The susceptibility of management accountants to framing bias

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Abstract

Purpose – The emerging business partner role of management accountants (MAs) results in an increased requirement of MAs to make business decisions. Frame dependence cognitive biases regularly influence decisions made in conditions of uncertainty, as is the case in business decision-making. Consequently, this study aims to examine susceptibility of MAs to frame dependence bias.

Design/methodology/approach – A survey was conducted among an international sample of practising MAs. The proportion of MAs influenced by framing bias was analysed and compared to findings in other populations. Logistic regression was then used to determine whether MAs who exhibit a higher preference for evidence-based (as opposed to intuitive) decision-making are more susceptible to framing bias.

Findings – Despite a comparatively high preference for evidence-based decision-making, the prevalence of framing bias among MAs is comparable to that of other populations. A higher preference for evidence-based decision-making was found to only be associated with higher susceptibility to endowment effect bias.

Originality/value – To the best of the authors' knowledge, this is the first study to comprehensively examine framing bias for MAs as a group of decision-makers. Additionally, this study's sample consists of practising MAs, and not only students.

Keywords Decision-making, Prospect theory, Management accountant, Business partner, Frame dependence

Paper type Research paper

1. Introduction

During the past two decades, research revealed that the role of management accountants (MAs) within businesses is changing from the traditional "controller" and "scorekeeper", to "hybrid accountant" and "business partner" (Komakech, 2009; Pierce and O'Dea, 2003; Puyou, 2018; Horton *et al.*, 2020). In these new roles, indications are that MAs are becoming more extensively involved in business-related decision-making (Byrne and Pierce, 2018; CGMA, 2016; Goretzki *et al.*, 2013; Kim *et al.*, 2012). In accordance with Byrne and Pierce (2018) and Horton *et al.* (2020), business-related decision-making involvement of management accountants is defined as involvement in the decision-making process of business decisions (both operational and strategic), which are beyond the traditional functional demarcation of the management accountant's roles. However, business decisions are regularly required to be

made in conditions of uncertainty, due to the limited availability of supporting information (Alkaraan, 2016; Järvenpää, 2007).

Harris (1994) argued that MAs may struggle to make intuitive business decisions, due to a general preference among MAs for basing decisions on available information, rather than on intuition. This argument was based on the premise that MAs differed from the general population due to a higher proportion of MAs exhibiting the sensing personality type on the sensing-versus-intuition measure of the well-known Myers–Briggs Personality Type Indicator (Harris, 1994). A literature review by Wheeler (2001) confirmed that the personalities of accountants are strongly oriented towards sensing, along with thinking (on thinking-versus-feeling scale) and judging (on judging-versus-perceiving scale) orientations. Unlike intuition personalities, sensing personalities do not like to make inferences and regard explicitly stated information as preferable (Kovar *et al.*, 2003). According to Kovar *et al.* (2003), the proportion of students studying towards an accounting degree who exhibit sensing personality types increased over time, despite attempts to attract more diverse accounting students. Therefore, the argument by Harris (1994) appears to remain valid to MAs in the new hybrid accountant and business partner roles.

Decisions made in conditions of higher uncertainty are particularly prone to the possible biasing influence of frame dependence (Alewine *et al.*, 2016; Kahneman and Tversky, 1979; Tversky and Kahneman, 1981). Frame dependence causes human decision-makers to be inconsistent (thus biased) when making decisions, due to being influenced by the specific frame in which the decision is presented and/or interpreted (Tversky and Kahneman, 1981). In a study on financial planners, Roszkowski and Snelbecker (1990) indicate that decision-makers who deal with financial risk on a regular basis are not immune to framing bias. Consequently, Mala and Chand (2015) and Wibbeke and Lachmann (2020) argue that it is of theoretical and practical interest to investigate behavioural biases, such as framing bias, within the management accounting field.

Rzeszutek (2015) report higher susceptibility to framing biases among risk-averse personalities, one of the characteristics Harris (1994) attributed to MAs. Pompian and Longo (2004) found, *inter alia*, that personalities who exhibit sensing, thinking and judging characteristics [identified by Wheeler (2001) to be prevalent among accountants] are more prone to overconfidence. Bazerman and Moore (2012) argue that many behavioural biases are facilitated by overconfidence, suggesting that more overconfident individuals tend to be more susceptible to biases. Yet, McIntosh (2005) conducted a preliminary examination on whether Myers–Briggs Personality Types could be associated with the influence of framing bias and found inconclusive results relating to the sensing-versus-intuitive, thinking-versus-feeling and judging-versus-perceiving scales.

Based on the preceding, the present study questions the pervasiveness of frame dependence bias among professional MAs, including whether MAs who exhibit a higher preference for basing decisions on supporting information, rather than on intuition (sensing oriented), are more prone to commit frame dependence bias than their colleagues who are more comfortable with intuitive decision-making. A survey was conducted among a demographically diverse sample of professional MAs to examine the abovementioned issues. Scenario-induced frame dependence bias is found to be pervasive among MAs, yet not more so than in studies on other populations. A higher preference for evidence-based decision-making, as opposed to intuitive decision-making, is found to only correlate with a higher susceptibility to endowment effect bias.

The present study contributes to the understanding of the decision-making behaviour of MAs within the context of their emerging involvement in business decision-making. This contribution is even more significant as the respondents surveyed are practising MAs who

experience the challenges of the changes taking place in the profession (Ismail and Rasheed, 2019). Furthermore, the development of a survey questionnaire to examine the prevalence of framing biases within a management accounting context represents a methodological contribution to the experiment dominated field.

The next section describes the main framing biases present in the literature, including a sub-section on the possible association between a higher preference for basing decisions on supportive information and a higher susceptibility to bias. Thereafter follow a description of the research methodology applied in the study, the findings of the study, as well as the conclusions to the study.

2. Review of theory

2.1 Prospect theory

Frame dependence stems from research originating from Prospect Theory. In terms of normative decision theories, different presentations of the same decision-problem should not change the outcome of the decision (Arrow, 1982), because decision-makers should always make the decision that maximizes utility. Research undertaken in line with prospect theory indicates, however, that the way a problem is presented does influence the outcome of a decision (Tversky and Kahneman, 1981). The frame of the decision is influenced, not only by presentation, but also the personal characteristics of the decision-maker (Lowies *et al.*, 2013). These characteristics include the "norms, habits and expectancies" of the decision-maker (Tversky and Kahneman, 1986).

Trepel *et al.* (2005) note how the prospect theory differs from the expected utility theory. Firstly, the utility function regarding absolute states of wealth is replaced by a value function regarding the valuation of gains and losses relative to a reference point (usually the status quo); secondly, probabilities are replaced by decision weights to weigh each possible outcome (attach a weight to each gain or loss); and thirdly, the framing of a problem is explicitly incorporated in the prospect theory to allow for the observation that different descriptions of the same problem may result in different decisions being made. Some of the key elements of the prospect theory are as follows (Trepel *et al.*, 2005):

- Curve of the value function – The value function is concave for gains and convex for losses, meaning the incremental value of the gain or the loss diminishes relative to an increase in the size thereof.
- Loss aversion – The slope of the loss section of the value function is steeper than the slope of the gain section, meaning that decision-makers are more averse to losses than to gains (the disposition effect) and that risk-seeking is more prominent when attempting to avoid losses, while risk aversion is more prominent when making decisions regarding the generation of possible gains.
- Curve of the decision weighting function – The decision weighting function is inversely S-shaped, indicating a tendency to overweigh low probabilities and to under-weigh medium-to-high probabilities.

2.2 Frame dependence biases and management accountants

The preceding section introduced Prospect Theory as the base for frame dependence research. Before discussing the biases, which may emanate from frame dependence, the necessity for studying the susceptibility of MAs to frame dependence is explained.

Birnberg *et al.* (2007) provide a comprehensive summary of research relating to psychological theories in the field of management accounting. The research in the summary

that is relevant to framing-related bias generally examines how the presentation of management accounting information influences managerial decisions (Harwood *et al.*, 1991; Lipe, 1993). Similarly, albeit with reference to environmental accounting information, Alewine *et al.* (2016) found that the frame in which information is provided by a hypothetical MA influences business students' judgement regarding the environmental responsibility performance of the business. Wibbeke and Lachmann (2020) provided an updated and expanded literature review to that of Birnberg *et al.* (2007), arguing that behavioural research in the management accounting field is a highly relevant and expanding field. Yet, the focus remains on how management accounting practices influence managerial decisions.

