin culture. They applied a between-subject design by asking
samples of US and Brazilian accountants to complete English and Portuguese surveys, respectively.

The between-subject design approach, however, suffers from a significant issue: ecological fallacy, or assuming group correlations to be suitable substitutes for individual correlations (Robinson 1950). Another potential limitation of the between-subject design is its inability to eliminate the translation problem. As discussed in Section 2.3.2.1, many researchers have asserted that equivalent translation, particularly of uncertainty wordings, is hard to achieve. In addition, other variables such as age, gender, educational background, or language proficiency levels are hard to control in the analysis of between-subject experiments.

The within-subject design asks each respondent to complete the questionnaire in both languages. Charness, Gneezy and Kuhn (2012) noted that the advantages of a within-subject design are that its internal validity does not depend on random assignment, it increases statistical power, and it provides a closer match to a theoretical perspective. In this context, therefore, the within-subject design could reduce the translation problem because each participant faces the same translation.

3.2.2. Hypotheses based on RQ1

This study’s first research question asks:

RQ1: How does the use of non-native language affect the interpretation of uncertainty expressions in accounting?
Chapter 3 – Development of Hypotheses

This question targets the issue of the interpretation of uncertainty expressions in one’s native and non-native language. Specifically, it aims to identify whether variances exist in the interpretation of uncertainty expression in different language conditions.

As highlighted above, the cross-lingual study of uncertainty expression is not new to accounting research, but most of these studies have applied the between-subject design\textsuperscript{20}. Very often, such between-subject investigation uses one of several approaches. The first approach targets different cohorts of participants but gives them the questionnaire in only one language. For example, Chand, Cummings and Patel (2012) and Hu, Chand and Evans (2013) applied a between-subject design to investigate the education and cultural effect on Australian and Chinese accounting students’ judgement and decision-making. In their design, they gave only an English-language questionnaire to all participants regardless of their origin. Thus, the Australian participants were using their native language, and the Chinese participants were using their non-native language. Similarly, in a psychological study, Ponari et al. (2015) conducted a between-subject experiment to investigate the language effect on processing emotional words. In their experiment, participants came from different language backgrounds: native English speakers and non-native English speakers. Specifically, the non-native English speakers consisted of people whose first language was either Indo-European (Dutch, Danish, and Norwegian) or not (Chinese, Japanese and Malay). In summary, this type of between-subject design would lead to group-level intra-personal analysis.

\textsuperscript{20} Notably, there are few exceptions of between-subject research using mixed-language questionnaires. For example, in Doupnik and Richter’s (2003) research, the authors designed a mixed-language questionnaire that contained uncertainty expressions in German and English, and Doupnik and Richter (2004) designed a mixed German- and English-language questionnaire to examine the culture impact on interpretation. Wehrfritz and Haller (2014) designed a mixed-language survey for German and UK accountants to investigate the influence of their national origin on IFRS application. This type of design, however, suffers an inherent limitation: the carry-over effect. That is, participants would be affected by their previous tasks (in one language) and carry over such influence in their subsequent task (in another language). The ideal approach is to apply the within-subject design with at least one week-long interval between the two phases (Pan & Patel 2016).
Chapter 3 – Development of Hypotheses

The second approach is to target one cohort of participants and survey them in different languages. For example, Holthoff, Hoos and Weissenberger (2015) investigated the translation issues of IFRS on accounting judgement by targeting German accounting students. They designed the research instruments in two languages – English and German – and compared the responses between subjects. A similar accounting study conducted by Davidson, Ronald A. and Chrisman (1994) also targeted only one cohort of participants – Canadian accounting students – but implemented the research instrument in English and French. Similarly, this type of between-subject design would also lead to group-level intra-personal analysis.

As mentioned above, the between-subject design suffers some inherent limitations. Typical obstacles include variances in personal attributes, translations, and understandings. To satisfactorily examine the effect of FLE on interpretation, therefore, it is necessary to include a within-subject analysis.

3.2.2.1. H1: Interpretation of IFRS uncertainty expressions
Based on the research findings on the FLE, it is reasonable to believe that a person’s perception regarding uncertainties will change depending on the language used (e.g., Oganian, Korn & Heekeren 2016). Applied to accounting, this suggests that the same person would provide different interpretations when uncertainty expressions are presented in native and non-native language forms. This leads to the first set of hypotheses:

H1. The FLE exists in the interpretation of uncertainty expressions in accounting.

H1a: In the between-subject experiment, subjects in the non-native-language group would interpret accounting uncertainty expressions differently to those in the native-language group.

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H1b: In the within-subject experiment, subjects’ interpretation of uncertainty expressions would significantly differ between when they used their native and non-native languages.

3.2.3. Hypotheses based on RQ2

This study also intends to explore the FLE on accounting judgement. Specifically, the second research question is framed as follows:

RQ2: How does the use of non-native language affect the judgement of uncertainty expressions in accounting?

Addressing this research question is important because people may provide inconsistent judgement and interpretation of verbal probabilities even in their native language. For instance, auditors’ word-to-number interpretation of the term “materiality” may not reflect how they would assess a particular item in the auditing process because both context and economic consequence would change the process of judgement.

Such inconsistency may be due to certain features of verbal probabilities. For example, the meanings of verbal probabilities are believed to have low precision or high subjectivity, and thus would stimulate associative and intuitive thinking in judgement (Windschitl & Wells 1996). As Mosteller and Youtz (1990, p. 2) point out, verbal probability is more about “qualitative expression”; its quantification (word-to-number interpretation) may not always reflect how people make judgements in reality.

Individuals’ beliefs and actions often contradict their previous interpretation of uncertainty expressions (Teigen & Brun 1999). For example, the terms “possible” and “uncertain” may not be interpreted significantly differently in numerical terms, but the expression “X is possible”
Chapter 3 – Development of Hypotheses

often leads to a judgement of the potential occurrence of X, whereas “X is uncertain” often leads to a perception of potential of non-occurrence (Teigen & Brun 2003a). Thus, uncertainty interpretations may not yield equivalent uncertainty judgements. Additionally, such inconsistencies in judgement and interpretation also suggest that verbal probabilities are easy to manipulate in communication. This ease of use provides a communication pathway when people are not confident about how to interpret uncertainty information (Beyth-Marom 1982). Importantly, this allows flexibility when making probabilistic estimations.

For the current study to confirm the FLE in uncertainty judgement, there should be analyses from both the between-subject and within-subject perspectives.

3.2.3.1. H2: Uncertainty judgement – probabilistic estimation
The first issue of the uncertainty judgement relates to the FLE on probabilistic estimation (Section 3.1). Abundant evidence shows that the between-subject variation is significant when people are making probabilistic estimations. Such variation can be explained by different factors. For example, Yates and de Oliveira (2016) provided a comprehensive literature review on the influence of culture on probabilistic estimations, including an extensive comparison between East Asian and Anglo cultures. Also, Smith, Benson and Curley (1991) discussed the cognitive aspects of probabilistic estimations, arguing that individual differences in belief and knowledge would affect the reasoning process in the interpretation of uncertainty expressions.

According to the main assumption of the FLE, thinking in a foreign language results in a decrease in processing fluency and emotion, and an increase in psychological distance (Costa, Vives & Corey 2017). This leads to a prediction that people in the foreign-language condition
may exhibit less sensitivity to emotional-arousal content, which in this case is the probabilistic estimation based on different economic consequences.

Evidence from the between-subject studies and the propositions of the FLE leads to the second set of hypotheses:

**H2: The FLE exists in the process of uncertainty judgement on probabilistic estimations.**

H2a: In the between-subject experiment, subjects in the non-native-language group would provide a less biased probabilistic estimation than those in the native-language group.

H2b: In the within-subject experiment, subjects’ responses on the probabilistic estimation task would be less biased in the non-native-language condition than in the native-language condition.

3.2.3.2. **H3: Uncertainty judgement – directionality of expressions**
The second issue of uncertainty judgement relates to the FLE on directionality judgement (Section 3.1). Continuing from hypotheses H1a and b on probabilistic estimations, there is another scenario when the judgement is affected by the choice of uncertainty expressions. For example, the numeric interpretations “quite uncertain” and “some possibility” may share a similar numerical range (for example, 30%-35%) while “some possibility” may lead to a positive direction for subsequent judgements, and “quite uncertain” to negative (e.g., Teigen & Brun 1999).

The directionality of verbal probability expressions has been extensively investigated in native-language settings (e.g., Budescu, David V, Karelitz & Wallsten 2003; Teigen & Brun 2003b); however, its effect in the non-native-language setting remains largely unexamined.
Chapter 3 – Development of Hypotheses

As discussed in Section 2.2.4, when using a non-native language, people often display a reduced sensitivity towards uncertainty expressions (Costa, Foucart, Arnon, et al. 2014). Researchers have attributed these differences to the language effect on emotionality (Caldwell-Harris 2015), cognitive load (Volk, Köhler & Pudelko 2014), and language processing (Perani & Abutalebi 2005).

It is possible that people in a non-native language may also experience a reduced sensitivity to the directionality of uncertainty expressions, making their uncertainty judgements less biased. This leads to a third set of hypotheses:

**H3: The FLE exists in the process of uncertainty judgement on directionality.**

H3a: In the between-subject experiment, subjects in the non-native-language group would provide less biased directionality judgements than those in the native-language group.

H3b: In the within-subject experiment, subjects’ responses on the directionality-judgement task would be less biased in the non-native-language condition than in the native-language condition.

3.2.3.3. H4: Uncertainty judgement – risk framing
The third issue of uncertainty judgement relates to the FLE on risk framing. As noted earlier, the use of verbal probability allows associative thinking because of its inherent subjectivity. Such subjectivity is highly contextual, which could also be affected by how the uncertainty information is framed.

A main proposition of the FLE is that using a non-native language would reduce judgement biases relates to risk framing (e.g., Keysar, Hayakawa & An 2012). This proposition originated from Tversky and Kahneman (1981, p. 453) work on the “framing of decisions”. This proposition also rests on the assumption of Dual-Process Systems in one’s uncertainty
judgement (Section 2.2.3.2). As noted, the idea of Dual-Process Systems suggests that people make uncertainty judgements based on two cognitive systems: one that is automatic, unconscious, emotional, and quick (system 1), and another that is deliberate, conscious, logical, and slow (system 2). Inspired by these psychological findings, Keysar, Hayakawa and An (2012) developed experiments to test the FLE on risk framing. However, Keysar, Hayakawa and An (2012) and subsequent studies on the FLE only analysed inter-personal level variances with a between-subject design. This includes two replications by Costa, Foucart, Arnon, et al. (2014) and Oganian, Korn and Heekeren (2016), and several extensions on moral judgement (Cipolletti, McFarlane & Weissglass 2016; Corey et al. 2017; Costa, Foucart, Hayakawa, et al. 2014; Geipel, Hadjichristidis & Surian 2015, 2016; Hayakawa et al. 2017).

Given the psycholinguistic assumptions about the use of non-native language – for example, the Sapir-Whorf Hypothesis discussed in Section 2.2.3.1 – and empirical findings regarding the FLE from both between-subject and within-subject studies, this study proposes a fourth set of hypotheses:

**H4: The FLE exists in the process of uncertainty judgement on risk framing.**

**H4a:** In the between-subject experiment, subjects in the non-native-language group would provide a less biased risk judgement than those in the native-language group.

**H4b:** In the within-subject experiment, subjects’ responses for the risk-judgement task would be less biased in the non-native-language condition than in the native-language condition.

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21 It should be noted that Pan and Patel (2016) conducted a within-subject experiment to investigate the FLE in accounting at the intra-personal level.
Chapter 3 – Development of Hypotheses

3.3. SUMMARY

This chapter has proposed four sets of hypotheses. Each set contains two sub-hypotheses, aiming to explore the between-subjects (inter-personal) and within-subject (intra-personal) aspects of the FLE.

The first set of hypotheses addresses the first research question of how the FLE affects the interpretation of uncertainty expressions. The second, third, and fourth sets of hypotheses collectively address the second research question of how the FLE affects the judgement of uncertainty expressions. Specifically, the second sets of hypotheses target the FLE on probabilistic estimation, the third concerns the FLE on directionality, and the fourth aims to reveal the FLE on risk framing.

The next chapter systematically describes the research methodology in responding to the proposed hypotheses.
CHAPTER 4 – RESEARCH DESIGN AND DATA

4.1. INTRODUCTION

Chapter 3 developed four sets of hypotheses that aim to answer the research questions from two aspects: (1) the FLE on the interpretation of uncertainty expressions and (2) the FLE on the judgement of uncertainty expressions.

These hypotheses are developed based on the theory of the FLE. The main proposition of FLE theory is that people who are thinking in a non-native language would be less emotional (Section 2.2.3.1.1), conduct more cognition processing (Section 2.2.3.1.2), and impose a greater workload on memory (Section 2.2.3.1.3). Collectively, such impacts would exhibit in an individual’s uncertainty judgements that are less biased in a non-native-language condition (Section 2.2.6) than in a native-language condition.

Within the accounting context, the current study raises concerns about the FLE in accounting communication. Such concerns are derived from the discussion of the linguistic features of accounting language (Section 2.3.2), the psychological characteristics of uncertainty expression (Section 2.4), and the practical issues of uncertainty judgement (Section 2.5). The structures of the research questions and corresponding hypotheses are shown in Table 3.1.

This chapter aims to design appropriate research instruments to test these hypotheses. As discussed in Section 3.2.1, the investigation of inter-personal variance can be made using a between-subject experimental design and the intra-personal investigation using a within-
Chapter 4 – Research Design and Data

subject experimental design. As a result, the overall investigation consists of two separate experiments: Experiment 1, based on the between-subject design, and Experiment 2, based on the within-subject design.

To ensure the comparability and consistency of the data, the research instruments are identical in both experiments: survey questionnaires containing contain four tasks. Task 1 tests the interpretation of uncertainty expression (H1). Task 2 tests the uncertainty judgement of probabilistic estimation (H2). Notably, Task 2 also includes a manipulation check. Task 3 tests the uncertainty judgement of directionality (H3). Task 4 test the uncertainty judgement of risk framing (H4). The structure of the research instrument and relevant hypothesis testing is shown in Figure 3.1.

To test the FLE from the between-subject (inter-personal) perspective, Experiment 1 develops four versions of the online questionnaire and randomly asks each participant to complete only one version. These four versions have been developed based on a 2 (language) x 2 (context) method: (1) English-Asset version; (2) English-Liability version; (3) Chinese-Asset version; and (4) Chinese-Liability version.

To test the FLE from the within-subject (intra-personal) perspective, Experiment 2 uses the same versions as in Experiment 1 but operates in two steps. The first step is identical to Experiment 1 in randomly assigning participants to one of the four questionnaire versions. In the second step, which occurs seven days later (Section 4.4.2), the same participants are asked to complete the other questionnaire within the same context. Details of the procedure are provided in Section 4.4.
This chapter is organised as follows: Section 4.2 describes the details of research design; Section 4.3 discusses pilot studies; Section 4.4 provides the research procedure; and Section 4.5 addresses the sample selection.

### 4.2. DESIGN OVERVIEW

#### 4.2.1. Task 1: Interpretation – word-to-number conversion of uncertainty expressions

Task 1 aims to test the first hypothesis (H1). It requires participants to provide a word-to-number conversion for each uncertainty expression drawn from IFRS.

**H1:** The FLE exists in the interpretation of uncertainty expression in accounting.

The uncertainty expressions are in-context with statements, which are excerpted from IFRS. Statement selection follows three steps: (1) summarise a list of phrases from the accounting literature focusing on uncertainty expressions (Appendix B); (2) review the examples of usage from IFRS and IAS (Appendix A); and (3) select uncertainty expressions and excerpts from both the original (English) and Chinese-language versions of IFRS (Table 4.1).

<table>
<thead>
<tr>
<th>Uncertainty expressions (English)</th>
<th>Uncertainty expressions (Chinese)</th>
<th>Original usage IFRS/IAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasonably possible</td>
<td>合理可能</td>
<td>IFRS 4</td>
</tr>
<tr>
<td>Remote</td>
<td>可能性极小</td>
<td>IAS 37</td>
</tr>
<tr>
<td>Probable</td>
<td>很可能</td>
<td>IAS 38</td>
</tr>
<tr>
<td>Improbable</td>
<td>不大可能</td>
<td>IFRS Conceptual Framework</td>
</tr>
<tr>
<td>More likely than not</td>
<td>多半会存在</td>
<td>IAS 37</td>
</tr>
<tr>
<td>Uncertain</td>
<td>不确定</td>
<td>IAS 32</td>
</tr>
</tbody>
</table>

The rationale for using the original excerpts from IFRS is to eliminate any personal involvement in translation. Although there are still concerns about the quality of official IFRS
translation (Dahlgren & Nilsson 2012; Evans, L 2010; Evans, L, Baskerville & Nara 2015; Holthoff, Hoos & Weissenberger 2015; Huerta, Petrides & Braun 2013), using the official translation is still the best solution to minimise personal involvement in translation.

As shown in Table 4.1, six excerpts were selected from various IAS and IFRS texts. Three of the expressions are positively framed (probable, reasonably possible, and more likely than not). Three of the expressions are negatively framed (remote, improbable, and uncertain). The excerpts cover a broad range of accounting contexts, such as disclosure of accounting information (remote, reasonably possible), recognition of accounting elements (probable, improbable), and probabilistic judgement (more likely than not, uncertain).

Similar to previous accounting studies (e.g., Chand, Cummings & Patel 2012; Doupnik & Riccio 2006), participants are asked to interpret contextually based uncertainty expressions. Responses are made by sliding a cursor along a scale bar that has a range from 0 to 100%. This method has also been empirically tested as a valid alternative for interpreting uncertainty expressions in behavioural psychology (Budescu, David V, Broomell & Por 2009; Budescu, David V, Weinberg & Wallsten 1988).

The example below illustrates Task 1:

Example:

IAS 37 states that an entity should disclose a contingent liability, unless the possibility of an outflow of resources embodying economic benefits is remote.

If you believe that the expression “remote” corresponds to a probability of 15%, indicate this value as your response in the scale bar provided.
4.2.2. Task 2: Judgement – probabilistic estimation

Task 2 relates to the test of the second hypothesis (H2) and aims to examine whether the probabilistic estimation in the judgement scenario would differ to the word-to-number conversion in the interpretation scenario.

H2: The FLE exists in the process of uncertainty judgement on probabilistic estimations.

The rationale for this test is that there are controversial views in the accounting literature regarding the distinction between interpretation and judgement. Some refer to the word-to-number conversion as interpretation, either context-free (Chesley 1986; Doupnik & Richter 2003; Laswad & Mak 1997) or within a specific context (Doupnik & Riccio 2006; Doupnik & Richter 2004), while others refer to the word-to-number conversion as judgement (Chand, Cummings & Patel 2012; Hu, Chand & Evans 2013).

Although it is logical to assume that interpretation is a key component of judgement, the two are still vastly different. This is evident from work based on psychology theories, such as the Prospect Theory (Section 2.2.3.2) and the Communication Model Preference (Section 2.4.4.3), and empirical findings across the fields of climate forecasting (Budescu, David V, Broomell & Por 2009; Budescu, D. V., Por & Broomell 2012), intelligence and security study (Barnes 2016), and behavioural psychology (Juanchich & Sirota 2013; Riege & Teigen 2013). To illustrate this, an individual’s interpretation of “probable=65%” in asset recognition (Conceptual Framework) may not reflect that same individual’s probabilistic estimation in deciding the $20 asset and $20 million asset items.

In the accounting context, an uncertainty judgement often involves economic (or monetary) consequences. A typical example would be the materiality judgement, where auditors provide
probabilistic estimations on various aspects of financial reporting (Section 2.5.4.1). Thus, Task 2 attempts to test whether people’s sensitivity to probabilistic estimations would be affected by the consequences (such as the economic consequences) of their judgement and the use of language.

Specifically, Task 2 consists of three independent judgements manipulated by the value of the item. It requires participants to provide probability estimations based on different accounting items (asset or liability) with three values: $1,000, $100,000, and $10,000,000 (randomly displayed).

The task starts with a description from IFRS on the recognition of an asset or liability. Participants are required to answer a control question before conducting the probability estimation. The control question aims to eliminate random responses and ensure that subjects understand the context of the task. The control-question items are also randomly ordered. Following the control question, subjects provide the lowest threshold of “probable” for each value (either asset or liability). The example below illustrates the task design:

**Example:**

1. "An asset is recognised in the balance sheet when it is **probable** that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably." (IFRS - Conceptual Framework)

2. The statement is about the recognition of:
   - Asset
   - Liability
   - Equity
   - Income
   - Expense

3. You would recognise a **$10,000,000** asset in the balance sheet when there is a _____% chance of future economic benefit flow into the entity.
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4.2.3. Task 3: Judgment – directionality of uncertainty expressions

Task 3 is designed to test the third hypothesis (H3). Specifically, it tests whether participants’ judgements would be affected by the manipulation of uncertainty expressions and the versions of language.

H3: The FLE exists in the process of uncertainty judgement on directionality.

This design is underpinned by the phenomenon of directionality in the judgement of uncertainty expressions. As discussed in Section 2.4.4.1, previous empirical work has shown that uncertainty expressions often affect the direction of judgements, influencing them to be either positive or negative (for reviews, see Budescu, David V, Karelitz & Wallsten 2003; Teigen & Brun 1999).

Task 3 consists of two independent questions. Participants are asked to provide judgement based on the assigned uncertainty expressions. This study selects two uncertainty expressions – uncertain and reasonably possible – which arguably have significant directional impact in the uncertainty judgement (Appendix C). Importantly, the selected expressions also correspond with expressions in Task 1, where participants had provided the relevant numerical interpretations.

This study constructs two versions of the questions. Each version contains a description from IFRS on the recognition of an asset or liability and two independent judgements on recognition (randomly manipulated with uncertain and reasonably possible). The uncertainty judgements were measured based on a 21-point scale where -10 corresponded to “No, absolutely not”, 0 to “Equally favours”, and 10 to “Yes, absolutely”.
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The example below demonstrates the task design:

**Example:**

(1) You are evaluating an asset's future economic benefit inflow. IFRS states:

"An asset is recognised in the balance sheet when it is **probable** that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably." (IFRS – Conceptual Framework)

(2) If it is **uncertain** that the future economic benefit will flow to the company, how would you advise your company?

4.2.4. Task 4: Judgment – framing effect on risk

Task 4 aims to examine the fourth hypothesis (H4) by evaluating the existence of the FLE in risk judgement.

**H4:** The FLE exists in the process of uncertainty judgement on risk framing.

Task 4 replicates the design of Costa, Foucart, Arnon, et al. (2014), with minor modifications. The original design was based on the well-known Asian Disease Problem found in Tversky and Kahneman (1981) and discussed in **Section 2.2.3.2.1**, where judgement biases were observed between different framing versions. The judgement biases suggest that people are risk-averse when choices involve gains and risk-seeking when choices involve loss. This choice pattern is known as the framing effect (Table 4.2).
As shown in Table 4.2, Keysar, Hayakawa and An (2012) tested this research design on participants using both their native language and a foreign language. The authors found that the judgement biases between different frames were significantly less in the foreign-language condition. Inspired by Keysar and his colleagues, Costa, Foucart, Arnon, et al. (2014) modified the testing material to develop the Financial Crises Problem (Table 4.2).
Table 4.2 – Materials relating to the framing effect


Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

**Problem 1 (gain frame)**
If Program A is adopted, 200 people will be saved.
If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
Which of the two programs would you favor?

