RESEARCH ARTICLE

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Financial Forecasting, Risk-taking and Venture Performance

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ABSTRACT

This conceptual paper develops a model based on prospect theory that explores how the effort entrepreneurs expend developing financial forecasts may influence risk-taking and performance. It proposes that the more effort they expend on developing forecasts, the more likely they will be to use the results of the forecasts as reference points against which they evaluate their ventures' future performance. Furthermore, we propose that effort leads to more optimistic reference points that are less likely to be adjusted. Our model suggests that these factors are related to subsequent risk-taking by entrepreneurs. The model further suggests that, for entrepreneurs, the relationship between risk-taking and performance is moderated by the level of utility the entrepreneur experiences from venture performance.

Keywords: Forecasting, Prospect Theory, Reference Point, Risk-Taking.

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I. Introduction

A seminal paper by Kahneman and Tversky (1979) provided a then-novel, but now widely accepted theory called prospect theory to explain why individuals take risks. Despite the fact that prospect theory is very relevant to situations involving risk and uncertainty, such as those that confront entrepreneurs, few entrepreneurship studies have relied upon it (Baron, 2004). According to prospect theory, people will engage in riskier behavior when they are not satisfied with a situation—that is, when their utility regarding the situation is low. Specifically, the theory posits that utility or satisfaction decreases, placing an individual in the domain of loss, when an outcome falls below a specific value that the individual had in mind. Prospect theory refers to this value as a reference point. In an entrepreneurship context, prospect theory posits that an entrepreneur is likely to increase risk-taking—for example, by introducing new products—when his venture's performance is below the reference point. Although reference points play an important role in explaining risky decisions, we found only one study (Shrader *et al.*, 2021) that examined the origins of reference points used by entrepreneurs.

Examining the role of forecasting in the formation of reference points might provide helpful insights. Financial forecasting is arguably among the most often-studied topics in entrepreneurship (Brinckmann *et al.*, 2010; Hills, 1985). Furthermore, it is a well-accepted tenet that at some point, most entrepreneurs will need to develop forecasts. There is reason to believe that the results of forecasts may at times be used as specific reference points against which future performance is judged. Forecasts result in specific concrete numbers that can easily be compared to later results; they are, by definition, statements of expectations, and some, but not all, entrepreneurs invest substantial effort in developing projections and take them quite seriously (Brinckmann *et al.*, 2010; Hills & Shrader, 1998). However, research on whether and when entrepreneurs will use forecasts as reference points remains scant, despite the theoretically plausible reasons why they might do so. This omission is especially glaring given that entrepreneurship researchers have studied the relationship between forecasting and many other facets of entrepreneurship but, with the exception of Shrader *et al.* (2021) have never examined its relationship to risk-taking. Without providing support, several studies assume that entrepreneurs will use forecasts to form reference points, whereas others assume that an entrepreneur's reference point may stem from other sources, including what the entrepreneur believes he could earn if he were not self-employed (Estrin *et al.*, 2017; Hsu *et al.*, 2017). These seemingly contradictory assumptions regarding whether entrepreneurs will use forecasts as reference points lead to the following research questions:

R1: What factors increase the likelihood that financial forecasts will be used as reference points?

R2: When financial forecasts are used as reference points, what is their likely effect on risk-taking and performance?

This conceptual article explores whether entrepreneurs who invest more effort when developing forecasts are more likely to use the forecasts' predicted outcomes as reference points and whether doing so relates to risk-taking and performance. The following section reviews scholarly work related to prospect theory. Next, the paper develops specific propositions that explore the relationships of interest. The final section explores the implications of the model and proposes future research directions.

II. Literature Review and Theory

Within the discipline of economics, decision-making theory traditionally focused on the utility that an individual

attained from a certain outcome, such as income (Read, 2007). Theorists assumed that the utility an individual received from an outcome was based on its value (e.g., $10,000 in income would provide a given amount of utility for an individual). However, prospect theory (Kahneman & Tversky, 1979) questioned this belief. Many studies have supported the fundamental tenets of prospect theory, which proposed that satisfaction was not just a function of the value of the outcome but instead stemmed from the comparison of that value with a reference point. A reference point is defined as a specific outcome level at which a person is neither satisfied nor dissatisfied but is neutral. As such, utility is dependent upon that point. If the value of an outcome is greater than the reference point, the utility experienced from that outcome will be in the domain of gains. Conversely, if the outcome is less than the reference point, the utility experienced will be in the domain of loss. The utility is therefore reference dependent. For example, assume an individual earns $10,000. The utility of that $10,000 may depend upon how much he expected to receive (his reference point). If he expected to earn $8,000, then the $10,000 will generate satisfaction, placing him in the gain domain. In contrast, if he thought he would earn $14,000, then $10,000 would be in the domain of loss and he would be dissatisfied with the income.

