THE IMPACT OF MANAGERIAL OVERCONFIDENCE ON THE RELATIONSHIP BETWEEN EQUITY-BASED COMPENSATION AND STRATEGIC RISK-TAKING IN THE U.S. RESTAURANT INDUSTRY

A Dissertation in
Hotel, Restaurant and Institutional Management

by

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Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

August 2012
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ABSTRACT

The purpose of this study is to examine 1) the effects of different forms of CEO equity-based compensation (EBC) on strategic risk-taking (SRT), 2) the moderating effect of CEO overconfidence on the relationship between EBC and SRT in the U.S. restaurant industry. In particular, these effects are investigated under two decision situations: 1) gain situation where CEOs perceive increase in the accumulated value of EBC as gain, 2) loss situation where CEOs perceive decrease in the accumulated value of EBC as loss. Neither the main effect between EBC and SRT nor the moderating effect of overconfidence has been empirically tested in the hospitality literature. Based on behavioral agency model (BAM) and prospect theory, this study incorporated a behavioral perspective into the analyses of the association between EBC and SRT. The sample of this study consists of 54 CEOs in 42 publicly traded U.S. restaurant companies during the period of 1992 to 2010. To control for potential cross-sectional and serial correlations, both clustered standard errors and fixed-effects model were used to analyze the data. Our results found evidence supporting BAM arguments that stock options did not promote risk-taking at high levels of value when CEOs are loss averse. Further, we found the positive moderating effect of overconfidence, suggesting that overconfident CEOs may be less sensitive to loss and thus, less susceptible to risk aversion bias. Using a behavioral perspective, the findings of this study could provide a more comprehensive understanding of the relationship between EBC and SRT in the U.S. restaurant industry.
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ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Amit Sharma, for his continuous guidance and encouragement throughout my graduate studies. He has taught me very valuable lessons that will benefit my future career as a teacher and researcher. I would also like to thank my family who has always been a source of my strength. My parents, Sanggil Seo and Seunghee Yang, have always been supportive in my decisions. My brother, Jeongtae Seo, has been a great mentor for me. I am also indebted to my dear wife, Miryeong Kim, without whose love and sacrifices neither my life nor work would have been complete. Finally, I would like to dedicate this dissertation to my son, Noah Seo, who has brought joy and happiness into my life.
Overview

Agency problem refers to the divergence of interest between shareholders and managers. Many agency theorists emphasize the fundamental role of dissimilar risk preferences plays in agency problem (Jensen & Meckling, 1976; Barney & Hesterly, 1996; Wiseman & Bromiley, 1991). That is, the conflict of interest stems from different risk choices in corporate decisions between risk-neutral shareholders and risk-averse managers. Equity-based compensation (EBC, hereafter) such as stock options has been argued to align their risk preferences by promoting greater managerial risk-taking (Jensen & Meckling, 1976; Wiseman & Gomez-Mejia, 1998). Specifically, this risk-taking is referred to as strategic risk-taking (SRT, hereafter) that involves the selection of investments with extreme potential outcomes (Miller & Bromiley, 1990; Larcker, 1983; Sanders & Hambrick, 2007). While this view is generally supported, some empirical studies have found contradicting results (Devers, Wiseman, & Holmes, 2007; Larraza-Kintana, Wiseman, Gomez-Mejia, & Welbourne, 2007; Wright, Kroll, Krugg, & Pettus, 2007; Devers, McNamara, Wiseman, & Arrfelt, 2008; Lim, 2011). This study proposes to test additional influences that may contribute to explaining the association between EBC and SRT: decision situations and managerial overconfidence. The purpose of this study is to investigate the effects of EBC on SRT and the moderating effects of managerial overconfidence on the relationship between EBC and SRT in the U.S. restaurant industry. In particular, these effects are examined under two decision situations: 1) gain situation where CEOs perceive increase in the
accumulated value of EBC as gain 2) loss situation where CEOs perceive decrease in the accumulated value of EBC as loss.

**Agency problem in the U.S. restaurant industry**

Agency problem looms as a particular challenge in the U.S. restaurant industry given its specific ownership structures. Many restaurant firms hold unique ownership structures such as franchising that exclusively separates ownership from management (Gannon & Johnson, 1997). Franchising has been widely used to support growth in the U.S. restaurant industry (Ketchen, Combs, & Upson, 2006). Extensive use of franchising further implies specific managerial risk preferences in this industry. Franchisors may exhibit greater risk aversion in that they attempt to reduce business risk by forcing a relatively large risk on their franchisees (Rubin, 1978). Lafontaine and Bhattacharyya (1995) also postulate that risk sharing is a primary drive for franchising, suggesting broad risk aversion among franchisors. In addition, franchising allows firms a relatively stable cash flow stream and a safer means of financing that can contribute to reducing operational and financial risks (Caves & Murphy, 1976; Roh & Kwag, 1997; Combs & Ketchen, 1999; Roh, 2002; Madanoglu, Lee, & Catrogiovanni, 2011). Thus, these specific characteristics of franchising may play an important role in forming a higher tendency of risk aversion among CEOs in the restaurant industry. This suggests exceptional opportunities to study agency problems specifically associated with managerial risk preferences in the U.S. restaurant industry.

