

# HOW TO BETTER REDUCE CONFIRMATION BIAS? THE FIT BETWEEN TYPES OF COUNTER-ARGUMENT AND TASKS

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## ABSTRACT

Confirmation bias is a driver of problematic decision making. People search information supporting current beliefs and ignore real critical evidence. Counter-argument i.e. providing evidences opposite to preferred beliefs was shown to have an effect on reducing confirmation bias. This study advances past studies by separating counter-arguments into two types and examining their effects in different stock investment contexts. We attempt to show that different types of counter-arguments are needed under different decisional contexts.

## Keywords

Confirmation bias, counter-argument, de-bias, risk aversion

## INTRODUCTION

Human beings are boundedly rational. Problematic subjective judgments during cognitive processes prohibit people from making the right decision by distracting them from rationally accessing and utilizing information, which then lead to overtrading and low profitability in financial markets. Researchers refer to these problematic subjective judgments as cognitive biases. Behavioral decision making literatures indicate that intrinsic cognitive biases exist in the decision making process and these cognitive biases have a negative impact on decision making (Arnott, 2006). Therefore, contemporary computer supported decision making tools were developed to reduce biases mentioned by Tversky and Kahneman (1974).

However, the rationalization of a decision-making process by formalizing it within a computer-based information system does not seem to make the process itself more rational (George et al., 2000). The bias that operates without the information system continues to operate within it (e.g. Jiang et al., 1995, Barber and Odean, 2002). To fill this gap, some researchers have entered significant efforts in understanding how DSS can provide de-bias function to eliminate confirmation bias during decision making process (e.g. Huang, 2009). The results revealed that confirmation bias can be effectively reduced through providing counter-arguments.

Although previous research has built a foundation by showing that counter-arguments can effectively reduce negative consequences of confirmation bias, over simplified research setting limits the value of findings and implications. There is a need to explore the concept in a more complex setting in order to understand phenomenon thoroughly. For example, counter-argument is solely defined as information conflicting to current beliefs but, however, it can be separated in advance into two types – argument opposite to the preferred one or supporting alternatives. It is reasonable to suspect that these two types of counter-argument may not always generate the same effect. Furthermore, past research only employed one type of task (to arrange money into two stocks) in the experiment. However, in the stock market, traders may buy or sell stock in their daily life - that is, different types of task. Putting these two concepts together, we believe that people tend to weigh different types of counter-argument differently when they face different decision tasks (e.g. buy or sell). Specifically, based on risk aversion perspective (Elton and Gruber, 1997; Kahneman and Tversky, 1979), we predict that, to avoid risk, information which shows that the target stock won't perform well will generate more countering effect when traders attempt to buy it. In contrast, when traders attempt to sell one of several stocks in hand, more countering effects can be generated by providing evidences which show that other stocks in hand may be perform worse.

In a summary, although the effect of counter-argument in specific task has been shown by past research, whether DSS should provide different types of counter-argument under different tasks is not clear. Therefore, under computer-supported decision making context, this study focuses on understanding how different types of counter-argument may generate different level of effect under different types of decision tasks - buy or sell stock. Experiments will be conducted to examine these proposed ideas.

## LITERATURE REVIEW AND HYPOTHESES

In this section, we first review the literature about confirmation bias and its impact on decision making. In the following section, we then define counter-argument and classify it into two types. Research models and hypotheses are then developed based on the review.

### Confirmation bias and its impact on decision outcome

Most people have a bias while carrying out a concept or verifying an assumption. Within this bias, people tend to restrict their attention to a favored hypothesis, prefer treatment of evidence supporting existing beliefs, look only or primarily for positive cases, overweight positive confirmatory instances, and see what one is looking for (Nickerson, 1998). That is, “decision-makers seek confirmatory evidence and do not search for disconfirming information.” (Russo et al., 1996; Heath, 1996; Arnott, 2006). Wason (1960) defined it as confirmation bias and indicated that individuals tend to seek evidence in support of their assumptions, instead of searching for and comparing evidence against their assumptions.

Confirmation bias may defeat decision making in several ways (Nickerson, 1998). First, people tend to restrict themselves to the preferred hypotheses only and ignore, intentionally or unintentionally, other possible hypotheses. Second, people tend to look for information fitting to their existing beliefs. Third, with information at hand, people tend to overweight the information that fits with their beliefs and disconfirm the information that does not fit their hypothesis. Even in ambiguous situations, where both positive and negative supports are provided, people only need a little positive evidence to support their hypothesis (Pyszczynski and Greenberg, 1987). For example, medical doctors may overweight some test results and underweigh, or even ignore other possible explanations while diagnosing (Casscells et al. 1978). The consequence of overweighting some evidence and underweighing other evidence is reaching a wrong conclusion.