**Problem 2 (loss frame)**
If Program C is adopted 400 people will die.
If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.
Which of the two programs would you favor?

**Keysar, Hayakawa and An (2012, p. 662)**

Recently, a dangerous new disease has been going around. Without medicine, 600,000 people will die from it. In order to save these people, two types of medicine are being made.

**Problem 1 (gain frame)**
If you choose Medicine A, 200,000 people will be saved.
If you choose Medicine B, there is a 33.3% chance that 600,000 people will be saved and 66.6% chance that no one will be saved.
Which medicine do you choose?

**Problem 2 (loss frame)**
If you choose Medicine C, 400,000 people will die.
If you choose Medicine D, there is a 33.3% chance that nobody will die, and a 66.6% chance that 600,000 will people die.
Which medicine do you choose?

**Costa, Foucart, Arnon, et al. (2014, p. 240)**

Recently, a serious financial crisis has started. Without any action, the company you manage will lose 600,000 euros. In order to save this money, two types of actions are possible.

**Problem 1 (gain frame)**
If you choose Action A, 200,000 euros will be saved.
If you choose Action B, there is a 33.3% chance that 600,000 euros will be saved and a 66.6% chance that no money will be saved.
Which action do you choose?

**Problem 2 (loss frame)**
If you choose Action A, 400,000 euros will be lost.
If you choose Action B, there is a 33.3% chance that no money will be lost and a 66.6% chance that 600,000 euros will be lost.
Which action do you choose?
The current study applied a modified version of the financial-crisis problem studied by Costa et al. (2014). First, it changes the currency (from euros to dollars) and the economic consequence of judgement (e.g., changing a €600,000 loss to a $6,000,000 loss). This allows the judgement to be less affected by a specific currency unit and places more emphasis on the significance of the economic consequences.

Second, it restates the percentage probability as a frequency probability (e.g., 33.3% versus 1/3); this eliminates the computation problem in the studies of both Keysar, Hayakawa and An (2012) and Costa, Foucart, Arnon, et al. (2014).

Keysar’s (2012) gain frame may serve as an example of the computation problem:

1) Option B provides the computation of 600,000 x 33.3% = 199,800 people to be saved and 600,000 x 66.6% = 399,600 people not to be saved. This leaves 200+400=600 people out of the calculation.

2) The computation based on percentage probability (199,800 people to be saved) does not provide a statistically equal result as the sure option (200,000 people to be saved).

As a result, the modified material aims to address these problems. The example below demonstrates the design of Task 4.

**Example:**

There has recently been a significant economic downturn. Without intervention, the company you manage will lose $6,000,000. You are faced with two possible courses of action.

[Sure option] If you choose Action A, $2,000,000 will be saved.
[Probabilistic option] If you choose Action B, there is a 1/3 chance that $6,000,000 will be saved and a 2/3 chance that no money will be saved.

Which action do you prefer?
4.2.5. Demographic questions

Demographic questions collect participants’ background information, including age, gender, country of origin, native language, length of stay in a foreign country, self-rated foreign language skills, relevant working experience (if applicable), educational background, familiarity with IFRS, and knowledge of other accounting standards.

In particular, participants rate their foreign language skills in reading, understanding, writing, and speaking on a five-point scale (1=almost none, 2=poor, 3=fair, 4=good, 5=very good). This question is based on Geipel, Hadjichristidis and Surian (2015) and was subsequently applied by Hadjichristidis, Geipel, and Savadori (2015) and Geipel, Hadjichristidis, and Surian (2016). The main purpose is to eliminate any potential invalid responses that result from participants’ language insufficiency.

Notably, this study places the demographic questions at the end of the questionnaire to eliminate the potential impact from being confronted at the outset with sensitive and private questions (Bradburn, Sudman & Wansink 2004; Sue & Ritter 2012).

4.2.6. Questionnaire translation method: back-translation

The back-translation approach has been implemented to ensure comparability and equivalence between English and Chinese-language versions (Brislin 1970; Doupnik & Richter 2003; Pan & Patel 2016). Specifically, all questionnaire items (except IFRS excerpts in part 1) are initially prepared in English, translated into Simplified Chinese, and then translated back into English. Additionally, bilingual native speakers of the languages used in each experiment have been consulted to ensure that words and phrases convey the same content across languages.
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4.3. PILOT STUDY

The previous section described the details of research design, outlining four experimental tasks to test the relevant hypotheses. The current section discusses the process of designing the research instrument. As part of the research development, this study conducted three pilot phases over six months.

4.3.1. First pilot study

The first pilot study was conducted at an Australian university on an academic staff research day. Twelve accounting academics participated and provided feedback regarding the questionnaire structure and content. Notably, the first pilot study used the paper-based questionnaire for the purpose of feedback collection (Table 4.3).

<table>
<thead>
<tr>
<th>Probable:</th>
<th>First draft</th>
<th>After feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is probable that the expected future economic benefits that are attributable to the asset will flow to the entity (IAS 38).</td>
<td>Probable: ______ % to _______%</td>
<td>Probable: IAS 38 states that an intangible asset shall be recognised if, and only if: it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity, and the cost of the asset can be measured reliably. Probable: _______%</td>
</tr>
</tbody>
</table>

The feedback highlighted three major issues. The first issue concerned the context-free design in Task 1. The original draft provided only part of the IFRS context (Table 4.3); several academics commented on the need for context-based accounting standards instead of incomplete sentences.

The second issue, also related to Task 1, concerned the format of the interpretation between range probability and point estimate. Feedback from the pre-test suggested that estimates using
a “cut-off” point can reduce the inconsistency compared to a range-probability estimate. For example, the expected response for “probable” is the range from a lower bound of 40% to an upper bound of 70%. However, many responses provided an upper bound of 100%. It appeared that a cut-off point of 40% provided a better indication than the range of 40% to 70% (or 100%).

The limitation of using range probability has also been highlighted in accounting research; for example, auditors often use the lower bound rather than the midpoint when using a range probability to calculate the size of adjustment (e.g., Griffin 2014). Thus, using a point estimate is more appropriate than using a range probability in the interpretation of uncertainty expressions.

The third issue related to the design of the manipulation check. The questionnaire should include several design strategies as an essential component to filter out invalid responses due, for example, to a random reply to the questionnaire or to participants’ insufficient English-language ability.

Related to this issue, feedback indicated that the original design was oversimplified in that it asked participants a yes-or-no question about a particular judgement. The feedback received from senior academics suggested that a multiple-choice question with options related to the judgement context presented in a random order would serve as a better manipulation check. Accordingly, the refined task integrated a manipulation check in Task 2 (Section 4.2.2).

**4.3.2. Second pilot study**

The second pilot study was conducted with PhD accounting students at an Australian university. Ten volunteers completed the questionnaire through the Qualtrics online platform. The main
feedback concerned both the content and the aesthetics of the questionnaire. Specifically, feedback indicated that although a point estimate approach could facilitate data collection and analysis, data quality remained questionable. Related to these issues, some suggested that converting verbal expressions into numerical ones required a significant cognitive load, and that if a participant were under time pressure or unfamiliar with the texts, they might be less willing to put effort into the task.

In response to this feedback, the updated questionnaire incorporated a point-estimate probability with a graphic display of a percentage scale bar. Participants were then able to choose whether to indicate the position of the cut-off point or provide the numeric equivalent.

4.3.3. Third pilot study

The third pilot study was conducted with non-accounting Chinese students at an Australian university. The volunteers were from the School of Computing and Information Technology and had limited knowledge of accounting. The purpose of this piloting was to ensure that the language was understandable and to address the potential computation issues neglected in the original design.

One of the main comments concerned the computation issues in Task 4. As addressed in Section 4.2.4, the original design copied the financial-crisis problem from Costa, Foucart, Arnon, et al. (2014). The original material, however, had an inherent computation problem: the statistical calculations between the sure and probabilistic options were not equal. As a result, the updated version addressed this issue by using the frequency probability.
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4.4. PROCEDURE

The previous section provided details of the pilot studies. In response to the feedback from the pilot studies, the research instruments were refined.

This section describes the implementation of the experiments. As discussed in Section 4.1, the overall investigation consisted of two experiments: Experiment 1 applied the between-subject design and Experiment 2 used the within-subject design. The research instruments were identical in both experiments (Section 4.2).

Both experiments were conducted entirely online. Data was collected from participants during their computer lab time (Experiment 1 and the first stage of Experiment 2) and spare time (second stage of Experiment 2). Participants were able to choose the survey method: on either a computer or a mobile device.22

The class lecturers were not in the computer lab at the time of the survey, and participants were informed the voluntary nature of their participation. The chief investigator (the author) also reassured participants that there were no correct or incorrect answers and that the uncertainty expressions should be treated independently and judgement should be personal. The chief investigator stayed in the computer lab during the entire session. Figure 4.1 shows the research instruments.

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22 To ensure the feasibility of this study, the chief investigator generated four QR codes that linked to the online questionnaire. Therefore, participants could elect to complete questionnaires with their mobile devices.
4.4.1. Experiment 1 – between-subject design

Experiment 1 applied the 2 x 2 (language: Native versus Foreign; context: Asset-Gain versus Liability-Loss), between-subject design. Participants were randomly allocated into four groups (A, B, C, D) and were only required to complete one questionnaire. Because each participant in Experiment 1 only completed one version of the questionnaire (either A, B, C, or D), both the language and the context can be considered between-subject factors.

4.4.2. Experiment 2 – within-subject design

Experiment 2 applied the within-subject design in two stages. The first stage was identical to Experiment 1. Specifically, Qualtrics was used to randomly assign one of four online questionnaires (A, B, C, D) to each respondent, who could elect to provide their email address to be contacted for the second stage of the experiment.

The second stage took place seven days later (similar as: Pan & Patel 2016). The participants who had provided their contact emails in the first stage received a version of their first questionnaire in their non-native language. Collectively, each subject would complete two questionnaires in two languages, either A-B or C-D. So, for each respondent, only the language changed between the first and second stages.
4.4.3. Data control

To filter invalid responses, the research instrument included one manipulation check and one language-ability control. The design of the manipulation check was based on feedback from the first pilot study (Section 4.3.1).

Example:

(1) "An asset is recognised in the balance sheet when it is **probable** that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably." (IFRS – Conceptual Framework)

(2) The statement is about the recognition of:

- ○ Asset
- ○ Liability
- ○ Equity
- ○ Income
- ○ Expense

As illustrated above and in Section 4.2.2, the manipulation check integrated into Task 2 took the form of a statement from the Conceptual Framework on the recognition of an asset or liability (depending on the questionnaire version). Participants were asked to identify the type of account the statement referred to (Asset, Liability, Equity, Income, or Expense). If participants were unable to correctly identify the type of account presented to them in the questionnaire, their response was excluded from the analysis.


Example:

Please self-rate your English language skills:

<table>
<thead>
<tr>
<th></th>
<th>Almost none</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Understanding</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Writing</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Speaking</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
To eliminate invalid responses from participants with insufficient English-language ability, questionnaires were excluded if they provided low self-rated proficiency scores (“almost none” or “poor”) in any of the English-language skills (reading, understanding, writing, and speaking). The overall data-filtering process is shown in Figure 4.2.

4.5. SAMPLE SELECTION

This research targets a sample population of accounting students from Chinese and Australian universities.

There are two main rationales for using this sampling. The first relates to the relevance of IFRS to the potential participants. Targeting accounting students from China and Australia provides the following advantages: (1) the IFRS Foundation provides the official Chinese-language version of IFRS. Therefore, the IFRS deems the excerpted accounting standards from these language versions to be comparable and consistent. (2) Australia has made its national
accounting standards as set by the Australian Accounting Standards Board (AASB) consistent with IFRS, which means all entities using AASB can assert compliance with IFRS (IFRS Foundation 2016). Similarly, the Chinese Accounting Standards (CAS) have been made substantially consistent with IFRS, and China is continually working towards its goal of full convergence with IFRS (IFRS Foundation 2015). Importantly, many Chinese firms use IFRS for the purpose of trading in the US and European markets (IFRS Foundation 2016). 3) China and Australia provide an appropriate cross-national context for this research. In China, accounting education is becoming increasingly internationally integrated, with many accounting courses delivered in both Chinese and English (Zhang, Boyce & Ahmed 2014). In Australia, more than 170,000 international students enrolled in business and accounting courses in 2014 (Department of Educational and Training 2015), most of whom spoke English as a non-native language. Importantly, Australia has a large proportion of international accounting students.

The second rationale relates to the accuracy of the experimental results. Participants were accounting students who were being asked to perform multiple tasks related to uncertainty judgement. One potential concern would be how the test results compared to actual uncertainty judgements made by accounting practitioners. However, there is sufficient evidence to support that accounting students can act as surrogates for accounting professionals in interpreting uncertainty expressions and exercising accounting judgement (e.g., Mortensen, Fisher & Wines 2012; Nelson & Kinney Jr 1997; Riley, Semin & Yen 2014). For example, Nelson and Kinney Jr (1997) chose MBA students as surrogates for general financial statement users in an experiment regarding contingent loss judgement. Furthermore, Libby, Bloomfield and Nelson (2002) claimed that students who possess a basic familiarity with accounting can be good surrogates for accounting professionals in experiments focusing on judgements.
Accordingly, it was assumed that the sample population could provide valid responses for the purposes of this study. The following sections outline the demographic details from Experiments 1 and 2.

4.5.1. Demographic details – Experiment 1

Experiment 1 adopted a between-subject design and recruited participants from one Australian and one Chinese university. The sample population in Experiment 1 represented a linguistically diverse community.

A total of 328 participants completed the questionnaire. Three responses were excluded either because of failure in the manipulation check or because the participants had self-rated their English language skills as “almost none” or “poor”. Therefore, 325 responses were valid for analysis. Participants’ demographic summaries are provided in Table 4.4.
Table 4.4 – Demographic data from Experiment 1

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>220</td>
<td>67.7</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>105</td>
<td>32.3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years in English-speaking country</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 year</td>
<td>285</td>
<td>87.7</td>
<td></td>
</tr>
<tr>
<td>1-2 years</td>
<td>9</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>3-4 years</td>
<td>7</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>5-6 years</td>
<td>2</td>
<td>.6</td>
<td></td>
</tr>
<tr>
<td>More than 8 years</td>
<td>22</td>
<td>6.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>295</td>
<td>90.8</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>14</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Other23</td>
<td>16</td>
<td>4.9</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Major</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>295</td>
<td>90.8</td>
<td></td>
</tr>
<tr>
<td>Other24</td>
<td>30</td>
<td>9.2</td>
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</table>

<table>
<thead>
<tr>
<th>English ability</th>
<th></th>
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<th>3.49</th>
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<tbody>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaking</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years of study</th>
<th></th>
<th></th>
<th>2.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>20.80</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Questionnaire version25</th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Native-Asset-Gain</td>
<td>136</td>
<td>41.8</td>
<td></td>
</tr>
<tr>
<td>Foreign-Asset-Gain</td>
<td>56</td>
<td>17.2</td>
<td></td>
</tr>
<tr>
<td>Native-Liability-Loss</td>
<td>56</td>
<td>17.2</td>
<td></td>
</tr>
<tr>
<td>Foreign-Liability-Loss</td>
<td>77</td>
<td>23.8</td>
<td></td>
</tr>
</tbody>
</table>

*English ability: subjects self-rated their English language skills in reading, understanding, writing, and speaking on a five-point scale (1=almost none, 2=poor, 3=fair, 4=good, 5=very good; scale adapted from Caldwell-Harris and Aycicegi-Dinn (2009)).

As shown in Table 4.4, the questionnaire versions were randomly distributed, with 136 subjects completing the Asset-Gain version in a native language, 56 subjects completing the Asset-Gain

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23 Other nationalities (total of 16) included: India (2), Indonesia (2), Kyrgyzstan (1), Malaysia (4), Norway (1), Sri Lanka (2), Sweden (1), and Vietnam (2).

24 Other majors (total of 30) included: Business (4), Economics (1), Finance (15), Management (4), and Marketing (6).

25 The author maintains that the distribution process was random and well supervised. The appeared disproportion on Native-Asset-Gain version of questionnaire can be explained as the followings: First, subjects voluntarily attended the experimental tasks; therefore, they were able to reject the participation before and during the experiment. Second, subjects may resist to complete the experimental tasks in their foreign language before starting the questionnaire; therefore, the numbers of completion were relatively low (56 on Foreign-Asset-Gain and 77 on Foreign-Liability-Loss). Third, subjects may resist to complete the tasks in 'loss' context due to the potential emotional discomfort when thinking about the loss. Therefore, some may reject to complete the tasks during the experiment (56 on Native-Liability-Loss). The current study only counted the number of completed questionnaire, all rejections (as mentioned above) were discarded for analysis and were not subjected for the main research focus.
version in a non-native language, 56 subjects completing the Liability-Gain version in a native language, and 77 subjects completing the Liability-Gain version in a non-native language.

In terms of personal attributes, 67.7% of the subjects were female, and 32.3% were male. The average age of subjects was 20.80, and most were in their second or third year of study (mean=2.30 years). Amongst these students, over 90% of them were undertaking accounting degrees; the rest were undertaking accounting-related degrees.

In terms of nationality and language, over 90% of the subjects were native Chinese students, with 87.7% of the subjects having spent less than one year in an English-speaking country. The self-rated English-language proficiency results suggested that subjects had obtained sufficient language skills, with the mean score across all skill components above 3 (out of 5). This indicates that most subjects self-rated their language ability between “fair” and “good”.

4.5.2. Demographic details – Experiment 2

Experiment 2 used a within-subject design and recruited participants from two Chinese universities. The accounting courses in these universities were highly ranked, both universities were classified in the First Tier (yī běn 一本) category in China. This means that students enrolled at these universities had satisfied English-language entry requirements as measured by the National Matriculation English Test (NMET) (Cheng & Qi 2006). Participants were selected from among second-, third-, and final-year undergraduate accounting students to ensure their familiarity with accounting standards.

As described in the research design, the within-subject design consisted of two stages. In the first stage, participants were allocated one of the four versions of the questionnaire (which were
identical to those in the between-subject design). The second stage of survey was conducted seven days later, and invited the same participants to complete the same questionnaire they had received in the first stage, but in the other language. A total of 170 participants conducted the survey in the first stage. After the data control (Section 4.4.3), 26 participants were either failed in the manipulation check or unable to continue the second stage survey, resulting attrition rate of 15% (26/170). Therefore, 144 participants remained who had completed both questionnaires: 72 participants who had completed the asset version and 72 participants who had completed the liability version.

As shown in Table 4.5, 68.1% of the subjects were female, and 31.9% were male. The average age of subjects was 20.22, and most were in their second or third year of study (mean=2.46 years). Over 92% of the subjects had spent less than one year in an English-speaking country.

Table 4.5 – Demographic data from Experiment 2

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>98</td>
<td>68.1</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>46</td>
<td>31.9</td>
<td></td>
</tr>
<tr>
<td><strong>Years in English-speaking country</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 year</td>
<td>133</td>
<td>92.4</td>
<td></td>
</tr>
<tr>
<td>5-6 years</td>
<td>2</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>7-8 years</td>
<td>2</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>More than 8 years</td>
<td>7</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td><strong>Country of origin</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>144</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>Major</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>135</td>
<td>93.8</td>
<td></td>
</tr>
<tr>
<td>Economic</td>
<td>4</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>4</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>1</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td><strong>English ability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td></td>
<td>3.43</td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td></td>
<td>3.31</td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td></td>
<td>2.97</td>
<td></td>
</tr>
<tr>
<td>Speaking</td>
<td></td>
<td>2.78</td>
<td></td>
</tr>
<tr>
<td><strong>Years of study</strong></td>
<td></td>
<td>2.46</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td>20.22</td>
<td></td>
</tr>
<tr>
<td><strong>Questionnaire version</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset-Gain</td>
<td>72</td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td>Liability-Loss</td>
<td>72</td>
<td>50.0</td>
<td></td>
</tr>
</tbody>
</table>

*English ability: subjects self-rated their English language skills in reading, understanding, writing, and speaking on a five-point scale (1=almost none, 2=poor, 3=fair, 4=good, 5=very good; scale adapted from Caldwell-Harris and Ayçiçeği-Dinn (2009)).
In terms of language ability, the self-rated English-language proficiency question suggests that most subjects rated their reading (mean=3.43 out of 5) and understanding (mean=3.31 out of 5) skills as between “fair” and “good”, and as superior to their writing and speaking skills.

4.6. SUMMARY

This chapter provides details of the research design. The overall investigation consisted of two separate experiments. Experiment 1 took the between-subject design approach, aiming to test the FLE at the inter-personal (group) level. Experiment 2 took the within-subject design approach, aiming to test the FLE at the intra-personal (individual) level.

This study developed four versions of a survey questionnaire, which were used for both experiments. Each version contained four tasks to test the relevant hypotheses.

To ensure the feasibility of the research instruments, this study conducted three pilot studies. Once feedback had been incorporated, the overall research design was deemed to be appropriate for the purpose of the current study.

In summary, this chapter contributes to the design of research into the intersection between the FLE and uncertainty judgement in the accounting context, and to clarifying the underlying mechanisms of accounting judgement about uncertainty expressions. Using both between-subject and within-subject designs, this study examines the inter-personal and intra-personal differences in the thinking process regarding uncertainties. Both designs have been employed in accounting-judgement and FLE studies, yet there are rare examples of accounting research that integrates both approaches into one study.
The next chapter, therefore, aims to provide empirical evidence on (1) the FLE on interpretation in one’s native and non-native language; (2) the FLE on accounting judgement in one’s native and non-native language; and (3) the relationship between one’s interpretation and judgement of uncertainty expressions.
CHAPTER 5 – DATA ANALYSIS AND RESULTS

5.1. INTRODUCTION

Chapter 4 described the details of research design and demographic information from both experiments. Both experiments used the same research instruments, which contained four tasks. Task 1 aimed to test the first hypothesis by asking participants to convert verbal probability expressions into numerical probabilities. Task 2 aimed to test the second hypothesis by asking participants to provide probabilistic estimations on three differently valued accounting items. Task 3 aimed to test the third hypothesis by requesting participants to provide judgements based on the directions of the uncertainty expressions. Task 4 aimed to test the fourth hypothesis by collecting participants’ uncertainty judgements on different frames of risks.

H1: The FLE exists in the interpretation of uncertainty expression in accounting.
H2: The FLE exists in the process of uncertainty judgement on probabilistic estimations
H3: The FLE exists in the process of uncertainty judgement on directionality
H4: The FLE exists in the process of uncertainty judgement on risk framing.

After filtering responses using the manipulation check and the language-ability control, the data was ready for statistical analysis. This chapter provides detailed data analysis for both experiments, including tests on each sub-hypothesis. The description of the analytical methods is shown in Appendix D.