During the past decades, a large body of corporate finance literature on agency problem has attempted to find ways to mitigate the divergence of interest between managers and owners (Jensen & Meckling, 1976; Hall & Liebman, 1998; Aggarwal & Samwick, 1999; Jensen &
Murphy, 1991). EBC has been considered as an efficient means to alleviate the agency conflict. EBC links executive pay directly to the company’s stock price allowing executives to be compensated for performance. Hall and Liebman (1998) state that “the most direct solution to the agency problem is to align the incentives of executives with the interests of shareholders by granting stocks and stock options to the CEO” (p. 656). In particular, agency theory predicts that EBC will align the divergence of risk preferences between risk-averse managers and risk-neutral shareholders by encouraging managers to take greater risks (Jensen & Meckling, 1976; Wiseman & Gomez-Mejia, 1998). While agency theorists contend that EBC has increasingly reduced agency problem, empirical evidence for this effect still remains ambiguous. Some scholars have linked CEO stock options to firm outcomes such as acquisitions (Sanders, 2001), the use of derivatives (Rajgopal & Shevlin, 2002), and performance (Sanders & Hambrick, 2007). These findings suggest that stock options may help mitigate agency problem. Others examined the effects of different forms of EBC on SRT (Devers et al., 2008; Lim, 2011). Given that CEOs with high levels of EBC holdings benefit from increased firm value, they tend to make large investments on uncertain projects, hoping to dramatically boost firm value (Sanders & Hambrick, 2007). Prior research used three types of investment spending to indicate SRT: capital spending, R&D spending, and long-term debt (Miller & Bromiley, 1990; Hoskisson, Hitt, & Hill, 1993; Beckman & Haunschild, 2002). They argued that SRT is more direct behavioral outcomes of EBC than firm performance. In particular, the influence of EBC on SRT could be further associated with behavioral style and personal characteristics of managers given that CEOs and other top executives play a critical role in determining corporate policies (Bertrand & Schoar, 2003). The results of these studies, however, revealed that some EBC failed to align risk
preferences by exacerbating risk aversion among CEOs. These mixed results suggest more thorough research is needed to better explain the relationship between EBC and agency problem.

Despite the unique ownership structure of the U.S. restaurant industry, very little attempt has been made to study the effect of EBC in the hospitality literature. Existing compensation related studies looked at the determinants of CEO cash compensation in the restaurant and casino industries (Gu & Choi, 2004; Kim & Gu, 2005; Guillet, Kucukusta, & Xiao, 2012), the interaction between supervision and compensation in the hotel industry (Freedman & Kosova, 2010), and the elasticity of compensation to firm performance in the restaurant industry (Dalbor, Oak, & Rowe, 2010). These studies, however, did not focus on EBC nor consider the effect of EBC on firm behavior. The lack of understanding about the association between agency problem and EBC represents a critical gap in the hospitality literature. This study proposes a more comprehensive view of the effect of EBC on SRT in the restaurant industry by integrating behavioral attributes, decision situation and managerial overconfidence, with agency theory-based models of managerial risk-taking. Based on prospect theory, Wiseman and Gomez-Mejia (1998) developed a behavioral agency model (BAM, hereafter) that explains managerial risk-taking in different decision situations. A comparison of agency model and BAM’s key arguments are summarized in table 1. This study further extends these arguments by incorporating managerial overconfidence into BAM. The impact of EBC on SRT in relation to these two behavioral attributes will be discussed in detail in the following sections.

**Decision situations: gain vs. loss**

This study investigated the effect of EBC in different decision situations. Based on prospect theory, this study creates two decision situations for CEOs: gain and loss. Some
scholars argue that the effects of EBC can vary between the two decision situations (Wiseman & Gomez-Mejia, 1998; Larraza- Kintana et al., 2007; Wright et al., 2007; Lim, 2011). Assuming constant risk aversion among managers, agency theory argues that EBC will effectively promote managerial risk-taking. However, this does not explain why some EBC fails to encourage risk-taking in some situations. Empirical studies have found that some EBC discourages risk-taking when CEOs hold high levels of EBC (Sanders & Hambrick, 2007; Devers et al., 2007; Devers et al., 2008; Devers et al., 2008; Lim, 2011). Prospect theory, on the other hand, provides more comprehensive explanations. It allows changes in risk preferences relative to some neutral reference point (Wiseman & Gomez-Mejia, 1988). This implies managers may change their risk-taking behaviors across different decision situations. It further suggests that individuals are risk-averse in positive domains but risk-seeking in negative domains (Kahneman & Tversky, 1979; Hastie & Dawes, 2001). The positive (gain) domain refers to situations where an individual anticipates an outcome to exceed one’s reference point. In contrast, the negative (loss) domain refers to situations where an individual anticipates an outcome to be below one’s reference point. The shift in risk preferences between gain and loss domains occurs because individuals are more sensitive to losses than gains (Tversky & Kahneman, 1986). Thus, they may accept riskier options over less risky ones to avoid an immediately anticipated loss. For example, Shefrin and Statman (1984) argue that investors tend to hold losing stocks because they are reluctant to realize immediate losses.

When applied to EBC context, the asset position of a manager at a particular point in time may serve as a reference point (Devers et al., 2007; Devers et al., 2008; Larraza- Kintana et al., 2007; Wright et al., 2007; Lim, 2011). The manager then perceives the magnitude of the change from this asset position as gain or loss. For instance, Devers et al. (2007) contend that rising
stock prices induce gain domains as they increase the value of stock options while declining prices elicit loss domains as they decrease the value of stock options. In the gain domain, risk aversion may occur when managers are highly concerned about losses. Managers may want to pursue lower risk investment strategies to protect their wealth as the value of EBC increases. On the other hand, managers exhibit more aggressive risk-taking behaviors when facing a loss condition. This is because they may perceive less risk to their personal wealth when facing losses since the wealth is already lost (Wiseman & Gomez-Mejia, 1998). In addition, EBC is argued to separate managers from downside risk to their current wealth (Lawler, 2000; Sanders, 2001). The current wealth remains intact as they have not made any initial investment to acquire their EBC. Hence, they are more likely to implement high-risk actions when the value of EBC falls as they perceive less risk to their personal wealth. These arguments could help provide a better explanation for how EBC influences risk-taking under particular contexts. However, the extant empirical evidence on the effects of EBC has mostly been limited to the gain domain (Devers et al., 2007; Devers et al., 2008; Larraza-Kintana et al., 2007; Wright et al., 2007; Lim, 2011). This study extended to include loss contexts to better explain the effects of EBC on SRT. Examining the effects of EBC in both gain and loss contexts could provide a more comprehensive understanding of the relationship between EBC and SRT.