In addition to adding to our understanding of utility, prospect theory also adds to our understanding of risky behavior. The theory indicates that a given loss will be more painful to an individual than an equivalent gain would be pleasurable (Kahneman & Tversky, 1979). As Fig. 1 shows, being $50 below a reference versus being $50 above a reference point has a disproportionate influence on utility. According to prospect theory, being in the domain of loss is so painful that individuals in the domain of loss may be willing to pursue riskier choices if the outcome of those choices could place them in the gain domain.

Even though prospect theory offers meaningful insights into the decision-making of entrepreneurs, few entrepreneurship scholars have employed the theory (Baron, 2004). In notable exceptions, scholars used it to explore whether entrepreneurs would launch riskier products, start second business ventures (Hsu *et al.*, 2017) or close ventures (Estrin *et al.*, 2017). Although the limited amount of published research employing prospect theory has advanced our understanding of entrepreneurship, there remains much about the decision-making of entrepreneurs that can be studied using this theory, including risky decisions such as entering new markets or expanding production. In addition, despite the important role that reference points play in choosing whether to take risks, previously published research offers little insight into how entrepreneurs' reference points are established.

To the best of our knowledge, only one published study has examined the origins of reference points used by entrepreneurs. In their experimental study, Shrader *et al.*, (2021) found that the amount of effort entrepreneurs invested in forecasting was positively related to the likelihood that they would use those forecasts as reference points. They also found that the use of forecasts as reference points was related to risk-taking. Our article builds upon those findings to develop a more complete conceptual model that also explains relationships between the effort invested in forecasting and the optimism and rigidity of reference points based on those forecasts. These constructs are important because the more optimistic a financial projection is, the less likely it is to be achieved, and the less rigid a reference point is, the more likely one is to simply abandon it and form a new one. Thus, optimism and rigidity are critical to understanding relationships between reference points and risk-taking. Whereas Shrader *et al.* (2021) did not address performance, our model (Fig. 2) suggests iterative relationships between experienced utility, risk-taking, and financial performance. Lower experienced utility can lead to greater risk-taking, which is likely to lead to lower performance, which is likely to reduce experienced utility--thus indicating an important, potentially fatal downward spiral.

