

## Even better than the real thing: Alternative outcome bias affects decision judgements and decision regret

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Three experiments demonstrated that decisions resulting in considerable amounts of profit, but missed alternative outcomes of greater profits, were rated lower in quality and produced more regret than did decisions that returned lesser (or equal) amounts of profit but either did not miss or missed only slightly better alternatives. These effects were mediated by upward counterfactuals and moderated by participants' orientation to the decision context. That decision evaluations were affected by the availability and magnitude of alternative outcomes rather than the positivity of actual outcomes is counter to the outcome bias effect—a bias in which decisions are rated more positively when they led to more positive outcomes (despite *a priori* probabilities associated with the decision outcomes). Experiment 3 demonstrated that these effects represent a bias that occurs even when it is clear that the process by which decisions were made followed rational decision processes. This research suggests that when alternative worlds are even better than the desirable outcomes experienced, affect and cognition may be more strongly linked to the magnitude of alternative realities than to obtained outcomes.

**Keywords:** Counterfactual thinking; Outcome bias; Decision-making.

Decision evaluations are common in both professional and personal settings. The nature of our decision evaluations can have major consequences for our future behaviour, such as investment strategies, and our physical and psychological health (e.g., Bell, 1982; Connolly & Reb, 2005; Landman, 1993). From simple associative processes we might expect that—following a decision that produced positive outcomes—people would evaluate their

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decision positively and experience positive affect. Indeed, research on what is known as the “outcome bias” in judgement and decision-making also leads us to expect that people would evaluate a decision leading to good outcomes as a good decision (e.g., Baron & Hershey, 1988; Emerson et al., 2010). The outcome bias refers to the tendency for people to base their evaluations of decisions on their outcomes, rather than on the procedures and processes involved in making the decision itself (e.g., Baron & Hershey, 1988; Emerson et al., 2010). More generally, outcome biases relate to tendencies for people to make inferences about the “outcome of a performance rather than the performance even when the outcome may be determined by an arbitrary rule” (Agrawal & Maheswaran, 2005, p. 798; see also Mackie, Worth, & Allison, 1990). The tendency for people to be biased by the outcomes of decisions is of concern because of the potential impact of this bias on important decisions, such as financial investments, evidence-based medical decisions and emergency medicine (e.g., Henriksen & Kaplan, 2003).

Research also investigates factors that are related to decision quality evaluations and the affective consequences of decision-making (see Reb, 2008). Seta and Seta’s consistency model of regret (e.g., Seta, McElroy, & Seta, 2001; Seta & Seta, 2013; Seta, Seta, McElroy, & Hatz, 2008) assumes that the consistency of a decision with respect to a person’s goals is related to both perceptions of decision quality and feelings of regret. Quality decisions would be decisions that are congruent with routes to goal-attainment and serve a cue function in signalling that an individual is behaving in line with his/her goals. The extent to which a decision is justified can also influence decision process regret and decision quality (e.g., Connolly & Zeelenberg, 2002). For example, failure to collect an adequate amount of information prior to making a “poor” decision led participants to take more time making decisions and to collect more information prior to making a choice (Reb, 2008).

Scant attention, however, has been directed at investigating how knowing about the outcomes of alternative decisions influences judgements about the quality of decisions and resultant affect (i.e., feelings of regret), although it has been assumed that alternative outcomes are important factors determining one’s post-decision satisfaction (e.g., Zeelenberg, et al., 1998). Boles and Messick (1995) presented research on the influence of social comparison information on decision-makers’ evaluations of decisions. In one of their studies, observers rated the quality of decisions made by either a player who was relatively successful or one who was relatively unsuccessful in comparison to decisions made by another player. Observers read that an objectively successful player received a lesser amount of money than that received by a social comparison target. In a contrasting condition, they read about a player whose monetary outcome was greater than the one received by the

social comparison target. When looking across these two conditions, the alternative outcome received by the comparison target outweighed the influence of the player's objective outcomes in participants' views of the quality of the player's decision. Counter-intuitively, participants rated the quality of the decision made by the relatively successful player *less* positively than the choice of another player who made objectively less money but whose performance was better than a social comparison target. Thus, evaluations of decisions were influenced by reference points set by a social comparison other.

Baron and Hershey (1988) also conducted a study on foregone outcomes and decision quality. In this experiment, participants evaluated the quality of a series of gambles made by a fictitious person; the outcomes of the gambles were determined by the spin of a roulette wheel. In all, there were four sets of gambles; for each set, the actual amount received was held constant, the decision-maker always chose between two options, and one of the options always could have potentially earned the highest amount of profit.

In one set of gambles, the hypothetical decision-maker chose between a sure option and a risky one. The risky option was the alternative option because the decision-maker chose the sure option. On the one hand, when the risky alternative option turned out to be successful, it would have returned the highest amount of profit; on the other, when it turned out to be unsuccessful, it would have returned the least amount—always a zero profit. Participants rated the quality of every decision in each of the four sets of gambles. Decision quality ratings were most positive when the outcome associated with the foregone option would have returned the least amount of profit.

The present research went beyond this study in several ways. In using a within-subjects design, participants in the Baron and Hershey (1988) experiment may have simply compared differences between the successful and unsuccessful foregone outcomes in each set of gambles, rather than the difference between what happened (actual event) and what could have happened for a particular gamble. In order to eliminate the possibility of across condition comparisons and other carry-over effects, we used between-subjects designs in the present research. Furthermore, Baron and Hershey (1988) did not test for the possible causes or moderators of their effects. In contrast, a primary purpose of the present research is to test whether the generation of counterfactual thoughts mediates the influences of alternative outcomes on decision quality judgements and regret, and whether participants' orientation to the decision context moderates the influence of alternative outcomes on decision quality.

### Counterfactual thinking

Counterfactual thinking is a special form of imagination that has been of interest to philosophers and psychologists for decades (Byrne, 2005).

Counterfactuals may help people consider the possible causes for the outcome of their actions. Counterfactuals may be functional in several ways, including self-regulation (e.g., Epstude & Roese, 2008; Roese, Hur, & Pennington, 1999; Seta et al., 2008), but may also be dysfunctional in impeding learning from experience (e.g., Petrocelli, Seta, & Seta, 2013; Sherman & McConnell, 1995).