**Types of EBC: stock options and restricted stock**

This study examined different forms of EBC. Executive compensation plans include various types of EBC such as stock options, restricted stock, stock appreciation rights, performance based stock shares, and employee stock ownership plan. This study focused primarily on stock options and restricted stock. Recent empirical studies have shown that different forms of executive EBC have varying effects on managerial risk-taking (Sanders, 2001;
Devers et al., 2007; Sanders & Hambrick, 2007; Wright et al., 2007; Devers et al., 2008; Lim, 2011). The findings of these studies demonstrated that each pay element of EBC needs to be examined individually. Despite mixed results, these studies showed that increases in the accumulative value of stock options encouraged greater risk-taking, but at a decreasing rate (Sanders, 2001; Devers et al., 2008; Lim, 2011). This is consistent with agency theory arguments that EBC promotes managerial risk-taking. This concave function, however, implies that the influence of stock options on risk-taking marginally diminishes and may result in risk aversion at high levels of gains.

In contrast, Devers et al. (2008) found a negative relation between restricted stock and SRT, which suggests that restricted stock may exacerbate risk aversion as its accumulated value increases. That is, CEOs are less likely to take risks as the accumulated value of restricted stock increases. Lim (2011) conducted a similar study and found a curvilinear association between the accumulated value of restricted stock and SRT. She posits that CEOs will attempt to prevent losses by constraining risk as the accumulated value of restricted stock reaches certain levels. These results are also consistent with loss aversion arguments in that CEOs may become risk-averse in the gain domain. That is, CEOs are less willing to take greater risks when they perceive the accumulated value of EBC as gain relative to some reference point. Following the previous studies (Devers et al., 2008; Lim, 2011), this study examines stock options and restricted stock individually.

**Managerial overconfidence**

In an attempt to further explain the relationship between EBC and SRT, this study argues that managerial overconfidence can moderate the relationship between EBC and SRT.
Overconfidence refers to the tendency for individuals to believe their knowledge is more accurate than it actually is (Langer, 1975; March & Shapira, 1987). It may cause miscalibration of probability judgments in individuals’ decision making. In corporate settings, recent empirical studies contend that highly confident CEOs tend to be more risk-seeking as they overestimate the returns of risky investments and/or underestimate the probability of failure (March & Shapira, 1987; Roll, 1986; Heaton, 2002; Malmendier & Tate, 2005a, 2005b, 2008; Baker, Ruback, & Wurgler, 2007). This evidence provides important implications for the extant compensation research in that the effects of EBC on SRT may vary depending on levels of CEO confidence. That is, the influence can differ for those with high levels of confidence as it promotes more aggressive risk-taking.

Several theoretical studies supported this view. Keiber (2005) analyzed how the available signal and overconfidence affect principal-agent relationship. His model suggests that regardless of the available information, stronger overconfidence reduces agency problem but increases the variable component of the compensation contract such as stock options. This finding implies an important role of overconfidence in designing the compensation contract. Gervais, Heaton, and Odean (2011) developed a capital budgeting model to show the influence of the compensation contract on overconfident managers. Overconfident managers are more prone to undertaking risky projects since they perceive less risk (Roll, 1986; Heaton, 2002; Malmendier & Tate, 2005a, 2008; Gervais et al., 2011). They argue the degree of overconfidence determines the form and amount of compensation contract. For example, it may require less performance-based compensation to encourage moderately overconfident managers to act more aggressively. Put differently, fixed compensation such as salary may be sufficient to motivate them. They further maintain shareholder value may increase because it is cheaper to motivate overconfident
managers to engage in risky projects. These tendencies imply a positive role of overconfidence in the agency relationship (Goel & Thakor, 2008). Unlike risk-averse managers, thus, overconfident managers may not need to be propelled toward riskier behaviors by granting a large amount of EBC.

Despite these theoretical predictions, empirical evidence on the effect of overconfidence in the agency relationship context is scarce. A recent study by Lim (2011) that investigated the accumulation effects of CEO stock options and restricted stock on SRT presented overconfidence as a factor affecting risk taking. The findings showed that high accumulated value of excisable stock options reinforced SRT. She argued that high accumulated value of these options may increase CEO confidence, which in turn promotes risk-seeking behaviors. For example, accumulated gains from successful firm performances in the past enhance CEO confidence (Hayward & Hambrick, 1997). Thus, CEO confidence was considered as a partial cause of SRT. However, the impact of overconfidence on SRT was not directly tested in this study. It still remains unclear whether overconfidence will induce CEOs to become risk-seeking. In addition, prior studies only consider overconfidence as a cause of SRT in the gain context (Keiber, 2005; Goel & Thakor, 2008; Gervais et al., 2011). Therefore, this study extends these previous studies by examining the influence of overconfidence on the relationship between EBC and SRT in both gain and loss contexts.

Prior compensation studies have mainly looked at the relationship between EBC and SRT (main effect). There has been no attempt to investigate the influence of overconfidence as the moderating effect on this relationship. This study adds to the extant literature by investigating the moderating effect in the context of loss aversion in prospect theory. Based on the arguments that overconfidence induces more risk-taking this study proposes that: 1) overconfidence positively
moderates the relationship between EBC and SRT in the loss domain. 2) overconfidence positively moderates the association between EBC and SRT in the gain domain. The former refers to the positive moderating effect that intensifies the effect of EBC on SRT. That is, risk-seeking resulted from the negative value of EBC (in the loss domain) could be bolstered by overconfidence. The latter refers to the positive moderating effect that diminishes the effect of EBC on SRT. This means that risk aversion caused by the positive value of EBC (in the gain domain) could be alleviated by overconfidence. The significant moderating effect could imply that behavioral biases such as overconfidence have significant explanatory power that outweighs the main effect of EBC on SRT. This also suggests that shareholders may benefit from managerial overconfidence when EBC fails to align risk preferences of managers and shareholders. This will provide important implications for owners and investors of the restaurant industry in that executive compensation plans need to be considered relative to behavioral aspects of managers.