With formed beliefs, decision makers tend to focus on specific hypothesis only or, if multiple hypotheses are considered, choose the information which fit their beliefs. They may also distort the information and explain it in ways which fit their beliefs. The effects of confirmation bias reflect on two broadly discussed decisional characteristics: decisional adjustment and confidence. Decision makers suffer from error anchoring and inadequate adjustment (Tversky and Kahneman, 1974). Adjustment refers to the tendency for decision maker to be influence by additional information. Additional evidence may be positive or negative and people adjust their beliefs in either direction (increase or decrease) according to the additional information (Ashton and Ashton, 1988). Tversky and Kahneman (1974) indicated that, in general, it is difficult for people to anchor in the correct value initially and insufficient or inappropriate adjustment is made while concerning other positive or negative information related to the initial decision. Subjects may adjust their decision toward the center (no difference between two options) or move away from center (strong preference toward one target). People move their decision to center when they are less confident toward their prior preference. This happens when decision makers receive information opposite to the prior preference. In contrast, decision makers move their final decision to one end when they receive information fitting with their preference, which increases the degree of confidence. With confirmation bias, moving away from center is expected because decision makers actively read information which fits with their prior preference.

H1a: People with confirmation bias tend to adjust their decision away from the center to their previous preference.

Decision confidence refers to the subjects’ beliefs regarding their investing performance and their perceived probability that their decisions are correct (Peterson and Pitz, 1988; Davis and Kottemann, 1994). It is not rare for people to be over optimistic and under estimate the risk and over estimate their problem solving ability (Kahneman and Riepe, 1998). This happens in many professional fields, such as financial investing, and tends to be greater for difficult tasks. Griffin (1996) indicates that optimism serves as a driving force for over estimating that the favored outcome will occur. Confidence tends to be higher when people seek support for their initial view rather than to look for disconfirming evidence (Russo and Schoemaker, 1992). Therefore, we hypothesize that

H1b: People with confirmation bias tend to be more confident toward their decision.

### **De-bias: Computer-mediated counter-argument**

Various de-bias functions were proposed to counter confirmation bias and those propositions were examined by empirical studies (Keren, 1990; Fishoff, 1982; Bazerman, 2002; Russo and Schoemaker, 1992). Theory indicates that once one's belief is formed, it is not easy to change if there is no other stimulus (Hoch and Deighton, 1989). Counter arguments encourage decision makers to consider why their initial assumptions might be wrong or ask others to give them counter arguments. For example, Block and Harper (1991) found that warnings can usefully reduce the effect caused by anchoring and insufficient adjustment, although it cannot be eliminated completely. Moreover, George et al. (2000) conducted a similar experiment to test whether the existence of warning can reduce or eliminate anchoring and adjustment biases. The result shows that the cognitive biases that exist under without a computer-supported environment continue to exist within it.

Conceptual and empirical studies indicate that there is a need to provide stimulus to challenge one's belief so that the decision making process can be more rational (Russo and Schoemaker, 1992; Gorman, 2005). Empirical studies also showed that computer-mediated counter-argument can effectively reduce irrational confidence and allow decision makers to adjust their decision to the right direction. In previous study, the moderating effect of counter-argument has been proposed and confirmed (Huang, 2009).

Counter-argument refers to evidence opposite to current beliefs and it can be separated into two types: alternative-support and self-opposite. Alternative-support type of counter-argument refers to arguments providing positive evidence which show that other non-preferred options are as good as or superior than the preferred one. On the other hand, self-opposite type of counter-argument refers to arguments providing negative evidence which show that the preferred options may not perform as good as expected or even worse than other non-preferred options. Although the effect of counter argument has been illustrated, past research has mixed these two types of counter-argument and, therefore, cannot answer whether different types of counter-argument can generate different effects. To answer this question in this study, we adopt risk aversion concept and attempt to show that the reduction of the effect of confirmation bias by counter argument is determined by whether counter-argument fits the task in hand.

#### **The fit between the types of counter-argument and task**

Kahneman and Tversky (1979) found that traditional expect utility theory can not fully explain the human decision-making behavior under uncertainty and risky situations. To explain it, they proposed the Prospect theory. According to reflection effect (one effect of prospect theory), decision makers are risk-averse in the positive domain and are risk-seeking in the negative domain. Kachelmeier and Shehata (1992) demonstrated that people tend to make different decisions depending on the choice task which involves buying or selling stock. Decision makers tend to perform risk-seeking behaviors while buying and tend to perform risk-aversion behaviors while selling stock (Kachelmeier and Shehata, 1992; Holt and Laury, 2002). Since traders buy and sell stock in their daily life and possess different attitudes toward risk, this elicits our interest in investigating the effect of counter-argument under these two tasks. Furthermore, we explore which type of counter-argument can fit into the task and generate better effect in de-biasing. In the following, we discuss the effect of counter-argument type in different types of task.