Although the preceding studies and literature reviews stress that frame dependence is relevant to management accounting, no studies could be found that investigated the susceptibility of MAs, *as a group of decision-makers*, to frame dependence biases. In the introduction to the present article, it was argued that MAs may be particularly susceptible to framing bias due to a general tendency by MA personalities to shy away from making intuitive decisions towards a preference for basing decisions only on strong supportive information (Harris, 1994; Pierce and O'Dea, 2003; Rzeszutek, 2015; Wheeler, 2001). When management accountants are then forced to make intuitive decisions, they may logically be more anxious when making such decisions. Wilson *et al.* (2018) corroborate that anxiety could exacerbate framing bias.

Furthermore, Zhang *et al.* (2019) recently argued that accounting students were influenced by the directionality of uncertainty expression, a concept comparable to the directionality of gains or losses from a reference point in frame dependence. Interestingly, Tan and Yates (1995) found that management accounting students were susceptible to framing related sunk cost to a similar than students from other backgrounds. Yet, the bias levels of MA students decreased, compared to the other decision-makers, when the decision scenario was more comparable to the business-related relevant costing, or capital budgeting, decisions encountered in their MA studies. Consequently, *H1* states that *management accountants are susceptible to the biasing influence of the following frame dependence biases when making business decisions, namely; loss aversion, concurrent-decisions, certainty effect, pseudo-certainty effect, mental accounting and endowment effect*. These framing biases are the most prevalent biases in current literature and are discussed in more detail below.

Prospect theory argues that human decision-makers are more sensitive to losses than to gains of similar value. Tversky and Kahneman (1992) refer to the human inconsistency in sensitivity to losses, as opposed to gains, as *loss aversion*. The main criticisms regarding loss aversion were addressed by Mrkva *et al.* (2019), who argue that loss aversion is a valid and pervasive behavioural bias. However, Haigh and List (2005) criticized the loss aversion studies preceding theirs, as the participants in previous studies were mostly undergraduate students. In their own study, the authors found that professional share traders are often more acutely loss averse than undergraduate students. Tokar *et al.* (2016) found loss aversion tendencies among experienced inventory controllers of a large retail firm in the USA, as well as a 35.6% prevalence of loss aversion among undergraduate and MBA students in the business field. Therefore, experienced professionals, including individuals with controller function backgrounds, are susceptible to loss aversion bias. In their seminal study, Tversky and Kahneman (1981) note that 50% of the university students in their sample switched their preferences when the decision problem was reframed to invoke loss aversion bias, while Bazerman (1994) report a 60% bias level in his discussion on loss aversion in managerial decision-making.

Tversky and Kahneman (1981) also demonstrated that, under certain circumstances, the framing of a set of *concurrent decisions* in two parts, rather than a combined whole, leads to irrational decision-making as a result of the influence of loss aversion (among 73% of participants). Shefrin (2002) explains that most human decision-makers fail to evaluate the separate parts of concurrent decisions as a single package, citing a 50% bias rate in his tests. Bazerman and Moore (2012) point out that business managers are expected to encounter many such "interconnected decisions" in separate parts when performing their managerial duties. Indeed, Sebora and Cornwall (1995) presented strategic management students with a pair of concurrent decisions within a business scenario and found strong evidence (72.1% prevalence) of concurrent decisions bias. Consequently, concurrent decisions bias is very relevant to the managerial context.

The human tendency to over-weigh decision options which create certainty, compared to those that merely create probability, was originally documented by Allais (Ramrattan and Szenberg, 2011). Tversky and Kahneman (1981) refer to this phenomenon as the *certainty effect*, citing a substantial 78% bias prevalence in their sample. Ramrattan and Szenberg (2011) uphold that the certainty effect withstood criticisms and scrutiny by researchers.

As an extension of the certainty effect, Bazerman and Moore (2012) discuss how the framing of decision outcomes may manipulate a decision-maker's perception that certainty is present. Tversky and Kahneman (1981) refer to the manipulation of framing to create a perception of certainty as *pseudo-certainty*. As an example of pseudo-certainty framing, Bazerman and Moore (2012) indicate that the same insurance policy could be framed as coverage against one of several events (framed as a probability of being covered against several events), or as full coverage for a specific event (framed as certain coverage for a specific event). Sebora and Cornwall (1995) adapted an earlier pseudo-certainty setting of Tversky and Kahneman (1981), who reported a 57% bias prevalence in their sample, into a business scenario of an acquisition decision involving contingencies. Sebora and Cornwall (1995) found that the pseudo-certainty effect is also present in a managerial context, although they found a somewhat lower bias prevalence of 44%.

Thaler (1999) refers to cognitive procedures that human decision-makers use with reference to their financial activities, as *mental accounting*. Thaler (1999) argues that decision-makers use these cognitive procedures to mentally organize financial activities into accounts and then evaluate and monitor these activities in terms of the conventions they develop for each of these accounts. This allocation may be affected by the frame in which the decision is presented (Ackert and Deaves, 2010). One example from an accounting context is described by Bonner *et al.* (2014) who found that managers select aggregated or disaggregated presentation of income statement items, based on which presentation (aggregated or disaggregated) induces the lowest loss aversion. Bonner *et al.* (2014) argue that managers display this behaviour to mentally account for the lower level of loss aversion. Yet, Sebora and Cornwall (1995) found a very limited 4% prevalence of mental accounting-based preference reversal in their business decision scenario on which the present study's question is based.

Kahneman *et al.* (1991) refer to the subjective increase in the value of a good when it is owned by a decision-maker, as the *endowment effect*. Ackert and Deaves (2010) explain that the endowment effect is consistent with the principles of the prospect theory, as the loss of an object is experienced more acutely than the attainment of an object. Kahneman *et al.* (1991) note that the primary cause of the endowment effect is the pain of losing the good, and not any enhanced appeal of the good due to ownership. Glöckner *et al.* (2015) suggest that the endowment effect may be partly responsible for breakdowns in co-operation by companies in situations where negotiations surrounding fragmented rights to a common

resource takes place. Importantly, the study by Glöckner *et al.* (2015) indicates that the endowment effect may also be present in the business environment, where the goods are owned by the business at which the human decision-maker is employed. As studies which investigate endowment effect bias rarely report prevalence rates, due to the nature of the tests, no prevalence rates could be provided for this bias.

2.3 Preference for supporting information and bias susceptibility

Literature suggests that MAs have a strong preference for basing decisions on supporting information (Harris, 1994; Kovar *et al.*, 2003), even if it detrimentally affects the timeliness of the decision (Byrne and Pierce, 2007). The question arises as to whether this preference may exacerbate particular MAs' susceptibility to framing biases, as is explained in the discussion which follows.

The preference a decision-maker exhibits for supporting information may be influenced by risk aversion, which can then be related to the individual's level of loss aversion (Schmidt and Traub, 2002). Similarly, a preference for evidence-based, rather than intuition-based decision-making, can be logically expected to result in a relatively higher level of anxiety when required to make intuition-based decisions. According to Wilson *et al.* (2018), anxiety may indicate a higher level of susceptibility to framing bias. A strong preference for only basing decisions on sound supporting information may therefore be associated with higher bias susceptibility.

In line with the arguments above, Filbeck *et al.* (2005) hypothesized, but did not find, a positive relationship between a lower preference for using intuition on the Myers–Briggs sensing versus intuition measure, and a lower level of risk tolerance in investment decision-making. However, Pompian and Longo (2004) did find that sensing personalities were twice as risk averse, as intuitive personalities. These authors argue that these personality differences should also result in different susceptibility levels to behavioural biases, such as those emanating from frame dependence. Interestingly, McIntosh (2005) could not find sufficient evidence to support an association between sensing and bias susceptibility. Nonetheless, based on the preceding arguments and discussions *H2* states that *management accountants who exhibit a higher preference for basing decisions on supportive information rather than on intuition are more susceptible to frame dependence bias.*

If the above hypothesis is supported by the results of this study, it would imply that MAs who exhibit a higher preference for supporting information than their fellow MAs, may indeed be affecting business decision-making negatively, due to framing bias being inherent in their decision-making behaviour.

