

Enhancing Decision-Making Skills: Know and Avoid Frame Dependence Bias

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EXECUTIVE SUMMARY

Financial decision-making behavior results in inconsistencies because the way information is presented may influence and manipulate the decision maker. Based on their pivotal role, management accountants must take note of possible decision frame bias in their own and others' decision-making behavior. The results from a new study indicate how to accomplish this. hrough evaluating financial decisions, management accountants make key contributions to the business world. The fast-paced business environment, however, often does not allow time to perform extensive rational analyses, so they revert to cognitive decision processes to evaluate complex financial decisions. For instance, a management accountant would usually evaluate a business transaction based on relevant costing principles but does not always have the time nor all the information to perform these calculations. Consequently, a fair amount of judgment comes into play.

Management accounting syllabi correctly prescribe that we *should* rationally evaluate financial decisions that involve uncertainty. Relevant costing, decision trees, and other decision-making topics encourage calculating expected values on which to base decisions in order to maximize expected value. We also need to consider risk, mainly by assessing probabilities attached to various outcomes. Research has confirmed, however, that cognitive decision-making processes result in behavior that is *not* consistent with prescribed rational principles of maximizing expected value.

Daniel Kahneman and Amos Tversky developed the Prospect Theory, which describes how people actually evaluate financial decisions when partially relying on their judg-

Table 1: Rational vs. Actual Decision Making

Rational Decision Making (Prescriptive)

Options should be evaluated based on which one maximizes wealth.

Each outcome (effect on state of wealth) should be weighed by its probability of occurrence.

Decision makers should *consistently* choose the option that maximizes financial wealth.

Prospect Theory (Descriptive)

Outcomes are evaluated as gains and/or losses relative to a specific reference point, which is usually the status quo, but could be influenced by other factors.

Each outcome (gain or loss) is weighed by a specific weighting function.

Frame dependence is assumed to influence decisionmaking behavior, which sometimes results in *irrational* decision making.

ment.¹ After developing the Prospect Theory, the duo continued to research how framing a financial decision influences it and in some cases leads to inconsistent decision-making behavior.²

To learn more about this behavior, I conducted a study to identify whether frame dependence biases how information is presented—influence management accountants in line with the Prospect Theory. I am grateful to IMA[®] (Institute of Management Accountants) for distributing the survey to a sample of its members, as well as to CIMA (Chartered Institute of Management Accountants) for marketing the survey to its members. This article features the results and, perhaps more importantly, helps management accountants understand possible biases in their own decisionmaking behavior as well as in others. The biases include loss aversion, concurrent decisions, certainty and pseudocertainty effect, mental accounting, and endowment effect.

The findings indicate that management accountants are susceptible to framing biases to differing degrees. To limit it, the first step is to understand and acknowledge the influence of frame dependence bias. To fully eliminate these biases, decision-making research suggests that we may need additional debiasing strategies.

Management accountants who understand framing biases can ultimately influence outcomes. This article explains each bias and illustrates it with relevant questions from the survey to test for bias. The actual survey appears in the appendix.

THE PROSPECT THEORY

The rational decision-making tools in management

accounting syllabi prescribe how practitioners should make financial decisions. The Prospect Theory, on the other hand, describes how people actually make them. Table 1 summarizes the differences.

The Prospect Theory suggests that management accountants evaluate decisions as either gains or losses, relative to a reference point (see Figure 1). The horizontal line indicates gains and losses from the reference point, while the vertical line shows the value decision makers assign to gains and losses. The curve is the typical value function that decision makers use.

Figure 1 highlights two important aspects. First, the curve is concave for gains and convex for losses. In the judgment of the decision maker, the comparative incremental value of gains and losses diminishes relative to

Figure 1: Typical Prospect Theory Value Function





Figure 2: Typical Prospect Theory

an increase in financial size. Second, compared to the gains section, the loss slope section is steeper. This means that decision makers place a higher relative weight on a specific financial loss than the relative weight they would place on a gain of the same value. As a result, decision makers take more risk to avoid a loss than they would to attain a gain of the same value.

Table 1 further indicates the value of outcome gains or losses is weighted according to a particular weighting function that does not correspond to a linear probability function. Figure 2 shows the typical weighting function used by decision makers. The horizontal axis represents actual probabilities, while the vertical axis represents the weight that the decision maker would assign to the outcome.