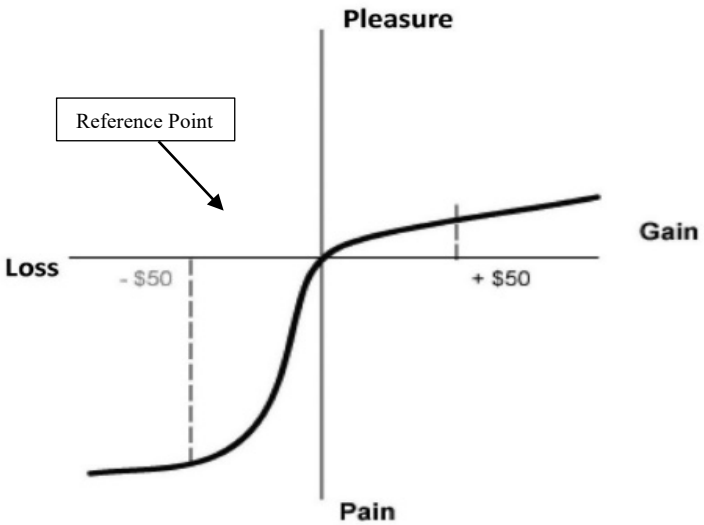

Fig. 1. Prospect Theory.
Source: Adapted from Kahneman & Tversky, 1979

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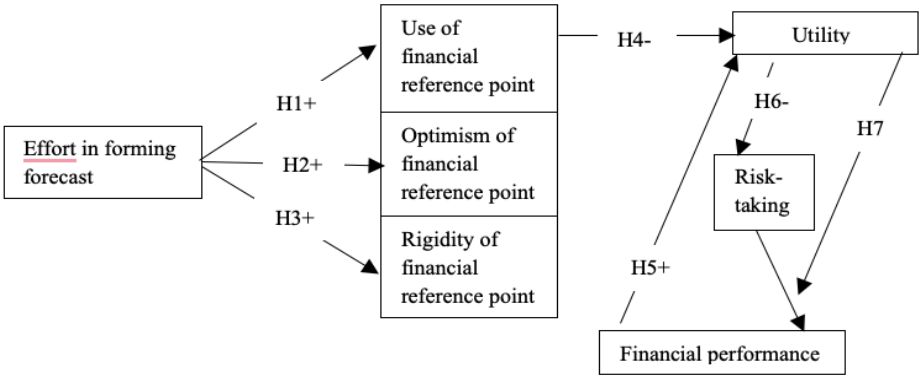

Fig. 2. Forecasting effort, reference points and financial Performance.

III. PROPOSITIONS

To gain insight into when an entrepreneur will use a forecast as his reference point, it is important to recognize that prospect theory is a theory of behavioral decision-making. Research on behavioral decision-making suggests that reference points are influenced by cognitive biases. Cognitive biases are systematic patterns of deviation from rationality when making judgments (Tversky & Kahneman, 1974). One bias that may influence the use of financial projections as reference points is availability bias. Availability bias causes individuals to use the information that is easiest to remember ('top of mind'), even when other information is more accurate, relevant, and/or appropriate (Tversky & Kahneman, 1974). In the section below, we argue that the amount of effort expended to develop a forecast increases the availability of the forecasted number in the mind of the entrepreneur and, in turn, increases the likelihood that the forecast will be used as a reference point when reacting to actual firm performance.

Entrepreneurs differ in the amount of effort they expend to develop economic projections (Brinckmann *et al.*, 2010). For example, some entrepreneurs don't conduct any forecasts and just go by their gut instincts or intuition (Hills & Shrader, 1998). Others develop forecasts because external stakeholders 'force' them to, but after the forecast's development they rarely consider the numbers generated. Finally, several scholars have reported that some entrepreneurs take forecasts quite seriously, expend great effort in their development, believe in their accuracy, view them as road maps, and refer back to them often (Brinckmann *et al.*, 2010; Cassar, 2010; Hills & Shrader, 1998).

We believe that the more cognitive energy entrepreneurs invest when they initially develop financial projections, the more likely they will be to consider and discuss their forecast more frequently and for longer durations, which in turn makes the forecast more available and more likely to become a reference point against which outcomes will be compared. In contrast, forecasts that did not stem from the effort are less likely to be remembered and less likely to be used for comparison (Cassar 2010; Hills & Shrader, 1998; Tversky & Kahneman, 1973). This leads us to a proposition consistent with Shrader *et al.*'s (2021) findings:

P1: The greater the effort an entrepreneur expends developing forecasts, the more likely it is that the forecast will serve as the entrepreneur's reference point.

In addition to proposing that effort leads to the use of a forecast as a reference point, we believe that increased effort may also be associated with forecasts that are overly optimistic. Research indicates that entrepreneurs are more optimistic than most other individuals. For example, 95 percent of entrepreneurs believe their ventures are more likely than not to succeed, and over a third believe the venture had no chance of failing (Cooper *et al.*, 1988). Yet roughly half of all ventures fail (Cooper *et al.*, 1988). Perhaps even more extreme, one study of the founders of technology companies found that roughly two-thirds of the subjects thought their ventures were risk-free (Corman *et al.*, 1988). Finally, another study indicated that venture capitalists estimated that 60% to 100% of business plans they reviewed contained forecasts that overstated demand—often markedly so (Hills, 1985).

As we discussed earlier, cognitive biases influence behavioral decision-making. Confirmation bias is another important bias and is manifested when individuals seek or interpret evidence in ways that support their existing beliefs rather than performing an unbiased search. We believe that confirmation bias plays an important role in entrepreneurs using forecasts that are overly optimistic. Kahneman and Lovallo's (1993) seminal article supported the assertion that entrepreneurs become more confident in their optimistic forecasts through the forecasting process. More specifically, they argued that when developing initial forecasts, individuals have difficulty envisioning negative factors that could decrease performance and instead focus on positive factors. By ignoring detrimental possibilities that could lower performance (Kahneman & Lovallo, 1993), the results of the forecast become more optimistic. As entrepreneurs expend more and more effort, they tend to seek any additional information that is positive but have the tendency to ignore negative information. As such, it is not surprising that Cassar (2010) found that the more time entrepreneurs spend developing forecasts, the more optimistic the entrepreneurs become. Cassar also contended that additional effort leads the entrepreneur to a greater belief that the outcome is controllable, which is associated with greater optimism (Astebro & Adomdza, 2007). Therefore:

P2: The greater the effort an entrepreneur expends developing a financial forecast, the greater the extent to which that forecast will be optimistic.