**Purpose of the study**

The main purpose of this study are to examine 1) the effects of different forms of EBC, stock options and restricted stock, on SRT in the U.S. restaurant industry, 2) the moderating effects of overconfidence on the relationship between EBC and SRT. Neither the main effect between EBC and SRT nor the moderating effect of overconfidence has been tested in the hospitality literature. However, given a higher tendency of risk aversion among managers in the restaurant industry, understanding their decision making that involves strategic risk-taking is significantly important. As discussed earlier, franchising has been recognized as a relatively safe way to expand business and support growth in the hospitality industry (Caves & Murphy, 1976; McGuire & Staelin, 1983; Roh & Kwag, 1997; Sen, 1998; Combs & Ketchen, 1999; Roh, 2002).
Martin, (1988) posits that franchising allows franchisors to reduce uncertainties by spreading risks across multiple units, suggesting the tendency toward risk aversion among franchisors.

This implies that the effect of EBC on SRT needs to be thoroughly examined in relation to particular risk preferences of managers in specific industry contexts. A better understanding of risk-taking behaviors of managers could contribute to more efficiently aligning the divergence of risk preferences between managers and owners in the restaurant industry. This study further investigated the moderating effect of managerial overconfidence on the relationships between EBC and SRT. The findings of this study could provide valuable insights to understand: 1) various risk preferences and risk-taking behaviors among hospitality managers in different decision making situations, 2) the effect of EBC on SRT in relation to behavioral biases in the U.S. restaurant industry. The research questions are as follows:

1. How does equity-based compensation influence strategic risk-taking in the gain and loss domains in the U.S. restaurant industry?
2. Does managerial overconfidence moderate the relationship between equity-based compensation and strategic risk-taking in the U.S. restaurant industry?
3. Does franchising exacerbate the degree of risk aversion among CEOs in the U.S. restaurant industry?

Figure 1 graphically illustrates these research questions.

**Contributions of the study**

EBC is designed to align the divergence of risk preferences between managers and shareholders by rendering incentives to influence managerial behavior and decision making for the benefit of the shareholders. Although agency theorists argue that compensation discourages
risk aversion among managers (Jensen & Meckling, 1976; Jensen & Murphy, 1990), others found opposing results that compensation may exacerbate risk aversion (Holmstrom, 1979; Shavell, 1979). These mixed findings provided an opportunity to study the effect of EBC beyond the rational assumptions of agency costs. Hence, this study identified significant theoretical and empirical gaps in the extant research and adopts more rigorous ways to fill these gaps.

First, the effect of EBC on SRT has not been completely examined in the context of loss aversion. As discussed above, the loss aversion predicts that certain types of EBC may induce managers to be more risk-averse while other types may cause them to be more risk-seeking. For instance, certain excisable stock options were found to motivate managers to engage in riskier investments (Core et al., 2003; Gervais et al., 2003; Malmendier & Tate, 2005, 2008; Dever et al., 2007, 2008; Sanders & Hambrick, 2007; Lim, 2011). Although the positive correlation was found between these stock options and risk-taking, this relation was only limited to the gain domain (e.g. in-the-money stock options) (Sanders & Hambrick, 2007; Devers et al., 2007, Devers et al., 2008; Lim, 2011). This study further examined this relationship in the loss domain. Analyzing the relation between EBC and SRT in the loss domain could provide a more holistic understanding of risk behavior of managers in the U.S. restaurant industry.

Second, most compensation research has attempted to find the effect of EBC on risk-taking (McGahan & Porter, 1997; Yermack, 1997; Rajgopal & Shevlin, 2002; Sanders & Hambrick, 2007; Devers et al., 2007, Devers et al., 2008; Lim, 2011). However, they did not consider behavioral factors beyond rationality that might provide important insights into the understanding of the relationship between EBC and SRT. As discussed above, behavioral biases such as overconfidence induce managers to engage in more aggressive risk-taking such as acquisitions (Heaton, 2002; Malmendier & Tate, 2005, 2008). This study proposed that
overconfidence moderates the relationship between EBC and SRT. Hence this study extended simplistic and rational predictions to complex but more realistic predictions about human behavior by incorporating risk incentives from overconfidence.

Third, the majority of compensation studies have focused on the manufacturing industry (Dever et al., 2007, 2008; Sanders & Hambrick, 2007; Lim, 2011). This is because managers in the manufacturing industry make investment decisions that involve risk-taking more regularly than other industries (Miller & Bromiley, 1990; Devers et al., 2008; Lim, 2011). For example, machinery and equipment investments are rarely made in the service industry (Gill et al., 2009). However, unique business environment in the restaurant industry suggests that managers of the restaurant firms may show different risk-taking behaviors. In particular, given a wide use of franchising, managers may exhibit a higher tendency of risk aversion. This indicates that industry specific study can have a special significance.
CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter reviews literature on conventional and behavioral approaches to examining the effect of EBC. First, agency problem related issues and risk behaviors of CEOs in the U.S. restaurant industry are explained. Second, expected utility theory and prospect theory, as an account of decision making under risk, are discussed. Third, agency theory and behavioral agency model (BAM) that provide a comprehensive understanding of the role of EBC are reviewed. Finally, this chapter ends with a detailed overview of the existing literature on the effects of EBC on SRT.

Agency problems in the U.S. restaurant industry

Agency conflicts and agency costs are particularly important in the U.S. restaurant industry given its unique ownership structures and business environments. A fundamental examination of critical aspects of the owner-operator relationships in the restaurant industry is discussed next.