The chapter is organised as follows: Section 5.2 analyses the data from Experiment 1. Section 5.3 analyses the data from Experiment 2. Section 5.4 provides a systematic discussion based on the findings from both experiments. Specifically, this section aims to answer the research questions of this study. Section 5.5 provides a summary.
5.2. EXPERIMENT 1: BETWEEN-SUBJECT DESIGN

5.2.1. H1a: Interpretation of IFRS uncertainty expressions

As noted in the discussion of the first sub-hypothesis, this study expected that participants in the native-language group would interpret IFRS uncertainty expressions differently to those in the foreign-language group.

H1a: In the between-subject experiment, subjects in the non-native-language group would interpret accounting uncertainty expressions differently to those in the native-language group.

Task 1 was designed to test the first sub-hypothesis. As described in Section 4.5.1, participants came from two universities, one in Australia and one in China. To test the between-subject (inter-personal) variations, this study divided the overall responses into two language groups: native and foreign language. Specifically, responses that were categorised into the native-language group were those from: (1) native-Chinese speakers using the Chinese-language versions of the questionnaire and (2) native-English speakers using the English-language versions.

Responses that were categorised into the foreign-language group26 were those from: (1) native-Chinese speakers using the English-language versions of the questionnaire and (2) non-native English-speakers using the English-language versions.

To support H1a, the analytical results should show a significant difference between the native-language group and the foreign-language group. A normality check on the responses suggested

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26 Notably, because the questionnaire distribution was random, participants who were allocated the Chinese language version but had no Chinese-language ability were excluded from the data analysis.
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that participants’ interpretations were overall normally distributed. Therefore, the ANOVA was appropriate for the analysis. Table 5.1 reported the test results for the six pairs of uncertainty expressions.

### Table 5.1 – Experiment 1: Interpretation of uncertainty expressions

<table>
<thead>
<tr>
<th>Language</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>ANOVA df</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>45.77</td>
<td>22.11</td>
<td>1</td>
<td>5.489</td>
<td>.020*</td>
</tr>
<tr>
<td>Foreign</td>
<td>51.68</td>
<td>22.75</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>72.83</td>
<td>22.06</td>
<td>1</td>
<td>12.778</td>
<td>.000**</td>
</tr>
<tr>
<td>Foreign</td>
<td>64.06</td>
<td>21.30</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasonably possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>60.22</td>
<td>19.97</td>
<td>1</td>
<td>0.002</td>
<td>.962</td>
</tr>
<tr>
<td>Foreign</td>
<td>60.32</td>
<td>18.82</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improbable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>40.15</td>
<td>27.48</td>
<td>1</td>
<td>8.561</td>
<td>.004**</td>
</tr>
<tr>
<td>Foreign</td>
<td>49.11</td>
<td>26.64</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More likely than not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>60.71</td>
<td>18.20</td>
<td>1</td>
<td>5.889</td>
<td>.016*</td>
</tr>
<tr>
<td>Foreign</td>
<td>55.50</td>
<td>20.13</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>30.00</td>
<td>28.81</td>
<td>1</td>
<td>36.352</td>
<td>.000**</td>
</tr>
<tr>
<td>Foreign</td>
<td>48.89</td>
<td>26.18</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the .05 level
**Significant at the .01 level

As shown in Table 5.1, the results showed significant between-subject variances in the interpretation of the terms “uncertain” ($p=0.020$), “probable” ($p=0.000$), “improbable” ($p=0.004$), “more likely than not” ($p=0.016$), and “remote” ($p=0.000$). There was one exception:
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for “reasonably possible” ($p=0.962$), participants provided almost identical interpretations between their native and non-native language (also see Figure 5.1).

The overall result, therefore, suggested that participants in the foreign-language group interpreted uncertainty expressions differently to those in the native-language group. This essentially supported $H1a$: at the inter-personal level, subjects in the non-native-language group would interpret accounting uncertainty expressions differently to those in the native-language group.

Notably, such between-subject analysis could not eliminate the translation effect. In other words, the variances of interpretation could be explained by multiple factors, including the use of language, translation of IFRS, or a mixture of both. To exclude the translation effect, the relevant task would need to be extended to the within-subject design (Section 5.3.1).

5.2.2. $H2a$: Uncertainty judgement based on different values

As noted in the discussion of the second sub-hypothesis, this study expected that participants in the foreign-language group would make less biased probabilistic estimations than those in the native-language group.

$H2a$: In the between-subject experiment, subjects in the non-native-language group would provide a less biased probabilistic estimation than those in the native-language group.

Task 2 was designed to test the second sub-hypothesis (Section 4.2.2). In this task, participants were asked to provide their lowest probability threshold for the recognition of either an asset or a liability. As mentioned in Section 4.2.2, participants were randomly divided into four
groups. Each participant was required to exercise their probabilistic estimations based on three values: $1,000 (small), $100,000 (medium), and $10,000,000 (large).

To test the inter-personal variance of probabilistic estimations, the analysis was processed by first pairing each participant’s Task 2 responses with the anchor value. The anchor value was each participant’s interpretation on the numeric expression of “probable” from Task 1. The second step was to divide the pairs into three groups: Small value – Anchor; Medium value – Anchor; and Large value – Anchor. The third step was to further divide the pairs based on the language and context versions. Accordingly, there were 12 pairs for analysis (Table 5.2).

The statistical analysis was based on the Paired-Sample T test. If using a foreign language reduces participants’ biases in the probabilistic estimation, then the results should report less variance for each pair in the foreign-language group than for each pair in the native-language group.

### Table 5.2 – Experiment 1: probabilistic estimation

<table>
<thead>
<tr>
<th>Language</th>
<th>Mean</th>
<th>Anchor</th>
<th>Paired-Samples T Test</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small value ($1,000)</td>
<td>Native</td>
<td>55.82</td>
<td>72.60</td>
<td>-6.315</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>59.41</td>
<td>59.95</td>
<td>-.172</td>
</tr>
<tr>
<td>Medium value ($100,000)</td>
<td>Native</td>
<td>59.10</td>
<td>72.60</td>
<td>-5.348</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>59.66</td>
<td>59.95</td>
<td>-.114</td>
</tr>
<tr>
<td>Large value ($10,000,000)</td>
<td>Native</td>
<td>57.07</td>
<td>72.60</td>
<td>-5.733</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>59.18</td>
<td>59.95</td>
<td>-.254</td>
</tr>
<tr>
<td><strong>Liability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small value ($1,000)</td>
<td>Native</td>
<td>56.82</td>
<td>73.41</td>
<td>-4.089</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>58.27</td>
<td>67.05</td>
<td>-2.690</td>
</tr>
<tr>
<td>Medium value ($100,000)</td>
<td>Native</td>
<td>51.66</td>
<td>73.41</td>
<td>-6.104</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>58.47</td>
<td>67.05</td>
<td>-2.874</td>
</tr>
<tr>
<td>Large value ($10,000,000)</td>
<td>Native</td>
<td>49.36</td>
<td>73.41</td>
<td>-5.257</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>53.08</td>
<td>67.05</td>
<td>-4.147</td>
</tr>
</tbody>
</table>

Anchor: The mean value of “probable” interpreted by subjects in Task 1

* Significant at the .05 level
** Significant at the .01 level
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As shown in Table 5.2, participants in the native-language group provided significantly biased judgement of probabilistic estimation on assets ($p=0.000$) and liabilities ($p=0.000$) (see also Figures 5.2 and 5.3 on native language). Specifically, participants’ probabilistic estimations on differently valued accounting items violated their initial anchor values. Using the response on Small value – Asset (native language) as an example to interpret these results:

1) After being given the accounting standard on asset recognition, participants were required to judge the uncertainty expression “probable” for the future economic benefit inflow of a small-value asset ($1,000)
2) Participants provided the average mean probabilistic estimation that when there was a $55.82\%$ chance that future economic benefit would flow to the entity, a small-value asset could be recognised.
3) In comparison, participants’ initial interpretation of “probable” (provided in Task 1) was $72.60\%$.
4) The paired-sample analysis showed that such variance was statistically significant ($p=0.000$).

This result suggests that participants were significantly biased by the value of accounting items when making a probabilistic estimation in their native language.

The response from the foreign-language group, however, displayed different patterns. In the context of liability recognition, participants did provide biased judgement on probabilistic estimations (small value $p=0.009$; medium value $p=0.005$; large value $p=0.000$). However, such biases in the non-native-language group were relatively smaller than those in the native-language group (Figure 5.3). At the same time, in the context of asset recognition, participants in the foreign-language group showed no biases in probabilistic estimation (small $p=0.864$; medium $p=0.910$; large $p=0.800$). This means that participants were not affected by the changing value of asset items when making probabilistic estimations in their foreign language (Figure 5.2).
Responses for Small value – Asset (foreign language) can serve as an example:

1) After being given the accounting standard on asset recognition, participants were required to judge the uncertainty expression “probable” for the future economic benefit inflow of a small-value asset ($1,000).

2) Participants provided the average mean probabilistic estimation that when there was a \(59.41\%\) chance that future economic benefit would flow to the entity, a small-value asset could be recognised.

3) In comparison, participants’ initial interpretation of “probable” (provided in Task 1) was \(59.95\%\).

4) The paired-sample analysis showed that such variance was statistically insignificant \((p=0.864)\).

Overall, the results supported H2a, indicating less judgement bias in participants’ probabilistic estimation in the foreign-language group than in the native-language group.
It is worth mentioning that the test results only reflected the between-subject variance. A number of variables, such as culture, education, gender, or language proficiency, may also have affected the statistical results. To eliminate these factors and to better understand the FLE, a follow-up analysis based on the within-subject design would need to be conducted (Section 5.3.3).

5.2.3. H3a: Uncertainty judgement based on the directionality of expressions

As noted in the discussion of the third sub-hypothesis, this study expected that participants in the foreign-language group would make judgements less biased by the direction of uncertainty expressions than those in the native-language group.

**H3a:** In the between-subject experiment, subjects in the non-native-language group would provide a less biased directionality judgement than those in the native-language group.

Task 3 was designed to test the third sub-hypothesis. In this task, participants were asked to provide uncertainty judgements based on different expressions. Specifically, the expressions
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were selected due to their inherent direction (“uncertain” was considered to have a negative direction, and “reasonably possible” was considered to have a positive direction). The uncertainty judgements were related to asset or liability recognition.

The task allocation was the same as in the previous section: four groups of participants allocated to either the native-asset, native-liability, foreign-asset, or foreign-liability group. Each participant provided two separate judgements, which were manipulated using the two uncertainty expressions “uncertain” and “reasonably possible”. The order of the judgements was random. The uncertainty judgements were measured based on a 21-point scale. On the scale, (-10) was labelled as “No, absolutely not”, (0) was labelled as “Equally favours”, and (10) labelled as “Yes, absolutely”.

To examine whether participants in the foreign-language group would be less biased in uncertainty judgement than those in the native-language group, this study formulated two variables for analysis: the directionality (DIR) of uncertainty judgements and the consistency (CS) of uncertainty judgements. To support H3a, the results should show significant variances in the responses’ DIR and/or CS between the native- and foreign-language groups.

The computation of directionality (DIR) was based on Budescu, David V, Karelitz and Wallsten (2003) study:

\[
DIR = \frac{\text{number of pro judgements} - \text{number of con judgements}}{\text{number of pro judgements} + \text{number of con judgements}}
\]
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Specifically, pro judgements were identified as a positive response (1 to 10) on the 21-point scale. The con judgement was identified as a negative response (-10 to -1) on the 21-point scale. The neutral judgement was identified as a neutral response (0) on the 21-point scale.

Based on the formula, the DIR range should between -1 and 1. Specifically, -1 would indicate that all judgements on accounting recognition are negative; 0 would indicate a neutral judgement on accounting recognition; and 1 would indicate that all judgements on accounting recognition are positive. The sign of DIR (+/-) indicates the uncertainty expression’s directionality.

The following example illustrates this:

1) Use the expressions “uncertain” and “reasonably possible” to describe the chances of rain. The uncertainty judgement is whether or not to take an umbrella.
2) Pro judgement is to take umbrella and con judgement is not to take the umbrella.
3) If “uncertain” has a negative DIR, this indicates that people will judge not to take an umbrella when there is an uncertain chance of raining.
4) If “reasonably possible” has a positive DIR, this indicates that people will judge to take an umbrella when there is a reasonably possible chance of rain.
5) Overall, the expression “uncertain” leads to a negative direction of judgement, and the expression “reasonably possible” leads to a positive direction of judgement.

The computation of consistency$^{27}$ (CS) was developed for this thesis:

$$CS = \frac{\text{The number of consistent judgements}}{\text{Total number of judgements}}$$

Specifically, consistency was defined as a consistent judgement between one’s interpretation and directional judgement. To determine whether one’s directional judgement was consistent,

---

$^{27}$ The current study uses a different definition of the term “consistency” to the one used in Budescu, David V, Kareftiz and Wallsten (2003) because of the different research design.
the analysis paired each participant’s judgements in Task 3 with their initial anchor values (their interpretation of “probable”, “uncertain” and “reasonably possible” from Task 1).

Based on the formula, CS indicated the proportion of consistent judgements. The CS range should be between 0 and 1. Specifically, 0 indicated that all judgements were inconsistent, and 1 indicated that all judgements were consistent.

The expression “uncertain” can be used as an example:

1) The general rule is to take an umbrella when the chance of rain is “probable”.
2) Consistent judgement – numerical interpretation “uncertain” < “probable” and the judgement is NOT to take an umbrella, and vice versa.
3) Inconsistent judgement – numerical interpretation “uncertain” < “probable”, and the judgement is to take an umbrella and vice versa.

Table 5.3 displays the overall analytical results.

<table>
<thead>
<tr>
<th>Uncertain – Asset</th>
<th>Pro</th>
<th>Con</th>
<th>Neutral</th>
<th>Consistent Judgement</th>
<th>Total</th>
<th>Directionality</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DIR</td>
<td>χ²</td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td>CS</td>
</tr>
<tr>
<td>Native</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign</td>
<td>23</td>
<td>23</td>
<td>10</td>
<td>19</td>
<td>56</td>
<td>0.00</td>
<td>1.87</td>
</tr>
<tr>
<td>Reasonably possible – Asset</td>
<td>79</td>
<td>38</td>
<td>19</td>
<td>45</td>
<td>136</td>
<td>0.35</td>
<td>1.14</td>
</tr>
<tr>
<td>Foreign</td>
<td>29</td>
<td>20</td>
<td>7</td>
<td>13</td>
<td>56</td>
<td>0.18</td>
<td>0.57</td>
</tr>
<tr>
<td>Uncertain – Liability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasonably possible – Liability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>34</td>
<td>14</td>
<td>8</td>
<td>18</td>
<td>56</td>
<td>0.42</td>
<td>0.18</td>
</tr>
<tr>
<td>Foreign</td>
<td>46</td>
<td>18</td>
<td>13</td>
<td>16</td>
<td>77</td>
<td>0.44</td>
<td>0.18</td>
</tr>
</tbody>
</table>

* Significant at the .05 level
** Significant at the .01 level
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As shown in Table 5.3 (in the column DIR), the directionality of each uncertainty expression was relatively stable within both language groups, with “uncertain” leading to a negative judgement (DIR<0) and “reasonably possible” leading to a positive judgement (DIR>0). This result resembled prior studies on directionality (for review, see Budescu, David V, Karelitz & Wallsten 2003; Teigen & Brun 1999).

In the condition of asset recognition, participants in the foreign-language group showed relatively lower directionality biases (uncertain: DIR= 0.00; reasonably possible: DIR=0.18) than those in the native-language group (uncertain: DIR= -0.21; reasonably possible: DIR=0.35).

In contrast, in the condition of liability recognition, participants in the foreign-language group showed relatively stronger directionality biases (uncertain: DIR= -0.12; reasonably possible: DIR=0.44) than those in the native-language group (uncertain: DIR= -0.05; reasonably possible: DIR=0.42).

In the analysis of consistency, the results (Table 5.3, consistency columns) showed that participants in the native-language condition made relatively highly consistent judgements compared to those in the foreign-language condition (native CS > foreign CS). Notably, the results also indicated that the term “uncertain” leads to a higher level of consistent judgement than the term “reasonably possible” (CS_{uncertain} >CS_{reasonably possible}).

Overall, the results only partially support H3a: that at the inter-personal level, subjects in the non-native-language group would provide a marginally less biased directionality judgement.
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than those in the native-language group. Such variances, however were not statistically significant.

Specifically, the overall results were also conditioned with certain limitations. First, the inter-personal analysis on DIR revealed different patterns of DIR bias in the native-language and foreign-language groups. Participants in the foreign-language group displayed marginally less DIR bias in the context of asset recognition. In contrast, participants in the native-language group displayed marginally less DIR bias in the context of liability recognition. Notably, the largest inter-personal variance of DIR was observed in the condition of asset recognition based on “uncertain” ($\chi^2=1.87, p=0.39$). Having said that, the Chi-square ($\chi^2$) reported insignificant differences across all groups ($p>0.05$).

Second, the results on judgement consistency indicated that participants in the native-language group provided relatively more consistent judgement than those in the foreign-language group. The Chi-square ($\chi^2$) reported that only one condition – asset recognition manipulated with “uncertain” – had reported a statistically significance difference ($\chi^2=9.27, p=0.002$) between the two language groups. Responses from other three conditions did not show similar inter-personal variances ($p>0.05$).

In summary, the analysis on DIR and CS provided two main findings. First, the DIR results partially confirmed H3a: that participants in the foreign-language group provided less biased directional judgements than those in the native-language group. This conclusion is conditioned in the context of asset recognition.
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Second, the CS results indicated that participants in the foreign-language group provided less-consistent judgement than those in the native-language group. This combination indicates a potential ecological fallacy in the between-subject design (Section 3.2.1).

To clarify whether the use of a foreign language was the determining variable in reducing directional judgement bias, a further examination from the intra-personal perspective was be warranted (Section 5.3.3).

5.2.4. H4a: Uncertainty judgement based on different frames

As noted in the discussion of the fourth sub-hypothesis, this study expected that participants in the foreign-language group would make less biased risk judgements than those in the native-language group.

**H4a:** In the between-subject experiment, subjects in the non-native-language group would provide less biased risk judgements than those in the native-language group.

Task 4 was designed to test the fourth sub-hypothesis. In this task, participants were required to make an uncertainty judgement based on the modified financial-crisis problem from Costa, Foucart, Arnon, et al. (2014). The design was originally developed by Keysar, Hayakawa and An (2012) and replicated by Costa, Foucart, Arnon, et al. (2014). Below is an excerpt from Task 4:

**Gain version**

There has recently been a significant economic downturn. Without intervention, the company you manage will lose $6,000,000. You are faced with two possible courses of action.

[Sure option]

If you choose Action A, $2,000,000 will be saved.
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[Probabilistic option]
If you choose Action B, there is a 1/3 chance that $6,000,000 will be saved and a 2/3 chance that no money will be saved.

Loss version
There has recently been a significant economic downturn. Without intervention, the company you manage will lose $6,000,000. You are faced with two possible courses of action.

[Sure option]
If you choose Action A, $4,000,000 will be lost.

[Probabilistic option]
If you choose Action B, there is a 1/3 chance that no money will be lost and a 2/3 chance that $6,000,000 will be lost.

To test the hypothesis, this study provided two analyses. The first analysis followed the same procedure as in Costa, Foucart, Arnon, et al. (2014) to test the judgement biases between each frame. Specifically, this analysis aimed to test the validity of the framing effect.

The second analysis aimed to compare the inter-personal variances between native- and foreign-language groups. Similar to Keysar, Hayakawa and An (2012) and Costa, Foucart, Arnon, et al. (2014), this analysis intended to verify the existence of the FLE in uncertainty judgements.

According to the framing effect, participants should provide responses that are risk-averse in the gain context and risk-seeking in the loss context (Section 2.2.3.2.1). According to the FLE, participants in the foreign-language group should provide less biased judgements between the sure and the probabilistic options (Table 5.4).

The “gain” version gives an example:
1) It is assumed that the framing effect exists in the uncertainty judgement, and that the FLE reduces judgement biases.
2) In the native-language condition, the responses should display a significant pattern that more participants would chose the sure option than the probabilistic option.
3) In the foreign-language condition, the responses should display insignificant preferences between the sure and probabilistic options.

Table 5.4 presents the results of the analysis.

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Native language</th>
<th>Foreign language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td>Loss</td>
</tr>
<tr>
<td>Sure option (A)</td>
<td>98</td>
<td>72%</td>
</tr>
<tr>
<td>Probabilistic option (B)</td>
<td>38</td>
<td>28%</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>56</td>
</tr>
</tbody>
</table>

Chi-square $\chi^2=11.392$ p=0.001** $\chi^2=15.714$ p=0.000**

* Significant at the .05 level
** Significant at the .01 level

As shown in Table 5.4 and Figure 5.4, participants from both language groups exhibited a similar pattern. Specifically, in the gain-frame native-language group, participants chose the sure option more often than the probabilistic option (72% versus 28%), but the variance was much smaller in the loss frame (46% versus 54%). The Chi-square test showed that the
response between the sure and probability options was asymmetrical: $\chi^2(1, N=192) = 11.392, p=0.001$.

In the gain-frame foreign-language group, participants chose the sure option much more often than the probabilistic option (84% versus 16%), whereas the preference for the sure option was almost equal to that for the probabilistic option (51% versus 49%). Similarly, the Chi-square test showed that the response between the sure and probabilistic options were also asymmetrical: $\chi^2(1, N=133) = 15.714, p<0.000$. Figure 5.4 shows the preference patterns.

Collectively, these results rejected H4a: that participants in the foreign-language group would provide less biased judgements than those in the native-language group. Clearly, these results did not replicate previous findings from Keysar, Hayakawa and An (2012) and Costa, Foucart, Arnon, et al. (2014). However, the findings were similar to a study by Oganian, Korn and Heekeren (2016, p. 144), which found that the framing effects were at a “similar magnitude in [first language] L1 and [foreign language] FL conditions”.

To justify the above conclusion, this study applied another analysis, as developed by Pan and Patel (2016), to test the judgement biases between each language group. This analysis intended to verify whether participants had provided similar judgements between the native- and foreign-language groups. To achieve this, the same data was grouped into gain-frame and loss-frame responses (Table 5.5).

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Gain</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Native</td>
<td>Foreign</td>
<td>Native</td>
<td>Foreign</td>
<td></td>
</tr>
<tr>
<td>Sure option (A)</td>
<td>98</td>
<td>72%</td>
<td>47</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>Probabilistic option (B)</td>
<td>38</td>
<td>28%</td>
<td>9</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
<td>56</td>
<td>56</td>
<td>77</td>
<td></td>
</tr>
</tbody>
</table>

| Chi-square | $\chi^2=3.023$ | p=0.082 | $\chi^2=0.231$ | p=0.631 |

* Significant at the .05 level
** Significant at the .01 level
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As shown in Table 5.5, there was no statistical difference between native- and foreign-language groups in either the gain frame, $\chi^2(1, N=192) = 3.023, p=0.082$, or the loss frame, $\chi^2(1, N=133) = 0.231, p=0.631$. These results justified the previous analysis that no inter-personal variance was observed in the judgement of risk framing between participants using their native language and a foreign language.