Frame dependence literature highlights two demographic variables which are associated with higher levels of frame dependence bias. To appropriately examine *H2*, these variables should be included as control variables in analyses. Each of these two variables is briefly discussed below.

Schmidt and Traub (2002) considered possible differences in the level of loss aversion, based on *gender*, and found evidence of higher loss aversion by women than by men, which they indicate may be linked to the comparatively higher level of risk aversion of women. This was confirmed by Pompian and Longo (2004) and Eckel and Grossman (2008). Similarly, Johnson and Gleason (2009) argue that higher risk aversion exhibited by women could be expected to also manifest in higher susceptibility to the certainty effect bias. Gender will therefore be included as the first control variable.

Age may also indicate higher susceptibility to framing bias. Shefrin (2008) suggests that risk aversion increases until about 70 years of age, with the lowest tolerance between 50 and 70 years. Subsequently, Mrkva *et al.* (2019) found strong evidence that loss aversion bias

also increases with age. Similarly, with reference to the certainty effect, Mather *et al.* (2012) found that older adults regard certainty as more important than younger adults (75% prevalence compared to a 39% prevalence, respectively). Accordingly, age will be included as the second control variable in the analyses regarding *H2*.

More detail on how the data were obtained and which analysis methods were applied are provided in the section that follows.

3. Material and methods

3.1 Research instrument

Data for this study were gathered using a questionnaire. The changing role of MAs is subjecting them to making decisions in the business environment where the high-quality information that these professionals tend to prefer is practically unattainable (Alkaraan, 2016; CGMA, 2016; Järvenpää, 2007; Pierce and O'Dea, 2003). Consequently, the questions selected to be included in the instrument simulates this business decision-making environment.

The main approach to ensure the validity of the questionnaire in the present study was to use existing questions from previous research (Bazerman, 1994; Kahneman *et al.*, 1991; Sebora and Cornwall, 1995; Tversky and Kahneman, 1981). However, some of the questions had to be amended to make it applicable to the context of business decisions. Accordingly, other methods to ensure validity, which include obtaining the insights of an international expert in the behavioural field, and pilot testing the questionnaire, were also employed. The only revisions required after applying these methods were to decrease the length of the questionnaire by somewhat more concise presentation of the questionnaire. Information on each question is presented along with the discussion of the results *(a static DOI to the questionnaire will be made available for publication, or the questionnaire is available in the Appendix. However, the questionnaire is attached as an "additional document for review" for review purposes).*

Qualtrics Online Survey software was used to administer the questionnaire. Brandon *et al.* (2013) confirm that Qualtrics is a regularly relied upon research instrument delivery platform and encourage its use in behavioural accounting research. The questions were presented in random order to each participant. Additionally, controls were implemented to ensure that the test questions related to the same bias were not presented consecutively.

3.2 Population and sampling

Various behavioural studies, especially experiment-based studies, regularly rely on student samples alone (Finucane *et al.*, 2000; Glöckner and Pachur, 2012; Kahneman *et al.*, 1991; Sebora and Cornwall, 1995). Yet, Menkhoff and Nikiforow (2009), Mrkva *et al.* (2019) and Zhang *et al.* (2019) argue that it is advisable to include qualified professionals in the survey target group to ensure that findings are representative of the larger population. Due to the changing business role of MAs, it is therefore essential that the sample largely consists of practising MAs. Also note that Sharp and Salter (1997) found that framing effects do not seem to differ across cultural boundaries, supporting the selection of an international sample.

To reach the internationally dispersed population of MAs, a non-probability convenience sampling approach was implemented. Brandon *et al.* (2013) argue that convenience samples are often adequate substitutes for probability samples, especially when the population is widely dispersed and difficult to reach. Yet, Fogelman and Comber (2002) suggest that research using convenience sampling should be informative about the selection of the sample, as well as about the sample itself.

The sample was obtained using three main response sources. The largest proportion of responses (45.8%, n = 124) was generated with the assistance of the Institute of Management Accountants (IMA), based in the USA, which agreed to distribute the questionnaire to a representative sample of its members (Krumwiede, 2017). The response rate of 2.48% to the present study compares favourably to the response rate of the study by Clinton and White (2012) of 2.38% on the same population.

The second-largest portion of responses was from members of the Chartered Institute of Management Accountants (CIMA). Of the final combined sample, 29.5% of the responses (being n = 80) was collected from the marketing of the questionnaire by CIMA to its member base via various CIMA media broadcasting platforms. CIMA's current policies do not permit direct e-mails to members with invitations to participate in a survey. As a result, no response rate could be calculated.

The third portion of responses was obtained through the assistance of Qualtrics response panel services. The responses gained via this procedure represent 24.7% (n = 67) of the final combined sample. The procedures, described by Brandon *et al.* (2013), which Qualtrics applies to ensure valid and reliable panel responses, were confirmed in the present study.

Apart from the uniquely wide international composition of the sample, the composition compares well to the samples of previous studies in the management accounting field (Clinton and White, 2012; Montano *et al.*, 2001). A summary of the demographic composition of the sample is available in the Appendix to this doi: 10.25403/UPresearchdata.19121714. Accordingly, the external validity of the combined sample is considered to be adequate. It should be noted that the length of the questionnaire resulted in some response attrition, as it mostly required responses to two case studies per bias. Accordingly, the testable sample size did vary to some extent between the various biases. Chi^2 tests for non-response bias were conducted between bias levels of early and late respondents. Apart from loss aversion bias, non-response bias seems to be absent from these responses. The possibility of non-response bias in the loss aversion tests could not be eliminated and is regarded as a limitation, which should be noted when interpreting the findings of loss aversion bias in the present study.

3.3 Data analysis

In line with previous studies (Bazerman, 1983; Benartzi and Thaler, 2007; Lowies *et al.*, 2013; Tversky and Kahneman, 1981), the obtained data are mainly either dichotomous or categorical and, as a result, non-parametric analysis techniques are appropriate. For testing *H1*, some of the survey questions required a comparison of actual response proportions with expected proportions, to identify significant bias in the decision-making behaviour of respondents. In the absence of bias, all respondents should reasonably be expected to select the rational option as their response. The chi-square test for goodness of fit is the preferred test for comparing expected and actual proportions. However, the chi-square test for goodness of fit cannot determine the significance of the difference between the expected proportion and the actual proportion, if either one of the proportions is 0 or 1 (i.e. 0 or 100%). Accordingly, much of the previous literature (Bazerman, 1994; Lowies, 2012; Shefrin, 2002; Tversky and Kahneman, 1974; Tversky and Kahneman, 1981) that used these questions only reported the proportions with no indication of statistical significance for these specific differences. For the present study, the Wilson binomial interval estimation, as suggested by Brown *et al.* (2001), is considered preferable to provide an indication of significance.

When testing for the significance in the preference reversal of respondents between a question framed to induce frame dependence and a clearly framed question, or between two differently framed questions of the same scenario, McNemar's test is applied, as it is able to test the significance of preference reversals by the same group of respondents (Field, 2013).

Analyses performed to examine *H2* were performed using binary logistic regression. D'Angelo *et al.* (2018) applied logistic regression in their behavioural bias study with a comparable sample. Logistic regression is specifically relevant to analyses where the outcome variable is categorical (Hosmer and Lemeshow, 2000), in this case being biased or unbiased.

The analysis methods described and motivated in this section were used to obtain the results and findings in the section which follows.

4. Results
Firstly, the results of the analyses of the susceptibility of MAs to framing biases are presented, which address *H1*. Thereafter, the results of the analyses addressing *H2* is presented, with a focus on the results of the endowment effect analysis, the only bias where a statistically significant result was obtained.