##### *The buying task*

When people attempt to add one a stock among several stocks into the portfolio, according to confirmation bias theory, they tend to read information which shows this stock is profitable or shows that other stocks are non-profitable. That is, people search and read information which fit into their existing mental model. They ignore those messages opposite to existing mental model because those messages are considered as inappropriate or wrong. Therefore, counter-argument is required to remind decision maker that other options may be also profitable (other-support) or the preferred one may not be so profitable (self-opposite) (Kahneman and Tversky, 1979; Kachelmeier and Shehata, 1992; Holt and Laury, 2002). However, according to risk aversion perspective, people try to avoid potential risk which may lead to the loss of money. Therefore, traders tend to pay more attention to evidence which shows that the preferred stock may not as profitable as expected because it represents a high possibility of losing money. On the other hand, people tend to pay less attention to evidence which shows that other non-preferred stock may be as profitable because the preferred target is still profitable.

The consequence of confirmation bias is abnormal decisional confidence and inadequate adjustment of decision. These consequences imply that decision makers overweigh messages which fit into their pre-preference and ignore important messages during the decision making process. Therefore, we hypothesize that

- H2a: Under buying context, compared with subjects who receive alternative-support counter-argument, confirmation bias has less effect on decision adjustment for subjects who receive self-opposite computer-mediated counter-argument.

H2b: Under buying context, compared with subjects who receive alternative-support counter-argument, confirmation bias has less effect on decision confidence for subjects who receive self-opposite computer-mediated counter-argument.

*The selling task*

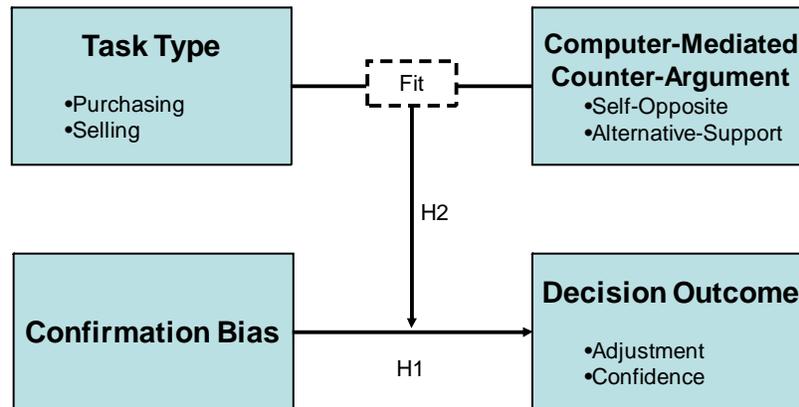
When people attempt to sell a portion or total of one stock in hand, according to confirmation bias theory, they attempt to check evidences which show that the target stock is not worse to be possessed or other stocks in the portfolio are more worth to be kept in the future (Elton and Gruber, 1997; Kachelmeier and Shehata, 1992). Therefore, counter-arguments refer to evidences which show that the selected stock (to sell) may perform much better than expected (self-opposite) or other stocks may perform much worse than expected (alternative-support). Under this context, risk aversion refers to avoiding losing money from selling the wrong stock. Therefore, to traders, alternative-support type of counter-argument tend to draw more attention from traders since those evidences imply that keeping those stocks equals to losing money. That is, risk increases if they choose to keep those stocks. In contrast, self-opposite type counter-arguments generate less impact because they only show that the selected target may not perform as bad as expected which is far less important than losing money through keeping those stocks may decrease the total value. Therefore, we hypothesize that

H2c: Under selling context, compared with subjects who receive self-opposite type of counter-argument, confirmation bias has less effect on decision adjustment for subjects who receive alternative-support type computer-mediated counter-argument.

H2d: Under selling context, compared with subjects who receive alternative-support counter-argument, confirmation bias has less effect on decision confidence for subjects who receive self-opposite computer-mediated counter-argument.

**RESEARCH METHODS**

In this project we focus on the moderating effect of counter argument, an experiment will be conducted to test listed hypotheses. The model is showed in Figure 1. A stock investment task is selected because DSS are intensively adopted to support stock investment decision making to cope with high uncertainty and process data in large quantities. A GUI-based DSS, with 4GL programming language and a relational database management system, will be developed for the experiment. Actual designing activities will follow Hung et al., (2007)’s recommendations. A total of 256 subjects are expected to be recruited. Since our predefined task is stock investment, we will focus on subjects with stock or other investing experience.



**Figure 1. Research model**

**EXPECTED RESULTS**

A couple implications for academia can be gleaned from this project. First, past study has shown the existing of confirmation bias in stock investment task. This study aims at providing another piece of evidence to show how confirmation bias take places in different decision making context. Second, we attempt to show that different type of counter-argument is needed for different type of tasks. For practitioners, this project serves as an example which shows the decision support systems designer that how different types of de-bias means can be incorporated into the system design to effectively counter cognitive biases.

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