Notably, this conclusion was based on the between-subject design. To understand how a person would make such uncertainty judgements under the influence of different languages, a within-subject design was necessary (Section 5.3.4).

5.2.5. Summary and discussion of Experiment 1

Experiment 1 was designed to test the inter-personal variance of the FLE. The test was based on the between-subject research design. The overall design consisted of four tasks. This section summarises the main findings from the four tasks.

The first task measured the between-subject (inter-personal) variances in the interpretation of uncertainty expressions. The test results supported H1a: that participants in the foreign-language group would interpret uncertainty expressions differently to those in the native-language group. These results were similar to findings by Chand, Cummings and Patel (2012) and Hu, Chand and Evans (2013).

The second task measured the between-subject (inter-personal) variance in the task of probabilistic estimations. By manipulating the value of asset/liability items, the results clearly supported H2a, reporting reduced biases in the foreign-language group. Particularly, the reduction in bias reached statistical significance in the context of asset recognition.
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The third task targeted the between-subject (inter-personal) variance in the task of directionality on asset/liability recognition. The test results partially supported H3a: that in asset recognition, participants in the foreign-language group provided less biased directionality than those in the native-language group. However, the results from liability recognition showed the opposite pattern. The consistency analysis provided that uncertainty judgements were overall more consistent in the native-language group than in the foreign-language group (native CS > foreign CS). This result corresponded with the view on the accounting decision-making quality that using one’s native language results in a higher-quality decision than using a foreign language (Holthoff, Hoos & Weissenberger 2015).

The last task replicated Costa, Foucart, Arnon, et al. (2014) study (and essentially replicated that of Keysar, et al.) to analyse the framing effect between different language groups. It contained two analyses. The first clearly showed an insignificant inter-personal variance in risk judgements, leading to the rejection of H4a. The second compared judgement variances within each frame, and arrived the same conclusion: that the foreign-language group did not provide less biased risk judgements than those in the native-language group.

The overall results from Experiment 1 provided some contradictory findings for the FLE from the between-subject (inter-personal) perspective. Such conflicting findings would suggest an inherent limitation in the between-subject research design. As mentioned earlier, the between-subject design is susceptible to the ecological fallacy, which cannot control variables such as personal attributes.
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To justify these concerns and to further explore the FLE from the intra-personal perspective, the next section provides a detailed analysis of Experiment 2.

5.3. EXPERIMENT 2: WITHIN-SUBJECT DESIGN

The previous section analysed the results of Experiment 1. As indicated in the research design (Section 4.4.1), Experiment 1 aimed to test the inter-personal variance of FLE. To achieve this, Experiment 1 took a between-subject approach.

The test results from Experiment 1 provided several contradictory findings compared with prior studies (Sections 5.2.3 and 5.2.4). It is possible that such contradictions may be due to the inherent limitations of a between-subject design, such as the ecological fallacy (Section 5.2.5). At the end of the previous section, this study asserted that an intra-personal investigation of the FLE is essential in understanding the role of language in uncertainty judgement. To explore the intra-personal aspect of the FLE, this study implements a separate experiment – Experiment 2 – that uses a within-subject research design.

The purpose of this section is to analyse the test results of Experiment 2. Experiment 2 uses the same research instruments as Experiment 1, but consists of two stages. As discussed in Section 4.4.2, each participant was required to complete the same questionnaire in both languages. This section follows a similar analytical approach as did Section 5.2 in its analysis of the data from Experiment 1.
5.3.1. H1b: interpretation of IFRS uncertainty expressions

As specified in H1b, this study expected that participants would interpret uncertainty expressions differently when using their native language versus a foreign language.

H1b: In the within-subject experiment, subjects’ interpretation of uncertainty expressions would significantly differ between when they use their native and non-native language.

Task 1 was designed to test H1b. As described in Section 4.5.2, participants were selected from two Chinese universities, and thus all were native speakers of Chinese.

To test the within-subject (intra-personal) variances, this experiment compares participants’ responses between their native and foreign language. Therefore, the overall analysis was based on the six-paired interpretations between participants’ native and foreign languages.

To support H1b, the test results should show significantly different interpretations between participants’ native and foreign languages. A normality check for six-paired interpretations suggested that responses were largely not normally distributed\(^{28}\). Therefore, the Wilcoxon Signed Rank Test (Z-score), as a nonparametric test, was appropriate for to analyse paired-sample variances (Siegel 1956). Table 5.6 gives the test results for the six-paired uncertainty expressions derived from each participant’s responses in both languages.

\(^{28}\) There are two explanations for this non-normal distribution. First, word-to-number interpretation is a cognitive process based on participants’ subjective beliefs or their knowledge of the context (Smith, Benson & Curley 1991). Therefore, each response can be subjective and inconsistent. Second, subjects could either respond randomly or fail to understand the question. This assumption, however, was not in this case because the mean responses (Table 5.6) across the six expressions did not suggest random rankings. Specifically, the mean ranking in the Chinese-language condition shows the following: Remote – Improbable – Uncertain – Reasonably possible – More likely than not – Probable. The mean ranking in the English-language condition shows the following: Improbable – Remote – Uncertain – More likely than not – Reasonably possible –Probable.
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Table 5.6 – Experiment 2: interpretation of uncertainty expressions

<table>
<thead>
<tr>
<th>Interpretation</th>
<th>N=144</th>
<th>Language</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Wilcoxon Signed Rank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Z</td>
</tr>
<tr>
<td>Uncertain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.835</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Native</td>
<td>47.01</td>
<td>19.444</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>44.70</td>
<td>22.520</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Native</td>
<td>76.25</td>
<td>18.384</td>
<td>-4.794</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>66.09</td>
<td>19.130</td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td></td>
<td>Native</td>
<td>60.04</td>
<td>19.327</td>
<td>-0.385</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>61.72</td>
<td>20.710</td>
<td></td>
</tr>
<tr>
<td>Reasonably possible</td>
<td></td>
<td>Native</td>
<td>38.38</td>
<td>27.577</td>
<td>-1.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>36.10</td>
<td>28.292</td>
<td></td>
</tr>
<tr>
<td>Improbable</td>
<td></td>
<td>Native</td>
<td>61.99</td>
<td>17.344</td>
<td>-3.259</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>53.40</td>
<td>24.268</td>
<td></td>
</tr>
<tr>
<td>More likely than not</td>
<td></td>
<td>Native</td>
<td>28.86</td>
<td>27.769</td>
<td>-4.838</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foreign</td>
<td>41.86</td>
<td>27.181</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the .05 level
** Significant at the .01 level

As shown in Table 5.6, the results showed a significant language effect on the interpretation of “probable” (Z=-4.794, p=0.00), “more likely than not” (Z=-3.259, p=0.00), and “remote” (Z=-4.838, p=0.001), and a marginally significant effect on the interpretation of “uncertain” (Z=-1.835, p=0.067). The results also showed relatively consistent interpretations on “reasonably possible” (Z=-0.385, p=0.700) and “improbable” (Z=-1.159, p=0.247) when manipulating the language versions. This pattern also appears in Figure 5.5.
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The overall result partially supports H1b: that at the intra-personal level, participants would change most of their numerical interpretations after switching to a different language. Notably, this intra-personal analysis was based on the within-subject design, which could control other potential variables from the between-subject design, as mentioned in Experiment 1 (Section 5.2.1).

5.3.2. H2b: Uncertainty judgement based on different values

As noted in the discussion of H2b, this study anticipated that participants would provide less biased probabilistic estimations in their foreign language than in their native language.

**H2b:** In the within-subject experiment, subjects’ responses on the probabilistic estimation task would be less biased in the non-native-language condition than in the native-language condition.

Task 2 was designed to test H2b. As described in Section 4.2.2, each participant was asked to provide the lowest probability threshold for the recognition of either assets or liabilities across three different values: $1,000, $100,000, and $10,000,000. As in Experiment 1, at the first stage, participants were randomly divided into four groups. At the second stage, each participant replicated the same task in another language. That is, each participant provided six probabilistic judgements (Figure 5.6). As a result, the total responses can be divided into two groups: responses based on the asset version and on the liability version.
To test the within-subject (intra-personal) variance of probabilistic estimations, the analysis was similarly to that for the Experiment 1: each participant’s Task 2 responses were paired with their anchor values\(^{29}\), which were their interpretations of the term “probable” in their native and foreign languages. The second step was to divide the pairs into three contextual groups: Small value – Anchor, Medium value – Anchor, and Large value – Anchor. Finally, the pairs were divided into native- and foreign-language conditions. Accordingly, there were 12 pairs for analysis (Table 5.7).

The statistical analysis was based on the Wilcoxon Signed Rank Test. If using a foreign language could reduce judgement biases in the probabilistic estimation, then the results should display less variance for each pair in a participant’s foreign language than in their native one.

\(^{29}\) In the current experiment (Experiment 2), each participant was required to complete two language versions; therefore, the anchor values are: one in the native language and one in the foreign language.
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Table 5.7 – Experiment 2: probabilistic estimations

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mean</th>
<th>Anchor</th>
<th>Wilcoxon Signed Rank Test</th>
<th>Z</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Value ($1000)</td>
<td>Native</td>
<td>58.68</td>
<td>78.11</td>
<td></td>
<td>-4.878</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>57.35</td>
<td>65.19</td>
<td></td>
<td>-2.353</td>
<td>.019**</td>
</tr>
<tr>
<td>Medium value ($100,000)</td>
<td>Native</td>
<td>63.94</td>
<td>78.11</td>
<td></td>
<td>-4.853</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>65.64</td>
<td>65.19</td>
<td></td>
<td>-2.49</td>
<td>.003**</td>
</tr>
<tr>
<td>Larger value ($10,000,000)</td>
<td>Native</td>
<td>66.89</td>
<td>78.11</td>
<td></td>
<td>-3.542</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>67.00</td>
<td>65.19</td>
<td></td>
<td>-1.169</td>
<td>.242</td>
</tr>
<tr>
<td><strong>Liability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Value ($1000)</td>
<td>Native</td>
<td>55.39</td>
<td>74.39</td>
<td></td>
<td>-4.550</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>57.31</td>
<td>66.99</td>
<td></td>
<td>-2.553</td>
<td>.011*</td>
</tr>
<tr>
<td>Medium value ($100,000)</td>
<td>Native</td>
<td>50.03</td>
<td>74.39</td>
<td></td>
<td>-6.232</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>51.42</td>
<td>66.99</td>
<td></td>
<td>-4.476</td>
<td>.000**</td>
</tr>
<tr>
<td>Larger value ($10,000,000)</td>
<td>Native</td>
<td>42.03</td>
<td>74.39</td>
<td></td>
<td>-6.162</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>53.10</td>
<td>66.99</td>
<td></td>
<td>-2.969</td>
<td>.003**</td>
</tr>
</tbody>
</table>

Anchor: The mean value of “probable” interpreted by subjects in the first task.
* Significant at the .05 level
** Significant at the .01 level

As shown in Table 5.7, responses from the asset version indicated a significant FLE. Specifically, the Wilcoxon signed-rank test results showed that participants’ probabilistic estimations in the native language differed significantly to their initial anchor values (Small value p=0.000; Medium value p=0.000; and Large value p=0.000).

In contrast, in the foreign-language condition, participants provided insignificant variations in their probabilistic estimations in Medium and Large value contexts (Medium value p=0.803; and Large value p=0.242). Interestingly, participants provided significant variations between their response and the anchor values (Small value p=0.0190). Notwithstanding this unexpected result, responses on Small value asset recognition still displayed a marginally reduced judgement biases in compare with the native language condition (Foreign: Z=-2.353; Native: Z=-4.878). Overall, such patterns (see also Figure 5.7) suggested that the use of a foreign language would reduce participants’ biases of probabilistic estimation in asset recognition.

However, responses from the liability version did not demonstrate a significant FLE. As shown in Table 5.7, in both language conditions, participants provided probabilities estimations on a liability significantly different to their initial anchor values (p<0.05). Although the results did
Chapter 5 – Data Analysis and Results

not yield a statistical significance for the FLE, participants still provided marginally less biased probabilistic estimation in the foreign language than in the native one (see also Figure 5.8).

![Figure 5.7](image)

Figure 5.7 – Experiment 2: graphic display of probabilistic estimation on asset context
Error bars represent 95% confidence intervals.

![Figure 5.8](image)

Figure 5.8 – Experiment 2: graphic display of probabilistic estimation on liability context
Error bars represent 95% confidence intervals.

Overall, the test results supported H2b: that the use of a foreign language would reduce bias in probabilistic estimation. This reduction reached statistically significance particularly in the context of asset recognition. The implications of this finding are discussed in Section 6.3.2.1.
5.3.3. H3b: Uncertainty judgement based on the directionality of expressions

As discussed in the H3b, this study expected that participants would provide less biased directional judgement in their foreign language than in the native one.

**H3b:** In the within-subject experiment, subjects’ responses on the directionality judgement task would be less biased in the non-native-language condition than in the native-language condition.

Task 3 was designed to test H3b. In this task, participants were asked to provide uncertainty judgements based on different expressions. Similar to Experiment 1, two expressions – “uncertain” and “reasonably possible” – were randomly manipulated in the questions. In contrast to Experiment 1, the process consisted of two stages, as each participant provided judgements in both languages.

Specifically, at the first stage, each participant provided two separated judgements in either their native or foreign language. At the second stage, participant repeated the same task but in an opposite language. That is, each participant had provided four judgements. As a result, the total responses can be divided into two groups: responses based on the asset context and responses based on the liability context (see Figure 5.9).
Since the research instruments were identical to those in Experiment 1, the variables were also computed with the same procedure (Section 5.2.3): DIR\(^{30}\) represented the direction of uncertainty expressions and CS\(^{31}\) represented the consistency of judgement. To support H3b, the analytical results would need to show significant variances in the DIR and/or CS responses between participants’ native and foreign languages.

Table 5.8 – Experiment 2: Directionality and consistency of judgement

<table>
<thead>
<tr>
<th></th>
<th>Pro</th>
<th>Con</th>
<th>Neutral</th>
<th>Consistent judgement</th>
<th>Total</th>
<th>Directionality</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uncertain – Asset</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>DIR</strong></td>
<td><strong>CS</strong></td>
</tr>
<tr>
<td>Native</td>
<td>17</td>
<td>44</td>
<td>11</td>
<td>43</td>
<td>72</td>
<td>-0.44</td>
<td>0.60</td>
</tr>
<tr>
<td>Foreign</td>
<td>19</td>
<td>38</td>
<td>15</td>
<td>40</td>
<td>72</td>
<td>-0.33</td>
<td>0.56</td>
</tr>
<tr>
<td><strong>Reasonably possible – Asset</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Z</strong></td>
<td><strong>p</strong></td>
</tr>
<tr>
<td>Native</td>
<td>50</td>
<td>10</td>
<td>12</td>
<td>20</td>
<td>72</td>
<td>0.67</td>
<td>0.28</td>
</tr>
<tr>
<td>Foreign</td>
<td>54</td>
<td>11</td>
<td>7</td>
<td>34</td>
<td>72</td>
<td>0.66</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>Uncertain – Liability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>p</strong></td>
<td><strong>z^2</strong></td>
</tr>
<tr>
<td>Native</td>
<td>23</td>
<td>30</td>
<td>19</td>
<td>38</td>
<td>72</td>
<td>-0.13</td>
<td>0.53</td>
</tr>
<tr>
<td>Foreign</td>
<td>23</td>
<td>38</td>
<td>11</td>
<td>37</td>
<td>72</td>
<td>-0.25</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>Reasonably possible – Liability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>p</strong></td>
<td><strong>z^2</strong></td>
</tr>
<tr>
<td>Native</td>
<td>51</td>
<td>11</td>
<td>10</td>
<td>23</td>
<td>72</td>
<td>0.65</td>
<td>0.32</td>
</tr>
<tr>
<td>Foreign</td>
<td>44</td>
<td>19</td>
<td>9</td>
<td>33</td>
<td>72</td>
<td>0.40</td>
<td>0.46</td>
</tr>
</tbody>
</table>

* Significant at the .05 level  
**Significant at the .01 level

\(^{30}\) In the analysis of DIR, this study applied the Wilcoxon Signed Rank Test.  
\(^{31}\) In the analysis of CS, this study applied the McNemar Test on paired nominal variables at the individual level. The McNemar Test could indicate whether participants had made different uncertainty judgements after switching between their native and foreign language.
As shown in Table 5.8 (DIR column), the mean DIR value for the target expressions showed a clear pattern in both language conditions, with “uncertain” leading to a negative judgement (DIR<0) and “reasonably possible” leading to a positive judgement (DIR>0). This pattern resembled the results from Experiment 1. In short, it confirmed the inherent directions of both expressions in affecting participants’ judgment.

In the condition of asset recognition, participants provided less directionality bias in their foreign language than in their native language (uncertain: |DIR_{Foreign}| < |DIR_{Native}|; reasonably possible: |DIR_{Foreign}| < |DIR_{Native}|). Such variances, however, did not reach statistically significance (Uncertain \( p=0.76 \); Reasonably possible \( p=0.30 \)).

In the condition of liability recognition, the DIR results were rather mixed. Participants judged “uncertain” with more bias in their foreign language than in their native language (uncertain: |DIR_{Foreign}| > |DIR_{Native}|); while the reverse was the case for “reasonably possible” (reasonably possible: |DIR_{Foreign}| < |DIR_{Native}|). Similar to the asset condition, the differences of DIR on liability recognition were not statistically significant (Uncertain \( p=0.29 \); Reasonably possible \( p=0.45 \)).

In the analysis of consistency (CS), the results showed two interesting patterns (Table 5.8, consistency column). First, judgements based on the expression “uncertain” had an overall higher level of consistency than those based on the expression “reasonably possible” (\( CS_{uncertain} > CS_{reasonably\ possible} \)). Specifically, more than half the participants provided consistent judgement of asset or liability (\( CS_{uncertain}>0.5 \)) recognition when the expression was manipulated by “uncertain”, while fewer than half provided consistent judgement.
When the expression was manipulated by “reasonably possible”,\( CS_{\text{reasonably possible}} < 0.5 \), this pattern, which was similar to the results from Experiment 1, was observed in both language conditions. Second, participants provided more consistent judgements in their native language when the expression was manipulated by “uncertain” (native \( CS_{\text{uncertain}} > \) foreign \( CS_{\text{uncertain}} \)), and less consistent judgements in their native language when the expressions was manipulated by “reasonably possible” (native \( CS_{\text{reasonably possible}} < \) foreign \( CS_{\text{reasonably possible}} \)). This pattern was observed in the conditions of both asset and liability recognition.

Notably, the McNemar Test found that only one task – asset recognition manipulated with “reasonably possible” – showed a statistical significance (\( \chi^2 = 4.69, p = 0.03 \)) between participants’ native and foreign languages, while analyses from the other three contexts indicated no statistical variance.

Overall, the test results only partially supported H3b: that at the intra-personal level, participants would provide marginally less biased directional judgement in their foreign language when the context was asset recognition. However, such reduction on judgement biases was not statistically significant.

These findings resembled those from Experiment 1 (Section 5.2.3). However, there were few exceptions. First, Experiment 2 showed that, at the intra-personal level, participants provided less biased directional judgements in their foreign language. These included judgements made based on both the asset and liability contexts (except the context of liability with “uncertain”).
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Second, the CS results indicated that “reasonably possible” was judged more consistently than “uncertain” in participants’ foreign language. This result contradicted the findings of Experiment 1 (Section 5.2.3).

5.3.4. H4b: Uncertainty judgement based on different frames

As noted in the discussion of H4b, this study anticipated that participants would reduce judgement biases when the framing language was switched from the native to the foreign language.

**H4b.** In the within-subject experiment, subjects’ responses for the risk judgement task would be less biased in the non-native-language condition than in the native-language condition.

Task 4 was designed to test H4b. In this task, participants were required to make uncertainty judgements based on the modified financial-crisis problem, as in Experiment 1 (Section 5.2.4). In the first stage, each participant provided a judgement in either their native or foreign language. In the second stage, participants repeated the same task but in the other language, ultimately providing two judgements in two languages (Figure 5.10). As a result, the total responses can be divided into two groups: responses based on the gain frame and responses based on the loss frame.
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The analysis followed the same procedure as in Experiment 1. First, it tested the judgement biases between each frame. Second, it compared the intra-personal variance between the use of the native and foreign languages. If using a foreign language reduced participants’ judgement biases, the test results should show their responses to be less risk-averse in the gain context and/or less risk-seeking in the loss context. Table 5.9 presents the overall analytical results.

Table 5.9 – Experiment 2: judgement between frames

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Native language</th>
<th></th>
<th>Foreign language</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td>Loss</td>
<td>Gain</td>
<td>Loss</td>
</tr>
<tr>
<td>Sure option (A)</td>
<td>47</td>
<td>65%</td>
<td>30</td>
<td>42%</td>
</tr>
<tr>
<td>Probabilistic option (B)</td>
<td>25</td>
<td>35%</td>
<td>42</td>
<td>58%</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Chi-square</td>
<td>$\chi^2=8.067$</td>
<td>$p=0.005^*$</td>
<td>$\chi^2=10.366$</td>
<td>$p=0.001^*$</td>
</tr>
</tbody>
</table>

* Significant at the .05 level
** Significant at the .01 level
Chapter 5 – Data Analysis and Results

As shown in Table 5.9, responses based on different framing versions exhibited significant framing biases in both language conditions. In the native-language condition, participants allocated the “gain” frame task chose the sure option more often than the probabilistic option (65% versus 35%), while the opposite pattern was observed for participants allocated the “loss” frame task (42% versus 58%). The Chi-square test affirmed that the variance between two options was statistically significant, $\chi^2(1, N=144) = 8.076, p=0.005$.

Similar results were also observed in the foreign-language condition, in which participants chose the sure option much more often than the probabilistic option (72% versus 28%), while the preference for the sure option (see Section 4.2.4) was marginally less than for the probabilistic one (46% versus 54%). Similarly, the Chi-square test also revealed the significant variances of the response, $\chi^2(1, N=144) = 10.366, p=0.001$. Figure 5.11 shows the preference patterns between the gain and loss frames.

Collectively, these results fail to support H4b, as they show a similar magnitude for the framing effect in the native and foreign language condition (as with Experiment 1).
To justify the findings, this study conducted another analysis by grouping the responses into the gain frame and the loss frame. Similar to Experiment 1 (Section 5.2.4), this analysis would provide an insight into the intra-personal variance when judgements were made in different languages. Table 5.10 outlines the analytical results.

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Gain</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Native</td>
<td>Foreign</td>
</tr>
<tr>
<td>Sure option (A)</td>
<td>47</td>
<td>65.3%</td>
</tr>
<tr>
<td>Probabilistic option (B)</td>
<td>25</td>
<td>34.7%</td>
</tr>
</tbody>
</table>

* Significant at the .05 level
** Significant at the .01 level

As shown in Table 5.10, the McNemar test results suggested no statically significant differences between participants’ native and foreign languages in either the gain frame (p=0.383) or the loss frame (p=0.607). This test reinforced the conclusion that participants’ judgements on risk frames were not significantly affected by the use of their native language versus a foreign language.