Norm theory (Kahneman & Miller, 1986) is perhaps the best known theoretical analysis of the role of counterfactual thought in decision-making. Norm theory proposes that, when exposed to events that are abnormal or unexpected, people mentally simulate alternatives to reality by mutating specific aspects of the event. More recent analyses have assumed that, in order to engage in counterfactual thinking, specific bits of information must be linked together to form mental models (e.g., Byrne, 2002, 2005; Petrocelli & Sherman, 2010). These mental representations use subjective constructions, such as “if” and “would have” (e.g., Egan, Garcia-Madryga, & Byrne, 2009; Frosch & Byrne, 2012; Walsh & Byrne, 2007). People also consider the likelihood that a counterfactual event could have occurred and if so, take into account the likelihood that it would have led to a desired outcome—a concept termed “counterfactual potency” (Petrocelli, Percy, Sherman, & Tormala, 2011).

Research has uncovered several patterns of counterfactual thinking. These thoughts tend to occur more often following an undesirable versus desirable outcome. Research demonstrates that counterfactual thinking about alternative realities of others is most likely to occur when others are described as experiencing negative outcomes or events. Counterfactuals often lead observers to make attributions of victim blame and responsibility. For example, Branscombe, Owen, Garstka, & Coleman (1996) demonstrated that people judged a rape victim to be more blameworthy in circumstances in which they imagined how the victim could have avoided the assault. Counterfactuals are also more likely to occur under conditions in which actions are controllable (e.g., Markman, Gavanski, Sherman, & McMullen, 1993; Roese, 1994) and for the first of several possible causes (e.g., Wells, Taylor, & Turtle, 1987). People also change an action to be like a more positive alternative (Dixon & Byrne, 2011). Furthermore, counterfactual thoughts are influenced by people’s motives and the number of reasons that they recall for performing an action (e.g., Davis, Lehman, Wortman, Silver, & Thompson, 1995; Gilovich & Médvic, 1995; Roese & Olson, 1995; Sanna, Chang, & Meier, 2001; Walsh & Byrne, 2007).

### Linking counterfactual thought to decision quality evaluations

Although there is a wealth of literature on counterfactual thinking (see Byrne, 2005), research has not investigated whether upward counterfactual thinking

(thoughts about how things could have been better) mediates the influence of alternative outcomes on evaluations of decision quality. Prior work suggests that this is a likely possibility. Upward counterfactual alternatives serve as comparison standards for the actual outcome. In doing so, they influence the cognitive, affect and behavioural responses to the actual event (e.g., Epstude & Roese, 2008; Markman, et al., 1993; Roese & Olson, 1995). As noted by Roese (1999), any analysis of decision quality should include an analysis of the link between judgements of decision quality and counterfactual thought. We provide such an analysis in the following research.

It is likely that decision quality evaluations are influenced by upward counterfactual thinking. People change a usual alternative into an exceptional one when the exceptional alternative led to a better outcome (Dixon & Byrne, 2011). From this work, we expect that, when confronted with a decision situation where better foregone outcomes were possible, people will generate upward counterfactual thoughts about this more favourable alternative action and these thoughts will influence their perceptions of decision equality. When a decision could have produced an alternative outcome that was more positive than the one received, the decision-maker may generate upward counterfactual thoughts that reduce the perceived quality of the decision and increase feelings of regret. If so, then the quality of the decision producing the most positive objective outcome may not be evaluated most positively. This result would be counter to predictions based on associative perspectives and outcome biases. Three experiments were performed to test predictions concerning decision quality, feelings of regret and counterfactual thinking. These experiments differ from prior research on regret, as will be discussed below.

## Regret

Although there have been questions regarding whether counterfactuals always mediate feelings of regret or whether there have really been adequate tests of this common assumption (see N'gbala & Branscombe, 1997; Seta et al., 2001 for further discussion), the strong connections among negative decision outcomes, regret and counterfactuals are often assumed to be causally related. Regret and counterfactual thinking, however, are not typically assumed to result from decisions that produce positive outcomes; rather, people are assumed to experience positive emotions and "rejoice" under these conditions. In addition, positive outcomes are typically thought not to invoke the type of elaborative thought (e.g., "soul-searching") that produces feelings of regret.

Although considerably less research has been conducted on regret and counterfactuals in the context of positive decision outcomes than it has for negative ones, there is some evidence that people do experience regret under conditions in which they have experienced objectively positive outcomes.

Medvec, Maday, and Gilovich (1995) found that silver medal winners in the Olympics showed signs of negative affect even though they medalled in the Olympics. They reasoned that this finding was most likely due to the fact the athletes came close to the goal of winning a gold medal. There is some evidence that second place winners are likely to generate counterfactuals about how the gold medal goal could have been obtained (e.g., Matsumoto & Willingham, 2006; Medvec et al., 1995). This research was conducted in the context of real-world competition which is, of course, important, but does not allow for the type of control important for making inferences about causality inherent in laboratory research. This research also involved a performance situation, not one that involved decisions between/among options. In addition, it did not measure perceptions of decision quality or whether upward counterfactuals mediated these perceptions. The question therefore remains: Do upward counterfactual inferences mediate perceptions of decision quality in contexts in which people make decisions that lead objectively positive outcomes?

### Overview of research

We used different manipulations and different dependent measures of decision quality in each of the experiments to provide converging evidence for the influence of alternative outcomes on perceptions of decision quality and feelings of regret. The following three studies tested the hypothesis that the perceived quality of the decision will depend upon the relationship between actual outcomes and alternative outcomes. Perceptions of decision quality were predicted to be inversely related to the positivity of the alternative outcomes whereas feelings of regret (measured in Experiments 2 and 3) were predicted to increase as a function of the positivity of alternative outcomes. Experiments 1 and 3 used scenario methodologies whereas Experiment 2 involved participants' actual decisions.

If, as predicted, alternative outcomes do influence perceptions of decision quality, then this effect could reflect a bias in which these judgements are affected by factors other than the processes by which the decisions are made. Experiment 3 allowed us to assess whether this alternative outcome bias effect (AOBE) occurs in the face of explicit information about rational decision-making processes used to make decisions.

We predicted an AOBE even though the decision-makers received the same actual outcomes (Experiment 3) or as in Experiments 1 and 2, the decision-maker who obtained the most positive actual outcome also missed an opportunity that would have returned the most profit. The actual outcome was either slightly (Experiment 1) or significantly (Experiment 2) more positive in the situation where the missed opportunity would have returned the highest profit. To illustrate: Persons A and B have \$2000 to invest in stocks

and they can divide their money in any way they wish. On the one hand, Person A earned \$480 by buying 40 shares of one stock that increased by \$6 and 60 shares of another that increased by \$4. Person B, on the other hand, earned approximately twice as much as Person A by investing 40 shares in a stock that increased by \$22 and 60 shares in one that returned much less than a dollar. Here, Person B earned the most money but also missed an opportunity to earn even more. In these two experiments, the decision that was associated with the largest alternative outcome also returned the largest amount of profit. Thus, in addition to determining whether the magnitude of an alternative outcome influenced decision quality ratings, it also pitted the AOB E against the outcome bias effect, in which the quality of a decision is determined by the extent to which it is associated with a desirable or undesirable outcome, independent of the decision process (e.g., Baron & Hershey, 1988).