It is important to also consider factors that can make reference points more rigid. If an entrepreneur's reference point is easily changed, then, when confronted with

performance below the reference point, he may recognize that his reference point was overly optimistic and simply adjust that reference point downward, which diminishes the probability that a reference point will lead to riskier actions. But to a large extent, we do not believe this will occur when one exerts effort in developing the forecast. As argued previously, effort makes information more available (i.e., easier to retrieve from memory). Not only are entrepreneurs more likely to use information that is easily accessible, but we believe the greater effort will decrease the chances that they will later dismiss their prior conclusions (Simon & Kim, 2017). Also, there are limits to an individual's information-processing capacity. As such, by virtue of having information already easily retrievable, it blocks the consideration and evaluation of new information, even if the new data is more relevant to the judgment being made (Wyer, 2008). This is supported by evidence that shows that a decision-maker has a general predisposition toward holding fast to the first number he derived rather than abandoning it (Tversky & Kahneman, 1974).

The arguments above are consistent with findings in a closely related area. Simon and Kim (2017), for example, compared subjects who expended effort versus those who did not expend effort in predicting a new product's demand and time to market. Even when the two groups were equally confident in their conclusions, the group who expended effort was more likely to ignore disconfirming feedback from experts and stick with their original forecast. Therefore:

P3: The amount of effort an entrepreneur expends forecasting financial performance is positively associated with the rigidity of his reference point based on that forecast.

Collectively, P1 and P3 suggest that entrepreneurs who have expended effort developing forecasts will be more likely to use rigid reference points when assessing subsequent performance. P2 indicates that, in addition to being used, the forecasted results will also be optimistic. Entrepreneurs can of course sometimes achieve optimistic results. However, it stands to reason that results are less likely to meet optimistic forecasts than they are to meet pessimistic forecasts. In addition, there is no reason to believe that being optimistic will have a positive effect on actual results. Several studies (e.g., Astebro & Adomdza, 2007; Cassar, 2010; Hmieleski & Baron, 2009) have suggested that not only does optimism fail to increase performance, but it may actually decrease it. It then follows that all other things being equal, the more rigid and optimistic a reference point, the more likely it is that actual performance fails to meet aspirations, thereby decreasing an entrepreneur's utility and increasing the probability they will perceive a loss (Kahneman & Tversky, 1979). Therefore:

P4: All other things being equal, the greater the extent to which entrepreneurs use effort-based forecasts as their reference points, the more likely they are to experience utility that is in the domain of loss when assessing the performance of their ventures.

Utility, though, is affected by two factors: the reference point and actual performance (Kahneman & Tversky, 1979). At the simplest level, reference point minus actual financial outcome equals utility (although admittedly, the relationship is not linear). This suggests that actual outcome will have a direct effect on utility. Whereas a high reference point potentially has a negative effect on utility, it is still possible for entrepreneurs to nevertheless achieve optimistic forecasts if actual performance is high enough. As such, the higher the actual performance, the higher the utility (even if still in the loss domain), regardless of the reference point. Conversely, for any given reference point, the lower the level of actual performance, the lower the utility (even if still in the gain domain). Therefore:

P5: All other things being equal, the lower the financial performance of an entrepreneur's venture, the lower his utility.

Prospect theory argues that when decision-makers are in the loss domain, they are more likely to choose riskier actions. When an outcome falls below a decision maker's pre-established reference point, that gap has a large negative impact on his utility (Kahneman & Tversky, 1979). This lower utility may lead the decision maker to take greater risks if he believes the outcome might place him in the gain domain (Tversky & Kahneman, 1974; Shrader *et al.*, 2021). In support of this assertion, Simon *et al.* (2003) found that entrepreneurs who experienced dissatisfaction with their companies' results were more likely to make risky product introductions. Therefore:

P6: The further an entrepreneur is in the domain of loss, the riskier actions he will take.