Based on this analysis, the overall results failed to support H4b. The results suggested that the FLE was not observed in the task of framing judgement. Based on the observation, the data even exhibited an incremental judgement bias when participants used a foreign language under the gain frame. Specifically, in the foreign-language condition the preference gap between the sure and probabilistic options (72.2% versus 27.8%) was larger than in the native-language condition (65.3% versus 34.7%).

Notably, Experiment 2 was based on a within-subject research design. The analysis of the within-subject experiment provided an intra-personal perspective of how language would
affect participants’ judgement biases, as the only variable to change was the language they used. The following section provides a summary of Experiment 2.

### 5.3.5. Summary and discussion of Experiment 2

The purpose of Experiment 2 was to verify the FLE from the intra-personal perspective. It was designed to respond to the findings of Experiment 1 and to compensate for some of the limitations of Experiment 1.

The research instruments of Experiment 2 were identical to the Experiment 1, although Experiment 2 was conducted in two steps, as each participant was asked to complete the questionnaire in both language conditions. The first test analysed the intra-personal variance in the interpretation of uncertainty expressions. The test results partially supported H1b: that within certain conditions, participants would change their word-to-number interpretations after switching to a different language. Combined with the findings from Experiment 1, the current study can confirm the existence of the FLE in the interpretation of IFRS uncertainty expressions, thereby supporting H1: that there is a foreign-language effect in the interpretation of uncertainty expressions in accounting.

The second test measured the intra-personal variance in probabilistic estimations. Similar to Experiment 1, participants provided probabilistic estimations based on manipulated asset/liability contexts. As the experiment used a within-subject design, the same participants conducted the identical task in another language. The test results supported H2b: that using a foreign language would reduce biases in probabilistic estimations. This variance reached statistical significance in the condition of asset recognition (with an exception in the Small value context). Combined with the findings of Experiment 1, the current experiment, which
supported the same conclusion, thereby supports H2: that there is a foreign-language effect in the process of uncertainty judgement on probabilistic estimations.

The third test evaluated the directionality of uncertainty judgement between participants’ native and foreign languages. The results reported an overall reduction of bias in directional judgement in participants’ foreign language. Combined with the findings from Experiment 1, there was sufficient evidence to support the existence of the FLE in the process of uncertainty judgement on directionality, thereby marginally supporting H3: that there is a foreign-language effect in the process of uncertainty judgement on directionality.

The last test assessed the framing biases between participants’ native and foreign languages. In contrast to most prior studies, this experiment was based on the within-subject design, thereby aiming to assess intra-personal variances. The task material was identical to Experiment 1. The test results revealed no significant FLE in reducing participants’ judgement biases. Accordingly, the overall result failed to support H4b. Combined with the findings from Experiment 1, the overall results did not support H4: that there is a foreign-language effect in the process of uncertainty judgement on risk framing.

**5.4. SUMMARY**

The current research conducted two experiments to investigate the FLE from the inter-personal and intra-personal perspectives. Experiment 1 focused on the inter-personal aspect by using a between-subject design. Experiment 2 explored intra-personal variances by using a within-subject design. Both experiments applied the same research instruments; therefore the results are comparable.
Four tasks were included in each experiment. Task 1 tested the interpretation of uncertainty expression. Task 2 tested the judgement of probabilistic estimations. Task 3 assessed the judgement of directionality. Task 4 replicated Keysar, Hayakawa and An (2012) test of the framing effect and assessed the judgement of risk framing. Collectively, these tasks targeted two major issues: the FLE on the interpretation of uncertainty expressions and the FLE on uncertainty judgement. Specifically, the research designs of between-subject (Experiment 1) and within-subject (Experiment 2) provided insights into both the inter-personal and intra-personal aspects of the FLE.

The test results confirmed the hypothesis of FLE on the interpretation of uncertainty expression. The most interesting outcome, however, emerged from the tests on uncertainty judgement, which revealed a unique aspect of the FLE that differed from the original FLE proposed by Keysar, Hayakawa and An (2012). The discussion and implications of the results and the limitations of this research are presented in Chapter 6.
CHAPTER 6 – SUMMARY AND CONCLUSION

6.1. INTRODUCTION

Chapter 5 provided statistical analyses of two experiments. The first experiment used a between-subject design to test the inter-personal variance of FLE. The second experiment applied a within-subject design to assess the intra-personal variance of FLE. The overall results reveal several important findings.

Continuing from Chapter 5, this chapter summarises the overall research project. Then it discusses the overall findings from both experiments and outlines two major research contributions from the theoretical and methodological perspectives, followed by the directions for future research that extend beyond the context of the current thesis. The last section discusses research limitations from two aspects.

6.2. SUMMARY

This study aims to test the existence of the FLE – that using a foreign language would reduce one’s judgement biases – in the accounting context. This proposition was first raised by a group of Chicago psychologists in their paper “The foreign-language effect: Thinking in a foreign tongue reduces decision biases” (Keysar, Hayakawa & An 2012). Since then, the concept of the FLE has triggered critical thinking in behavioural psychology (Corey et al. 2017; Costa, Vives & Corey 2017; Hayakawa et al. 2017), international business (Brannen, Piekkari & Tietze 2014; Hadjichristidis, Geipel & Surian 2017; Volk, Köhler & Pudelko 2014), and, more recently, accounting (Pan & Patel 2016). Most scholars have acknowledged the importance of the FLE to cross-lingual research; this is one motivation for the current research project.
Chapter 6 – Summary and Conclusion

The current research extends the FLE investigation to a specific accounting context: the interpretation and judgement of uncertainty expressions. This context reflects a lengthy debate in the cross-lingual accounting research, where scholars have tried to apply a cultural dimension (Doupnik & Richter 2004), educational background (Chand, Cummings & Patel 2012; Hu, Chand & Evans 2013), and translation issues (Evans, L, Baskerville & Nara 2015; Holthoff, Hoos & Weissenberger 2015) to explain why people would provide different interpretations or judgements to different uncertainty expressions.

As discussed in the literature review, most cross-lingual accounting studies focus on inter-personal variance by using a between-subject design (Sections 2.4.5 and 2.5.4). As addressed by Robinson (1950) and Freedman (2001), between-subject designs suffer an inherent limitation: the ecological fallacy.

Until a recent attempt by Pan and Patel (2016), the within-subject (intra-personal) approach to the cross-lingual research had been rarely discussed in the accounting literature. The resulting lack of empirical evidence provides another motivation for the current research.

In responding to the lack of within-subject accounting research on language, the current study developed two experiments based on different research designs: a between-subject design in Experiment 1 to test inter-personal variance, and a within-subject design in Experiment 2 to assess intra-personal variance. Both experiments employ the same research instruments, which are designed to test two FLE issues: the FLE on the interpretation of uncertainty expressions and on uncertainty judgement based on uncertainty expressions. Uncertainty expressions were
Chapter 6 – Summary and Conclusion

chosen for study due to their subjective nature in accounting and the potential disconnections between the interpretation and the judgement of uncertainty expressions.

Specifically, this thesis addresses the two major modes of uncertainty expressions in describing the uncertainty information: verbal probability (expressed as words or phrases) and numerical probability (expressed as numbers). Reporting uncertainty information in accounting often relies on the use of verbal probability, as shown in the texts of accounting standards and financial reports. However, the use of verbal probabilities in accounting information creates certain issues because of the subjectivity in the process of interpretation and judgement that they introduce.

Furthermore, research on accounting uncertainty expressions has yet to agree on the differences between interpretation and judgement. Early studies referred to word-to-number conversion as the “interpretation” (Chesley 1986; Doupnik & Richter 2003; Laswad & Mak 1997), while some recent studies have perceived it as the “judgement” (Chand, Cummings & Patel 2012; Hu, Chand & Evans 2013). This suggests that people’s reactions (e.g., feeling) towards uncertainties will vary if the uncertainty information is presented in different languages. This, in turn, could lead to different patterns of judgement behaviour. Investigating the interpretation and judgement of uncertainty expressions would provide an avenue to extend the FLE research to accounting.

The current study reveals two sets of findings in relation to the FLE. First, the results support the hypothesis that the FLE exists in the interpretation of uncertainty expressions. Based on the analyses from both experiments, this study finds that people provide word-to-number conversion of uncertainty expressions differently in their non-native language than in their
native language. This result strengthens the assumption from prior cross-lingual accounting literature that language affects the numerical meanings of verbal probabilities (Doupnik & Riccio 2006; Doupnik & Richter 2003, 2004). It also addresses Evans, Baskerville, and Nara’s (2015) concerns about the problems of equivalent translation in IFRS.

Second, the results conditionally support the hypotheses of the FLE on uncertainty judgement. Specifically, when the uncertainty expressions were related to a positive economic outcome (i.e., asset recognition), the FLE on uncertainty judgement was significant. In contrast, when the uncertainty expressions were related to a negative economic outcome (i.e., liability recognition), the FLE on uncertainty judgement was insignificant.

The following sections discuss the findings on the interpretation and judgement of uncertainty expressions separately from three perspectives: (1) results compared with expected outcome; (2) results compared with other studies; and (3) explanation of unexpected results (if any).

### 6.3. RESEARCH FINDINGS

This section aims to summarise the research findings from two experiments: Experiment 1, based on a between-subject design, and Experiment 2, based on a within-subject design. It also intends to answer the research questions outlined in the first chapter (Section 1.3). The two major research questions were:

**RQ1:** How does the use of non-native language affect the interpretation of uncertainty expressions in accounting?

**RQ2:** How does the use of non-native language affect the judgement of uncertainty expressions in accounting?
Based on the research findings, this section further proposes a conditional FLE in accounting judgement. This conditional FLE lies in the emotional context of the accounting information, suggesting an inverse relationship between the emotional context and the significance of the FLE on accounting judgement.

6.3.1. Interpretation of uncertainty expressions

This section intends to answer the first research question: whether the FLE affects the interpretation of uncertainty expressions. This study took the word-to-number conversion approach to measure variances in interpretations (e.g., likely: ___ %). The analyses were based on six in-context uncertainty expressions taken from IFRS and IAS, resembling some common interpretation practices in accounting (Table 4.2).

The results of Experiment 1 showed significant between-subject (inter-personal) variances in word-to-number conversion ($p<0.05$), with only one exception, the phrase “reasonably possible” ($p=0.962$). These results corresponded to prior between-subject studies with the same Chinese-English language settings (e.g., Chand, Cummings & Patel 2012; Hu, Chand & Evans 2013). They were also similar to between-subject studies in other language settings (e.g., Davidson, Ronald A. & Chrisman 1994; Doupnik & Riccio 2006; Doupnik & Richter 2003, 2004).

As addressed in earlier sections, because of the between-subject design, the observed variance in word-to-number conversion may also be explained by other variables such as culture, educational background, or English language ability (Section 5.2.1). Moreover, the test results may also be subject to the ecological fallacy (Robinson 1950), which would impair the concept of the FLE. This has been the major concern in the analytical process of the data from Experiment 1. To address this concern, the current study also integrated a within-subject
experiment (Experiment 2). The results of Experiment 2 revealed significant within-subject (intra-personal) variances on three of the uncertainty expressions ($p<0.05$). Notably, the overall responses of participants’ interpretations on uncertainty expressions was more consistent in Experiment 2 (within-subject) than in Experiment 1 (between-subject).

6.3.2. Judgement of uncertainty expressions

Continuing from the last section, this section aims to answer the second research question: whether the FLE affects the judgement of uncertainty expressions. To answer this question, this study composed three separate tests from the aspects of: (1) probabilistic estimation (H2); (2) directionality of uncertainty expressions (H3); and (3) the framing effect on risk (H4).

6.3.2.1. FLE on probabilistic estimation

The test on probabilistic estimation (H2) aimed to understand whether using a non-native language would reduce a person’s sensitivity towards economic consequences, thereby providing a less biased probabilistic estimation. Based on the analyses from both experiments, this study revealed two interesting findings. The first finding concerned the context of asset recognition. In both experiments, participants exhibited significant judgement biases when performing the task in their native language. Specifically, their probabilistic estimations changed significantly when the value of accounting items changed. As expected, such judgement biases could be explained by the effect of emotionality, as a large-value item could arouse more emotional reaction in judgement (Section 2.5.3.4).

In contrast, such biases were lower in the condition of participants using their non-native language. The data suggested that participants’ responses varied less significantly in probabilistic estimation when the task was presented in their non-native language. Notably,
this reduction of biases was observed across all three value contexts (asset items valued at $1,000, $100,000, and $10,000,000). As expected, these results correlated with the main proposition of the FLE: that the use of a non-native language increases emotional distance, thereby reducing judgement biases (Keysar, Hayakawa & An 2012).

The second finding concerned the context of liability recognition. Unexpectedly, both experiments had provided significant variations in probabilistic estimations for both language conditions. Specifically, participants had changed their probabilistic estimations in responding to the changes of liability value (liability items valued at $1,000, $100,000, and $10,000,000). These changes were statistically significant in both languages. In another words, the FLE almost disappeared\textsuperscript{32} when the judgement was related to negative economic consequences (e.g., liability recognition).

There is one possible explanation for the conflicting results. The consequence of recording liability would lead to a negative economic impact. The possibility of a negative economic impact often stimulates a much stronger emotional effect than the possibility of a positive economic impact (Kahneman 2011). For example, a person’s feelings about losing $10,000 would be much stronger than about gaining $10,000. In other words, a negative outcome results in a far stronger emotional reaction than the same magnitude of positive outcome. This behaviour has been referred as loss aversion (Tversky & Kahneman 1991). Accordingly, participants in the foreign-language condition would still show high sensitivity in the task on liability recognition.

\textsuperscript{32} Having said that, the judgement biases in the non-native-language condition were still marginally smaller than the ones in the native-language condition.
6.3.2.2. FLE on directionality

The test of directionality (H3) was inspired by the directionality theory from behavioural psychology (Budescu, David V, Karelitz & Wallsten 2003; Teigen & Brun 1995, 1999). Directionality theory suggests that verbal expressions often carry directional meanings that may bias people’s judgement (Section 2.4.4.1).

The expected outcome was that a reduced directional bias in the judgement of uncertainty expressions would be apparent when participants were using a non-native language. This assumption was based on research that suggested that the FLE would prompt people to think more deliberately when using their non-native language (Section 2.2.3.2.2). The test results, however, revealed some interesting findings. First, both experiments revealed significant directionality between the expressions “uncertain” and “reasonably possible”. Specifically, “uncertain” led to a negative judgement, and “reasonably possible” led to a positive judgement (Tables 5.3 and 5.8). This result agrees with the prior literature on directionality. Second, both experiments reported insignificant variations between participants’ use of their native and non-native languages. Although the variances were insignificant, there were still patterns to support H3: that the FLE would reduce biases in the directional judgement task.

In the context of asset recognition, there was a clear reduction in the biases of directional judgement when participants were using a non-native language. The consistency analysis showed that certain expressions were significantly affected by the language (“uncertain” in Experiment 1 and “reasonably possible” in Experiment 2).

In the context of liability recognition, the results showed an overall reduction of directionality bias, yet the consistency analysis yielded no statistical significance. This would indicate that
participants were less affected by the use of native versus non-native language when the task was related to liability recognition.

This task showed a certain resemblance to the previous task of probabilistic estimation. It appeared that the FLE on directionality judgement was also conditioned by the context. Specifically, the FLE was stronger in the context of economic gain (asset recognition) than economic loss (liability recognition).

To justify the differences in the FLE in the gain and loss contexts, the next task implemented the framing-effect theory to test the judgement biases between gain and loss frames.

6.3.2.3. FLE on risk frames

The design of this test was taken from Keysar, Hayakawa and An (2012) article on the FLE. The applied testing material was based on Costa, Foucart, Arnon, et al. (2014) financial-crisis case. The analytical process was identical to these studies. The major difference was the research procedure. The current study applied both between-subject and within-subject research designs. In particular, the within-subject design was able to analyse intra-personal variance, which had been neglected in prior studies.

According to the fourth hypothesis (H4), the expected outcome was that framing biases would be significantly smaller when participants were using their non-native language, as shown by their choosing equally between the sure and probabilistic options in the non-native language condition.
Based on the same analytical procedure as in Keysar, Hayakawa and An (2012) and Costa, Foucart, Arnon, et al. (2014), the test results in both experiments failed to justify the existence of framing biases in participants’ native language. Importantly, the overall results also failed to support H4: that the FLE would reduce judgement biases for different frames.

Interestingly, the current study did observe strongly risk-averse behaviour in the context of the gain frame, but did not observe any risk-seeking behaviour in the context of the loss frame. These patterns were almost identical between participants’ native and non-native languages. In fact, such findings were similar to Oganian, Korn and Heekeren (2016). Although Costa, Foucart, Arnon, et al. (2014, p. 241) also reported similar judgement behaviour, their study still supported the FLE by arguing that the “experiment in the foreign language showed a qualitatively similar pattern but with a different magnitude”.

In fact, the current findings of no risk-seeking behaviour had been indirectly reported in Keysar, Hayakawa and An (2012), under the English-Japanese and English-Korean language conditions, as well as in Costa, Foucart, Arnon, et al. (2014), under the English-Hebrew language condition. However, these studies did not fully address this issue. Notably, both studies were based on a between-subject design, indicating the potential for the presence of the ecological fallacy.

Overall, the current study failed to support H4: that no FLE was observed in the process of uncertainty judgement on risk framing.
6.3.3. Answers to research questions

6.3.3.1. Answer to RQ1
This study provided a comprehensive investigation of the first research question: whether the FLE affects the interpretation of uncertainty expressions from both between-subject and within-subject perspectives. The overall results suggested that the use of a non-native language would lead participants to make different numerical interpretations of verbal probabilities.

6.3.3.2. Answer to RQ2
To address the second research question, that the FLE affects the judgement of uncertainty expressions, this study developed three separate tasks to measure uncertainty judgement. Combining the test results on the three tasks (probabilistic estimation, directionality, and risk framing) suggested an interesting conclusion: when participants faced uncertainty judgement that led to a negative economic outcome (e.g., liability recognition and loss frame), the FLE was relatively weak and insignificant. In contrast, when the uncertainty judgement led to a positive economic outcome (e.g., asset recognition), the FLE was strong.

Considering the psycholinguistic theory on linguistic relativism, the best explanation for the significance of the FLE in uncertainty judgement would be the emotional difference between the negative and positive outcomes (Section 2.2.3.1). Based on these findings, this thesis provided the following propositions to answer RQ2:

The FLE on the judgement of uncertainty expressions has an inverse relationship with the context of the uncertainty information:

1) The weaker the emotionality in context, the stronger the FLE in reducing accounting judgement biases.
2) The stronger the emotionality in context, the weaker the FLE in reducing accounting judgement biases.
6.4. CONTRIBUTIONS

As addressed in the previous section, this study is unique in extending the FLE research to the accounting context. The comprehensive research design also provides the insights of how language is involved in the process of interpretation and judgement of uncertainty expressions.

In overall, this study contributes to the cross-lingual accounting research both theoretically and methodologically. Tables 6.1 and 6.2 summarise its contributions, which are discussed in detail in the following sections.

<table>
<thead>
<tr>
<th>No.</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC.1</td>
<td>FLE in the accounting context</td>
</tr>
<tr>
<td>TC.2</td>
<td>Linguistic Relativity in accounting</td>
</tr>
<tr>
<td>TC.3</td>
<td>Dual-Process Systems in accounting</td>
</tr>
<tr>
<td>TC.4</td>
<td>Directionality in accounting uncertainty expressions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC.1</td>
<td>Within- and between-subject design</td>
</tr>
<tr>
<td>MC.2</td>
<td>Within-subject design for interpretation</td>
</tr>
<tr>
<td>MC.3</td>
<td>Within-subject design for judgement</td>
</tr>
</tbody>
</table>

6.4.1. Theoretical contributions

As cross-discipline research in psychological and linguistic issues in accounting, this study has contributed to the development of accounting theory in four ways.

First, the current study contributes by filling a gap in the cross-lingual accounting research by highlighting that the FLE concept has not yet been fully covered in the existing accounting literature. Arguably, the only application of the FLE in accounting research was made by Pan and Patel (2016) in the Journal of Business Ethics. Adding further evidence to Pan and Patel’s (2016) findings, this thesis has demonstrated that foreign language matters in the process of uncertainty accounting information. Specifically, individuals’ interpretation of uncertainty
expressions and the relevant uncertainty judgement have been shown to differ between when they are using their native language versus a non-native language. An important contribution of this investigation, therefore, lies in increasing awareness about language as a vital variable in judgement and decision-making accounting studies.

Second, this thesis has emphasised the linguistic relativity in determining one’s perception and judgement of uncertainty information. The concept of linguistic relativity was introduced to accounting in the late 1970s by Riahi-Belkaoui (1978). While Riahi-Belkaoui had systematically discussed linguistic relativity using empirical findings (e.g., Riahi-Belkaoui 1980), future explorations have been rare. For example, there has been a lack of investigation from the perspective of native versus foreign language in accounting judgement. Instead, subsequent studies have focused more on cultural relativity in cross-lingual accounting studies (e.g., Bagranoff, Houghton & Hronsky 1994; Doupnik & Richter 2004). Consider the relationship between linguistic and cultural relativity, Doupnik and Richter (2003, p. 18) wrote that “language and culture are interrelated”, while linguistic relativism relates to role of language in shaping one’s worldview, culture relativism links to the shared experience of the individuals that is affected by language. On the other hand, the major difference between linguistic and cultural relativity lies on the intra-personal and inter-personal views of individuals’ behaviour. As highlighted in Section 2.2.3.1, linguistic relativism can help explain the intra-personal (within-subject) variances on emotion, cognition, and memory that are relevant to individuals’ judgment and decision-making. By exploring the FLE framework, this thesis has shown that linguistic relativity is valid and vital to the understanding of accounting judgement.
Third, this study generates knowledge about Dual-Process Systems in the cross-lingual accounting research. Prior accounting judgement studies had neither considered the significance of the Dual-Process Systems in individual’s information processing\(^{33}\) nor tested the validity of this theory in the accounting context. Indeed, several accounting studies had chosen other cognitive theories, such as cognitive styles (Gul 1984; Patel & Day 1996) and comprehensive thinking ability (Butler & Ghosh 2015) to investigate the issue of accounting judgement. However, none of these theories, including the Dual-Process Systems theory, had been applied in the cross-lingual conditions. Clearly, the Dual-Process Systems theory deserves more attention in the research on accounting judgement because it combines theories from psychology (i.e., emotion with heuristics) and linguistics (i.e., native language with emotion). A contribution of the current study, therefore, lies in increasing the attention paid to the usefulness of the Dual-Process Systems theory in researching cross-lingual accounting judgement.