4.1 Susceptibility of management accountants to frame dependence bias
Table 1 presents a summary of the susceptibility of MAs to the various biases tested, after which the results of the analysis for each bias is explained in more detail. Note that references to the optimal option to decision-problems refer to the options which maximizes expected utility from the perspective of the decision-maker (Tversky and Kahneman, 1981). It should be noted that the previous bias proportions against which the current sample's level of bias are compared, were not determined using the same question scenarios as the present study. Consequently, the comparisons of bias susceptibility levels are preliminary in nature, although a number of comparative proportions from different studies are listed to strengthen the interpretations

The two loss *aversions* questions presented respondents with a positively and negatively framed version of the same scenario. McNemar's test indicate a statistically significant preference reversal ($p < 0.001$) by respondents ($n = 219$). The risk-averse preference of 64.4% of respondents when presented with the positively framed problem, decreased to 52.5% of respondents when the problem was framed negatively. The odds ratio ($OR = 1.63$) indicates a moderate effect, in that respondents in the sample are 1.63 times more probable to select the risk-seeking alternative in the loss frame than in the gain frame. While loss aversion bias is present in the business-related decision-making behaviour of MAs in the sample, the level of preference reversal in the current sample (11.9%) is substantially lower than those of previous studies, for example, Bazerman (1994) (60%), Tokar *et al.* (2016) (35.6%) and Tversky and Kahneman (1981) (50%).

In the analysis of *concurrent decisions* bias, the option selection of respondents in the transparently-framed version of the concurrent decisions problem is compared to their option combinations when the scenario is framed as two concurrent decisions. The study follows the prudent approach suggested by Sebora and Cornwall (1995), in only comparing selections of combinations in the first question that has exact equivalents in the second question. Accordingly, the qualifying number of responses were only $n = 136$. The preference by respondents for the optimal solution (84.6%) when presented in a transparent frame reverses to a preference for the sub-optimal combination (80.1%) when presented in the concurrent-decisions frame. This preference reversal is statistically highly significant ($p < 0.001$) according to McNemar's test. The odds ratio ($OR = 22.108$) indicates that respondents in the sample are 22.108 times more likely to select the sub-optimal option in the concurrent frame, than in the transparently presented frame. This substantial level of preference reversal of 64.7% is similar to previous studies, for example, Sebora and Cornwall (1995) (72.1%), Shefrin (2002) (50%) and Tversky and Kahneman (1981) (73%).

Framing bias	Usable responses (n)	Survey question information	Option selection (%)	Statistical significance test (significance)
Loss aversion	219	Question 1 Positive frame Question 2 Negative frame	Risk averse: 64.4 Risk seeking: 35.6 Risk averse: 52.5 Risk seeking: 47.5	McNemar's test ($p < 0.001^*$)
Concurrent decisions	136	Question 3 Transparent frame Question 4 Concurrent frame	A – sub-optimal: 15.4 B – optimal: 84.6 A and D – sub-optimal: 80.1 B and C – optimal: 19.9	McNemar's test ($p < 0.001^*$)
Certainty effect	246	Question 5 Certainty, sub-optimal frame Optimal frame	Biased: 45.9 Unbiased: 54.1	Wilson binomial confidence intervals (95) ($p < 0.01$)
Pseudo-certainty effect	219	Question 6 Transparent frame Question 7 Pseudo-certainty frame	A – 41.1 B – 58.9 A – 50.7 B – 49.3	McNemar's Test $p = 0.02^*$
Mental accounting	219	Question 8 Same mental account Question 9 Different mental accounts	A – 69.9 B – 30.1 A – 69.4 B – 30.6	McNemar's Test ($p = 1.000^*$)
Mental accounting	219	Questions 8 and 9, bi-directional preference reversal	Preference reversed: 34.2 Preference maintained: 65.8	Wilson binomial confidence intervals (95) ($p < 0.01$)

Note: * Binomial distribution used

Table 1.
Analysis of response proportions (all the selected biases, except endowment effect)

With reference to the *certainty effect*, respondents were presented with two insurance premium increase options, option B increased coverage from 80 to 100% for its event, and option A from 70 to 90% for its event yet is less expensive per percentage point of coverage. Of the respondents ($n = 246$), 54.1% selected the financially optimal option A and 45.9% were biased by the certainty provided by option B. The 95% Wilson binomial confidence intervals indicate that the actual responses by MAs in the sample differ statistically significantly from rationality ($p < 0.01$). Although certainty bias was present, a smaller percentage of the respondents in the sample of the present study were influenced by the certainty option (45.9%) than in the seminal work by Tversky and Kahneman (1981) (78%). However, a recent study by Mather *et al.* (2012) found a very high variance in the prevalence of the certainty effect between younger adults (18 to 35 years; 39% prevalence) and older adults (60 to 85 years; 75% prevalence) in an experiment in the loss domain, similar to the current study. The present study's findings are closer to the younger adult prevalence found by Mather *et al.* (2012), which can be expected, as the median and mode age of respondents in the sample is represented by the 30–39 years age bracket.

Pseudo-certainty was examined through a transparently framed question, and a question which frames the same decision problem to create an option with illusionary certainty. The preference by respondents ($n = 219$) for the slightly superior option B in the transparently framed problem (58.9%) reversed to a preference for the pseudo-certainty option A (50.7%). According to McNemar's test, this reversal is moderately statistically significant ($p = 0.02$). According to the odds ratio ($OR = 1.47$), respondents in the sample are 1.47 times more likely to select the inferior option A when it is presented in a frame that creates pseudo-certainty, than in a clear frame. The percentage of MAs who selected the pseudo-certainty option (50.7%) falls within the range reported by earlier studies on other populations, for example, Sebora and Cornwall (1995) (44%), Slovic *et al.* (1982) (57%) and Tversky and Kahneman (1981) (74%).

Mental accounting-based bias is tested using two questions regarding a loss incurred. In the one question the loss is framed as related to a specific expenditure item, while in the other it is framed as an unrelated loss. The average preference for the option to incur an additional expense of the same amount remained the same, irrespective of the mental account the problem frame attempted to induce (69.9% and 69.4%) and the very slight difference is statistically insignificant ($p = 1.000$, $n = 219$). However, a further analysis was performed which identified that 34.2% of respondents changed their preference. Accordingly, almost half of the 34.2% who reversed their preference changed their preference in one direction, and almost half in the other direction (bi-directional preference reversal), resulting in a non-significant difference in the average preference. Yet, the bi-directional preference reversal proportion is statistically significant ($p < 0.01$) according to the 95% Wilson binomial confidence intervals. It can therefore be concluded that the difference in framing did significantly influence the preferences of MAs in the sample, but not in the traditionally expected mental accounting-based manner. Benartzi and Thaler (2007) and Thaler (1999) indicate the significant presence of mental accounting-based bias in decision-making by individuals concerning their personal finances. Bonner *et al.* (2014) suggest that mental accounting may also be present when making decisions regarding the finances of an individual's employer. However, similar to the present study, Sebora and Cornwall (1995) found limited evidence of mental accounting in a business scenario. Sebora and Cornwall (1995) do not indicate whether some participants in their study exhibited inverse preference reversals to the general mental accounting theory. As mental accounting is closely related to budgeting in a business scenario, the findings of the present study represent fertile opportunity to further investigate the possible manifestations of mental accounting in business-related decision-making.

The current study tests whether the *endowment effect* is also present when MAs value a good that is owned by the business where they are employed. The differently framed questions had eight ordinal (ranked) price categories from which to select a suggested value for a property. These questions were adapted to a business scenario from the questions discussed by Kahneman *et al.* (1991). The test for the presence of the endowment effect bias is presented in Table 2.

The Wilcoxon signed-rank test indicates that respondents ($n = 219$) valued the property significantly higher ($p = 0.001$, $z = -3.416$) when it is owned by their employer (*First Quart* = 4, *Mdn* = 5, *Third Quart* = 6*)* than when it is owned by a third party (*First Quart* = 3, *Mdn* = 4, *Third Quart* = 5) and the employer is interested in purchasing the property. The effect size ($r = 0.21$) indicates a medium effect. The results indicate that MAs are influenced by the endowment effect with reference to business decisions. This finding provides further evidence to support the findings by Glöckner *et al.* (2015) that the endowment effect may be present in decision-making by an individual, even when the particular good is the property of the individual's employer.

A summary of the findings of the susceptibility of MAs to frame dependence bias is presented in Table 3.