We also tested whether the AOB E would be influenced by participants' orientation to decision contexts; we expected the AOB E to be reduced when participants concentrated on the actual profit obtained relative to when they were open to consider any aspect of what occurred. When participants concentrate on the obtained profit, attention is directed away from the profit not obtained in the alternative; in contrast, when participants consider any or all decision consequences, the amount of profit that they could have earned is relatively salient.

## EXPERIMENT 1

Our first experiment was designed to determine whether people's evaluations of decision quality are influenced by information that alternative decisions could have produced more profits than were obtained by the actual decisions. We expected that we would find an influence of alternative profit outcomes on ratings of decision quality. Specifically, we expected participants who received an above average amount of profit but missed an alternative outcome that would have produced a significantly greater amount (large alternative outcome description condition) to rate the quality of their decisions less positively than those who received a somewhat lesser amount of profit but only missed a slightly better alternative (small alternative outcome description condition). This effect, however, was expected to be moderated by how participants were oriented to think about the outcomes of their decisions. To manipulate participants' orientation, we directed them to concentrate either on the profits obtained (obtained profit orientation condition) or adopt an open orientation (open orientation condition) in which they could consider any aspect of what had occurred. When participants concentrate on the amount earned as a result of the decision, they should be less likely to consider the amount that was not earned as a result of choosing one investment strategy over the other—upward counterfactuals. In contrast, when

participants are open to consider any aspect of what happened, the alternative amount of profit that could have been earned if only a different decision had been made is relatively salient. If so, then participants in this condition would be expected to rate the chosen decision less positively than participants who were oriented to the profit that was actually obtained; thus the alternative outcome effect should be more apparent in the open orientation than in the obtained profit orientation condition. Specifically, this reasoning leads to the hypothesis that the difference between decision quality evaluations in the large versus small alternative outcome description condition should be less in the obtained profit than in the open orientation condition.

## Method

*Participants and design.* Two hundred forty-two University of North Carolina–Greensboro students volunteered and participated in groups of 40–50 persons in a classroom setting. Students volunteered to participate in exchange for extra course credit. All conditions were represented within each session and, within this constraint, participants were randomly assigned to one of four conditions defined by a 2 alternative outcome description (large vs. small)  $\times$  2 thought orientation (open vs. obtained profit orientation) between-subjects design.

Twenty-five participants were excluded from the experiment because they did not focus on the profit earned in the obtained profit orientation condition; rather they tended to focus on the information about alternative outcomes and generated upward counterfactuals, such as “if he made another choice, he could have earned more money.” The large number of participants who did not follow instructions suggests that there is a propensity for people to focus on alternative outcomes and generate upward counterfactuals, even when directed to focus on the amount of earned profit.

It should also be noted that there were 31 other participants who did not follow instructions across other conditions as well, and wrote statements that indicated a lack of understanding of the scenario (i.e., wrote statements that were incorrect) or failed to write any statements at all<sup>1</sup>. For these reasons, these participants were excluded from the experimental analysis.

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<sup>1</sup> Two researchers read these statements and evaluated whether the statements included upward counterfactuals; a single judge evaluated whether the statements reflected a misunderstanding of the information (e.g., indicated that more profit could have been earned by an option that was described as returning the least profit). One of the judges evaluated the statements of all participants and the other evaluated 30 samples. It was necessary for one judge to be aware of the experimental condition in order to determine whether the participants' statements reflected accurate understanding of the scenario. The second judge was blind to experimental conditions. This procedure was also utilised in Experiment 3. In both experiments, there was a high level of inter-rater reliability (90% in Experiment 1 and 93% in Experiment 3).

*Procedure.* Participants read a vignette in which they were asked to imagine that they had decided to invest \$10,000 of their money in the stock market and were given information about the histories and trends of two stocks (N and P). After considering this information, they were asked to imagine that they had initially decided to split their \$10,000 between the two stocks, but that the final decision was to invest almost all of their money (\$9500) in stock N and a relatively small amount in stock P.

In the high alternative outcome condition, participants read that stock N increased by 5%, earning \$475 on the \$9500 investment, whereas stock P increased by 50%, earning \$250 on their \$500 investment. The total profit was \$725. In the low alternative outcome condition, stock N increased by 7%, earning \$665 on their \$9500 investment, whereas stock P increased by 5%, earning \$25 on their \$500 investment. The total profit was \$690. All participants then read that the average stock increased by 4%, or \$400, on a \$10,000 investment. Thus in both conditions participants' investments were above the average (\$725 in the high, and \$690 in the low alternative outcome condition).

After reading about the fate of their investment decision, and before evaluating the decision, participants were asked to think about (take into consideration) and write their thoughts; approximately half of the participants were asked to think and write about "what actually happened" (open thought orientation condition) and half were asked to think and write about the total amount of money that the decision produced (obtained profit thought orientation condition). Then they rated the decision on an 11-point response scale with  $-5$  (worst possible decision),  $0$  (neutral) and  $+5$  (best possible decision) as the anchor labels. (See Appendix for exact instructions.)

## Results

We performed a  $2$  (alternative outcome description: Small vs. large alternative outcome)  $\times 2$  (open vs. obtained profit thought orientation) between-subjects analysis of variance (ANOVA) on participants' evaluations. The ANOVA revealed main effects of both alternative outcome condition and thought orientation condition (see Table 1). The main effect of the alternative outcome variable is due to the fact that participants rated the decision more positively when there was a small ( $M = 2.6$ ) versus a large ( $M = 1.1$ ) profit left behind,  $F(1, 182) = 28.31, p = .000, \eta^2 = .12$ . The main effect of the thought orientation factor was due to the finding that, when the participants were oriented to think about the total amount of profit earned in the obtained profit orientation condition, they evaluated the decision more positively ( $M = 2.6$ ) than in the open thought orientation condition ( $M = 1.2$ ),

TABLE 1

Means and standard deviations of decision evaluation responses as a function of alternative outcome condition and thought orientation conditions (Experiment 1)

	<i>Thought orientation descriptions</i>			
	<i>Open</i>		<i>Total profit</i>	
<i>Alternative outcome</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Large	.27	2.35	2.00	1.70
Small	2.23	1.95	3.00	1.01

$F(1, 182) = 20.16, p = .000, \eta^2 = .08$ . The interaction effect did not reach the traditional level of significance,  $F(1, 182) = 2.97, p = .087, \eta^2 = .01$ .