Another contribution of this thesis lies in introducing the directionality of verbal probabilities. It shows that verbal probabilities can carry directional meanings either positively or negatively, which leads to individuals’ judgement being directionally biased. The directionality of verbal expressions has been testified in behavioural psychology (Budescu, David V, Karellitz & Wallsten 2003; Teigen & Brun 1999), yet it has received only limited attention from accounting scholars. Given that most accounting uncertainty expressions are expressed in words (as opposed to numbers), the issue of directionality needs further exploration. This would not only improve the accuracy of IFRS pronouncements, but also benefit the users of accounting information in making optimal judgements when faced with uncertainty expressions. Thus, this

\(^{33}\) However, this concept had been raised in the late 1970s (for review, see Schneider & Shiffrin 1977)
research makes a contribution by expanding the knowledge of directionality in accounting uncertainty expressions.

6.4.2. Methodological contributions

The first methodological contribution is the combination of two separate experiments: one based on a between-subject design to test inter-personal variances, and the other based on a within-subject design to test intra-personal variances. The implementation of this methodology could help test the FLE propositions, particularly its main proposition that when thinking in a non-native language, individuals would make a less biased uncertainty judgement than when thinking in their native language.

In other words, the FLE should represent an impact at the within-subject (intra-personal) level because it suggests a reduction of judgement biases within one person. However, most FLE studies, including the original work by Keysar, Hayakawa and An (2012) chose a between-subject design.

In line with Robinson’s (1950) discussion on the ecological fallacy, the present study demonstrates that ecological (group) and individual correlations are not necessarily equal (also see, Charness, Gneezy & Kuhn 2012). Such findings indirectly justified the current study’s methodological contribution by adding a within-subject experiment (Experiment 2) to the existing between-subject experiment (Experiment 1).

The second methodological contribution lies in the within-subject design for interpreting uncertainty expressions. As addressed in Section 2.4.5, most accounting studies on uncertainty expressions have followed a between-subject design approach. A between-subject design,
however, only leads to analysis at the inter-personal level. To test the language effect at the intra-personal level, this study contributes by implementing a within-subject experiment. Importantly, by adding a within-subject experiment to the overall test of the FLE on interpretation, this method also allows a comparable analysis of subsequent tests of the FLE on uncertainty judgement.

The third methodological contribution is the implementation of within-subject design for research on accounting judgement. Arguably, only very few accounting studies have adopted a within-subject design. The examples include Nelson and Kinney Jr (1997) within-subject study on the effect of uncertainty expressions on reporting judgement, Butler and Ghosh (2015) within-subject experiment on managerial accounting judgement, and Pan and Patel (2016) within-subject test of the FLE on aggressive financial reporting.

The within-subject design, in contrast, has been extensively applied in studies of the psychology of judgement. These include Beyth-Marom (1982) measurement of the intra-personal variance of word-to-number conversion, Einhorn and Hogarth (1985) investigation of the intra-personal variance of uncertainty judgement, Miller and Keenan (2011) examination of the FLE on working memory, and Juanchich and Sirota (2013) examination of the effect of politeness on risk communication.

Although prior studies have demonstrated that people can make inconsistent uncertainty judgements due to various factors (e.g., culture and education), the methodology of testing the FLE on uncertainty accounting judgement has rarely been applied. The current thesis is, to the author’s knowledge, the first to consider three aspects of uncertainty judgement in relation to uncertainty expressions: probabilistic estimation, directionality, and risk framing. Thus, this
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Research provides a unique methodological contribution to the research into accounting judgement by advancing the understanding of the impact of the modes of uncertainty expression (word versus number) and the use of language (native versus non-native).

Beyond the contributions described above, this study also provides several implications for accounting research. The next section discusses the major implications from fours aspects: standardisation of verbal expressions of uncertainty, multilingual corporate governance, multilingual accounting education, and multilingual consumer behaviour.

**6.5. IMPLICATIONS FOR FUTURE RESEARCH**

As discussed in Section 6.4, the current thesis provides contributions to both theoretical and methodological aspects of research into accounting language. The theoretical contributions lie in generating knowledge about psychological and linguistic theories in the accounting context. The methodological contributions lie in combining a within-subject design with a between-subject design, thereby interpreting the FLE at both the intra-personal and inter-personal levels.

The research findings support the above contributions. For example, this study finds inconsistent results between Experiment 1 and Experiment 2 for the task of probabilistic estimation (Section 6.3.2.1.). In fact, several important questions have been brought to the surface as a result of this research.

<table>
<thead>
<tr>
<th>No.</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI.1</td>
<td>Standardising verbal expressions of uncertainty</td>
</tr>
<tr>
<td>RI.2</td>
<td>Multilingual corporate governance</td>
</tr>
<tr>
<td>RI.3</td>
<td>Multilingual accounting education</td>
</tr>
<tr>
<td>RI.4</td>
<td>Multilingual consumer behaviour</td>
</tr>
</tbody>
</table>
This section discusses the implications of the current thesis in four areas (Table 6.3): uncertainty expressions, uncertainty judgement, language proficiency, and cross-lingual consumer behaviour.

6.5.1. Standardising verbal expressions of uncertainty

6.5.1.1. Objective uncertainty
As discussed in Section 2.4.2, the uncertainty factor can be either objective or subjective. Objective uncertainty can be attributed to the lack of exact knowledge of a measurand’s value. Subjective uncertainty can be attributed to personal interpretations of uncertainty.

A common approach to disclosing such information is to include the error factors or confidence intervals in the communication (e.g., JCGM 2010); for example:

\[
\text{Best estimated value } \pm \text{ Errors}
\]

In the context of accounting, when uncertainty issues are objective, such as measuring the fair value of an asset item, the valuation process could include error factors that are disclosed using a value range.

One advantage of such disclosure is that adding the error factors would not affect the mean value of the item, and thus would not affect the reporting figures in the financial statement. On the other hand, providing the error factors could alert information users of the uncertainty issues and assist information preparers in monitoring the accuracy of the error factors.
To illustrate this, if the best estimated fair value of an asset item is $1,000 and the error range is $50, the overall mean value would remain $1,000, while the additional disclosure of this item could be expressed as follows:

\[ \$1,000 \pm 50 \]

A disclosure in this form would allow information users to make judgements based on an understanding of the level of uncertainty (e.g., the error range). The disclosure of such information would also allow information preparers to continually monitor the level of uncertainty, thereby promoting the accuracy of the report.

6.6.1.2. Subjective uncertainty
When uncertainty is subjective, the preciseness of the uncertainty information is determined by the best judgement of the information preparers. In this case, a plausible approach would be to choose the least vague verbal probability to describe the uncertainty information, which should yield the least variations of numerical interpretation.

For example, a person may intend to deliver subjective uncertainty information, and the uncertainty can be described as either “very likely” or “highly probable” to the person’s best understanding. The person knows there is a standardised verbal probability: “very likely” has been assigned a numerical range of 80%±10%, and “highly probable” has been assigned a numerical range of 80%±5%. Because the possibility for error is smaller for “highly probable”, this is the appropriate choice to verbally express the uncertainty information. This example indicates that the use of standardised verbal expressions of uncertainty could help reduce the ambiguity or vagueness of the uncertainty information. One important finding from the current study is that some verbal expressions shared similar numerical meanings across different languages. For example, both experiments revealed a consistent interpretation of “reasonably
possible” (with narrow-ranged mean values of 60% in both language conditions). This suggests a potential value in using this expression in accounting standards and financial reporting. Table 6.4 provides comparable results between the current study and prior ones.

Table 6.4 – Comparison of mean interpretations with prior studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Language</th>
<th>Reasonably possible</th>
<th>Remote</th>
<th>Probable</th>
<th>Improbable</th>
<th>More likely than not</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>Native</td>
<td>60.22</td>
<td>30.00</td>
<td>72.83</td>
<td>40.15</td>
<td>60.71</td>
<td>45.77</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>60.32</td>
<td>48.89</td>
<td>64.06</td>
<td>49.11</td>
<td>55.50</td>
<td>51.68</td>
</tr>
<tr>
<td>Experiment 2</td>
<td>Native</td>
<td>60.04</td>
<td>28.86</td>
<td>76.25</td>
<td>38.38</td>
<td>61.99</td>
<td>47.01</td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td>61.72</td>
<td>41.86</td>
<td>66.09</td>
<td>36.10</td>
<td>53.40</td>
<td>44.70</td>
</tr>
<tr>
<td>Chand, Cummings and Patel (2012)</td>
<td>Native</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>68.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foreign</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reimers (1992)</td>
<td>English</td>
<td>58.10</td>
<td>9.40</td>
<td>77.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amer, Hackenbrack and Nelson (1994)</td>
<td>English</td>
<td>58.57</td>
<td>12.33</td>
<td>78.65</td>
<td>18.67</td>
<td>61.53</td>
<td></td>
</tr>
<tr>
<td>Davidson, Ronald A. and Chrisman (1994)</td>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>69.30</td>
<td>30.80</td>
</tr>
<tr>
<td>Laswad and Mak (1997)</td>
<td>English</td>
<td>43.00</td>
<td>7.06</td>
<td>65.00</td>
<td></td>
<td></td>
<td>53.47</td>
</tr>
</tbody>
</table>

Prior studies have identified few verbal expressions yielding consistent numerical meanings despite the users’ differences in professional and language background. For example, “equal chance” is generally taken to mean 50% probability; “very improbable” less than 5%, and “almost certain” between 90% and 95% (Appendix C).

The above discussions also suggest the possibility of drafting a standardised word-to-number scale for uncertainty expressions. Such scales are not new to many research domains. For example, the research on climate change has been working on guidelines for a word-to-number scale for several years, and extensive studies on standardising the use of uncertainty expressions have been conducted. Due to the needs of global reporting, the language-related challenges for the Intergovernmental Panel on Climate Change (IPCC) include not only the
standardisation of uncertainty expressions, but their translation and interpretation between different languages as well.

Notably, the IPCC’s discussion of guidelines for uncertainty expressions has been informed by studies such as Risbey and Kandlikar (2007), Budescu, David V, Broomell and Por (2009), and Budescu, D. V., Por and Broomell (2012). Table 6.5 gives the word-to-number scale guidelines provided by IPCC (2014).

Table 6.5  – Word-to-number scales for expressions of probability with percentages arranged vertically

<table>
<thead>
<tr>
<th>Verbal probability</th>
<th>Numerical probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtually certain</td>
<td>99-100%</td>
</tr>
<tr>
<td>Extremely likely</td>
<td>95-100%</td>
</tr>
<tr>
<td>Probability, very likely</td>
<td>90-100%</td>
</tr>
<tr>
<td>Likely</td>
<td>66-100%</td>
</tr>
<tr>
<td>More likely than not</td>
<td>&gt;50-100%</td>
</tr>
<tr>
<td>About as likely as not</td>
<td>33-66%</td>
</tr>
<tr>
<td>More unlikely than likely</td>
<td>0-&lt;50%</td>
</tr>
<tr>
<td>Unlikely</td>
<td>0-33%</td>
</tr>
<tr>
<td>Very unlikely</td>
<td>0-10%</td>
</tr>
<tr>
<td>Extremely unlikely</td>
<td>0-5%</td>
</tr>
<tr>
<td>Exceptionally unlikely</td>
<td>0-1%</td>
</tr>
</tbody>
</table>

* From IPCC (2014, p. 2)

In the field of behavioural psychology, several attempts to develop word-to-number scales have been made in studies such as Beyth-Marom (1982), Hamm (1991), and Witteman and Renooij (2003). Although they have a common purpose of standardising uncertainty expressions, the scales from these studies have different structures or properties. For example, Beyth-Marom’s (1982) scale is displayed horizontally, with the percentage modes of numerical probabilities forming column headers (Table 6.6).
Hamm’s (1991) scale arranges the p-value mode of numerical probabilities vertically (Table 6.7).

Witteman and Renooij (2003) proposed a short vertical scale for the percentage mode of numerical probabilities (Table 6.8).
Table 6.8 – Word-to number scales for expressions of probability with percentages arranged vertically

<table>
<thead>
<tr>
<th>Verbal probability</th>
<th>Numerical probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certain (almost)</td>
<td>100</td>
</tr>
<tr>
<td>Probable</td>
<td>85</td>
</tr>
<tr>
<td>Expected</td>
<td>75</td>
</tr>
<tr>
<td>Fifty-fifty</td>
<td>50</td>
</tr>
<tr>
<td>Uncertain</td>
<td>25</td>
</tr>
<tr>
<td>Improbable</td>
<td>15</td>
</tr>
<tr>
<td>(Almost) impossible</td>
<td>0</td>
</tr>
</tbody>
</table>

* From Witteman and Renooij (2003, p. 120)

In the field of intelligence and national security research, researchers have also proposed standardised word-to-number scales for uncertainty judgement. One example is from Barnes (2016) study, where the author provided the probability mapping standards used in the Canadian Security Intelligence Service (Table 6.9). This scale vertically displays numerical probabilities expressed as frequencies.

Table 6.9 – Probability mapping standards by Barnes (2016, p. 336)

<table>
<thead>
<tr>
<th>Verbal expression</th>
<th>Numerical probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will</td>
<td>[10/10]</td>
</tr>
<tr>
<td>Is certain</td>
<td>[9/10]</td>
</tr>
<tr>
<td>Almost certain</td>
<td>[7-8/10]</td>
</tr>
<tr>
<td>Extremely likely</td>
<td>[6/10]</td>
</tr>
<tr>
<td>Highly likely</td>
<td>[5/10]</td>
</tr>
<tr>
<td>Llikely</td>
<td>[4/10]</td>
</tr>
<tr>
<td>Probably</td>
<td>[3-4/10]</td>
</tr>
<tr>
<td>Probably not (Only a) low probability</td>
<td>[2-3/10]</td>
</tr>
<tr>
<td>Very unlikely</td>
<td>[1/10]</td>
</tr>
<tr>
<td>Highly unlikely</td>
<td></td>
</tr>
<tr>
<td>Extremely unlikely</td>
<td></td>
</tr>
<tr>
<td>Little prospect</td>
<td></td>
</tr>
<tr>
<td>No prospect</td>
<td>[0/10]</td>
</tr>
</tbody>
</table>
Chapter 6 – Summary and Conclusion

Inspired by the above studies, this thesis proposes two versions of the probability mapping standards (Tables 6.10, vertically displayed, and 6.11, horizontally displayed) to target different user groups. The rationale for using two versions relates to linguistic relativity in cognition. As already addressed in the literature, Boroditsky (2001) noted that native Chinese speakers perceive time in a vertical way, whereas native English speakers perceive time in a horizontal way. In clinical practice on scales to rate pain (for review, see Williamson & Hoggart 2005), evidence shows that horizontally presented scales yield a better result of interpretation for native English speakers (e.g., Scott & Huskisson 1979), whereas the vertically presented scales result in less error of interpretation on the part of the native Chinese speakers (e.g., Aun, Lam & Collett 1986). Accordingly, when the users of a word-to-number scale are not a native speaker, the scale’s graphic orientation should be adjusted.

Expressions of verbal probabilities are collected from the current IFRS and IAS and the proposed numerical translations are based on the empirical results from accounting and behavioural psychology. Notably, this thesis also suggests that for a better result, the vertical version is designed for English speakers (Table 6.10) and the horizontal version for native Chinese speakers (Table 6.11).
<table>
<thead>
<tr>
<th>Verbal expression</th>
<th>Numerical probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtually certain</td>
<td>[100%-90%]</td>
</tr>
<tr>
<td>Highly likely</td>
<td></td>
</tr>
<tr>
<td>Certainty</td>
<td>[90%-80%]</td>
</tr>
<tr>
<td>Highly probable</td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>Substantially expected</td>
<td>[80%-70%]</td>
</tr>
<tr>
<td>Reasonable assurance</td>
<td></td>
</tr>
<tr>
<td>Deemed</td>
<td></td>
</tr>
<tr>
<td>Significant</td>
<td></td>
</tr>
<tr>
<td>Sufficiently expected</td>
<td></td>
</tr>
<tr>
<td>More likely than not</td>
<td>[70%-60%]</td>
</tr>
<tr>
<td>Reliably</td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td></td>
</tr>
<tr>
<td>Reasonably possible</td>
<td></td>
</tr>
<tr>
<td>Insignificant</td>
<td>[60%-50%]</td>
</tr>
<tr>
<td>Less likely</td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>[50%-40%]</td>
</tr>
<tr>
<td>Sufficiently lower</td>
<td></td>
</tr>
<tr>
<td>Uncertain</td>
<td>[40%-30%]</td>
</tr>
<tr>
<td>No longer probable</td>
<td></td>
</tr>
<tr>
<td>Not probable</td>
<td>[30%-20%]</td>
</tr>
<tr>
<td>Remote</td>
<td></td>
</tr>
<tr>
<td>Improbable</td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>[20%-10%]</td>
</tr>
<tr>
<td>Not expected</td>
<td></td>
</tr>
<tr>
<td>Very unlikely</td>
<td>[10%-0%]</td>
</tr>
</tbody>
</table>
Table 6.11 – Probability-mapping standards for English speakers

<table>
<thead>
<tr>
<th>Probability Mapping</th>
<th>[0%-10%]</th>
<th>[10%-20%]</th>
<th>[20%-30%]</th>
<th>[30%-40%]</th>
<th>[40%-50%]</th>
<th>[50%-60%]</th>
<th>[60%-70%]</th>
<th>[70%-80%]</th>
<th>[80%-90%]</th>
<th>[90%-100%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very unlikely</td>
<td>-Improbable</td>
<td>-No longer probable</td>
<td>-Uncertain</td>
<td>-Less likely</td>
<td>-Reasonably possible</td>
<td>-Deemed</td>
<td>-Probable</td>
<td>-Highly likely</td>
<td>-Virtually certain</td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>-Not probable</td>
<td>-Possible</td>
<td>-Sufficiently lower</td>
<td>-Insignificant</td>
<td>-Significant</td>
<td>-Substantially</td>
<td>-Expected</td>
<td>-Certainty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not expected</td>
<td>-Remote</td>
<td>-More likely than not</td>
<td>-Reliably</td>
<td>-Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Very unlikely
- Improbable
- No longer probable
- Uncertain
- Less likely
- Reasonably possible
- Deemed
- Probable
- Very unlikely
- Remote
- Not expected
- Not probable
- Sufficiently lower
- Insignificant
- More likely than not
- Reliably
- Likely
6.5.2. Multilingual corporate governance

The investigation of the FLE on accounting judgement provides an avenue to explore relevant issues related to multilingual corporate governance. As addressed by many international business studies (e.g., Brannen, Piekkari & Tietze 2014; Hadjichristidis, Geipel & Surian 2017; Janssens & Steyaert 2014; Peltokorpi & Vaara 2012), the language issue has been critical to the operation, management, and communication of multinational corporations.

Specifically, in the field of international business, existing knowledge of foreign-language issues largely derives from the business communication between subsidiaries and headquarters, such as sharing goals and visions within the organisation (Reiche, Harzing & Pudelko 2015), or attempting to minimise the consequences of using a non-native working language that could affect the work processes of corporate boards (Piekkari, Oxelheim & Randøy 2015) and result in status inequalities between managers and employees (Bordia & Bordia 2015; Neeley 2013; Śliwa & Johansson 2014).

As discussed in Section 2.2.4.1, international-business scholars have already been developing a theoretical framework relating to the FLE (for example, see the Brain Drain Model in Figure 2.2). As more evidence begins to accumulate, the understanding of the FLE can offer more benefits for corporate governance in multilingual contexts. Based on the current study, there is evidence that the FLE could be significant in the process of communication and judgement. This suggests the need for more empirical examinations in this field.
6.5.3. Multilingual Accounting Education

The evidence for the FLE in accounting also raises series of questions; for example, whether accounting students would perform accounting practice differently when working in their native or non-native language, or whether accounting professionals would judge the same information differently when working in different languages.

As a major concern of the current study, non-native English-speaking accounting students may not only experience language challenges in learning, but also think differently to accounting students who are using their native language. In the field of accounting education, numerous studies have already addressed similar concerns about language. For example, research has found that a considerable proportion of non-native accounting students have trouble understanding their accounting textbooks because of insufficient language ability (e.g., Davidson, Ronald A & Baldwin 2005; Ferguson et al. 2006). Moreover, evidence also shows that language skill is amongst the most challenging issues for non-native accounting students in searching for employment (e.g., Benzie 2010; Watty, Jackson & Yu 2010).

Relate to the current study, accounting students had displayed significant FLE in the tasks of word-to-number interpretation and probabilistic estimation. These findings highlight a critical question on whether accounting educators should embrace and/or alert by the multilingual issues in teaching. As an area for future study, accounting educators may investigate psycholinguistic theories and implement relevant strategies in their teaching. The need for such research is increasingly urgent because many accounting schools in English-speaking countries have a large proportion of non-native English-speaking students. For example, more than 39,000 international students were
enrolled in degrees with accounting majors (Bachelor and Masters) in Australia in 2015, and about 42 percent of Australia’s accounting professionals were born overseas (CPA Australia 2015).

6.5.4. Multilingual consumer behaviour

Another important implication of the current research is the application of the FLE in research into consumer behaviour. The literature shows that uncertainty and emotion play vital roles in people’s consuming behaviour (e.g., Han, Duhachek & Agrawal 2014). Evidence also suggests that language and emotion together could influence people’s consuming behaviour (e.g., Puntoni, De Langhe & Van Osselaer 2009). Collectively, this research indicates the relevance of FLE theory in understanding people’s consuming judgement and decisions. For example, a person who lives in a remote area in Australia may plan to buy a pair of sports shoes (Figure 6.1). He has a limited budget, and limited options and time. Only four shops that he can feasibly reach sell sports shoes, and each shop is a considerable distance from the others. He can only visit one shop. How should he decide which one?

![Figure 6.1 – Shopping case in English](image)

Figure 6.1 – Shopping case in English
To make a rational decision\textsuperscript{34}, he needs to judge which shop would offer the lowest price for the shoes.

Shop A provides a certainty that all shoes are 30\% off the price tag; it can be labelled as “=30\% off”.

Shop B uses the verbal expression “clearance sale”, which can only be quantified based on personal experience. This could lead to a subjective judgement due to the lack of numerical references. For example, one might estimate that “clearance sale” roughly means 70\% off or “≈70\% off”, based on one’s personal shopping experience. This subjective estimation varies among individuals. Moreover, the person must also take into account the need to judge how long the sale will last, and additional level of uncertainty.

Shop C uses a different verbal term that requires a personal judgement: “last-day sale”. Compare with “clearance sale”, “last-day sale” provides at least one certainty: the sale will finish by the end of the day. Arguably, the term “last day” may influence a person’s emotions by imparting a feeling of urgency.

Shop D also applies a numeric expression but with an upper limit: “up to 70\% off”. This can be interpreted as “≤70\% off” or “0 to 70\% off”. However, it is still up to individual’s judgement on whether “≤70\% off” is better than “=30\% off”.

\textsuperscript{34}“Rational decision” refers to the optimal decision after thorough consideration, including determining all the relevant alternatives, consequences, and probabilities in a predictable manner (Kahneman 2003; Simon 1956).
Based on the key assumption of the FLE – that individuals’ native language shapes their world view – they may perceive the same type of advertisements differently if the language in which the advertisements are written is not the individuals’ own native language. In this case, assuming that the person is a native English speaker living in China, they should expect to see the Chinese-language (non-native, from their perspective) advertising language shown in Figure 6.2.