H1 is accepted as a significant proportion of MAs are influenced by framing bias. In contrast with an earlier study by Tan and Yates (1995) on sunk cost framing bias, the present study finds the proportions of MAs affected by framing bias are very similar to proportions identified in other populations.

4.2 Association between preference for supporting information and framing bias
Binary logistic regression analysis is used to test *H2*. The independent variable of "preference for supporting information" is measured on an 11-point scale on which respondents had to indicate, on a scale of 0 to 10, the level to which they prefer to base decisions on sound

Table 2.
Analysis of responses with reference to the endowment effect

Framing bias and (Hypothesis no.)	No. of categories for which:				Statistical significance test (significance)
	Responses (*n*)	Sell > Buy	Buy = Sell	Sell < Buy	
Full sample	219	86	94	39	Wilcoxon signed-rank test (two-tailed) $p < 0.001$

Table 3.
Summary of the findings – the influence of frame dependence-related biases

Bias	Proportion-biased respondents (%)	Significance of proportion	Comparison of proportion to previous studies on general populations
Loss aversion	11.9	Significant	Substantially lower than other populations
Concurrent decisions	64.7	Significant	Similar to other populations
Certainty effect	45.9	Significant	Similar to recent study, lower than older seminal study
Pseudo-certainty effect	50.7	Significant	Similar to other populations
Mental accounting	34.2	Significant	Bi-directional preference reversals differ from previous studies, which predominantly investigated uni-directional preference reversal.
Endowment effect	39.3	Significant	Not available

supporting information, rather than using their intuition. The decision was made to use this scale, rather than the Myers–Briggs Type Indicator's scale for sensing versus intuition, due to the pervasive accusation in the literature that MAs negatively affect decision-making in business due to their preference for wanting to obtaining sound supporting information before being willing to make decisions (Byrne and Pierce, 2018; Pierce and O'Dea, 2003).

Concerning the results, a significant association was found only between a strong preference for supporting information and the endowment effect bias. For the sake of brevity, this finding is presented and discussed first, followed by an aggregated presentation and a brief discussion of the insignificant results for the other biases.

4.3 Endowment effect bias susceptibility

A conservative approach was taken for this analysis, by excluding the 39 respondents who rated the property higher in die buy scenario than in the sell scenario to only perform the test on respondents biased specifically by endowment bias, as well as the unbiased respondents. Of the respondents included in the sample for this analysis (n = 180), 86 (47.8%) indicated a higher suggested sales price category than purchase price category and were therefore influenced by the endowment bias. The resulting findings are presented below. Table 4 presents the statistics regarding the fit of the model and Table 5 the actual model findings.

The model fit statistics provide indications of good model fit. Accordingly, the results for the endowment effect bias is provided in Table 5.

Preference for supporting information is significantly associated with susceptibility to endowment effect bias. The model indicates that each 10%-point increase in preference for making decisions based on sound supporting information, as opposed to using intuition, is associated with a 14.3% increase [Wald χ^2 = 5.011 (1), p = 0.025] in susceptibility to the endowment effect bias. The result from the analysis indicates that MAs who prefer to base decisions on sound supporting information, rather than intuition, are more susceptible to the biasing influence of the endowment effect. This finding provides some support, albeit regarding a different bias, for the arguments by Rzeszutek (2015) and Wilson *et al.* (2018) that individuals who are more anxious about using their judgement when making decisions may be more prone to behaviour-related biasing influences. In this instance, the decision-making behaviour of MAs with a preference for supporting information may negatively affect the quality of business decisions.

4.4 Insignificance of preference for supporting information concerning other biases

For all the other biases tested, a preference for supporting information was not found to be significantly associated with higher bias susceptibility. The results from these analyses are summarized in Table 6.

Statistic	Value	Finding
Likelihood ratio	9.734 (5), p = 0.083	Significant fit
R^2:		
• McFadden	0.039	Moderate fit
• Nagelkerke	0.07	
Hosmer and Lemeshow test	4.695 (8), p = 0.79	Good fit
Area under the ROC curve	62.1%	Moderate fit
Studentized residuals above 2	None	Good fit

Table 4.
Model fit statistics – supporting information preference and endowment effect bias susceptibility

A cautious comment based on an observation of the results is that for all of the biases, except mental accounting, the odds ratios of above 1 suggest that preference for supporting information may increase bias susceptibility. However, the statistical insignificance of the results renders this comment to be little more than speculation requiring further examination in future research.

It should be noted that gender and age were included as control variables in all of the mentioned logistic regression models, based on its theoretical importance. Although the control variables did influence the models, it was not to a statistically significant extent in any of the models[1].

5. Discussion and conclusion

The role of MAs is changing from "controllers" and "scorekeepers" to "hybrid accountants" and "business partners". However, the literature argues that these professionals may struggle to make intuitive judgement-based decisions regularly required in business decision-making (Harris, 1994; Pierce and O'Dea, 2003). Their natural preference for basing

Variable	Beta coefficient	Standard error	Significance (Wald)	Odds ratio	Confidence interval (95%) for odds ratio	
Test variable						
Preference for supporting info	0.133	0.064	5.011 (1) $p = 0.025$	1.143	0.015	0.281
Control variables						
Gender	0.275	0.359	0.633 (1) $p = 0.430$	1.316	−0.496	1.028
Age (20–29)			3.618 (3) $p = 0.306$			
Age (30–39)	0.576	0.395	2.128 (1) $p = 0.139$	1.780	−0.239	1.419
Age (40–49)	0.334	0.436	0.586 (1) $p = 0.452$	1.396	−0.605	1.224
Age (50+)	−0.239	0.546	0.192 (1) $p = 0.647$	0.787	−1.179	0.628

Table 5.
Final logistic regression model – supporting information preference and endowment effect bias susceptibility

Bias	Model fit: Likelihood ratio (*df*) significance	Supporting preference variable: Wald (*df*) significance	Beta (SE) and Odds ratio
Loss aversion	2.905 (5) $p = 0.715$	1.94 (1) $p = 0.164$	0.084 (0.064), 1.088
Concurrent decision	2.949 (5) $p = 0.708$	0.566 (1) $p = 0.452$	0.056 (0.076), 1.057
Certainty effect	5.009 (5) $p = 0.415$	0.113 (1) $p = 0.736$	0.17 (0.054), 1.017
Pseudo-certainty	4.703 (5) $p = 0.453$	0.606 (1) $p = 0.436$	0.052 (0.077), 1.053
Mental accounting	5.266 (5) $p = 0.384$	0.170 (1) $p = 0.680$	−0.023 (0.057), 0.977

Table 6.
Summary of findings of insignificance of supporting information preference for each other bias

decisions on sound supporting information (Wheeler, 2001), which is further reinforced by their technical training, is the base for this proposition. Consequently, the present study investigated the susceptibility of a diverse sample of MAs to the main framing biases and compared their susceptibility to that of other populations.

The study questioned the pervasiveness of frame dependence bias among MAs. For all the biases investigated, a significant proportion of MAs in the sample was influenced by each respective bias. This finding supports that of Roszkowski and Snelbecker (1990) that professionals from different professions are influenced by framing bias, even if they regularly make decisions related to financial risk. Contrary to the suggestions from the literature that MAs may struggle to make intuitive decisions (Byrne and Pierce, 2007; Harris, 1994; Tan and Yates, 1995), their frame dependence bias levels were found to be either similar (concurrent decisions bias, certainty and pseudo-certainty bias, endowment effect and mental accounting) or lower (loss aversion) than that of other, previously tested, populations (e.g. from Mather *et al.*, 2012; Sebora and Cornwall, 1995; Slovic *et al.*, 1982; Tversky and Kahneman, 1981). Consequently, framing-related behavioural bias does not represent a hurdle to management accountants' closer involvement in business decision-making, an encouraging finding for the profession.

Furthermore, the study questioned the possible association between preference for evidence-based decision-making and bias susceptibility; it was found that MAs who indicated a higher preference for basing decisions on ample supporting information, as opposed to using their intuition or judgement, are more susceptible to the endowment effect bias. This preference for evidence-based decision-making, a cause for much criticism towards MAs (Byrne and Pierce, 2007; Pierce and O'Dea, 2003; Rausch, 2011), was not found to be associated with increased bias susceptibility levels for any of the other biases. These findings support that of McIntosh (2005) that sensing personalities are not necessarily more susceptible to framing bias.