Following suggestions by Keppel (1991), we made planned comparisons (contrasts) to assess the specific predictions we made concerning the influence of alternative outcomes and thought orientation on judgements of decision quality. [This planned comparison approach tests the specific pattern of mean differences predicted by our hypothesis, and not all (or even several) other possible pattern mean differences. Therefore, this procedure does not inflate the probability of obtaining significant effects by chance and is appropriate for testing specific a-priori hypotheses (see Keppel, 1991).] Specifically we predicted that the difference between decision quality evaluations in the large versus small alternative outcome description condition would be less in the obtained profit versus the open orientation condition. To test this prediction, we performed a planned comparison in which we compared the rating difference in the high versus low alternative outcome conditions across the two thought orientation conditions (see Table 1). As predicted, the difference between evaluations of decisions in the large and small alternative outcome conditions was smaller when participants were oriented to think and write about the obtained profit than when they were given open thought orientation instructions,  $F(1, 182) = 6.14, p < .05$ . Thus, the effect of alternative superior outcomes was less apparent in the obtained profit orientation condition than in the open thought orientation condition. Further, the majority of participants (~70%) wrote an upward counterfactual thought in the high alternative—open condition, whereas fewer (~25%) expressed this type of thought in the low alternative—open orientation condition.

## Discussion

The results of this experiment showed that people are influenced by the availability of alternative positive outcomes (i.e., greater profits) even when

the decisions produced positive outcomes. Participants evaluated investment decisions more negatively when an alternative investment decision would have produced a significantly greater (versus slightly greater) amount of profit than the profit obtained. This effect was moderated by participants' orientation to the decision context, such that there were smaller differences in participants' evaluations across high versus low alternative profit conditions in the obtained versus open thought orientation conditions. It is noteworthy that many participants in the obtained profit orientation condition failed to follow instructions, and instead generated upward counterfactual statements about the amount of profit that could have been earned. This pattern suggests that people have a strong tendency to spontaneously generate upward counterfactual thoughts under these circumstances—a pattern that is consistent with the research of Dixon and Byrne (2011). They found that people relied on potential gains they could win in a scenario, rather than potential losses or calibrations of gains or losses.

In this experiment, as well as in Experiments 2 and 3, we used situations that described decision-makers as free to invest whatever amount they desired in each of several available options. So, for example, \$200 could be invested in option 1 and \$300 in option 2, rather than \$500 in option 1 or 2. This is similar to a procedure used by Dixon and Byrne (2011) in which a card game scenario was utilised; but other than this research, scant attention has been directed toward investigating this type of situation. More typically, research utilises situations in which a person invests all allotted resources in one of two options. Yet decisions about how to allocate investments (bets) among various options are a common type of decision people make in their lives (e.g., investment choices). Thus, the present research and that of Dixon and Byrne (2011) are more realistic in their depiction of investment decisions.

## EXPERIMENT 2

The previous experiment demonstrated that people's evaluations of decisions are affected by alternative positive outcomes and that they regretted their decisions even when they led to positive outcomes. The type of scenario procedure used in Experiment 1 is commonly used in the judgement literature. However, there are dynamics that are operative in the context of online decisions that may not occur in the context of evaluating decisions in a scenario. Experiment 1 employed a method in which participants were presented with verbal materials describing their decisions. Dixon and Byrne (2011) have shown that people tend to take a "gain" perspective in situations such as these; this tendency could lead participants to be especially sensitive to the magnitude of alternative profit possibilities. Thus we built on this prior work to explore whether the magnitude of alternative outcomes that

represented more “gain” would influence participants’ evaluations of their actual decisions. In Experiment 2, we used a paradigm in which participants made actual decisions in a more complex, online decision context and assessed whether the AOB generalised to this more involving context. Participants tracked the progress of stocks across time as is typical in stock investment. If we obtain similar results in this context as obtained in Experiment 1, this study would provide evidence that the availability of more profitable alternative outcomes affects people’s judgements of the quality of their decisions in a naturalistic decision context. We used different measures of decision quality than used in Experiment 1 in order to provide converging measures and we also tested the mediational role of upward counterfactual thoughts in this experiment.

Specifically, Experiment 2 was designed to assess decision-makers’ evaluations of their own decisions in a realistic decision-making context involving computer-based online investments and where immediate feedback was presented about better outcomes. We used a computerised stock investment task to manipulate alternative outcomes, such that participants always made a profit but could have made either a larger or smaller amount of profit across two between-participants conditions. We measured participants’ thoughts concerning their investments and assessed the mediational role of upward counterfactuals in determining the effects of alternative outcomes on participants’ decision quality evaluations and regret ratings. Our prediction was that more participants would generate upward counterfactual thoughts in the large versus small alternative outcome discrepancy condition. We also predicted that participants would evaluate their decisions more negatively in the large versus small alternative outcome condition and that upward counterfactual thought measures would mediate the effects of alternative outcome discrepancy on participants’ decision quality evaluations. Measures of affective regret were also collected; we expected participants to feel more regret in the large versus small alternative outcome condition and that upward counterfactuals would mediate this effect.

## Method

*Participants, design and procedure.* Sixty undergraduates enrolled in introductory psychology courses at Wake Forest University were randomly assigned to one of two between-subjects alternative outcome discrepancy conditions—small or large amounts of profit alternative outcome discrepancies. They were compensated with partial credit toward research options in introductory psychology.

All experimental materials were presented using MediaLab v2004 research software (Jarvis, 2004). The instructions of the experiment were self-paced, and participants advanced the instructions by pressing the space

bar or a response key. Participants were informed that they would be asked to examine two graphs that displayed the value fluctuations of two different stocks over the past year and to select how many shares they wanted to buy of each stock. Identical graphs were presented in both conditions. Participants were informed that they had a chance to win a \$75 drawing for participating in the experiment, and that their chances of winning the drawing depended on how well they performed in the decision task.

The stocks were labelled "ACS" and "BPI." Both stocks were valued at approximately \$400 per share. It was explained that they were to imagine that we gave them enough money to invest in 100 shares, splitting the 100 shares across both stocks. Their task was to study the graphs and to invest in both stocks by first indicating how many of their 100 shares they wanted to buy of ACS (minimum 1, and maximum 99). Before indicating their shares of ACS, it was explained that their remaining shares that they did not invest in ACS would be invested in BPI. After indicating their number of ACS shares, the program subtracted this number from 100 and reminded participants of how many shares of ACS and BPI they decided to buy. Participants were given the opportunity to go back and change their investments if they desired before locking in their final decision. Participants were then informed that a simulation would be run by the program and that they would get to see how their investments turned out as if it were six months later.