Restaurant industry

The U.S. Restaurant industry has witnessed the fastest growing business models, franchising. Over 56 percent of fast-food restaurants and 13 percent of full-service restaurants are operated under a franchise agreement (PricewaterhouseCoopers, 2004). Agency theory addressed a number of benefits of franchising (Rubin, 1978; Lafontaine, 1992).
First, franchising can reduce monitoring costs for owners. Owners incur agency costs when they monitor operators to ensure that they are not deviating from their mutual interests (Combs & Ketchen, 1997). Hsu et al., (2010) supported this view, finding the positive relationship between franchising and geographic dispersion in restaurant firms. For example, they argued that franchising can efficiently reduce monitoring of managers in geographically remote regions because franchisees are residual claimants to profits generated by their properties. Second, franchising provides owners with alternative sources of financing. Owners can grow and expand their businesses without having to rely on expensive external financing such as debt and equity (Oxenfeldt & Tompson, 1968; Caves & Murphy, 1976; Ketchen, Combs, & Upson, 2006). For example, franchise fees and royalty fees received from franchisees enable owners to expand operations and/or increase revenues. Prior studies have also found that restaurant firms use franchising for expansion and leverage to overcome capital scarcity (Dant, 1995; Sen, 1998; Alon, 2001, Hsu et al., 2010). Lastly, franchising allows owners to reduce uncertainties by spreading risks across multiple units (Martin, 1988). Lafontaine and Bhattacharyya (1995) postulate that risk sharing is primary drive for franchising. For instance, franchisors can significantly reduce risks by having franchisees operate in relatively risky locations with uncertain revenues (Combs & Castrogiovanni, 1994).

Empirical studies have mainly focused on finding the relationship between franchising and firm performance (Newby & Smith, 1999; Combs & Ketchen, 2003; Combs et al., 2004; Hsu & Jang, 2009; Gills & Castrogiovanni, 2010). Although the overall findings have been controversial, the literature seems to emphasize on the positive effect of franchising on firm performance. Therefore, CEOs in the restaurant industry may adopt franchising strategies in an
attempt to reduce risks and thus generate better financial performance. This, in turn, suggests that risk-averse CEOs are more likely to engage in franchising.

Compensation related studies

Despite unique ownership structures, there has been little attempt to investigate CEO compensation in the hospitality literature. Several studies have investigated the determinants of CEO cash compensation in the restaurant and casino firms (Gu & Choi, 2004; Kim & Gu, 2005; Guillet et al., 2012). Other studies have focused on assessing the relationship between CEO compensation and firm performance (Barber, Ghiselli, & Deale, 2006; Dalbor et al., 2010). However, many scholars criticized that this pay-to-performance relationship is complex and ambiguous because performance is affected by various other factors (McGahan & Porter, 1997; Yermack, 1997; Tosi et al., 2000). Instead, recent studies adopted strategic risk-taking (SRT) as a more direct outcome of CEO compensation reflecting risk preferences of CEOs (Sanders, 2001; Aggrawal & Samwick, 2003; Coles, Daniel, & Naveen, 2006; Sanders & Hambrick, 2007; Devers et al., 2008; Lim, 2011). They maintained that examining risk preferences of CEOs via SRT could provide a clearer understanding of how CEO compensation influences corporate policies. This approach has never been attempted in the hospitality research.

Restaurant industry may need to pay special attention to agency problem due to its ownership structure. In particular, a wide use of franchising suggests that managers in the restaurant industry may have a higher tendency of risk aversion. Risk sharing theory supports this view, positing that franchising contracts arise mainly because franchisors seek to reduce risk by sharing their investment and capital risks with franchisees (Rubin, 1978; Combs & Castrogiovanni, 1994; Lafontaine & Bhattacharyya, 1995). It is predicted that a higher tendency
of risk aversion will prevail in both gain and loss contexts for CEOs of the restaurant companies. Hence, the industry specific risk preferences have pointed the need to investigate the influence of EBC on SRT in the restaurant industry. Therefore, this study proposes to examine the relationship between EBC and SRT in the context of prospect theory. Next, a broad overview of decision making under risk in traditional and prospect theory is discussed.

**Behavioral approach in finance**

Behavioral approach integrates psychology and economics into the study of human judgment and biases in decision making under uncertainty (Kahneman & Tversky, 1979). It has been increasingly incorporated into corporate finance research to examine how market participants make their decisions (Kahneman & Tversky, 2000; Gilovich, Griffin, & Kahnema, 2002). In particular, many researchers have argued that understanding how CEOs make decisions under uncertainty is critical in investigating the behavior of the firm (Roll, 1986; Heaton, 2002; Ben-David et al., 2008; Baker et al., 2007). In this approach, CEOs are not assumed to be rational. Their beliefs and decisions are not formed logically, indicating the possibility of biases among them (Kahneman & Tversky, 2000). Baker et al. (2007) define ‘irrational managerial behavior’ as “behavior that departs from rational expectations and expected utility maximization of the manager (p. 35)”. In the following section, this study compares expected utility theory to prospect theory to explain how irrational managers make decisions under uncertainty.

**Decision making under uncertainty**

Expected utility theory, as a normative model of rational choice, has been generally used to analyze decision making under risk (Keeny & Raiffa, 1976; Slovic, Fischhoff, & Lichtenstein, 1982; Schoemaker, 1982). A normative model attempts to describe how a hypothetical intelligent
individual would make decisions in a simpler setting (Montier, 2002). In expected utility theory, individuals are assumed to be reasonable and rational to conform to the hypothetical axioms of the theory (Neumann & Morgenstern, 1944, 1947). They derive utility from their final wealth position and choose options with the highest expected utility when faced with decision making situations under risk.

For example, suppose a person is on the quiz show and he is given two options: 1) he can surely win $100, or 2) he can pick a marble from the bowl and then have a 50 percent chance of winning $400 and a 50 percent chance of winning nothing. The expected value of the first option is $100 (1.0*$100) whereas the expected value of the second option is $200 (0.5*$400 + 0.5*$0). He must choose the second option which has the higher expected value. However, he may feel that the sure winning of $100 has more utility (e.g. satisfaction) for him than taking a chance and choose the first option. That is, individuals will choose the highest expected utility not the highest expected value (Neumann & Morgenstern, 1944; Allias, 1953). The expected utility function shows diminishing marginal utility as individuals find less utility from the second unit of consumption than the first one. The curvature feature of the utility function also implies that individuals are risk-averse because they would not choose a fair gamble that has no expected value. Although expected utility theory provides important foundations for understanding decision making under risk, it has been criticized for its simplistic assumptions.