The diagonal dotted line represents the rational weight decision makers should assign to each outcome, so each should be weighted by its actual probability. Decision makers, however, actually employ an inversely S-shaped weighting function, meaning they overweigh low-probability outcomes over medium- to highprobability outcomes.

FRAME DEPENDENCE AND BIASES

Kahneman and Tversky divided framing into two phases.³ The first phase, framing of information, relates to the presentation of the information, the manner of which may be influenced by random factors or even by deliberate actions of the person presenting the information. The second phase is how the decision maker perceives the information, based on the decision maker's specific characteristics. Framing bias may result from either or both phases. The most prevalent biases result from differences in framing information.

Table 2 summarizes the main framing biases, along with initial suggestions on how to address them. Figure 3 shows how each bias influenced management accoun-



Figure 3: Percentage of Biased Responses

Table 2: Mainframe Dependence Biases and How to Address Each

Bias	Description	How to Address Bias
Loss aversion	Loss options from a specific reference point encourage risk seeking, while gain options from a specific reference point encourage risk avoidance.	Determine the correct risk attitude you should hold under the circumstances, then attempt to evaluate gains and losses consistently according to this risk attitude.
Concurrent decisions	When separate decisions represent a single big decision package, decision makers evaluate each separate decision on its own.	For each decision, carefully consider its possible links to a bigger-picture connection with other decisions. If warranted, evaluate the whole decision package by considering the big picture.
Certainty and pseudocertainty	Decision makers overweigh decision options that increase a probability to a certainty or decrease a certainty to a probability.	Be cognizant of possible overweighing certainty when encountering decisions where an option affords, or seems to afford, certainty then soberly evaluate options.
Mental accounting	Decision makers assign mental accounts to funds. They develop different conventions to treat the funds in the various mental accounts, resulting in the inconsistent treatment of funds.	Further research is required on this bias before debiasing strategies can be suggested.
Endowment effect	Decision makers value goods more highly when they or their employer own them as opposed to third parties.	Be cognizant of the tendency to subjectively overvalue goods you or your employer own. Where feasible, obtain independent valuations of goods.

tants. Note that prior research found that the debiasing of decision-making behavior remains a challenge, as awareness of biases alone is insufficient to fully debias an individual's behavior.

Let's now look at each bias and how management accountants responded to realistic situations framed differently with the survey.

Loss Aversion Bias

The slope of the typical value function is steeper for losses than for gains, indicating a tendency for riskseeking when attempting to avoid losses and risk averseness when attempting to make gains. This tendency is referred to as loss aversion. If the information manipulates the reference point the decision maker uses, it may influence the final decision. Based on the reference point, the information may be presented as either a loss, which would encourage risk-seeking, or a gain, which would encourage risk aversion. Questions 1 and 2 related to loss aversion by taking the same scenario and manipulating the reference point.⁴ In the scenario, a business experiences financial difficulties and now faces the prospect of having to close three manufacturing plants, which would result in the loss of 6,000 jobs. The business devises two plans that are framed differently:

• One question framed the decision as a choice between a plan closing two plants and losing 4,000 jobs or a plan entailing a two-thirds probability of losing all plants and all jobs and a one-third probability of losing no plants and no jobs. Framed as a loss of plants and jobs, this frame encourages risk-seeking behavior.

• At a different point in the survey, the other question framed the decision as a choice between a plan saving one plant and 2,000 jobs or a plan with a one-third probability of saving all plants and all 6,000 jobs with a two-thirds probability of saving no plants and no jobs. This gain frame encourages risk aversion. The results indicate that 12.9% of respondents changed their preference between the options when the survey only altered the framing scenario.⁵

Concurrent Decision Bias

We encounter many decisions in separate, concurrent parts, yet few recognize that separate decisions form a single scenario. If information is presented in a concurrent decisions frame, decision makers may be influenced by loss aversion that only relates to part of the decision, but it is not relevant within the whole scenario. Questions 3 and 4 presented management accountants with two concurrent decisions that must be made at the same point in time, relating to whether a company should engage in an acquisition.⁶

■ The first decision is between 100% certainty of a \$240 million increase or a 25% chance of a \$1 billion increase and a 75% chance of no gain in value. Viewed on its own, this decision frame will encourage *risk avoidance* and, therefore, selecting the certain \$240 million.

