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Overconfidence bias and conjunction fallacy in predicting outcomes of football matches

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ABSTRACT

The aim of this study was to explore the occurrence of the overconfidence bias and the conjunction fallacy in betting behavior among frequent and sporadic bettors and to test whether it was influenced by the task format (probability vs. frequencies). Frequent bettors ($N = 67$) and sporadic bettors ($N = 63$) estimated whether the bets on football games presented to them via an on-line questionnaire would be successful. The bets consisted of singles (one match outcomes) and conjunctions (two matches outcomes), and were presented either in probability or frequency terms. Both frequent and sporadic bettors showed similar levels of the overconfidence bias. However, the frequent bettors made the conjunction fallacy more often than the sporadic bettors. The presentation of the task in the frequency terms significantly reduced the overconfidence bias in comparison to the evaluations in probability terms, but left the conjunction fallacy unaffected.

1. Introduction

In addition to thrill, excitement and the possibility of a financial gain as the most obvious reasons that "drive" people into betting, it is possible that certain irrational beliefs and cognitive biases play a significant role in this type of behavior. For example, cognitive biases may lead to overconfidence regarding the possibility of winning and, consequently, wrong decisions about money investments (Nilsson & Andersson, 2010). In this paper we described the results of a study that investigated the occurrence of the two cognitive biases, the overconfidence bias and the conjunction fallacy, in predictions of outcomes of football matches. Specifically, we examined the differences in susceptibility to the two biases between people who frequently bet on sport outcomes (frequent bettors) and people who rarely or never bet on sport outcomes (sporadic bettors), and explored whether those biases can be reduced by the task format. Previous studies have shown that formulating the problem in terms of *frequency* rather than *probability* could help decrease the biases (Hertwig & Gigerenzer, 1999; Kahneman & Tversky, 1996). To the best of our knowledge, our study represents the first attempt of exploring problem

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formulations in terms of frequencies in the field of sports betting. Before describing our study in more detail, we will review the literature on the overconfidence bias, the conjunction fallacy, and the influence of task format on cognitive biases.

1.1. Overconfidence bias

Many studies have indicated that the phenomenon of overconfidence in judgments and decisions is widespread and frequent in occurrence. It has been identified in everyday life activities such as the opinion about one's own driving capabilities (Svenson, 1981) and evaluations of various future outcomes (e.g., academic, social and recreational choices for the following year, Vallone, Griffin, Lin, & Ross, 1990). More importantly the overconfidence in decisions has been regularly observed in the work of many professionals such as doctors, lawyers, engineers, psychologists or security analysts (see Belsky & Gilovich, 1999, for a review). In its essence the overconfidence bias reflects the fact that the confidence that people have in their judgments does not match real accuracy of those judgments. Montier (2007) reported the results of a study in which doctors, while claiming that they were 90% confident about their diagnoses, were actually accurate in less than 15% of cases. Torngren and Montgomery (2004) showed that when given a task to select the stock that would achieve the highest price growth in the following 30 days, the laymen were 59% confident about their choices, whereas the experts reported confidence at 65% level. The actual success of both groups was below chance – they would have made better choices if they followed a randomized procedure. Interestingly, the experts who claimed that they were 100% confident about their choice of stock were correct only 15% of the time. In a well-known paper about the relationship between intuition and expertise, Klein and Kahneman (2009) concluded that whenever the predictability of the environment in which the judgment is made is questionable and the possibility of learning regularities of that environment is small, even experts do not make accurate judgments. The prevalence of the overconfidence bias and dangerous consequences that could follow from it make this bias an important object of scientific research.

There are two predominant paradigms in studies of overconfidence: confidence in binary decisions and interval prediction format. The classic way of studying overconfidence is the one where researchers provide a series of questions for which two alternative answers are given, and the respondents' task is to pick the correct one. This type of exploring the overconfidence bias has two varieties. With the *half-range format*, questions take the following form: "Who lived longer – Ho Chi Minh or Claude Monet?" Respondents select the answer they think is more likely to be correct and express their confidence on a probability scale ranging from .50 to 1.0. With the *full-range format*, respondents receive the statement "Ho Chi Minh lived longer than Claude Monet did." (or vice versa) and give the probability that the statement is true on a scale from 0 to 1 (Klayman, Soll, Juslin, & Winman, 2006). The third way of expressing confidence is *interval production format* where participants are asked to specify the so-called "confidence interval" in their decision (Alpert & Raiffa, 1982). This interval represents the range of values within which the correct answer is located, depending how confident a subject is about the answer (for example, I am 90% certain that the city of Zagreb, Croatia has a population between 700,000 and 1,000,000 inhabitants). Although confidence in a knowledge domain varied depending on the assessment format (Hansson, 2007), all three research paradigms revealed that individuals overestimate accuracy of their judgments.

One of the possible explanations of the overconfidence bias is related to the mechanism through which individuals integrate evidences related to the decision. According to Griffin and Tversky (1992), evaluation of confidence about a certain hypothesis requires an integration of various types of evidence. In most problems it is possible to distinguish between two dimensions of evidence: the *strength* or the extremity of the evidence and the *weight* or the predictive validity of the evidence. The interplay of the two dimensions of evidence determines the level of confidence in a decision. Although predictive validity reflects the probability of an event occurrence, overconfidence is often based on the strength of the evidence. The combination of these factors explains why experts are often overconfident in their decisions. In situations where predictability is low every additional quantity of experts' knowledge increases the strength of evidence, but has no effect on its weight (i.e., predictive validity). In these situations experts are much more confident in their judgment, but the unpredictability of the situation disables the reflection of experience in the decision accuracy.

Few studies that dealt with the overconfidence bias in sport betting mostly confirmed the assumption that experts are overconfident in their judgments, and that their overconfidence stems from reliance on wrong types of evidence. Andersson, Ekman, and Edman (2003) showed that sport journalists, soccer fans and coaches ("experts") were no more successful than Swedish and American students with no knowledge about football ("laymen") in their predictions of which teams will win the second round of *FIFA World Cup 2002*. However, they were considerably more confident in their evaluations. The accuracy in both groups was at the level of random guessing, but while "laymen" admitted that their predictions were based on mere recognition of teams, the "experts" claimed that they relied on a wide search and an analysis of available information. Similar results were reported by Andersson, Memmert, and Popowicz (2009). When predicting which teams will qualify for the second round of the *FIFA World Cup 2006 tournament*, the "experts" were no more successful than the "laymen", but they showed considerably greater confidence in their predictions. In accordance with Griffin and Tversky's (1992) explanation of the overconfidence bias, the reason for this probably comes from the way the bettors use their information. For example, it has been shown that sport teams that play at home have a higher probability of winning the match than away teams (Nilsson & Andersson, 2010). This means that the information about where the game is played has a fairly good predictive validity (i.e., weight). But, when predicting outcomes, expert bettors often rely more on their broad knowledge about each team (i.e., strength of evidence), such as the form of particular players or injuries within the team, which usually have smaller predictive validity (Andersson & Ekman, 2003). Therefore, we should expect frequent, knowledgeable bettors to be more