At this point, all participants were randomly assigned to one of two between-subjects alternative outcome discrepancy conditions. Participants assigned to the small alternative outcome discrepancy condition were informed that both the ACS and BPI stocks increased in value over the next six months of their investment and translated into a \$460 gain. However, the difference in the two stocks' increase per share was relatively small. These participants were always informed that the stock in which they bought the fewest number of shares increased more relative to the stock in which they bought the most shares. This information was given in actual dollars to boost the feasibility of the scenario. For example, if a participant decided to buy 40 shares of ACS (invest ACS), and 60 shares of BPI (invest BPI), they were informed that ACS increased by \$5.98 a share and BPI increased by \$3.68 a share. The total increase in value of their 100 shares always totalled to a \$460 gain (see Appendix for equation). Thus, after participants in this condition indicated how many shares of ACS they wished to buy (invest ACS) the values per share and profits were calculated by the research software to conform to a total profit of \$460 (small alternative outcome condition).

Participants assigned to the large alternative outcome discrepancy condition were also informed that both the ACS and BPI stocks increased in value over the next six months of their investment and the profit translated into a \$920 gain. This is different from the small alternative outcome discrepancy

condition in that the difference in the two stocks' increase per share was relatively large. Similar to the small alternative outcome discrepancy condition, however, these participants were always informed that the stock in which they bought a fewer number of shares increased more relative to the stock in which they bought a greater number of shares. If a participant in the large alternative outcome discrepancy condition decided to buy 40 shares of ACS, and 60 shares of BPI, he/she was informed that ACS increased by \$22.77 a share and BPI increased by \$15 a share. The total increase in value of their 100 shares always totalled to a \$920 gain (See Appendix for exact equation). Thus after participants in this condition indicated how many shares of ACS they wished to buy (invest ACS), the values per share and profits were calculated by the research software to conform to a total profit of \$920 (large alternative outcome condition).

Participants were first asked to write one statement about their thoughts concerning their investment decision and then to evaluate their stock market decision by selecting a point on an 11-point response scale with  $-5$  (worst possible decision) and  $+5$  (best possible decision) as the anchors. They also evaluated their decision on a 5-item 9-point semantic differential scale using the following anchors: *Negative/positive*; *foolish/wise*; *bad/good*; *unfavourable/favourable*; and *undesirable/desirable*. Participants then indicated how much they regretted their decision on a 9-point scale with 1 (not at all) and 9 (extremely) as the anchors.

## Results

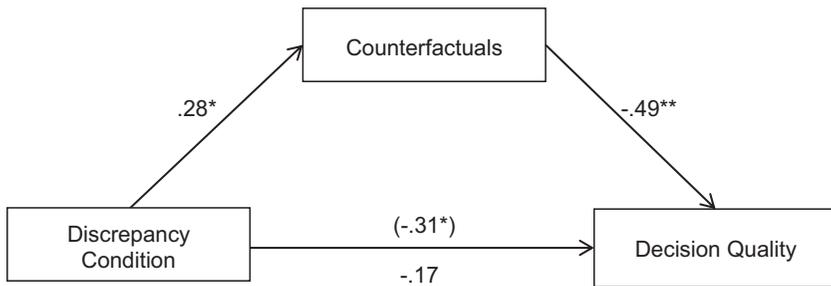
The first analysis was conducted in order to assess the prediction that there would be differences in the number of participants who generated an upward counterfactual thought across the small versus large alternative outcome discrepancy condition. To test the hypothesis that participants would generate upward counterfactuals in the large versus small alternative outcome condition, we performed a *chi-square* analysis on the number of participants in each condition who generated upward counterfactual thoughts. Upward counterfactuals in this context refer to the mental simulation of the availability of greater profits if another stock had been picked. Two independent coders were used to code each thought listing as to whether it reflected upward counterfactuals, downward counterfactuals or another type of thought. Initial agreement in the thought codes reached 93.33%; disagreements were settled by further discussion between the coders. The primary variable of interest was the number of participants in each condition who generated upward counterfactuals. The chi-square analysis revealed that there was a significant difference in the number of participants generating upward counterfactuals in the small ( $n = 7$ ) versus the large ( $n = 15$ ) alternative outcome discrepancy condition,  $\chi^2$  ( $df = 1$ ,  $n = 60$ ) = 4.59,  $p = .032$ ,

Cramer's  $V = .27$ , contingency coefficient =  $.27$ . This finding supports the expectation that large discrepancies between obtained and alternative outcomes would induce more upward counterfactual thoughts than smaller discrepancies.

The next analysis was conducted to assess the influence of alternative outcome discrepancies on the evaluation of the decision quality. Each of the semantic differential items was highly correlated with each of the other semantic differential items (mean correlation =  $.77$ ; Cronbach's  $\alpha = .94$ ) and was highly correlated with the single item measure  $r(58) = .79$ ,  $p < .001$ . Therefore, we averaged each participant's semantic differential scores and combined this average with the average  $z$ -score of the single evaluation items. We performed an ANOVA on these composite evaluation measures. Using this composite measure reduced the number of analyses performed on the data. As expected participants evaluated their decisions more positively in the small ( $M = .59$ ,  $SD = 1.78$ ) than in the large alternative outcome discrepancy condition ( $M = -.59$ ,  $SD = 1.84$ ),  $F(1, 58) = 6.44$ ,  $p = .014$ ,  $\eta^2 = .10$ .

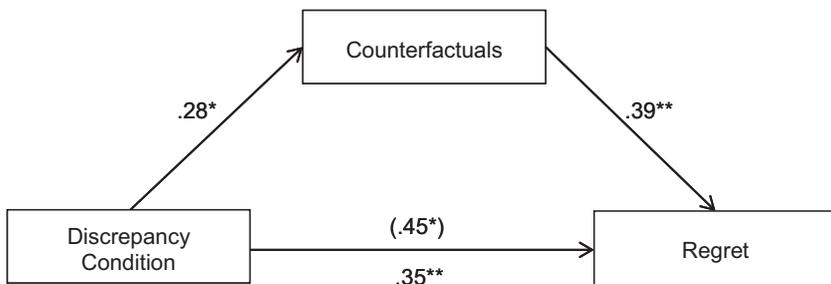
Our final analysis assessing the meditational role of upward counterfactuals on decision evaluations revealed that there was a significant effect of the alternative outcome discrepancy condition on participants' evaluations of the chosen decision's quality ( $\beta = -.31$ ),  $t(58) = -2.47$ ,  $p < .02$ , as well as on counterfactuals ( $\beta = .28$ ),  $t(58) = 2.19$ ,  $p < .05$ . The potential mediator—upward counterfactuals—was also significantly related to ratings of decision's quality ( $\beta = -.49$ ),  $t(57) = -4.30$ ,  $p < .001$ ; when including the mediator in the model, the effect of alternative outcome discrepancy condition, ( $\beta = -.17$ ),  $t(57) = -1.52$ ,  $p = .13$ , was significantly reduced, Sobel test:  $Z = -1.95$ ,  $p = .05$ . To further test our hypothesis that there is a significant indirect path between alternative outcome discrepancy conditions and our dependent variables that is mediated through upward counterfactuals, we used a bootstrap procedure to construct bias-corrected confidence intervals based on 5000 random samples with replacement from the full sample (see Preacher & Hayes, 2004, 2008). The size of the indirect effect of discrepancy condition on decision quality was  $-.27$  ( $SE = .14$ ), and the 95% confidence interval excluded zero, 95% CI  $[-.62, -.04]$ , indicating a significant negative, indirect path (see Figure 1).