**Prospect theory**

Prospect theory was proposed by Kahneman and Tversky (1979) as an alternative account of decision making under risk. It attempts to explain how individuals’ risk taking decisions depart from the predictions of normative models such as expected utility theory. There
are several fundamental reasons why prospect theory is inconsistent with expected utility theory. First, value is defined as deviations from a reference point in prospect theory whereas utility is contingent on final wealth (Kahneman & Tversky, 1979). In prospect theory, individuals perceive outcomes as gains and losses relative to some neutral reference point rather than final states of wealth (Tversky & Kahneman, 1974; Tversky & Kahneman, 1992; Thalor, 1980; Tvede, 1999). This reference point generally corresponds to the current wealth position, called the ‘status quo’ (Tversky & Kahneman, 1992, Kahneman, 2003). This means that the same level of wealth may imply differently for individuals depending on their current wealth position. For instance, a $10,000 cash bonus may not appear large for an executive who currently owns $100 million worth assets while it looms larger for another executive whose current assets are worth $50,000.

Second, prospect theory implies individuals are loss-averse whereas expected utility theory assumes consistent risk aversion (Kahneman & Tversky, 1979). Loss aversion refers to the tendency for individuals to be more sensitive to losses than gains (Kahneman & Tversy, 1979; Tversky & Kahneman, 1992). It suggests that if equal magnitude of gains and losses are applied to decision making the displeasure from losses is greater than the pleasure from gains (Hastie & Dawes, 2001). Individuals, hence, seek to minimize losses rather than maximize gains. Third, defined as deviations from some neutral reference point, the value function in prospect theory is concave for gains and convex for losses (Kahneman & Tversky, 1979). This indicates that individuals display risk aversion in the positive domain and risk-seeking in the negative domain. Expected utility theory, however, assumes risk aversion for both positive and negative domains (Schoemaker, 1982).
Kahneman and Tversky (1979, 2000) explain this shift in risk preferences between gain and loss domains by using the famous Asian disease example. Suppose there was disease affecting 600 people and individuals were given two options. The gain domain is framed as: 1) program A can save 200 of 600 people 2) program B offers 33 percent chance of saving all 600 people, and 66 percent chance that no one will be saved. The majority selected program A. This indicates that individuals tend to value a certain gain more than a gain that is less certain, showing risk aversion. The loss domain is framed as: 1) program C results in death of 400 people 2) program D offers 33 percent chance that no one will die, and 66 percent chance that all 600 people will die. Most people chose program D, seeking to avoid the loss of 400 people. This implies people will take greater risks to avoid loss (e.g. risk-seeking). In particular, Kahneman and Tversky (1979) note that manipulating the reference points individuals use makes the difference. Other scholars also documented this reversing in preference order, arguing that individuals are willing to accept more risk in the negative domain (Markowitz, 1959; Williamson, 1963; Wiseman & Gomez-Majia, 1998). Predictions from prospect theory have been argued to make valuable contributions in research that involves decision making (Holmes, Bromiley, Devers, Holcomb, & McGuire, 2011). In finance and management studies, many scholars used prospect theory to examine how CEOs and other top executives make decisions as they play a critical role in determining corporate policies (Bertrand & Schoar, 2003). In particular, much of the literature considers executive compensation as a factor, which affects their decision making (Wiseman & Gomez-Mejia, 1998; Sanders, 2001; Sanders & Hambrick, 2007; Larraza-Kintana et al., 2007; Wright et al., 2007; Devers et al., 2007; Devers et al., 2008; Lim, 2011). Therefore, progress in executive compensation research is reviewed next to explain applications of prospect theory.
Approaches in executive compensation research

Agency theory-based approach

Most compensation research is grounded in agency theory (Holmes et al., 2011). Agency theorists have long been concerned with conflicts of interest between managers and shareholders. Jensen and Meckling (1976) refer ‘agency costs’ to the costs that are related to having an agent. Agency costs arise when an agent (manager) who works on behalf of a principal (shareholders) pursues his/her own interests that depart from those of the principal. In a perfectly efficient market, the interests of managers and shareholders will be aligned (Modigliani & Miller, 1958). However, Jensen (1986) posits that managers have a propensity to pursue their own benefits because they do not capture the entire gains from firm profits. For example, they may make investment and/or operating decisions that may increase their own wealth but aggravate shareholder value.

Earlier studies have attempted to explain the conflicts of interest by understanding risk preferences of managers and shareholders (Berls & Means, 1932; Jensen & Meckling, 1976; Jensen & Murphy, 1990; Tosi, Katz, & Gomez-Mejia, 1997). Crutchley and Hansen (1989) maintain that shareholders are primarily concerned with firm specific risks because they can reduce systematic risks by diversifying their portfolios across multiple firms. Therefore, they are assumed to be risk-neutral and are willing to take large risks to maximize their returns. On the other hand, managers hold undiversified portfolios as most of their personal wealth and human capital are invested in their own firms. As a result, managers are assumed to be risk-averse and reluctant to take large risks that may have potential value increase in shareholder wealth (Eisenhardt, 1989; Jensen & Meckling, 1976). Agency theorists, thus, argue that this difference
in risk preferences is one of the main reasons for agency costs (Jensen & Meckling, 1976; Eisenhardt, 1989; Jensen & Murphy, 1990; Grossman & Hoskisson, 1998; Tosi, Werner, Katz, & Gomez-Mejia, 2000).