■ The second decision is between 100% certainty of losing \$750 million or a 75% chance of losing \$1 billion with a 25% chance of no loss. On its own, this decision frame would encourage *risk taking*, resulting in selecting the second option that holds the promise of a 25% chance to avoid a loss, but at the 75% risk of losing \$1 billion.

If the decision maker, however, views the decisions as a single package of concurrent decisions, which in fact it is, then selecting the risk-taking option in the first decision (25% of a \$1 billion increase and a 75% chance of no increase in value, resulting in an expected value of \$250 million), combined with the risk-avoiding option in the second decision (certain loss of \$750 million), provides the optimal combined expected value of \$500 million (the expected value or gain of \$250 million in the first decision of the decision package combined with the certain loss of \$750 million in the second decision of the decision package) and a maximum possible loss of \$750 million. The Prospect Theory suggests combining the risk-avoiding option in decision one (\$240 million certain gain) and risk-taking option in decision two (75% chance of losing \$1 billion and a 25% chance of no loss, resulting in an expected value of

\$750,000 loss), resulting in a combined expected value of a \$510 million loss, with a maximum possible loss of \$1 billion. Decision makers could select other combinations, but these are all inferior to the optimal combination.

Management accountants should pay close attention to identify decision packages where a combination of decisions may actually represent a set of concurrent decisions. Concurrent decisions bias was the most prevalent among management accountants (78.3%).

Certainty and Pseudocertainty Effect Bias

The Prospect Theory's weighting function indicates that decision makers do not weigh options correctly with reference to actual probabilities. This is especially true with reference to decisions where options may increase a probability to a certainty or decrease a certainty to a mere probability. Decision makers tend to overweigh certainty, known as the certainty effect.

For example, insurance companies exploit this tendency because they can more successfully market insurance as *full* insurance for a particular event, such as full insurance of property against theft. Whereas marketing the same insurance as only insuring against one of multiple events, such as insuring property only against theft but not against any other loss of property (for example, due to accidental destruction or a natural disaster) would be less successful. Similarly, a contingency can be framed to make it appear as if one option provides certainty even though that certainty may, in fact, depend on other factors and, therefore, is anything but certain. This is pseudocertainty framing.

Question 5 tested decision-making behavior for the certainty effect based on a scenario where a company is seeking to increase its insurance coverage. The options are mutually exclusive.

■ One option increases coverage for a specific event from 70% to 90% at an increase of \$2,450 to the monthly premium.

■ The other option increases coverage for a different event, which is comparable in terms of probability and expected loss to the first event, from 80% to 100% at an increase of \$2,500 to the monthly premium.

Rationally, on a per-percentage-point basis, the first option provides the better value, but the second option encourages the certainty effect bias. Slightly fewer than half (45.9%) were influenced by the certainty effect bias.

Question 6, which tested for pseudocertainty bias, is based on a takeover bid decision contingent on whether the target will resist the takeover bid.⁷ The scenario indicates a 75% chance that the target will resist the takeover bid and a 25% chance that it will not. The acquiring group has to decide between two bid amounts.

■ The first is expected to result in a 100% chance of a \$60 million increase in value.

The second has an 80% chance to result in a \$90 million increase in value and a 20% chance of no value increase.

The acquiring group has to decide on the bid amount and, therefore, the possible increase in its value before knowing whether the target will resist the takeover bid. It appears, however, as if there is a 100% certainty in the \$60 million increase, yet it is in fact contingent on the 25% probability that the target will not resist the takeover bid. When correctly viewed within the contingent setting, the expected value of the increase from the first bid option is \$15 million. (That is a 100% probability, contingent on the 25% probability that the takeover is not resisted, consequently an actual overall probability of 25% (100% x 25%) to gain a \$60 million increase.)

At the same time, the expected value of the second bid option is an increase of \$18 million. (That is an 80% probability, contingent on the 25% probability that the takeover is not resisted, resulting in an actual overall probability of 20% (80% x 25%) to gain a \$90 million increase.) The optimal option would, therefore, be to bid the amount that has the 80% probability to increase the acquiring group's value by \$90 million. Exactly half selected the first option, which provides pseudocertainty but is suboptimal from an expected value perspective.

Mental Accounting-Related Bias

Previous research identified that decision makers employ mental accounting for financial activities.⁸ Decision makers cognitively develop mental accounts to organize, evaluate, and monitor their financial activities. Each mental account is treated within the conventions that the decision maker attaches to that account. Consequently, they mentally allocate the funds to different accounts, and these funds are treated differently based on the conventions for each, possibly resulting in the inconsistent treatment of funds.