*Regret measures.* The results of an ANOVA on regret measures indicated that participants felt more regret in the large alternative outcome discrepancy condition ( $M = 5.13$ ,  $SD = 1.79$ ) than in the small discrepancy condition ( $M = 3.33$ ,  $SD = 1.81$ ),  $F(1, 58) = 14.98$ ,  $p = .000$ ,  $\eta^2 = .21$ . Thus, even though the decision itself produced more profit in the large discrepancy condition, the fact that there was more profit “left behind” in this condition produced more regret than when there was less obtained profit, but also less alternative profit that could have been gained.



**Figure 1.** Mediation of the relationship between discrepancy and decision quality by counterfactuals (Experiment 2). Discrepancy conditions was dummy-coded using 0 for small and 1 for large. Values displayed are standardised regression coefficients. \* $p < .05$ . \*\* $p < .01$ .

We entered both upward counterfactuals and the alternative outcome variable into a simultaneous regression analysis and found that both were significantly related to regret: Counterfactuals ( $\beta = .39$ ),  $t(57) = 3.50$ ,  $p < .01$  and the alternative outcome discrepancy condition ( $\beta = .35$ ),  $t(57) = 3.10$ ,  $p < .01$ ; when including the mediator in the model, the effect of alternative outcome discrepancy condition was marginally reduced, Sobel test:  $Z = 1.80$ ,  $p = .07$ . To further test our hypothesis that there is a significant indirect path between discrepancy condition and regret mediated through upward counterfactuals, we again used a bootstrap procedure to construct bias-corrected confidence intervals based on 5000 random samples with replacement from the full sample (see Preacher & Hayes, 2004, 2008). The size of the indirect effect of discrepancy condition on regret was .43 (SE = .23) and the 95% confidence interval excluded zero, 95% CI [.09, 1.04], indicating a significant indirect path (see Figure 2).



**Figure 2.** Mediation of the relationship between discrepancy and regret by counterfactuals (Experiment 2). Discrepancy conditions was dummy-coded using 0 for small and 1 for large. Values displayed are standardised regression coefficients. \* $p < .05$ . \*\* $p < .01$ .

## Discussion

These results demonstrate that: (1) Decision evaluations were less positive and feelings of regret more intense when participants missed an alternative outcome opportunity that was associated with a relatively large versus small amount of profit. These results were obtained even though the alternative outcome that was associated with a relatively large profit was also the one associated with the least amount of profit, and (2) the presence of upward counterfactuals predicted decision evaluations and regret. Thus, these results converge with those obtained in the previous experiment and find that in the context of ongoing, realistic decision-making, people are influenced by alternative outcomes that might have been obtained, even when the outcomes of their decisions were objectively positive.

## EXPERIMENT 3

So far, our research has demonstrated that the magnitude of alternative outcomes influences people's decision evaluations and feelings of regret following decisions that produced good outcomes. The following experiment employed a paradigm in which we described a decision that followed rational decision-making principles—taking the option that represented the highest expected value. We provided participants with a decision made by one of two individuals who always won the same amount of money, always had the same antecedent information and always made a decision that was associated with the highest expected value. Using this procedure, we were able to insure that the only difference between the two decisions was whether more money could or could not have been earned had a different decision been made. This method is often used in judgement and decision-making research and allows researchers to portray critical parameters of the decision context. The primary question we addressed is whether participants are influenced by alternative outcomes even when the decision-maker chooses the option with the highest expected value. In addition, we contrasted conditions in which there either was or was not a missed opportunity and used different decision quality measures than used in the previous two experiments in order to increase generalisability and provide converging measures.

## Method

*Participants, design and procedure.* Fifty-seven students from introductory classes were randomly assigned to one of two alternative outcome conditions defined by whether there was or was not a missed opportunity—an amount of profit associated with a non-chosen alternative decision. All conditions were represented within each experimental session.

Participants read about a person (Chris) who purportedly was afforded an opportunity to earn a bonus by being given \$10 to place on 1, 2 or 3 individuals, each of whom would roll a die. Chris could divide the money in any way he chose. The following are the amounts Chris would be awarded for each dollar placed on a given person: If person A rolled a 6, Chris would be awarded \$50, if person B rolled a 4 or 5, Chris would be awarded \$25 and if person C rolled a 1, 2 or 3, he would be awarded \$20. After participants read that Chris decided to place his \$10 on person C (this is the option with the highest expected value), they all read that person C rolled a 1. In the missed opportunity condition, person A rolled a 6 and person B a 5 whereas in the *not* missed opportunity condition person A rolled a 4 and B a 3. Thus, in the missed opportunity condition, persons A, B and C won and Chris would have earned more money if he placed money on either person A or B, whereas in the situation in which an opportunity was not missed, Chris not only won more money by placing his money on person C but would have won less if he placed money on anyone else. After writing a statement that reflected their most prominent thought concerning what could have happened if Chris made a different decision, they rated the quality of Chris' decision and whether he should consult another person for help in future discussions of this type. They responded on 11-point scales. The quality question was anchored by  $-5$  (terrible quality) and  $+5$  (excellent quality) with 0 as a neutral point. The consult question was anchored by  $-5$  (definitely consult an adviser) and  $+5$  (definitely make own decision) with 0 as a neutral point. They also rated the amount of regret that Chris had about his decision with 0 (none) and 10 (a great deal) as the anchors. (See Appendix for exact instructions.)