![Figure 6.2 – Shopping case in Chinese](image)

As with Shop A, most shops in China use the term “7 折”, or “70% of the normal price”, rather than the term “30% off”. Similarly, as with Shop D, Chinese shops often use the term “低至三折”, or “as low as 30% of normal price”, rather than the term “up to 70% off”.

The difference in framing between Shops A and D in both language contexts would affect individuals’ sensitivity to the numeric expressions (“30% off” versus “70% of”) and directionality of expressions (“up to” versus “as low as”).
Shop B uses a different verbal expression, “跳楼价” (“suicide-jumper price”\(^{35}\)), which is a more popular term than “清仓” (clearance). This expression is more effective in reaching Chinese-speaking consumers than users of other languages.

Shop C uses “最后一天甩卖” which equates directly with the English “last-day sale” (or “closing-down sale”).

For the consumer, the same type of advertisement is framed in different patterns. Such differences would affect that person’s thinking process in making the initial judgement about where to shop.

<table>
<thead>
<tr>
<th>Native language</th>
<th>Non-native language</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shop A</strong> “Everything 30% off”</td>
<td><strong>Shop A</strong> “All merchandise at 70% of normal price”</td>
</tr>
<tr>
<td><strong>Shop B</strong> “Clearance sale”</td>
<td><strong>Shop B</strong> “Suicide-jumper price”</td>
</tr>
<tr>
<td><strong>Shop C</strong> “Last-day sale”</td>
<td><strong>Shop C</strong> “Last-day sale”</td>
</tr>
<tr>
<td><strong>Shop D</strong> “Up to 70% off”</td>
<td><strong>Shop D</strong> “As low as 30% of normal price”</td>
</tr>
</tbody>
</table>

This example suggests that people perceive and interpret information differently between their native and non-native language (Table 6.12). This difference is not only attributed to translation, language proficiency, and culture, but also to the language-shaped perception. As the literature shows, people process judgements differently between their native and non-native languages because there are different language-processing mechanisms between the languages (Clahsen & Felser 2006; Hahne 2001; Perani & Abutalebi 2005).

\(^{35}\) “Suicide jumper price” is a Chinese idiom that refers to a price so low that the seller would jump off the building if the price continued to be so low; in other words, the seller is offering items at a price low enough to hurt the business.
6.6. LIMITATIONS

Although this thesis has made several important findings, there were some unavoidable limitations. These limitations can be placed into two categories: limitations on sampling (Table 6.13) and limitations on research design (Table 6.14). The following sections elaborate these limitations in detail.

Table 6.13 – Limitations from sampling

<table>
<thead>
<tr>
<th>No.</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS1</td>
<td>Sample size</td>
</tr>
<tr>
<td>LS2</td>
<td>Profile of the sample population</td>
</tr>
<tr>
<td>LS3</td>
<td>Lack of linguistic diversity</td>
</tr>
<tr>
<td>LS4</td>
<td>Sampling strategy</td>
</tr>
</tbody>
</table>

Table 6.14 – Limitations from the research design

<table>
<thead>
<tr>
<th>No.</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD1</td>
<td>Lack of emotionality test</td>
</tr>
<tr>
<td>LD2</td>
<td>Lack of prior FLE research design on uncertainty expressions</td>
</tr>
</tbody>
</table>

6.6.1. Limitations from sampling

The first limitation is the lack of a probability sampling strategy. As quantitative research, this study should ensure that the sample selection is free from biases. In practice, however, implementing a probability sampling strategy would be challenging.

To minimise potential sampling biases, the current study conducted the survey across three universities: two Chinese universities with a large number of accounting students, and one public Australian university with a large proportion of linguistically diverse accounting students. Future studies should extend the investigation to a broader scale that allows the implementation of probability sampling strategy.
The second limitation is the lack of linguistic diversity. Compared to prior research on the FLE, the current study has only investigated the English and Chinese languages. Specifically, Experiment 1 only have 30 participants from Australia and other countries, while 295 participants were original from China. In contrast, Keysar, Hayakawa and An (2012) investigated four pairs of languages (English-Japanese, Korean-English, French-English, and Spanish-English), and Hayakawa et al. (2017) investigated two pairs (German-English and Spanish-English). Therefore, the generalisability of these results is subject to certain limitations such as the diversity of participants’ native language. To enhance the understanding of the FLE in accounting, future studies should extend their investigation to more languages.

The third limitation is the lack of diversity in the participants’ profiles. As mentioned above, participants were students in accounting or accounting-related fields, most of whom possessed no professional experiences. This lack of professional experience would impair the overall strength of the research findings. This study acknowledges that the ideal profile of participants should consist of accounting professionals, academics, and members of professional accounting institutions. Therefore, future studies could focus on a more varied mix of accounting-information users.

The fourth limitation is the sample size. Experiment 1 had a sample size of just over 320 participants and Experiment 2 had only 144 valid responses. Although the sample size is larger than most prior studies (Table 6.15), a larger sample size is still needed to strengthen the research findings.
### Table 6.15 – Sample-size comparison

<table>
<thead>
<tr>
<th>Studies</th>
<th>Native language</th>
<th>Sample size</th>
<th>Foreign language</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current study - Experiment 1</strong></td>
<td>Chinese</td>
<td>192</td>
<td>English</td>
<td>133</td>
</tr>
<tr>
<td><strong>Current study - Experiment 2</strong></td>
<td>Chinese</td>
<td>72</td>
<td>English</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Korean</td>
<td>66</td>
<td>English</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>50</td>
<td>French</td>
<td>53</td>
</tr>
<tr>
<td>Geipel, Hadjichristidis and Surian (2015)</td>
<td>German</td>
<td>21</td>
<td>English</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td>28</td>
<td>English</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td>37</td>
<td>German</td>
<td>37</td>
</tr>
<tr>
<td>Hadjichristidis, Geipel and Savadori (2015)</td>
<td>Italian</td>
<td>46</td>
<td>English</td>
<td>46</td>
</tr>
<tr>
<td>Pan and Patel (2016)</td>
<td>Chinese</td>
<td>89</td>
<td>English</td>
<td>89</td>
</tr>
</tbody>
</table>

### 6.6.2. Limitations from the research design

In addition to the sampling limitations, this study also acknowledges three major limitations from the research design.

One limitation is the lack of emotionality measurement between the languages. As discussed in the literature, emotion plays a vital role in the cognitive process when an individual is using a non-native language (Section 2.2.3.1.1). The discussions on research findings also highlight the potential influence of emotion on the FLE (Section 5.4.2). However, the current study did not implement tasks to specifically measure participants’ emotional variances between the languages. This leads to an opportunity for further investigations to design an appropriate test for emotions (such as positive and negative feelings under each language condition). For future studies, scholars could adopt a similar design to that of Hadjichristidis, Geipel and Savadori (2015).

Another limitation is the lack of prior FLE research design on uncertainty expressions. This thesis develops the experimental tasks based on the existing theories regarding uncertainty expressions.
However, several aspects of uncertainty expressions, such as directionality and probabilistic estimations, have not yet been investigated in a cross-lingual context. Future studies may need to test the validity of these designs in other language conditions.

Additionally, the use of self-rated foreign language skills may be inaccurate due to participants’ social desirability biases. The social desirability bias refers to a systematic error in the self-report measurement because of the participants’ motivation to achieve a socially favourable image (Fisher 1993). Although prior FLE studies have adopted the self-report approach to measure participants’ foreign language skills (e.g., Geipel, Hadjichristidis & Surian 2015, 2016; Hadjichristidis, Geipel & Savadori 2015), future research should also include other measurements to cope with the social desirability biases (for review, see Nederhof 1985).

In summary, the investigation of the FLE in accounting is still in its infancy. Finding more pervasive effects not only would have consequences for research into accounting judgement, but may also have practical implications for multilingual business studies.
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Reference

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## List of uncertainty expressions and examples of their usage

<table>
<thead>
<tr>
<th>Uncertainty expressions</th>
<th>Examples of usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>certainty</td>
<td>1, 7, 11, 38</td>
</tr>
<tr>
<td>deemed</td>
<td>16, 17, 19, 29, 33, 37, 40</td>
</tr>
<tr>
<td>expected</td>
<td>1, 2, 8, 12</td>
</tr>
<tr>
<td>highly likely</td>
<td>40, 41</td>
</tr>
<tr>
<td>highly probable</td>
<td>39</td>
</tr>
<tr>
<td>highly unlikely</td>
<td>40</td>
</tr>
<tr>
<td>improbable</td>
<td>Framework 15</td>
</tr>
<tr>
<td>insignificant</td>
<td>7, 16, 32, 40</td>
</tr>
<tr>
<td>less likely</td>
<td>Framework 15</td>
</tr>
<tr>
<td>likely</td>
<td>1, 11, 19, 2, 28, 36, 37, 38, 39</td>
</tr>
<tr>
<td>more likely than not</td>
<td>37</td>
</tr>
<tr>
<td>most likely</td>
<td>36, 37</td>
</tr>
<tr>
<td>no longer probable</td>
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<td>26, 28, 36</td>
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<tr>
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<td>12, 37</td>
</tr>
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<td>probable</td>
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<td>20</td>
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<td>reasonably possible</td>
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<td>reliably</td>
<td>12, 16, 17, 23, 28, 34, 38, 39, 40, 41</td>
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</tr>
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<td>sufficiently</td>
<td>1, 11, 17, 19, 37</td>
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<td>17</td>
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<td>virtually certain</td>
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</table>
## APPENDIX B

Uncertainty expressions from accounting studies

### Comparison of Mean Probabilities with Accounting Studies

<table>
<thead>
<tr>
<th></th>
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<td></td>
</tr>
<tr>
<td>deemed</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
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</table>

| Students (No context)   |                       |                                          |                       |                             |                             |                             |                               |                             |
| Standard setters (No context) |                   |                                          |                       |                             |                             |                             |                               |                             |
| Accountant (No context) |                   |                                          |                       |                             |                             |                             |                               |                             |
| Accountant (Context)    |                   |                                          |                       |                             |                             |                             |                               |                             |
| Students (Context)      |                   |                                          |                       |                             |                             |                             |                               |                             |

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## Appendix C - Psychology and accounting research on the modifier effect of uncertainty expressions

**APPENDIX C**

Psychology and accounting research on the modifier effect of uncertainty expressions

<table>
<thead>
<tr>
<th>Expressions</th>
<th>Psychology study</th>
<th>Accounting study</th>
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<tbody>
<tr>
<td>Certain</td>
<td>99.60%</td>
<td>40.40%</td>
</tr>
<tr>
<td>Absolutely certain</td>
<td>99.60%</td>
<td>99.80%</td>
</tr>
<tr>
<td>Almost certain</td>
<td>90.20%</td>
<td>90.00%</td>
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<tr>
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## APPENDIX D: ANALYTICAL METHODS

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<tr>
<th>Research design</th>
<th>Task</th>
<th>Subject of the task</th>
<th>Task feature</th>
<th>Level of measurement</th>
<th>Statistical test method</th>
<th>Rationale</th>
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<tr>
<td>Experiment 1</td>
<td>Task 1</td>
<td>Numerical interpretations</td>
<td>Word-to-number conversion</td>
<td>Ratio/Interval</td>
<td>ANOVA</td>
<td>1. Two independent samples</td>
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<td>Task 2</td>
<td>Probabilistic judgement</td>
<td>Probabilistic estimations</td>
<td>Ratio/Interval</td>
<td>Paired-Sample T Test</td>
<td>2. Paired analysis</td>
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<td>Task 3</td>
<td>Directionality judgement</td>
<td>Judgment consistency</td>
<td>Ordinal</td>
<td>Chi-square test</td>
<td>3. Normal distribution</td>
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<td>Task 4</td>
<td>Risk judgement between languages</td>
<td>Risk choice</td>
<td>Nominal</td>
<td>Chi-square test</td>
<td>4. Parametric</td>
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<td>Experiment 2</td>
<td>Task 1</td>
<td>Numerical interpretations</td>
<td>Word-to-number conversion</td>
<td>Ratio/Interval</td>
<td>Wilcoxon Signed Rank Test</td>
<td>1. Two related samples</td>
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<td>Probabilistic judgement</td>
<td>Probabilistic estimations</td>
<td>Ratio/Interval</td>
<td>Wilcoxon Signed Rank Test</td>
<td>2. Paired replicates</td>
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<td>Task 3</td>
<td>Directionality judgement</td>
<td>Judgment consistency</td>
<td>Ordinal</td>
<td>Wilcoxon Signed Rank Test</td>
<td>3. Not normally distributed</td>
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<td>Risk judgement between languages</td>
<td>Risk choice</td>
<td>Nominal</td>
<td>McNemar Test</td>
<td>4. Nonparametric</td>
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</table>
APPENDIX E.1: ENGLISH VERSION 1

Survey Questionnaire

Your participation in the survey is voluntary. If you decide to participate, your responses are anonymous. This survey should take approximately 15 minutes to complete.

Yuqian Zhang (Michael)
PhD Candidate
UNIVERSITY OF WOLLONGONG, AUSTRALIA
Appendix E – Research Instrument

Task 1: Listed below are various statements from IFRS. Please indicate your BEST estimate for each uncertainty expression. (0 - 100%)

Example

If you believe that the expression “likely” corresponds to a probability of 55%, indicate this value as your response in the scale bar provided.

1. IAS 32 states that some financial instruments include a contractual obligation. The obligation arises because liquidation either is certain to occur and outside the control of the entity (for example, a limited life entity) or is uncertain to occur but is at the option of the instrument holder.

2. IAS 38 states that an intangible asset shall be recognised if, and only if, it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity, and the cost of the asset can be measured reliably.

3. IFRS 4 states that an insurer shall disclose a sensitivity analysis that shows how profit or loss and equity would have been affected if changes in the relevant risk variable that were reasonably possible at the end of the reporting period had occurred.

4. IFRS conceptual framework states that an asset is not recognised in the balance sheet when expenditure has been incurred for which it is considered improbable that economic benefits will flow to the entity beyond the current accounting period.

5. IAS 37 states that in rare cases it is not clear whether there is a present obligation. In these cases, a past event is deemed to give rise to a present obligation if, taking account of all available evidence, it is more likely than not that a present obligation exists at the end of the reporting period.

6. IAS 37 states that an entity should disclose a contingent liability, unless the possibility of an outflow of resources embodying economic benefits is remote.
Appendix E – Research Instrument

Task 2: Read the statement and answer the following questions:

"An asset is recognised in the balance sheet when it is **probable** that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably." (IFRS - Conceptual Framework)

1. This statement is about the recognition of:
   - [ ] Liability
   - [ ] Asset
   - [ ] Expense
   - [ ] Equity
   - [ ] Income

2. You would recognise an $1,000 asset in the balance sheet, when it is ____% chance of future economic benefit will flow to the entity.

3. You would recognise a $100,000 asset in the balance sheet, when it is ____% chance of future economic benefit will flow to the entity.

4. You would recognise a $10,000 asset in the balance sheet, when it is ____% chance of future economic benefit will flow to the entity.

Task 3: Read the statement and answer the following questions

"An asset is recognised in the balance sheet when it is **probable** that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably." (IFRS - Conceptual Framework)

1. If it is **uncertain** that the future economic benefit will flow to the company. How would you advise your company?

   **How would you advice your company?**

<table>
<thead>
<tr>
<th>Recognise in balance sheet?</th>
<th>No absolutely not (-10)</th>
<th>Equally favors (0)</th>
<th>Yes, absolutely (10)</th>
</tr>
</thead>
</table>

2. If it is **reasonably possible** that the future economic benefit will flow to the company. How would you advise your company?

   **How would you advise your company?**

<table>
<thead>
<tr>
<th>Recognise in balance sheet?</th>
<th>No absolutely not (-10)</th>
<th>Equally favors (0)</th>
<th>Yes, absolutely (10)</th>
</tr>
</thead>
</table>
Task 4: Read the scenario and answer the following question

There has recently been a significant economic downturn. Without intervention, the company you manage will lose $6,000,000. You are faced with two possible courses of action.

- If you choose Action A, $2,000,000 will be saved.
- If you choose Action B, there is a 1/3 chance that $6,000,000 will be saved and a 2/3 chance that no money will be saved.

Which action do you prefer?

☐ Action A  ☐ Action B

Demographic: Please provide your information

1. Your email address:  
   __________

2. Age:  
   __________

3. Gender:  
   ☐ Male  ☐ Female

4. What is your country of origin?  
   __________

5. What is your native language?  
   ☐ English  ☐ Chinese  ☐ Other __________

6. How long have you lived in an English-speaking country?  
   ☐ less than 1 year  ☐ 1-2 years  ☐ 3-4 years  ☐ 5-6 years  ☐ 7-8 years  ☐ more than 8 years

7. Please self-rate your English language skills:

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<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very good</th>
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<td>☐</td>
<td>☐</td>
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<td>Speaking</td>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

8. Are you now attending or enrolled in university as a student?  
   ☐ Yes  ☐ No

9. (if Yes): Is that full-time or part-time?  
   ☐ Yes, full-time student  ☐ Yes, part-time student  ☐ No

10. (if Yes): What grade or level are you attending?  
    _______ year in university

11. What is your study specialisation?  
    ☐ Accounting  ☐ Finance  ☐ Economic  ☐ Marketing  ☐ Business  ☐ Other __________

12. Please indicate your highest level of education (current or completed):  
    ☐ Diploma  ☐ Bachelor  ☐ Master  ☐ PhD

13. How familiar are you with International Financial Reporting Standards (IFRS)?  
    ☐ very familiar  ☐ familiar  ☐ somewhat familiar  ☐ not familiar

14. Are you familiar with another set of accounting standards than IFRS?  
    ☐ No  ☐ Yes, if yes, which one? _______

(End of Survey)
APPENDIX E.2: ENGLISH VERSION 2

Survey Questionnaire

Your participation in the survey is voluntary. If you decide to participate, your responses are anonymous. This survey should take approximately 15 minutes to complete.

Yuqian Zhang (Michael)
PhD Candidate
UNIVERSITY OF WOLLONGONG, AUSTRALIA
Appendix E – Research Instrument

Task 1: Listed below are various statements from IFRS. Please indicate your BEST estimate for each uncertainty expression. (0 - 100%)

Example

If you believe that the expression "likely" corresponds to a probability of 55%, indicate this value as your response in the scale bar provided.

Likely (55%)

1. IAS 32 states that some financial instruments include a contractual obligation. The obligation arises because liquidation either is certain to occur outside the control of the entity (for example, a limited life entity) or is uncertain to occur but is at the option of the instrument holder.

Uncertain (%)

2. IAS 38 states that an intangible asset shall be recognised if, and only if, it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity, and the cost of the asset can be measured reliably.

Probable (%)

3. IFRS 4 states that an insurer shall disclose a sensitivity analysis that shows how profit or loss and equity would have been affected if changes in the relevant risk variable that were reasonably possible at the end of the reporting period had occurred.

Reasonably possible (%)

4. IFRS conceptual framework states that an asset is not recognised in the balance sheet when expenditure has been incurred for which it is considered improbable that economic benefits will flow to the entity beyond the current accounting period.

Improbable (%)

5. IAS 37 states that in rare cases it is not clear whether there is a present obligation. In these cases, a past event is deemed to give rise to a present obligation if, taking account of all available evidence, it is more likely than not that a present obligation exists at the end of the reporting period.

More likely than not (%)

6. IAS 37 states that an entity should disclose a contingent liability, unless the possibility of an outflow of resources embodying economic benefits is remote.

Remote (%)

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Appendix E – Research Instrument

Task 2: Read the statement and answer the following questions:

"A liability is recognised in the balance sheet when it is probable that an outflow of resources embodying economic benefits will result from the settlement of a present obligation and the amount at which the settlement will take place can be measured reliably." (IFRS – Conceptual Framework)

1. This statement is about the recognition of:
   - [ ] Liability  [ ] Asset  [ ] Expense  [ ] Equity  [ ] Income

2. You would recognise an $1,000 liability in the balance sheet, when it is ___% chance of future economic benefit will flow out the entity.

3. You would recognise a $100,000 liability in the balance sheet, when it is __% chance of future economic benefit will flow out the entity.

4. You would recognise a $10,000 liability in the balance sheet, when it is __% chance of future economic benefit will flow out the entity.

Task 3: Read the statement and answer the following questions

"A liability is recognised in the balance sheet when it is probable that an outflow of resources embodying economic benefits will result from the settlement of a present obligation and the amount at which the settlement will take place can be measured reliably." (IFRS – Conceptual Framework)

1. If it is uncertain that the future economic benefit will flow out the company. How would you advise your company?

   How would you advise your company?

   ![Likert Scale]

2. If it is reasonably possible that the future economic benefit will flow out the company. How would you advise your company?

   How would you advise your company?

   ![Likert Scale]
Appendix E – Research Instrument

Task 4: Read the scenario and answer the following question

There has recently been a significant economic downturn. Without intervention, the company you manage will lose $6,000,000. You are faced with two possible courses of action.