However, agency theory has been criticized for its restrictive and simplistic assumptions (Coffee, 1988; Wiseman & Bromiley, 1996; Gomez-Mejia & Wiseman, 1997). First, in agency theory, agents are assumed to hold consistent risk preferences (e.g. risk aversion) regardless of decision situations (Lambert, 1986; Shavell, 1979). That is, if a manager is risk-averse, the magnitude of risk aversion only increases or decreases depending on situations. This is not consistent with prospect theory arguments that allow varied risk preferences among agents in different decision situations. Behavioral researchers argue that risk preferences of the agents can vary contingent on a reference point (Kahneman & Tversky, 1979). For example, Wiseman and Bromiley (1996) contend that an agent’s current wealth does not directly influence risk preferences of an executive instead it serves as a reference point for assessing future prospects. Thus, agents make decisions by comparing expected outcomes from available options against some reference point. Constant risk preferences assumptions in agency theory cannot explain varied risk behaviors of executives in different contexts.

Second, agency theory only allows agents to be either risk-averse or risk-neutral ignoring the probability that they may also be risk-seeking under certain circumstances (Markowitz, 1952; Machina, 1983; Fiegenbaum, 1990; Jegers, 1991; Wiseman & Bromiley, 1996). Kahneman and Tversky (1979) predict that individuals may exhibit risk-seeking preferences when choosing among negatively framed prospects. Therefore, a more comprehensive understanding of managerial decision making could be achieved by permitting various risk-taking behaviors of managers.
Behavioral agency model-based approach

Building on prospect theory, Wiseman and Gomez-Mejia (1998) constructed behavioral agency model (BAM) that suggests decision making situations such as monitoring, problem framing, and firm performance influence agents’ risk-taking behaviors. BAM assumes that risk preferences of an executive are displayed through his/her choice behavior on behalf of the firm. Unlike agency theory, however, executives may change their risk preferences with the framing of problems under BAM (Kahneman & Tversky, 1979; Lant, 1992). That is, executives compare expected outcomes among available choices using a reference point to frame problems. They frame problems positively when they see acceptable expected values from available options. On the other hand, they frame problems negatively when they see unacceptable expected values from available options. BAM predicts that positively framed problems will motivate risk aversion and negatively framed problems will encourage risk-seeking (Kahneman & Tversky, 1979; Wiseman & Gomez-Majia, 1998).

In corporate finance, BAM focuses on the shift in risk preferences of executives between positively framed contexts (gains) and negatively framed contexts (losses) relative to their perceptions of wealth. In addition, executives are assumed to be more concerned with losing wealth than gaining wealth (loss aversion) (Kahneman & Tversky, 1979; Kahneman et al., 199). Therefore, behavioral models explain that the tendency of avoiding loss induces executives to be risk-averse to protect their wealth in the positive context. They may, however, end up choosing even a riskier option in the negative context merely in anticipation of avoiding loss (Tversky & Kahneman, 1986). Sitkin and Pablo (1992) also attempted to explain risk-seeking by executives, stating that executives may display extreme risk-seeking behaviors in a loss condition when their
wealth is lost (e.g. they have nothing to lose). Hence, Wiseman and Gomez-Mejia (1998) provided a cognitive explanation for context dependent risk preferences among executives.

Further, prospect theory has significant implications for EBC. EBC was introduced to align the risk preferences between managers and shareholders (Jensen & Meckling, 1976; Eisenhardt, 1989; Hall & Liebman, 1998; Westphal, 1999; Tosi et al., 2000; Sanders, 2001; Sanders & Hambrick, 2007; Devers et al., 2008; Lim, 2011). EBC, such as stock options and restricted stocks, correlates executive pay with firm performance and thus allows managers to share some fraction of a firm’s return with shareholders (Holmstrom, 1979). The firm performance generally refers to stock price performance so managers’ EBC increases as the stock price goes up. Risk-averse managers who are paid with EBC are more willing to make risky investment decisions that may increase the firm’s stock price. This is consistent with investment portfolio theory that assumes a positive relationship between risk and return (Sharpe, 1970; Fama, 1976). Therefore, many scholars argued that EBC is an efficient tool to encourage CEOs to take greater risks.

In prospect theory, individuals perceive outcomes as gains and losses relative to some neutral reference point (e.g. status quo). This suggests that executives who are paid with EBC may make decisions using their current wealth position as a reference point. Thus, contingent on their valuations of current asset position, executives may react differently to the value of EBC. As loss aversion explains, they display risk aversion in the positive domain while showing risk-seeking in the negative domain. This implies that the influence of EBC may differ between positive and negative domains. For example, if the current wealth position of executives is in the positive domain prospect theory expects risk aversion. EBC can provide them with incentives to take greater risks. In contrast, risk-seeking will be reinforced in the negative domain as
executives are willing to take more risks in this domain. Thus, recent studies have emphasized the importance of understanding the effect of EBC in the context of prospect theory and loss aversion (Wiseman & Gomez-Mejia, 1998; Sanders & Hambrick, 2007; Devers et al., 2007; Devers et al., 2008; Lim, 2011).

Although the role of EBC in aligning risk preferences between managers and shareholders has been examined by many compensation studies (Beatty & Zajac, 1994; Sanders, 2001; Aggrawal & Samwick, 2003; Coles et al., 2006; Sanders & Hambrick, 2007), the findings still remain in question. This is largely due to restrictive assumptions such as constant risk aversion among executives in earlier compensation studies (Holmstrom, 1979; Lambert, 1986; McGuire, 1989). However, more recent studies using prospect theory have also shown mixed results (Wiseman & Gomez-Mejia, 1998; Wright et al., 2007; Devers et al., 2007; Devers et al., 2008; Lim, 2011). The following section explains EBC such as stock options and restricted stocks in more detail and discusses empirical findings of these compensation studies.

**Equity-based compensation and risk taking in compensation research**

As explained, EBC links executive pay to stock price performance. Among many types of EBC, this study focuses on stock options and restricted stock. An overview of stock options and restricted stock is provided next. This study, then, discusses the findings of existing empirical studies on the effects of EBC. Drawing on prospect theory, this study categorizes EBC into the domains of gains and losses and develops testable hypotheses.