Risky actions can lead to positive or negative results, so there is no direct relationship between risk-taking and a venture's performance. However, prospect theory suggests that experienced utility moderates the relationship between risk-taking and performance. When a decision maker's estimation of utility is in the domain of gain (e.g., performance exceeded his reference point, and he is satisfied with performance), he is likely to take risks only when the expected value of that risk is highly positive. In fact, Kahneman & Tversky (1979) found that individuals in the domain of gain will take a risk with a 50:50 outcome only if the upside is at least twice the downside. However, in the domain of loss, decision-makers are willing to accept risks even with a negative expected value if there is a chance that the upside could move them out of the domain of loss and back into the domain of gains (Kahneman & Tversky, 1979; Simon et al., 2003). Furthermore, the deeper a decision maker is in the domain of loss, the greater the pain they experience (see Fig. 1) and the more like they are to take even riskier actions if those actions have any chance of moving them into the domain of gains.

As a hypothetical example, assume an entrepreneur's forecast projected an annual profit of $100,000, and the entrepreneur used this forecast as his reference point when evaluating venture performance. If profits turned out to be only $75,000, then this entrepreneur would be in the domain of loss. In this situation, he might decide to introduce a new product that has a 50% chance of producing an additional profit of $30,000 and a 50% chance of producing a loss of $40,000. The expected value of this investment is a loss of $5,000.

In another hypothetical case, suppose his venture's profit was only $55,000 instead of the expected $100,000, putting him deeper in the domain of loss. The entrepreneur would be more likely to take even riskier actions. For example, he may decide to expand production and hire an additional

salesperson, which has a 30 percent chance of increasing profits by $60,000 and a 70 percent chance of resulting in a loss of $90,000. Although the expected value of this investment is a loss of $45,000, if the entrepreneur believes that this is the best option to bring him out of the painful domain of loss and into the domain of gain, he is likely to take what may be a foolish risk.

The problem of being in the loss domain is exacerbated by the fact that an entrepreneur is unlikely to know the probabilities associated with given outcomes of risky actions. However, research indicates that the greater one's desire to obtain a positive outcome, the more likely one is to engage in wishful thinking by inflating the likelihood of a positive outcome and/or the amount potentially generated by that outcome. More specifically, as a person's motivation increases, his belief in a positive outcome also increases, even when the belief is not necessarily appropriate (Simon & Shrader, 2012). This assertion is consistent with findings that entrepreneurs who are in challenging situations—such as introducing pioneering products, investing extensive resources, and operating in hostile environments—are more optimistic than the situation warrants (Simon & Shrader, 2012). In contrast, when one is in the domain of gains versus loss, prospect theory suggests their motivation to further enhance utility is much lower, suggesting they may have more accurate perceptions that are less influenced by motivated reasoning. Research by Simon *et al.* (2003) supported the assertions above, finding that entrepreneurs who are less satisfied with their businesses' performance will launch risky products that generate poor financial performance. Therefore:

P7: An entrepreneur's experienced utility will moderate the relationship between risk-taking and performance.

IV. Discussion

In this article, we used prospect theory to explore the relationship between the effort entrepreneurs expend on forecasting and the likelihood they would use those forecasts as reference points. Our theoretic model proposed that using those forecasts as reference points would likely put entrepreneurs into the domain of loss, which would increase risk-taking. Finally, our model suggested that an entrepreneur's experienced utility moderates the relationship between risk-taking and performance.

A. Research Implications

This article contributes to academic literature in important ways. First, the article demonstrated the usefulness of prospect theory for entrepreneurship research. Prospect theory offers a clear explanation for risk-taking, which is a critical part of entrepreneurship. Whereas a few previous studies have used prospect theory to examine entrepreneurs' decisions to launch or close business ventures (e.g., Estrin *et al.*, 2017), we argued that this theory is also useful for examining other risky entrepreneurial decisions, such as decisions to expand production or launch new products. These decisions have received little attention from scholars, and future research on these risky decisions is required to enhance our understanding of the growth and success of entrepreneurial ventures.