If you choose Action A, $4,000,000 will be lost.
If you choose Action B, there is a 1/3 chance that no money will be lost and a 2/3 chance that $6,000,000 will be lost.
Which action do you prefer?
□ Action A □ Action B

Demographic: Please provide your information

1. Your email address: __________________________
2. Age: ________
3. Gender:
   □ Male
   □ Female
4. What is your country of origin? __________________________
5. What is your native language?
   □ English
   □ Chinese
   □ Other ________
6. How long have you lived in an English-speaking country?
   □ less than 1 year
   □ 1-2 years
   □ 3-4 years
   □ 5-6 years
   □ 7-8 years
   □ more than 8 years
7. Please self-rate your English language skills:

<table>
<thead>
<tr>
<th>Reading</th>
<th>Understanding</th>
<th>Writing</th>
<th>Speaking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost none</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

8. Are you now attending or enrolled in university as a student?
   □ Yes
   □ No
9. (If Yes): Is that full-time or part-time?
   □ Yes, full-time student
   □ Yes, part-time student
   □ No
10. (If Yes): What grade or level are you attending?
   ___ year in university
11. What is your study specialisation?
   □ Accounting
   □ Finance
   □ Economic
   □ Marketing
   □ Business
   □ Other ________
12. Please indicate your highest level of education (current or completed):
   □ Diploma
   □ Bachelor
   □ Master
   □ PhD
13. How familiar are you with International Financial Reporting Standards (IFRS)?
   □ very familiar
   □ familiar
   □ somewhat familiar
   □ not familiar
14. Are you familiar with another set of accounting standards than IFRS?
   □ No
   □ Yes, if yes, which one? _______

(End of Survey)
APPENDIX E.3: CHINESE VERSION 1

这份问卷用于测评您对不确定表述的理解和判断。
本问卷遵循自愿与匿名的原则。
此次问卷大概耗时15分钟

张玉乾 (Michael)
博士研究生
伍伦贡大学，澳大利亚
第一部分：以下的表述摘取自国际会计准则（IFRS）。请根据自己对表述的理解，标记出对应的百分比数值（0-100%）。

例如

如果你认为“可能”所代表的概率值为55%，请将此数值标记在百分比尺上。

1. IAS 32 描述到“一些金融工具中包含合同义务。该义务的发生是因主体清算确定会发生且主体无法控制（例如，存续期间有限的主体），或不确定会发生但取决于工具持有人的选择。”

2. IAS 38 描述到“当且仅当满足以下条件时，无形资产应予确认：归属于该资产的未来经济利益很可能流入主体；以及该资产的成本能够可靠地计量。”

3. IFRS4 描述到“承保人应当披露以下所描述的信息：反映了报告期末与险种变动发生合理可能的变化如何影响损益和权益的敏感性分析。”

4. IFRS 财务报告概念框架描述到“如果支出已发生，但是认为经济利益不大可能在本会计期间后流入主体，就不应当在资产负债表内将其确认为资产。”

5. IAS 37 描述到“在极少数情况下，会不清楚是否存在一项现时义务。在这些情况下，如果考虑所有可获得的证据后，发现在报告期末多半会存在现时义务，那么可以认为过去事项导致了一项现时义务。”

6. IAS 37 描述到“主体应披露或有负债，除非含有经济利益的资源流出主体的可能性极小。”

可能性极小(%)
第二部分: 请阅读此段准则，并回答以下问题：

“如果一项资产的未来经济利益很可能流入主体，其成本和价值也能够可靠地计量，就应当在资产负债表内将其确认为资产。”（国际会计准则-财务报告概念框架）

1. 此段准则是关于确认：
   - 负债 □  资产 □ 费用 □ 所有者权益 □ 收入

2. 你会将价值$1,000的资产计入资产负债表，当其未来经济利益有___%的可能流入主体。

![百分比图](image1)

3. 你会将价值$100,000的资产计入资产负债表，当其未来经济利益有___%的可能流入主体。

![百分比图](image2)

4. 你会将价值$10,000,000的资产计入资产负债表，当其未来经济利益有___%的可能流入主体。

![百分比图](image3)

第三部分: 请阅读此段准则，并回答以下问题：

“如果一项资产的未来经济利益很可能流入主体，其成本和价值也能够可靠地计量，就应当在资产负债表内将其确认为资产。”（国际会计准则-财务报告概念框架）

1. 如果未来经济利益不确定会流入公司。
   你会如何建议公司？

   ![计分图](image4)

2. 如果未来经济利益合理可能流入公司。
   你会如何建议公司？

   ![计分图](image5)
第四部分：请阅读此段内容，并回答以下问题

近期的经济环境明显恶化，如果不采取措施，你管理的公司将损失$6,000,000 资金。你现在有两套可选方案。

方案 A 会挽回$2,000,000 资金
方案 B 会有 1/3 的概率挽回$6,000,000 资金，2/3 的概率不挽回任何资金

你会偏向哪个方案？
□ 方案 A □ 方案 B

请填写以下个人信息

1. 您的电子邮箱（email）：

2. 年龄：

3. 性别：
□ 男
□ 女

4. 你的出生地所在国：

5. 你的母语：
□ 英语
□ 汉语
□ 其他 ______

6. 你在英语为母语的国家生活了多久
□ 少于 1 年
□ 1-2 年
□ 3-4 年
□ 5-6 年
□ 7-8 年
□ 超过 8 年

7. 请评价你的英语能力：

<table>
<thead>
<tr>
<th></th>
<th>很差</th>
<th>差</th>
<th>一般</th>
<th>好</th>
<th>很好</th>
</tr>
</thead>
<tbody>
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<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>理解</td>
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<td>口语</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

8. 你现在是否注册或者就读于大学？
□ 是
□ 不是

9. （如果选）：是全日制或非全日制？
□ 是，全日制学生
□ 是，非全日制学生
□ 不是

10. （如果选）：你现在就读大学几年？
    第 ______ 年大学

11. 你的专业方向
□ 会计
□ 金融
□ 经济
□ 市场营销
□ 工商
□ 其他 ______

12. 你的最高学历（正在就读或者已经完成的）
□ 专科
□ 本科
□ 研究生
□ 博士

13. 你对国际会计准则（IFRS）的熟悉程度是多少？
□ 非常熟悉
□ 熟悉
□ 稍微熟悉
□ 不熟悉

14. 除了 IFRS 之外，你是否还熟悉其他会计准则？
□ 不
□ 是，如果是，请列举 ______

(问卷结束)
这份问卷用于测评您对不确定表述的理解和判断。
本问卷遵循自愿与匿名的原则。
此次问卷大概耗时 15 分钟

张玉乾 (Michael)
博士研究生
伍伦贡大学，澳大利亚
第一部分：以下的表述取于国际会计准则（IFRS）。请根据自己的理解，标记出对应的百分比数值（0-100%）。

例如

如果你认为“可能”所代表的概率值为55%，请将此数值标在百分比尺上。

可能（55%）

不确定（%）

很可能（%）

合理可能（%）

不大可能（%）

多半会存在（%）

可能性极小（%）

1. IAS 32 描述到“一些金融工具中包含合同义务。该义务的发生是因为主体清算确定会发生且主体无法控制（例如，存续期间有限的主体），或不确定性会发生并取决于工具持有人的选择。”

2. IAS 38 描述到“当且仅当满足以下条件时，无形资产应予确认：归属于该资产的经济利益很可能流入主体，以及该资产的成本能够可靠地计量。”

3. IFRS4 描述到“承保人应当披露以下所描述的信息：反映在报告期末相关风险变量发生合理可能的变化如何影响损益和权益的敏感性分析。”

4. IFRS 财务报告框架描述到“如果支出已经发生，但是认为经济利益不大可能在本会计期间以后流入主体，就不应在资产负债表内将其确认为资产。”

5. IAS 37 描述到“在极少数情况下，会不清楚是否存在一项现时义务。在这些情况下，如果考虑所有可获得的证据后，发现在报告期末多半会存在现时义务，那么可以认为过去事项导致了一项现时义务。”

6. IAS 37 描述到“主体应披露或有负债，除非含有经济利益的资源流出主体的可能性极小。”
第二部分：请阅读此段准则，并回答以下问题：

“如果由于一项现时义务的履行，含有经济利益的资源很可能流出主体，结算金额也能可靠地计量，就应当在资产负债表内确认为负债”（国际会计准则-财务报告概念框架）

1. 此段准则是关于确认：

   ☐ 负债 ☐ 资产 ☐ 费用 ☐ 所有者权益 ☐ 收入

2. 你会将价值$1,000 的负债计入资产负债表，当其未来经济利益有____%的可能流出主体。

   ![图表](0 10 20 30 40 50 60 70 80 90 100%)

3. 你会将价值$100,000 的负债计入资产负债表，当其未来经济利益有____%的可能流出主体。

   ![图表](0 10 20 30 40 50 60 70 80 90 100%)

4. 你会将价值$10,000,000 的负债计入资产负债表，当其未来经济利益有____%的可能流出主体。

   ![图表](0 10 20 30 40 50 60 70 80 90 100%)

第三部分：请阅读此段准则，并回答以下问题：

你正在评估一项负债的未来经济利益流出的概率。国际会计准则要求：

“如果由于一项现时义务的履行，含有经济利益的资源很可能流出主体，结算金额也能可靠地计量，就应当在资产负债表内确认为负债”（国际会计准则-财务报告概念框架）

1. 如果未来经济利益不确定会流出公司。
   你会如何建议公司？
   ![图表](不，绝对不建议 -10 中立意见 0 是，绝对建议 10)

2. 如果未来经济利益合理可能会流出公司。
   你会如何建议公司？
   ![图表](不，绝对不建议 -10 中立意见 0 是，绝对建议 10)
第四部分：请阅读此段内容，并回答以下问题：

近期的经济环境明显恶化，如果不采取措施，你管理的公司将损失$6,000,000 资金。你现在有两套可选方案。

方案 A 会损失$4,000,000 资金

方案 B 会有 1/3 的概率不损失任何资金，2/3 的概率损失 $6,000,000 资金

你会倾向哪个方案？
- 方案 A
- 方案 B

请填写以下个人信息

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<tr>
<th>序号</th>
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<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>年龄：</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>性别：</td>
<td>□ 男</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 女</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>你的出生地所在国：</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>你的母语：</td>
<td>□ 英语</td>
<td></td>
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<td></td>
<td>□ 汉语</td>
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<td></td>
<td></td>
<td>□ 其他 _______</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>你在英语为母语的国家生活了多久</td>
<td>□ 少于 1 年</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>□ 1-2 年</td>
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<td>□ 3-4 年</td>
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<td>□ 5-6 年</td>
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<td></td>
<td>□ 7-8 年</td>
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<tr>
<td></td>
<td></td>
<td>□ 超过 8 年</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>请评价你的英语能力：</td>
<td>很差</td>
<td>差</td>
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<td></td>
<td>阅读</td>
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<td>理解</td>
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<td>口语</td>
<td>□</td>
<td>□</td>
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<tr>
<td>8</td>
<td>你现在是否注册或则就读于大学？</td>
<td>□ 是</td>
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<td></td>
<td></td>
<td>□ 不</td>
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<td>□ 是，全日制学生</td>
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<tr>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>□ 不</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>（如果 詹）：你现在就读大学第几年？</td>
<td>第 ______ 年大学</td>
<td></td>
</tr>
<tr>
<td>11</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 金融</td>
<td></td>
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<td>□ 经济</td>
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<td>□ 市场营销</td>
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<td>□ 工商</td>
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<td>□ 其他 _______</td>
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<tr>
<td>12</td>
<td>你的最高学历（正在就读或者已经完成的）</td>
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<tr>
<td></td>
<td></td>
<td>□ 本科</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 研究生</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 博士</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>你对国际会计准则（IFRS）的熟悉程度是多少？</td>
<td>□ 非常熟悉</td>
<td></td>
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<tr>
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<td>□ 熟悉</td>
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<td>□ 稍微熟悉</td>
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<td></td>
<td></td>
<td>□ 不熟悉</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>除了 IFRS 之外，你是否还熟悉其他会计准则？</td>
<td>□ 不</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 是，如果是，请列举 _______</td>
<td></td>
</tr>
</tbody>
</table>

（问卷结束）
APPENDIX F.1 APPROVAL OF ETHICS

Yuqian Zhang

From: irma-support@uow.edu.au
Sent: Tuesday, 16 May 2017 1:57 PM
To: anura@uow.edu.au
Cc: corinne@uow.edu.au; Yuqian Zhang; rso-ethics@uow.edu.au
Subject: HREC Approval of Application 2017/092

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Dr De Zoysa,

I am pleased to advise that the application detailed below has been approved.

Ethics Number: 2017/092
Approval Date: 16/05/2017
Expiry Date: 15/05/2018
Project Title: The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgement
Researcher/s: Cortese Corinne; Zhang Yuqian; De Zoysa Anura
Documents Approved: Ethics Application V7 - 09032017
Research Instrument-Chinese version 2
Research Instrument-English version 2
Response to Review - 14/05/2017
Letter of permission V1 09032017

Sites:

<table>
<thead>
<tr>
<th>Site</th>
<th>Principal Investigator for Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Wollongong</td>
<td>Mr Yuqian Zhang</td>
</tr>
<tr>
<td>Jiangxi University of Finance and Economics</td>
<td>Mr Yuqian Zhang</td>
</tr>
<tr>
<td>(China)</td>
<td></td>
</tr>
<tr>
<td>Hubei University of Technology</td>
<td>Mr Yuqian Zhang</td>
</tr>
</tbody>
</table>

The HREC has reviewed the research proposal for compliance with the National Statement on Ethical Conduct in Human Research and approval of this project is conditional upon your continuing compliance with this document. Compliance is monitored through progress reports; the HREC may also undertake physical monitoring of research.
Appendix F – Ethics

Approval is granted for a twelve month period; extension of this approval will be considered on receipt of a progress report prior to the expiry date. Extension of approval requires:

- The submission of an annual progress report and a final report on completion of your project.
- Approval by the HREC of any proposed changes to the protocol or investigators.
- Immediate report of serious or unexpected adverse effects on participants.
- Immediate report of unforeseen events that might affect the continued acceptability of the project.

If you have any queries regarding the HREC review process or your ongoing approval please contact the Ethics Unit on 4221 3386 or email rso-ethics@uow.edu.au.

Yours sincerely,

Associate Professor Melanie Randle,
Chair, UOW & ISLHD Social Sciences Human Research Ethics Committee

The University of Wollongong and Illawarra and Shoalhaven Local Health District Social Sciences HREC is constituted and functions in accordance with the NHMRC National Statement on Ethical Conduct in Human Research.
APPENDIX F.2: INFORMATION AND CONSENT FORM

Participant Information and Consent Form

Research Title: The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgment

Researcher: Yuqian Zhang

I have been given information about “The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgment”. This is part of a PhD degree supervised by Dr Anura De Zoysa and Dr Corinne Cortese from the School of Accounting, Economics and Finance at the University of Wollongong.

I understand that my contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. I understand that there are no potential risks or burdens associated with this study.

I understand that my participation in this research is voluntary, I have been invited to participate and I am free to withdraw from the research at any time. My nonparticipation or withdrawal of consent will not affect my relationship with the School of Accounting, Economics and Finance at the University of Wollongong in my course/program of study.

If I have any enquiries about the research, I can contact Mr Yuqian Zhang (+61 ). If I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on 4221 3386 or email rso-ethics@uow.edu.au

By signing below, I am indicating my consent to participate in the research. I understand that the data collected from my participation will be used primarily for a PhD thesis, and will also be used in summary form for journal publication, and I consent for it to be used in that manner.

Signed

Date

.............................................................. ....../....../.....

Name (please print)

..............................................................
**APPENDIX E.2: LETTER OF PERMISSION**

Original emails - Hubei University of Technology

From: Wu Danhong  
Sent: Monday, 6 March 2017 8:56 PM  
To: Yuqian Zhang  
Subject: Re: [伍伦贡大学]博士研究生课题问卷请求

尊敬的张玉乾博士:

谢谢你的邮件及问卷请求。我代表我的院系及我所授课的班级，欢迎你来我校进行问卷调查。同时我也愿意协助你顺利完成问卷收集工作。  
祝好!

吴丹红  
湖北工业大学经济管理学院会计系

From: Yuqian Zhang  
Sent: 2017-03-06 14:49  
To: Wu Danhong  
Subject: [伍伦贡大学]博士研究生课题问卷请求

吴丹红教授，您好，

我叫张玉乾，现于澳大利亚伍伦贡大学(University of Wollongong)攻读会计博士学位。我想通过联系您及贵学院帮助我完成博士论文的问卷调查的课题。

我的博士论文课题是：

多语言环境下会计信息的判断和决策的影响（实证）

**The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgement**

指导我的论文两位导师分别是  
Anura De Zoysa 博士 [https://scholars.uow.edu.au/display/anura_de_zoysa](https://scholars.uow.edu.au/display/anura_de_zoysa)  
Corinne Cortese 博士 [https://scholars.uow.edu.au/display/corinne_cortese](https://scholars.uow.edu.au/display/corinne_cortese)

此实证研究是以自愿匿名问卷的形式来收集数据，该问卷将在课堂上进行，大概耗时15分钟。此问卷旨在分析会计信息使用者在使用中文和英文材料时对特定会计信息的判断和决策差异。因此，国内高校的财务会计专业的本科生（研究生）作为样本，特别是具有双语能力的学生。

我同我的两位导师详细介绍过贵校在国内财务会计教学和研究领域的优势，他们非常鼓励并支持我同贵校建立学术联系。由于伍伦贡大学要求在进行社科（管理）学的问卷调查前要征得被问卷方（机构）的许可，特此希望学院能够在我申请问卷调查的许可时给予支持。

如果请求获得您以及学院的许可，我会积极联系院系的老师并在今年上半年去贵校进行问卷。同时如果学院的老师需要了解此研究的相关内容，我也非常分享我的一些总结，并在问卷开始前给师弟师妹们做个简单的讲演介绍（大概10-15分钟）。

样本问卷的链接（中文版本）如下：
[http://uowcommerce.co1.qualtrics.com/SE/?SID=SV_0J3IHzeHWsN97tr](http://uowcommerce.co1.qualtrics.com/SE/?SID=SV_0J3IHzeHWsN97tr)

谢谢您的理解和支持，同时很期待您的回复。

张玉乾

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Translated letter of permission to conduct research from Hubei University of Technology

From: Wu Danhong  
Sent: Monday, 6 March 2017 8:56 PM  
To: Yuqian Zhang  
Subject: Re: [University of Wollongong] Ask for permission - PhD research survey  

Dear Yuqian Zhang,

Thanks for your email for survey permission. I reply this email on behalf of my school and my coordinated classes to welcome your research survey activity. During the meantime, I am more than happy to assist your through the survey to ensure a smooth and success investigation.

Best regards,

Danhong Wu
School of Accounting,  
Faculty of Economic and Management  
Hubei University of Technology

Translated letter to inform a potential participant/institution about research project

From: Yuqian Zhang  
Sent: 2017-03-06 14:49  
To: Wu Danhong  
Subject: [University of Wollongong] Ask for permission - PhD research survey  

Dear Professor Danhong Wu,

My name is Yuqian Zhang. I am currently undertaking PhD degree at the University of Wollongong, Australia. I would like to contact you and your faculty for the permission of conducting my PhD research survey.

My thesis title is:” The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgement”

My PhD thesis is under the supervision of Dr Anura De Zoysa and Dr Corinne Cortese.

The survey is voluntary and anonymous based and is designed to conducted in a computer lab environment for about 15 minutes. The purpose of this study is to investigate the potential impact of using accounting information in either English or Chinese and how it would affect different judgments. Therefore, the sample population should be university accounting students (including postgraduate level), ideally for students who can speak two languages.

I have introduced your university and faculty to my supervisors. They encouraged me build an academic contact with your faculty for current and future research. Due to the ethics requirement for survey, my university (UOW) request me to obtain an official permission for survey. Therefore, I hope you and your faculty could assist and support me to conduct survey there.

If the permission is granted, I will organise a future contact with subject coordinator at your faculty and began the survey as early as this first half year. Meanwhile, I am also happy to make presentation about this research to students who may have interest (the present is about 10-15 mins).

Please have a check of the sample survey (Chinese version) through the following link:  
http://uowcommerce.co1.qualtrics.com/SE/?SID=SV_0J31HzeHWsN97tr

Thanks again for your understanding and supporting, and I am looking forward your reply.

Regards,

Yuqian Zhang
Appendix F – Ethics

Original emails – Jiangxi University of Finance and Economics

From: zouchunfa
Sent: Friday, 3 March 2017 1:15 PM
To: Yuqian Zhang
Subject: Re: [伍伦贡大学]博士研究生课题问卷请求

张博士您好!

这么多天了才回复您的邮件，首先向您表示歉意！主要原因是开学初期会议多，事情多，在办公室的时间较少，登录电脑较少！

我代表我们学院（包括我自己）欢迎您在我们学院的学生中进行问卷调查，并愿意为您提供必要的支持和帮助！期待您的到来！

邹春发
2017. 3，3

From: Yuqian Zhang
Sent: 2017-02-28 13:40
To: zouchunfa
Subject: [伍伦贡大学]博士研究生课题问卷请求

邹书记，您好。

我叫张玉乾，原财大 05 级注册会计师 2 班的学生（原班主任贺三宝老师）。我想通过联系您及贵学院帮助我完成博士论文的问卷调查的课题。

我现在在澳大利亚伍伦贡大学(University of Wollongong)攻读会计博士学位。我的博士论文课题是：

多语言环境下会计信息的判断和决策的影响（实证）

The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgment

指导我的论文两位导师分别是
Anura De Zoysa 博士 https://scholars.uow.edu.au/display/anura_de_zoysa
Corinne Cortese 博士 https://scholars.uow.edu.au/display/corinne_cortese

此实证研究是以自愿匿名问卷的形式来收集数据，该问卷将在课堂上进行，大概耗时 15 分钟。此问卷旨在分析会计信息使用者在使用中文和英文材料时对特定会计信息的判断和决策差异。因此，国内高校的财经信息专业的本科生（研究生）作为样本，特别是具有双语能力的学生。

我同我的两位导师详细介绍过母校在国内财经信息教学和研究领域的优势，他们非常鼓励并支持我同母校建立学术联系。由于伍伦贡大学要求在进行社科（管理）学的问卷调查前要征得被问卷方（机构）的许可，特此希望学院能够在我申请问卷调查的许可时给予支持。

如果请求获得您以及学院的许可，我会积极联系院系的老师并在今年上半年回母校进行问卷。同时如果学院的老师需要了解此研究的相关内容，我也非常分享我的一些总结，并在问卷开始前给师弟师妹们做个简单的讲演介绍（大概 10-15 分钟）。

样本问卷的链接（中文版本）如下:
http://uowcommerce.co1.qualtrics.com/SE/?SID=SV_0J31HzeHWsN97tr

谢谢您的理解和支持，同时很期待您的回复。
张玉乾
Appendix F – Ethics

Translated letter of permission to conduct research from Jiangxi University of Finance and Economics

From: zouchunfa
Sent: Friday, 3 March 2017 1:15 PM
To: Yuqian Zhang
Subject: Re: [University of Wollongong] Ask for permission - PhD research survey

Dear Yuqian Zhang

First of all, I should apologise for my late reply. I rarely check my email recently due to the work and meeting for the new semester.

I am writing on behalf of my faculty (and myself) to welcome your survey on our students. Also, I would support and assist your survey process at my university if you have special request.

I am looking forward to seeing you soon.

Chunfa Zou
2017.3.3

Translated letter to inform a potential participant/institution about research project

From: Yuqian Zhang
Sent: 2017-02-28 13:40
To: zouchunfa
Subject: [University of Wollongong] Ask for permission - PhD research survey

Dear Secretary Chunfa Zou,

My name is Yuqian Zhang, a formal accounting (CPA direction) student enrolled in year 2005. I would like to contact you and your faculty for the permission of conducting my PhD research survey.

I am currently undertaking PhD degree at the University of Wollongong, Australia. My thesis title is:” The language effect: non-native language impacts on interpretation of uncertainty expressions and accounting judgment” My PhD thesis is under the supervision of Dr Anura De Zoysa and Dr Corinne Cortese.

The survey is voluntary and anonymous based and is designed to conducted in a computer lab environment for about 15 minutes. The purpose of this study is to investigate the potential impact of using accounting information in either English or Chinese and how it would affect different judgments. Therefore, the sample population should be university accounting students (including postgraduate level), ideally for students who can speak two languages.

I have introduced my formal university to my supervisors and highlighted its advanced accounting research in China. They encouraged me build an academic contact with the faculty of accounting for current and future research. Due to the ethics requirement for survey, my university (UOW) request me to obtain an official permission for survey. Therefore, I hope you and your faculty could assist and support me to conduct survey there.

If the permission is granted, I will organise a future contact with subject coordinator at your faculty and began the survey as early as this first half year. Meanwhile, I am also happy to make presentation about this research to students who may have interest (the present is about 10-15 mins).

Please have a check of the sample survey (Chinese version) through the following link: http://uowcommerce.co1.qualtrics.com/SE/?SID=SV_0J3IHzesNWs97tr

Thanks again for your understanding and supporting, and I am looking forward your reply.

Regards,
Yuqian Zhang

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