## Results and discussion

Two participants were excluded from the analysis because they misunderstood the alternative outcome condition—they indicated that less money should have been earned in this condition, which is not the case. ANOVAs were performed on the three dependent measures. Participants expressed more intense feelings of regret and their quality and consult responses were more negative in the alternative outcome missed condition in which the non-chosen options were associated with highly profitable outcomes,  $F(1, 53) = 20.9, p = .000, \eta^2 = .28$ ,  $F(1, 53) = 5.0, p = .029, \eta^2 = .09$ , and  $F(1, 53) = 7.4, p = .009, \eta^2 = .12$ , respectively (see Table 2). Thus all three measures revealed the predicted effects of the presence or absence of missed alternative outcomes.

To assess the extent to which the alternative outcome information stimulated the generation of counterfactuals across conditions, we performed *chi-square* analysis on the number of participants in each condition who generated upward counterfactual thoughts. Because participants were asked their thoughts about what could have happened,

TABLE 2  
Mean ratings and standard deviations by alternative outcome condition (Experiment 3)

	<i>Alternative outcome condition</i>			
	<i>Profit missed</i>		<i>Profit not missed</i>	
<i>Dependent variable</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Regret	4.29	3.29	.93	1.98
Quality	1.46	2.43	2.96	2.55
Consult	.57	2.56	2.26	2.01

Greater values indicate greater regret, greater decision quality, and whether future decisions should be made by the decision-maker as opposed to another person.

we scored the thought listing measure categorically as either an upward, downward or “other” response.

As expected, this analysis revealed that the vast majority of participants expressed upward counterfactual thoughts in the alternative outcome missed condition (93%) but did not do so in the not missed condition (11%),  $X^2 = 18.24$ ,  $p < .01$ . Rather than expressing upward counterfactual thoughts, the vast majority of participants (81%) in the not missed alternative outcome condition indicated that they could have been “worse-off” with a different decision, which are downward counterfactual statements.

*Mediation analyses.* We conducted mediation analyses in order to reveal the processes or variables that intervene between our independent variable (alternative outcome missed vs. not missed condition) and our dependent variables (two measures of decision quality; see Shrout & Bolger, 2002, for further discussion). Below, we present these analyses.

Participants’ average quality and consult ratings were significantly correlated ( $r = .49$ ,  $p < .01$ ); therefore, we used the average of the two measures in these analyses.

The average quality and consult ratings were significantly predicted by the alternative outcome variable ( $\beta = -.37$ ),  $t(53) = -2.92$ ,  $p < .01$ ; the alternative outcome variable also predicted participants’ upward counterfactuals ( $\beta = .86$ ),  $t(53) = 12.00$ ,  $p < .001$ , and upward counterfactuals predicted quality ratings ( $\beta = -.52$ ),  $t(53) = -4.45$ ,  $p < .001$ . To test our hypothesis that there is a significant indirect path between alternative outcome condition and decision quality mediated through upward counterfactuals, we used a bootstrap procedure to construct bias-corrected confidence intervals based on 5000 random samples with replacement from the full sample (see Preacher & Hayes, 2004, 2008). The size of the indirect effect of alternative outcome condition on decision quality was  $-.27$  (SE = .14), and

the 95% confidence interval excluded zero, 95% CI  $[-.62, -.04]$ , indicating a significant negative, indirect path.

*Regret.* The alternative outcome variable was a significant predictor of regret ( $\beta = .53$ ),  $t(53) = 4.57$ ,  $p < .001$ , and of upward counterfactuals ( $\beta = .86$ ),  $t(53) = 12.00$ ,  $p < .001$ . The potential mediator—upward counterfactuals—also predicted regret ( $\beta = .56$ ),  $t(53) = 4.97$ ,  $p < .001$ . To test our hypothesis that there is a significant indirect path between alternative outcome condition and regret mediated through upward counterfactuals, we used a bootstrap procedure to construct bias-corrected confidence intervals based on 5000 random samples with replacement from the full sample (see Preacher & Hayes, 2004). The size of the indirect effect of alternative outcome condition on decision quality was .43 (SE = .23), and the 95% confidence interval excluded zero, 95% CI  $[.09, 1.04]$ , indicating a significant positive, indirect path.

This experiment provided support for the influence of alternative outcomes on people's evaluations; participants rated decisions more negatively and reported more intense feelings of regret when there was versus was not a superior alternative outcome. Upward counterfactuals served as a mediator of these effects.

## GENERAL DISCUSSION

Although evaluations and regret following poor decisions have been the subject of considerable research (e.g., Connolly & Zeelenberg, 2002; Roese, et al., 1999; Seta et al., 2001; Seta & Seta, 2013), very little research on evaluations and regret following objectively "good" decisions (i.e., those producing positive outcomes) exists. Thus the present research adds to this body of knowledge and demonstrates that upward counterfactuals mediate the influence of alternative outcomes on feelings and evaluations of "good" decisions.

Experiments 1–3 demonstrated an important influence of alternative outcome opportunities on regret and decision quality evaluations, in the context of participants' own decisions (Experiments 1 and 2) and on evaluations of the decisions made by others (Experiment 3). In Experiment 3, even though the decision strategy used was rational, people evaluated the decision's quality more negatively and expressed higher levels of regret when there were alternative decisions that could have produced a higher level of profit than when these alternative outcomes were not present. In addition, individuals who received substantial profits, but left relatively large amounts of profit behind, evaluated the quality of decisions less positively and experienced more intense feelings of regret than those who received a substantial profit, but left a lesser amount of profit behind. The amount of missed

alternative outcomes mattered; participants in Experiments 1 and 2 rated the quality of good decisions less positively, and had more intense feelings of regret, when the alternative outcome was relatively large versus relatively small. Furthermore, the strength of this effect was reduced by orienting perceivers to the amount of obtained profit (Experiment 1).

One important feature of this research is that we used multiple measures and different manipulations to conceptually replicate our findings. This type of strategy has the major advantage of targeting the conceptual variable of interest, in this case, alternative outcomes (see Wilson, Aronson, & Carlsmith, 2010, for a good discussion of this research strategy). In our experiments, the influence of alternative outcomes outweighed the outcome bias effect, in that decision quality evaluations were lower when there were alternative outcomes that were more positive than the positive returns actually obtained. [An outcome bias is demonstrated by finding that a decision is rated as higher in quality (i.e., a good decision) when it led to more positive outcomes or profits (see Baron & Hershey, 1988).] The AOB is also a “bias” in that decision quality evaluations are influenced by the availability and magnitude of alternatives, rather than by the process through which the decision was reached. Experiment 3 is especially informative in demonstrating that our AOB is indeed a bias, in that the influence of alternative outcomes affected participants’ evaluations of decision quality even when rational decision-making processes were followed.