For instance, decision makers treat their own personal rebates and bonuses very differently, regarding whether they will spend or save them. For example, a person would tend to view an amount termed as a "rebate" as money related to the expenditure from which the rebate emanated and would rather save it for a similar future expenditure. If the same rebate was termed as a bonus payout, a person would be more likely to view it as a windfall to spend on any type of immediate expenditure. The frame in which the funds are presented may, therefore, determine how funds are used.

Evidence to identify whether decision makers also develop mental accounts for their employer's money is limited. Investigating mental accounting with reference to management accountants is of interest because of their familiarity with financial accounting.

To test for mental accounting, questions 7 and 8 featured the same scenario framed differently. The scenario relates to a staff function that is set to cost \$10,000.9

■ In one frame, the company paid an entertainment company that declared bankruptcy before the staff function took place. Since it is unlikely the company can recover any money, the options are to either cancel the staff function or pay another vendor \$10,000 to host the function.

■ The second frame indicates that the company has not yet paid for the staff function, as the contract for the function has not been finalized. The decision maker becomes aware of a customer's bankruptcy, unrelated to the staff function. The company is set to lose \$10,000 due to this customer's bankruptcy. The options are then to decide whether or not the company will host the staff function, which would cost \$10,000.

In both instances, the company lost \$10,000 due to the bankruptcy of a counterparty (the entertainment company or the customer bankruptcy), a loss for which staff should most probably not be responsible. Preference reversal between the two frames could be attributed to the presence of mental accounting bias. Of the respondents, 34.2% changed their preferences between the two mental accounting-framed scenarios.

It could also be argued, however, that budgeting considerations may influence the decision where the loss is accounted for as related to the staff function. Consequently, management accountants would be expected to be biased by budgeting principles in deciding to agree to let the staff function continue in the frame where the loss is not related to the staff function and due to a customer bankruptcy, but to possibly decide to cancel it when the loss is related to the staff function due to the entertainment company going bankrupt as the loss may then be deemed to be related to the amount budgeted for the staff function. Yet only half of the 34.2% who reversed their preferences reversed it in the manner suggested by budgeting principles as discussed, while the other half did so in the direct opposite to budgeting principles (i.e., from letting it continue when the loss is related to the staff function vendor bankruptcy and deciding to cancel it when the loss related to a customer bankruptcy). This finding contradicts the expectation and differs from past research on mental accounting of personal finance matters. Consequently, this matter should receive further attention to identify the reasons behind the contradictory preference reversals.

Endowment Effect Bias

The last frame dependence bias, the endowment effect, refers to the well-documented tendency of decision makers to value goods that they own more highly than similar goods that they do not own. The endowment effect is consistent with the Prospect Theory in that research observed the main cause is the agony that decision makers attach to losing or parting with something they own, rather than the possible enhanced appeal of an item emanating from owning it.

The endowment effect hinders ownership transactions as the current owner of an item tends to subjectively overvalue it. The natural question that arises is whether the endowment effect would be present when the employer owns an item rather than the decision maker. One recent study found that the endowment effect is one of the primary causes of the regular breakdown in anticommons negotiations (negotiation of fragmented rights to a common resource).¹⁰

Questions 9 and 10 asked respondents to select a suitable range of possible sales prices for property that their employer is considering to sell in the "own" frame and a suitable range of possible purchase prices for a similar property that their employer is considering buying in the "don't own" frame.¹¹

This survey confirmed the endowment effect in business decision making, as 47.8% of respondents value the property of their employing company more than the property of a third party.

IMPLICATIONS

Education and training within the management accounting profession focus largely on rational decisionmaking methods and tools. This article serves to introduce management accounting practitioners to the concept of how actual decision-making behavior may differ from rational principles, due to cognitive decision-making processes, with specific reference to the Prospect Theory and resultant frame dependence. The scenarios and questions represent situations that management accountants are likely to encounter. Indeed, a study recently indicated how the framing of incentive (penalty) remuneration schemes in a manner to invoke either a gain or a loss frame may influence the behavior of those subject to evaluation under the scheme.¹²

Consequently, those who understand framing bias have the opportunity to present scenarios in a specific manner in order to influence the final decisions, whether with noble or malevolent intentions. Equipping management accountants with knowledge about the influence of frame dependence should help them identify situations where the decision information may influence decision-making behavior.