Secondly, this article highlighted specific important gaps in the literature. For example, only a few entrepreneurship studies (e.g., Hsu *et al.*, 2017) have examined the role of reference points, even though reference points appear to be important determinants of satisfaction and risk-taking behavior—both of which are important topics for entrepreneurs and entrepreneurship scholars. This article focuses on the use of effort-based forecasts as reference points. Additional research is needed to investigate when and why entrepreneurs may use alternate reference points when assessing venture performance and how those alternate reference points relate to utility and risk-taking (e.g., Estrin *et al.*, 2017). For example, an entrepreneur might assess venture performance in terms of the income he needs to live on, what he could make as an employee, or what other ventures in similar situations earn. In addition, entrepreneurs may use non-financial reference points such as flexibility, autonomy, or convenience (Cooper & Artz, 1995).

Thirdly, the model we proposed provides valuable insights into relationships among utility, risk-taking, and performance. For example, it suggested that when an entrepreneur is in the loss domain, he is more likely to take risks despite the fact that in this domain, the relationship between risk-taking and performance is more likely to be negative. This may further decrease the entrepreneur's experienced utility and lead to additional risks with negative expected returns (Simon *et al.*, 2003). This pattern potentially creates a vicious spiral. Additional research that helps us understand this pattern will provide important insight into the failure of entrepreneurial ventures.

B. Managerial Implications

The current paper suggests several steps that entrepreneurs might take to minimize the potential negative results suggested by the model. One of these steps, however, should not be to entirely avoid making any type of forecast. First, from a practical perspective, entrepreneurs often have no choice; investors and lenders frequently require forecasts (Maxwell & Levesque, 2014). Second, some methods for developing forecasts bring to light crucial information and assumptions that might lead to important pivots (Sykes & Dunham, 1995). Furthermore, forecasts can assist entrepreneurs in determining how much and what types of resources they will need in the future (Sandberg *et al.*,1988).

Given that entrepreneurs often develop financial projections, it may be important to use methods that promise to minimize the extent to which their forecasts will be more optimistic than warranted, since over-optimism may cause the entrepreneur to take risks that ultimately generate negative outcomes. One technique suggested by Kahneman and Lovallo (1993) is for entrepreneurs to first explore how ventures in situations such as the one they are contemplating typically perform. They should then use this information as a starting point in making projections. Only then should entrepreneurs make adjustments from that base. Following this procedure should lead to more realistic projections. One reason forecasts are too optimistic is that entrepreneurs ignore the possibility of negative events that might lower outcomes (Kahneman & Lovallo, 1993). To avoid this trap, entrepreneurs might develop a specific list containing plausible or even likely potential negative events. They then

should project how their results might be influenced should these events occur. Following these procedures may lead to more realistic forecasts.

Our model suggested that it may be as important for entrepreneurs to be willing to adjust their reference points to make sure their reference points are not too optimistic. To decrease the possibility that entrepreneurs will be very rigid regarding their projected outcomes, they should develop pessimistic, neutral, and optimistic forecasts and they should invest an equal amount of time and effort in developing and thinking about each of these possible cases. Also, it may prove important to refer to the 'middle' case as neutral rather than as expected. The term expected might increase an entrepreneur's tendency to compare an outcome to it.

Entrepreneurs should also consider using reference points derived from nonfinancial outcomes. This is especially important given that entrepreneurs who emphasized noneconomic goals expressed higher levels of satisfaction (Cooper & Artz, 1995).

This paper's model suggested that being in the loss domain, versus the gain domain, might lead one to take large risks with negative expected values, which leads to some additional recommendations. When in the loss domain, entrepreneurs might want to seek other less emotionally invested individuals to help assess potentially risky actions. They should carefully consider the downside potential as well as the upside potential of risky investments, and they should try to project the expected value of those investments. This may help them avoid the temptation of taking foolish risks.

V. Conclusion

The goal of our model was to provide thought-provoking insights regarding the effects of effort expended on forecasting reference points, risk-taking, and performance. Unlike other entrepreneurship papers, we focused on the operating decisions that entrepreneurs may make during their ventures' life rather than on the decision to start or end the venture. Furthermore, the paper explicitly focuses on when, and why entrepreneurs might use a forecast as a reference point, rather than assuming an entrepreneur uses it as a given reference point. We believe this paper provides a model that is useful in that it explains the relationships among extremely important constructs in entrepreneurship—namely, forecasting, effort, risk-taking, and performance—in a novel way. It also spotlights the need for additional entrepreneurship research using prospect theory to help better understand important constructs of interest to scholars and practitioners.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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