The present research also revealed moderators of this AOB; namely, the decision-maker’s orientations to the outcomes of decisions appear to influence the extent to which alternative outcomes influence perceptions of decision quality and feelings of regret. The alternative outcome’s influence was reduced when people concentrated on the total profit that actually was obtained. This moderating influence supports the theoretical position that alternative outcome information exerts its influence via the route of upward counterfactual generation. Mediation analyses also support this view in revealing that upward counterfactuals mediated the influence of manipulated alternative outcomes in Experiments 1–3.

In addition to concentrating on actual profits, there are other situations that would be expected to reduce the alternative outcome’s influence. For example, large absolute profits may draw decision-makers’ attention away from alternative ones and toward outcomes that were received. The end result would be that the effect of the alternative outcome would not outweigh that of the actual one. Another factor may be the relative difference between alternative and obtained outcomes. A relatively large profit may reduce concern over a relatively small increment in alternative profits, thereby reducing the AOB. These and other factors may moderate the influence of alternative outcomes on judgements of decision quality and affective reactions and is an area of further research.

Why would individuals not enjoy the profits earned by a decision instead of considering alternatives that could have been better? One possibility is that these thoughts, albeit painful, could be functional in guiding future decisions. Creating alternative scenarios that produced more positive outcomes may be a particularly rational type of imagination that serves an analytic function. Consider the research conducted by Dixon and Byrne (2011). This research demonstrated that the well-known exceptional action effect (i.e., the tendency to mutate an exceptional, atypical action into a typical one) is guided by how the counterfactual could potentially lead to a better outcome, rather than typicality or justifiability per se. Thus, counterfactuals are seen to play a potentially functional role in goal-directed action. Another possibility is that attention to alternative and more profitable outcomes, along with upward counterfactuals, may be a by-product of a hedonistic nature that maximises profit. If so, then this is an ironic downside of hedonism; people are not always happy with their objectively positive decisions and the outcomes that stemmed from them when even better outcomes are available. This research suggests that when alternative worlds are even better than the desirable outcomes experienced, affect and cognition may be more strongly linked to the magnitude of alternative realities than to obtained outcomes.

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## APPENDIX

### EXPERIMENT 1 VIGNETTE

Please imagine:

Last year, you decided to invest \$10,000 of your hard earned money in the stock market. You closely analysed the histories and trends of stock N and stock P and invested \$10,000 in these two stocks. You first decided to

split your investments across the two stocks, investing 50% of your money (\$5000) in stock N and 50% (\$5000) in stock P. Your final decision was to invest almost all of your money (\$9500) in stock N and a relatively small amount (\$500) in stock P.

### High alternative outcome condition

Stock N increased by 5% so you earned \$475 on the \$9500 you invested in this stock. Stock P increased by 50%, so you earned \$250 on the \$500 you invested in this stock. At the end of the year the total profit on your \$10,000 investment was \$725. The average stock increased by 4% or \$400 on a \$10,000 investment.

### Low alternative outcome condition

Stock N increased by 7% so you earned \$665 on the \$9500 you invested in this stock. Stock P increased by 5%, so you earned \$25 on the \$500 you invested in this stock. At the end of the year the total profit on your \$10,000 investment was \$690. The average stock increased by 4% or \$400 on a \$10,000 investment.

### Obtained profit orientation condition

Please consider, when evaluating your stock market decision, the total amount you earned relative to the average return.

Please write a statement about the total amount you earned relative to the average return.

### Open thought condition

Please consider, when evaluating your stock market decision, what actually happened as a result of your stock market decision.

Please write a statement about what actually happened as a result of your stock market decision.

### All conditions read

Now, please evaluate your stock market decision by placing an X anywhere on the scale that best represents your feelings.

-5	-4	-3	-2	-1	0	1	2	3	4	5
Worst possible decision				Neutral			Best possible decision			

## EQUATIONS: SMALL AND LARGE ALTERNATIVE OUTCOME CONDITIONS OF EXPERIMENT 2

### Small alternative outcome condition

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ACS value increase	= IF (invest ACS > invest BPI, THEN (460/invest ACS) × .48), IF (invest ACS < invest BPI, THEN (460/invest ACS) × .52), IF (invest ACS = invest BPI, THEN (460/invest ACS) × .48)
BPI value increase	= IF (invest ACS < invest BPI, THEN (460/invest BPI) × .48), IF (invest ACS > invest BPI, THEN (460/invest BPI) × .52), IF (invest ACS = invest BPI, THEN (460/invest BPI) × .52)
ACS profit = (invest ACS × ACS value increase)	
BPI profit = (invest BPI × ACS value increase)	

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### Large alternative outcome condition

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ACS value increase	= IF (invest ACS > invest BPI, THEN (920/invest ACS) × .01), IF (invest ACS < invest BPI, THEN (920/invest ACS) × .99), IF (invest ACS = invest BPI, THEN (920/invest ACS) × .01)
BPI value increase	= IF (invest ACS < invest BPI, THEN (920/invest BPI) × .01), IF (invest ACS > invest BPI, THEN (920/invest BPI) × .99), IF (invest ACS = invest BPI, THEN (920/invest BPI) × .99)
ACS profit = (invest ACS × ACS value increase)	
BPI profit = (invest BPI × ACS value increase)	

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## EXPERIMENT 3 VIGNETTE

This is a case study in decision-making.

Chris has the opportunity to earn a bonus. He is given \$10 to place on 1, 2 or 3 people who will each roll a die. He can divide the money in any way he decides; for example, placing all the money on one person or a portion on each person.

If person A rolls a 6, Chris will be awarded \$50 for each dollar he placed on person A.

If person B rolls a 4 or 5, Chris will be awarded \$25 for each dollar placed on person B.

If person C rolls a 1, 2 or 3, Chris will be awarded \$20 for each dollar placed on person C.

### Alternative outcome not missed condition

Chris decides to place all \$10 on person C. It turns out that person A rolled a 4; person B rolled a 3; and person C rolled a 1. Therefore, because he bet all the money on person C, Chris was awarded \$200.

### Alternative outcome missed condition

Chris decides to place all \$10 on person C. It turns out that person A rolled a 6; person B rolled a 5; and person C rolled a 1. Therefore, because he bet all the money on person C, Chris was awarded \$200.

### All conditions read

Given how the rolls for each person turned out, please list one thought about how a different decision could have changed the amount of money awarded to Chris.

How would you evaluate the quality of Chris's decision?

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-5	-4	-3	-2	-1	0	1	2	3	4	5
Terrible quality					Neutral		Excellent quality			

---

Should Chris consult another person for help in future decisions of this type?

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-5	-4	-3	-2	-1	0	1	2	3	4	5
Definitely consult an advisor					Neutral		Definitely make own decision			

---

How much regret does Chris have about this decision?

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0	1	2	3	4	5	6	7	8	9	10
None									A great deal	

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