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ENDNOTES

1 Daniel Kahneman and Amos Tversky, "Prospect Theory: An

Analysis of Decision Under Risk," *Econometrica*, March 1979, pp. 263-291.

- 2 Daniel Kahneman eventually received the Nobel Prize for Economic Sciences in 2002 based on the new insights his research, in collaboration with Amos Tversky, brought to financial decision-making behavior under conditions of uncertainty (sadly, Tversky passed away before this honor was bestowed). Others expanded upon their research to indicate how decisionmaking behavior may explain anomalies, such as the equity premium puzzle on stock exchanges and the overselling of insurance; Amos Tversky and Daniel Kahneman, "The Framing of Decisions and the Psychology of Choice," *Science*, January 1981, pp. 453-458.
- 3 Amos Tversky and Daniel Kahneman, "Rational Choice and the Framing of Decisions," *The Journal of Business*, October 1986, pp. 251-278.
- 4 Adapted from a scenario by Max H. Bazerman and Don A. Moore, *Judgment in Managerial Decision Making*, third edition, John Wiley & Sons, Inc., New York, N.Y., 1994.
- 5 To test for most of the biases, management accountants who responded to the survey had to answer two differently framed questions for each bias, which could not be presented close to each other in the survey. Therefore, the sample size may differ

between the different framing biases, as respondents who did not answer both questions for a particular bias had to be disregarded from the analysis of a particular bias.

6 Adapted from a scenario by Terrence C. Sebora and Jeffrey R. Cornwall, "Expected Utility Theory vs. Prospect Theory: Implications for Strategic Decision Makers," *Journal of Managerial Issues*, April 1995, pp. 41-61.

- 8 Richard H. Thaler, "Mental Accounting Matters," *Journal of Behavioral Decision Making*, September 1999, pp. 183-206.
- 9 Adapted from a scenario used by Sebora and Cornwall, 1995.
- 10 Andreas Glöckner, Stephan Tontrup, and Stefan Bechtold, "Disentangling Psychological Sources of Overpricing in Anticommons Dilemmas: Strategic Incentives, Endowment Effects, and Interdependence of Outcomes," *Journal of Behavioral Decision Making*, September 2014, pp. 224-238.
- 11 Developed from ideas by Daniel Kahneman, Jack L. Knetsch, and Richard H. Thaler, "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias," *The Journal of Economic Perspectives*, March 1991, pp. 193-206.
- 12 Karla Oblak, Mina Ličen, and Sergeja Slapničar, "The role of cognitive frames in combined decisions about risk and effort," *Management Accounting Research*, June 2018, pp. 35-46.

APPENDIX: SURVEY INSTRUMENT

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?

- A. The plan that will result in the loss of two of the three plants and 4,000 jobs.
- B. The plan that has a two thirds (66.67%) probability of resulting in the loss of all three plants and all 6,000 jobs, but there is a one third (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?

- A. The plan that will save one of the three plants and 2,000 jobs.
- B. The plan that has a one third (33.33%) probability of saving all three plants and all 6,000 jobs but has a two thirds (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 rumored 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. A certain increase of \$240 million in CHARLIE's value.
- B. A 25% chance of increasing CHARLIE's value by \$1 billion and a 75% chance of gaining nothing.

Question 4: Choose between:

- C. A certain loss of \$750 million in CHARLIE's value.
- D. A 75% chance of losing \$1 billion 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):

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

⁷ Ibid.

Question 6:

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 takeover bid, resulting in failure to acquire FOXTROT.
- There is a 25% chance that your takeover 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. A certain increase of \$60 million.
- B. An 80% chance of a \$90 million increase.

Question 7:

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 the \$10,000, you are informed that MAMBO has been declared bankrupt and will not be able to honor 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?

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

Question 8:

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?

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

Question 9:

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?

0	<\$70,000	0	\$130,001 - \$150,000
0	\$70,000-\$90,000	0	\$150,001 - \$170,000
0	\$90,001 - \$110,000	0	\$170,001 - \$190,000
0	\$110,001 - \$130,000	0	\$190,000<

Question 10:

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?

о	<\$70,000
0	\$70.000-\$90.000

- o \$130,001 \$150,000 o \$150,001 - \$170,000
 - o \$170,001 \$190,000
- o \$90,001 \$110,000 o \$110,001 - \$130,000
- o \$190,000<