Contributions of the present study include identifying and estimating the presence and level of frame dependence biases among a hitherto under-researched group of financial decision-makers, namely, MAs. The investigation of the decision-making behaviour of these professionals is especially relevant due to their changing decision-making role (Wibbeke and Lachmann, 2020). In line with suggestions by Mrkva *et al.* (2019) and Zhang *et al.* (2019), the contribution of the present study is reinforced by the sample consisting of professionally employed respondents. The in-depth discussion of the biases serves to introduce the concepts to the MA readership of the journal to create more awareness of framing related biases. The questionnaire which was developed to test framing bias susceptibility within the business decision-making context also represents a methodological contribution as future studies may use it to investigate bias susceptibility trends within this environment.

The conclusions should be considered within the framework of the following main limitations which applied to the present study but which are not unique. The general difficulty to attain responses in survey research (Evans and Mathur, 2005) affected the current study. Additionally, the effort required in completing the scenario-based questionnaire resulted in a level of response attrition. The possibility of non-response bias could not be eliminated for the loss aversion bias test. The comparisons of bias proportions to that of previous studies are subject to the limitation that each study's proportions were based on its own unique questionnaire.

An enhanced understanding of the decision-making behaviour of MAs, as afforded by the present study, provides a basis for future studies to identify which de-biasing strategies would be most successful to lower the susceptibility of MAs to framing biases (Alkaraan, 2016). The way mental accounting influences the behaviour of MAs would benefit from

additional future research. The present study identified preference reversal in both directions based on the business decision scenario presented to respondents to the questionnaire. This is an area which has not received adequate research attention in past studies on behaviour in general and, accordingly, results in difficulty in interpreting the findings of the current study in this regard.

Note

1. Note that other demographic variables (experience and position employed in) were also investigated to identify possibly significant relationships with bias susceptibility. Similar to Roszkowski and Snelbecker (1990), no significant relationships were identified.

References

Ackert, L.F. and Deaves, R. (2010), *Behavioral Finance: Psychology, Decision-Making and Markets*, South-Western Cengage Learning, Mason, OH.

Alewine, H.C., Allport, C.D. and Shen, W.-C.M. (2016), "How measurement framing and accounting information system evaluation mode influence environmental performance judgments", *International Journal of Accounting Information Systems*, Vol. 23 No. 1, pp. 28-44, doi: 10.1016/j. accinf.2016.10.002.

Alkaraan, F. (2016), "Strategic investment decision-making–scanning and screening investment opportunities", *Meditari Accountancy Research*, Vol. 24 No. 4, pp. 505-526.

Arrow, K.J. (1982), "Risk perception in psychology and economics", *Economic Inquiry*, Vol. 20 No. 1, p. 1, doi: 10.1111/j.1465-7295.1982.tb01138.x.

Bazerman, M. (1994), *Judgement in Managerial Decision Making*, John Wiley and Sons, New York, NY.

Bazerman, M.H. (1983), "Negotiator judgment: a critical look at the rationality assumption", *American Behavioral Scientist*, Vol. 27 No. 2, pp. 211-228, doi: 10.1177/000276483027002007.

Bazerman, M. and Moore, D.A. (2012), *Judgment in Managerial Decision Making*, John Wiley and Sons, New York, NY.

Benartzi, S. and Thaler, R.H. (2007), "Heuristics and biases in retirement savings behavior", *Journal of Economic Perspectives*, Vol. 21 No. 3, pp. 81-104, doi: 10.1257/jep.21.3.81.

Birnberg, J.G., Luft, J. and Shields, M.D. (2007), "Psychology theory in management accounting research", in Chapman, C.S., Hopwood, A.G. and Shields, M.D. (Eds), *Handbooks of Management Accounting Research*, Elsevier, Oxford, UK.

Bonner, S.E., Clor-Proell, S.M. and Koonce, L. (2014), "Mental accounting and disaggregation based on the sign and relative magnitude of income statement items", *The Accounting Review*, Vol. 89 No. 6, pp. 2087-2114.

Brandon, D.M., Long, J.H., Loraas, T.M., Mueller-Phillips, J. and Vansant, B. (2013), "Online instrument delivery and participant recruitment services: emerging opportunities for behavioral accounting research", *Behavioral Research in Accounting*, Vol. 26 No. 1, pp. 1-23, doi: 10.2308/bria-50651.

Brown, L.D., Cai, T.T. and DasGupta, A. (2001), "Interval estimation for a binomial proportion", *Statistical Science*, Vol. 16 No. 2, pp. 101-117, available at: https://uplib.idm.oclc.org/login?url= https://www.jstor.org/stable/2676784

Byrne, S. and Pierce, B. (2007), "Towards a more comprehensive understanding of the roles of management accountants", *European Accounting Review*, Vol. 16 No. 3, pp. 469-498, doi: 10.1080/ 09638180701507114.

Byrne, S. and Pierce, B. (2018), "Exploring management accountants' role conflicts and ambiguities and how they cope with them", *Qualitative Research in Accounting and Management*, Vol. 15 No. 4, pp. 410-436.

CGMA (2016), *Business Analytics and Decision-Making: The Human Dimension*, CGMA, New York, NY.

Clinton, D. and White, L.R. (2012), "The role of the management accountant: 2003-2012", *Management Accounting Quarterly*, Vol. 14 No. 1, pp. 40-74.

D'Angelo, E., Mustilli, M. and Piccolo, R. (2018), "Is the lending decision-making process affected by behavioral biases?", *Modern Economy*, Vol. 9 No. 1, pp. 160-173, doi: 10.4236/me.2018.91010.

Eckel, C.C. and Grossman, P.J. (2008), "Forecasting risk attitudes: an experimental study using actual and forecast gamble choices", *Journal of Economic Behavior and Organization*, Vol. 68 No. 1, pp. 1-17, doi: 10.1016/j.jebo.2008.04.006.

Evans, J.R. and Mathur, A. (2005), "The value of online surveys", *Internet Research*, Vol. 15 No. 2, pp. 195-219, doi: 10.1108/10662240510590360.

Field, A. (2013), *Discovering Statistics Using IBM SPSS Statistics*, Sage, London.

Filbeck, G., Hatfield, P. and Horvath, P. (2005), "Risk aversion and personality type", *Journal of Behavioral Finance*, Vol. 6 No. 4, pp. 170-180.

Finucane, M.L., Alhakami, A., Slovic, P. and Johnson, S.M. (2000), "The affect heuristic in judgments of risks and benefits", *Journal of Behavioral Decision Making*, Vol. 13 No. 1, pp. 1-17, doi: 10.1002/(SICI)1099-0771(200001/03)13:1<1::AID-BDM333>3.0.CO;2-S.

Fogelman, K. and Comber, C. (2002), "Surveys and sampling", in Coleman, M. and Briggs, A.R.J. (Eds), *Research Methods in Educational Leadership and Management*, SAGE, London.

Glöckner, A. and Pachur, T. (2012), "Cognitive models of risky choice: parameter stability and predictive accuracy of prospect theory", *Cognition*, Vol. 123 No. 1, pp. 21-32, doi: 10.1016/j.cognition.2011.12.002.

Glöckner, A., Tontrup, S. and Bechtold, S. (2015), "Disentangling psychological sources of overpricing in anticommons dilemmas: strategic incentives, endowment effects, and interdependence of outcomes", *Journal of Behavioral Decision Making*, Vol. 28 No. 3, pp. 224-238, doi: 10.1002/bdm.1839.

Goretzki, L., Strauss, E. and Weber, J. (2013), "An institutional perspective on the changes in management accountants' professional role", *Management Accounting Research*, Vol. 24 No. 1, pp. 41-63, doi: 10.1016/j.mar.2012.11.002.

Haigh, M.S. and List, J.A. (2005), "Do professional traders exhibit myopic loss aversion? An experimental analysis", *The Journal of Finance*, Vol. 60 No. 1, pp. 523-534, doi: 10.1111/j.1540-6261.2005.00737.x.

Harris, P. (1994), "Can management accountants make decisions?", *Management Accounting: Magazine for Chartered Management Accountants*, Vol. 72 No. 7, p. 14.

Harwood, G.B., Pate, J.L. and Schneider, A. (1991), "Budgeting decisions as a function of framing: an application of prospect theory's reflection effect", *Management Accounting Research*, Vol. 2 No. 3, pp. 161-170, doi: 10.1016/S1044-5005(91)70032-2.

Horton, K.E., Wanderley, C. D A., Souza, G.H.C. and de Araujo, J.G. (2020), "Roles and attitudes in the management accounting profession: an international study", *Management Accounting Quarterly*, Vol. 21 No. 3, pp. 1-9.

Hosmer, D.W. and Lemeshow, S. (2000), "Applied logistic regression", *Applied Logistic Regression*, Wiley, New York, NY.

Ismail, S. and Rasheed, Z. (2019), "Influence of ethical ideology and emotional intelligence on the ethical judgement of future accountants in Malaysia", *Meditari Accountancy Research*, Vol. 27 No. 6, pp. 805-822.

Järvenpää, M. (2007), "Making business partners: a case study on how management accounting culture was changed", *European Accounting Review*, Vol. 16 No. 1, pp. 99-142, doi: 10.1080/09638180701265903.

Johnson, D.K. and Gleason, T.R. (2009), "Who really wants to be a millionaire? Gender differences in game show contestant behavior under risk", *Social Science Quarterly*, Vol. 90 No. 2, pp. 243-261, doi: 10.1111/j.1540-6237.2009.00615.x.

Kahneman, D., Knetsch, J.L. and Thaler, R.H. (1991), "Anomalies: the endowment effect, loss aversion, and status quo bias", *Journal of Economic Perspectives*, Vol. 5 No. 1, pp. 193-206, available at: www.jstor.org/stable/1942711

Kahneman, D. and Tversky, A. (1979), "Prospect theory: an analysis of decision under risk", *Econometrica*, Vol. 47 No. 2, pp. 263-291, doi: 10.2307/1914185.

Kim, J., Hatcher, C. and Newton, C. (2012), "Professional identity of management accountants: leadership in changing environments", *CIMA: Research Executive Summary Series*, Vol. 8 No. 1, pp. 1-21, available at: www.cimaglobal.com/Research–Insight/Professional-identity-of-management-accountants-leadership-in-changing-environments/

Komakech, S. (2009), "The nature of managerial involvement in strategic investment decisions", Unpublished Masters dissertation Unpublished Masters dissertation, De Montfort University.

Kovar, S.E., Ott, R.L. and Fisher, D.G. (2003), "Personality preferences of accounting students: a longitudinal case study", *Journal of Accounting Education*, Vol. 21 No. 2, pp. 75-94.

Krumwiede, K.R. (kkrumwiede@imanet.org) (2017), *RE: Behavioral Aspects that Influence Business Decision-making by Management Accounting*, Emailed to: Enslin, Z, available at: zack.enslin@up.ac.za (accessed 5 September 2017).

Lipe, M.G. (1993), "Analyzing the variance investigation decision: the effects of outcomes, mental accounting, and framing", *Accounting Review*, Vol. 68 No. 4, pp. 748-764.

Lowies, G.A. (2012), "The role of behavioural aspects in investment decision-making by listed property fund managers in South Africa", PhD Financial Management Unpublished PhD Thesis, University of Pretoria.

Lowies, G.A., Hall, J.H. and Cloete, C.E. (2013), "The influence of frame dependence on investment decisions made by listed property fund managers in South Africa", *Journal of Economics and Behavioral Studies*, Vol. 5 No. 11, pp. 805-814, doi: 10.22610/jebs.v5i11.454.

McIntosh, M.J. (2005), "Personality typology and thinking styles: their role in framing and prospect theory", *Advances in Consumer Research*, Vol. 32 No. 1, pp. 253-255.

Mala, R. and Chand, P. (2015), "Judgment and decision-making research in auditing and accounting: future research implications of person, task, and environment perspective", *Accounting Perspectives*, Vol. 14 No. 1, pp. 1-50, doi: 10.1111/1911-3838.12040.

Mather, M., Mazar, N., Gorlick, M.A., Lighthall, N.R., Burgeno, J., Schoeke, A. and Ariely, D. (2012), "Risk preferences and aging: the 'certainty effect' in older adults' decision making", *Psychology and Aging*, Vol. 27 No. 4, pp. 801, doi: 10.1037/a0030174.

Menkhoff, L. and Nikiforow, M. (2009), "Professionals' endorsement of behavioral finance: does it impact their perception of markets and themselves?", *Journal of Economic Behavior and Organization*, Vol. 71 No. 2, pp. 318-329, doi: 10.1016/j.jebo.2009.04.004.

Montano, J.L.A., Donoso, J.A., Hassall, T. and Joyce, J. (2001), "Vocational skills in the accounting professional profile: the chartered institute of management accountants (cima) employers' opinion", *Accounting Education*, Vol. 10 No. 3, pp. 299-313, doi: 10.1080/09639280210122339.

Mrkva, K., Johnson, E.J., Gächter, S. and Herrmann, A. (2019), "Moderating loss aversion: loss aversion has moderators, but reports of its death are greatly exaggerated", *Journal of Consumer Psychology*, Vol. 30 No. 3, pp. 407-428.

Pierce, B. and O'Dea, T. (2003), "Management accounting information and the needs of managers: perceptions of managers and accountants compared", *The British Accounting Review*, Vol. 35 No. 3, pp. 257-290, doi: 10.1016/S0890-8389(03)00029-5.

Pompian, M.M. and Longo, J.M. (2004), "A new paradigm for practical application of behavioral finance: creating investment programs based on personality type and gender to produce better investment outcomes", *The Journal of Wealth Management*, Vol. 7 No. 2, pp. 9-15, doi: 10.3905/jwm.2004.434561.

Puyou, F. (2018), "Systems of secrecy: Confidences and gossip in management accountants' handling of dual role expectations and MCS limitations", *Management Accounting Research*, Vol. 40 No. 1, pp. 15-26, doi: 10.1016/j.mar.2018.01.001.

Ramrattan, L. and Szenberg, M. (2011), "Maurice Allais: a review of his major works, a memoriam 1911-2010", *The American Economist*, Vol. 56 No. 1, pp. 104-122, doi: 10.1177/056943451105600112.

Rausch, A. (2011), "Reconstruction of decision-making behavior in shareholder and stakeholder theory: implications for management accounting systems", *Review of Managerial Science*, Vol. 5 Nos 2/3, pp. 137-169, doi: 10.1007/s11846-010-0053-2.

Roszkowski, M.J. and Snelbecker, G.E. (1990), "Effects of 'framing' on measures of risk tolerance: financial planners are not immune", *Journal of Behavioral Economics*, Vol. 19 No. 3, pp. 237-246, doi: 10.1016/0090-5720(90)90029-7.

Rzeszutek, M. (2015), "Personality traits and susceptibility to behavioral biases among a sample of polish stock market investors", *International Journal of Management and Economics*, Vol. 47 No. 1, pp. 71-81, doi: 10.1515/ijme-2015-0029.

Schmidt, U. and Traub, S. (2002), "An experimental test of loss aversion", *Journal of Risk and Uncertainty*, Vol. 25 No. 3, pp. 233-249, doi: 10.1023/A:1020923921649.

Sebora, T.C. and Cornwall, J.R. (1995), "Expected utility theory vs. prospect theory: implications for strategic decision makers", *Journal of Managerial Issues*, Vol. 7 No. 1, pp. 41-61, doi: 10.2307/40604049.

Sharp, D.J. and Salter, S.B. (1997), "Project escalation and sunk costs: a test of the international generalizability of agency and prospect theories", *Journal of International Business Studies*, Vol. 28 No. 1, pp. 101-121.

Shefrin, H. (2002), *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*, Oxford University Press, New York, NY.

Shefrin, H. (2008), *A Behavioral Approach to Asset Pricing*, Academic Press.

Slovic, P., Fischhoff, B. and Lichtenstein, S. (1982), "Response mode, framing, and information-processing effects in risk assessment", *New Directions for Methodology of Social and Behavioral Science: Question Framing and Response Consistency*, Vol. 11 No. 1, pp. 21-36.

Tan, H.-T. and Yates, J.F. (1995), "Sunk cost effects: the influences of instruction and future return estimates", *Organizational Behavior and Human Decision Processes*, Vol. 63 No. 3, pp. 311-319, doi: 10.1006/obhd.1995.1082.

Thaler, R.H. (1999), "Mental accounting matters", *Journal of Behavioral Decision Making*, Vol. 12 No. 3, pp. 183-206, doi: 10.1002/(SICI)1099-0771(199909)12:3<183::AID-BDM318>3.0.CO;2-F.

Tokar, T., Aloysius, J., Waller, M. and Hawkins, D.L. (2016), "Exploring framing effects in inventory control decisions: violations of procedure invariance", *Production and Operations Management*, Vol. 25 No. 2, pp. 306-329, doi: 10.1111/poms.12430.

Trepel, C., Fox, C.R. and Poldrack, R.A. (2005), "Prospect theory on the brain? Toward a cognitive neuroscience of decision under risk", *Cognitive Brain Research*, Vol. 23 No. 1, pp. 34-50, doi: 10.1016/j.cogbrainres.2005.01.016.

Tversky, A. and Kahneman, D. (1974), "Judgment under uncertainty: heuristics and biases", *Science*, Vol. 185 No. 4157, pp. 1124-1131, doi: 10.1126/science.185.4157.1124.

Tversky, A. and Kahneman, D. (1981), "The framing of decisions and the psychology of choice", *Science*, Vol. 211 No. 4481, pp. 453-458, doi: 10.1126/science.7455683.

Tversky, A. and Kahneman, D. (1986), "Rational choice and the framing of decisions", *The Journal of Business*, Vol. 59 No. S4, pp. 251-278, doi: 10.2307/2352759.

Tversky, A. and Kahneman, D. (1992), "Advances in prospect theory: cumulative representation of uncertainty", *Journal of Risk and Uncertainty*, Vol. 5 No. 4, pp. 297-323, doi: 10.1007/BF00122574.

Wheeler, P. (2001), "The Myers-Briggs type indicator and applications to accounting education and research", *Issues in Accounting Education*, Vol. 16 No. 1, pp. 125-150.

Wibbeke, L. and Lachmann, M. (2020), "Psychology in management accounting and control research: an overview of the recent literature", *Journal of Management Control*, Vol. 31 No. 3, doi: 10.1007/s00187-020-00302-3.

Wilson, C.G., Nusbaum, A.T., Whitney, P. and Hinson, J.M. (2018), "Trait anxiety impairs cognitive flexibility when overcoming a task acquired response and a preexisting bias", *Plos One*, Vol. 13 No. 9, p. e0204694, doi: 10.1371/journal.pone.0204694.

Zhang, Y., De Zoysa, A. and Cortese, C. (2019), "The directionality of uncertainty expressions and the foreign language effect: context and accounting judgement", *Meditari Accountancy Research*, Vol. 28 No. 3, pp. 543-563.

Appendix. Questionnaire

Frame dependence section of questionnaire
Before you continue, note the following:

Some of the scenarios below may seem very similar, but there are important *small differences*. *Please consider each question separately.*

There are no right or wrong answers to these questions – the purpose of the survey is to investigate decision-making <u>processes</u> based on your choices.

Question 1
A car manufacturer has experienced economic setbacks. Three plants may have to be closed and 6,000 employees laid off. The vice-president of production has developed two plans. Which plan would you choose?

- The plan that will result in the loss of two of the three plants and 4,000 jobs.
- The plan that has a 2/3 (66.67%) probability of resulting in the loss of all three plants and all 6,000 jobs, but there is a 1/3 (33.33%) probability of losing no plants and no jobs.

Question 2
A car manufacturer experienced economic setbacks. Three plants may have to be closed and 6,000 employees laid off. The vice-president of production has developed two plans. Which plan would you choose?

- The plan that will save one of the three plants and 2,000 jobs.
- The plan that has a 1/3 (33.33%) probability of saving all three plants and all 6,000 jobs, but has a 2/3 (66.67%) probability of saving no plants and no jobs.

Questions 3 and 4
As the CEO of CHARLIE Corporation you must decide whether your firm should acquire SIERRA Limited.

If you make a bid for the company, you face the following pair of concurrent decisions, because it is rumoured that you may be the target for acquisition by another firm.

Examine both decisions, then indicate your preferred options, bearing in mind that the decisions regarding Question 3 and Question 4 *must be made at the same time.*

Question 3: Choose between:

- A certain increase of $240m in CHARLIE's value.
- A 25% chance of increasing CHARLIE's value by $1bn and a 75% chance of gaining nothing.

Question 4: Choose between:

- A certain loss of $750m in CHARLIE's value.
- A 75% chance of losing $1bn in CHARLIE's value and a 25% chance of staying as you currently are.

Question 5

Your company is currently insured against 70% of the possible occurrences of Event 1 and 80% of the possible occurrences of Event 2. As the probability of each event occurring and the expected loss from each event is the same, the insurance premium to fully cover Event 1 is the same as the insurance premium to fully cover Event 2.

Choose between the following (assuming that you can only afford one increase):

- *Increase* coverage for Event 1 from 70 to 90% at an *additional* premium cost of $2,450 per month.
- *Increase* coverage for Event 2 from 80 to 100% (*full coverage*) at an *additional* premium cost of $2,500.

Question 6

Which of the following options would you prefer?

- A 25% chance of increasing the value of your company by $60m.
- A 20% chance of increasing the value of your company by $90m.

Question 7

You are the CEO of LIMA Corporation. You must decide whether your firm should acquire FOXTROT Limited.

- There is a 75% chance that FOXTROT will resist your take-over bid, resulting in failure to acquire FOXTROT.
- There is a 25% chance that your take-over bid will be successful.

If there is no resistance, depending on the amount of your bid, you may be able to increase LIMA's total value by choosing between the two options below. You have to choose between the two options before you know the outcome of your bid. Which option would you choose?

- A certain increase of $60m.
- An 80% chance of a $90m increase.

Question 8

As the CEO of a company, you have signed a contract and have paid $10,000 to an entertainment company, MAMBO Limited ("MAMBO"), to host a staff function. After paying over the $10,000, you are informed that MAMBO has been declared bankrupt and will not be able honour its contract with you. You are unlikely to get any of your money back.

Would you contract another company to host the staff function that you wanted originally, provided that you are still in a position to cancel the staff function?

- Yes. I would pay another $10,000.
- No. I would not pay another $10,000.

Question 9

As the CEO of a company, you have approached an entertainment company, NANO Limited, to host a staff function. Before you sign the final contract with NANO, you hear that your firm has lost $10 000 in the last quarter due to the unforeseeable bankruptcy of one of your customers, BRAVO Consolidated (an event unrelated to the staff function).

Would you still sign the contract with NANO and pay the $10,000 for the staff function, provided that you are still in the position to cancel the staff function?

- Yes. I would still sign the contract.
- No. I would not sign the contract.

Question 10

Your company owns a seaside holiday house. The house is made available to executives and their families on a rotating basis and is leased to the public when it is not being used by the executives.

- A good rental income is earned on the house when it is leased to the public, as the house is a sought-after property in its area.
- The current average value of properties in this particular seaside area is $120,000, with a standard deviation of around $20,000.

Based only on the information provided, what is the minimum price at which you think your company should consider *selling* the property?

- <$70,000
- $70,000–$90,000
- $90,001–$110,000
- $110,001–$130,000
- $130,001–$150,000
- $150,001–$170,000
- $170,001–$190,000
- >$190,000

Question 11

Your company is considering *buying* a seaside holiday house. The house will be made available to the executives and their families on a rotating basis and will be leased to the public when it is not being used by the executives.

- A good rental income can be earned on the house when it is leased to the public, as the house is a sought-after property in its area.
- The current average value of properties in this particular seaside area is $120,000, with a standard deviation of around $20,000.

Based only on the information provided, what is the maximum price at which you think that your company should *acquire* the property?

- <$70,000
- $70,000–$90,000

- $90,001–$110,000
- $110,001–$130,000
- $130,001–$150,000
- $150,001–$170,000
- $170,001–$190,000
- >$190,000

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