*Stock options*

A stock option is a type of contract in which a recipient is given the right to purchase (exercise) a specific number of shares of firm stock for a predetermined price. This price is
called a ‘grant price’ or ‘exercise price’. The grant price is usually determined as the price at which the stock is traded on the day the option is granted. The stock option can only be exercised over a certain period of time. That is, the recipient cannot exercise his/her stock option before a particular date (vesting date) and the stock option expires on a particular date (expiration date). This range is called ‘exercise period’. Thus, the recipient does not have control over the stock option for a certain period of time. This period is called a ‘vesting period’ and refers to the minimum amount of time for which an option must be held before option holders can exercise their rights to purchase company stocks (Murphy, 1999). During the vesting period, the recipient is not allowed to sell or transfer his/her stock option. Thus, stock options within the vesting period are called ‘unexercisable’ options. On the other hand, stock options that are after the vesting period are ‘exercisable’ and can be exercised any time before the expiration date. One of the main purposes of having a vesting period in executive stock options is to provide executives with incentives to remain employed with the company during such period (Murphy, 1999; Hall & Murphy, 2000). If executives leave their company before the vesting period their stock options generally become forfeited. Sanders and Hambrick (2007) also contend that executives have an incentive to take long-term perspective when they are paid with stock options. Typical stock options vest 4 or 5 years after the initial grant date and expire 10 years after the grant date. After vesting, the stock options can be exercised contingent on their payoff status. The payoff is the difference between the grant (exercise) price and the current market price.

Pay-off status of stock option

There are three types of option payoff status. First, a stock option is ‘in-the-money’ when the price underlying the stock option is higher than its grant price. If in-the-money stock option is exercised the option holder can make profits by purchasing stocks cheaper than the current
market price. The payoff is positive in in-the-money options. Second, a stock option is ‘out-of-the-money’ when the price underlying the stock option is lower than its grant price. The option holder will not exercise his/her stock option when the option is out-of-the-money because the payoff of the out-of-the-money stock option is negative. Third, a stock option is ‘at-the-money’ when the price underlying the stock option is equal to its grant price. The at-the-money stock option is not exercised since its payoff is zero. Therefore, a holder of stock option is not obliged to exercise when its payoff is negative or zero.

Sanders (2001) argued that stock options have asymmetric risk properties because they provide unlimited potential gains while limiting downside risks. That is, even if investments fail managers will not lose at least from their stock options. For instance, they can avoid immediate losses by choosing not to exercise their options. Lawler (2000) also maintained that CEOs do not need to exercise their stock options because there was no initial investment to acquire them. Such risk properties effectively motivate managers to take more risks, aligning their risk preferences with those of risk neutral shareholders (Haugen & Senbet, 1981; Tufano, 1996; Rajgopal & Shevlin, 2002). Empirical evidence has shown this positive influence of stock options on incentive alignment (Sanders, 2001; Sanders & Hambrick, 2007; Devers et al, 2008; Lim, 2011). Hence, stock options have become a major component of compensation for CEOs in the U.S. (Lublin, 2006). In 2005, 75 percent of CEOs were reported to receive stock options (Larraza-Kintana et al., 2007).

Many compensation scholars have attempted to empirically find the effect of stock options on various decision-making by managers. Sanders (2001) examined the effects of stock ownership and stock option pay and found that CEOs were more likely to engage in acquisitions and divestitures when paid with stock options. Rajgopal and Shevlin (2002) focused on a small
sample of oil and gas firms and found a positive relationship between executive stock options and increased firm risk. Others also supported this view, arguing stock options motivate CEOs to invest in risky projects (Kroll et al., 1997; Chang, 2003; Kroll et al., 2003). However, these studies contain intrinsic limitations because various forms of stock options are aggregated into one variable such as total stock option pay. As discussed earlier, a stock option can be decomposed based on its payoff status and vesting period (e.g. in-the-money vs. out-of-the-money; exercisable vs. unexercisable). In addition, extending behavioral agency model (BAM) by Wiseman and Gomez-Mejia (1998) to the understanding of executive risk-taking behavior in various situations has led to calls for further investigation of stock options on a fine grained level.

Most prior research has not considered different forms of stock options when examining their effects on risk-taking (Wiseman & Gomez-Mejia, 1998; Sanders, 2001; Sanders & Hambrick, 2007). However, behavioral researchers proposed that the effects of different forms of stock options on risk-taking can differ as their value and vesting status change (Devers et al., 2007; Devers et al., 2008; Lim, 2011). Recent compensation studies have reflected this view and contended that CEOs do not value their stock options to the same extent. Larraza-Kintana et al. (2007) argued that CEOs may value an unexercisable in-the-money option considerably lower than an exercisable in-the-money option because the value of the former is not readily endowed into their perceptions of personal wealth. Prospect theory expects risk aversion when CEOs are heavily endowed with the value of stock options and become concerned about losses. However, the value of unexercisable options cannot be realized until the vesting period ends. Hence, holding unexercisable options can encourage risk-seeking because CEOs may not perceive their personal wealth at risk until these options become excisable (Devers et al., 2007; Larraza-Kintana et al., 2007). This is referred to as ‘endowment effect’ that individuals value assets that
are already possessed more than those that are not yet possessed (Thaler & Johnson, 1990). That is, CEOs may perceive the value of stock options to increase once they become part of their endowment. Devers et al. (2007) supported this argument, finding that a higher value was placed on stock options that CEOs were already holding relative to stock options that were not yet awarded. These arguments are also consistent with discounting theory that individuals generally discount future outcomes than readily available outcomes (Rothbard, 1990; Shelly & Omer, 1996; Ainslie & Haslam, 1992). This suggests that CEOs may discount the value of unexercisable options that are not immediately accessible and assign lower value to them. Therefore, these findings indicate that not only stock options are not valued to the same extent but they also lead CEOs to choose different risk preferences.

Restricted stock

Another popular form of EBC is restricted stock. Restricted stock has recently gained popularity among practitioners and academic researchers as more companies are replacing their stock options with restricted stock (Hall & Murphy, 2002; Kerber, 2005). For example, major U.S. companies such as Microsoft and Amazon.com have recently moved toward restricted stock from stock options (Lim, 2011). Restricted stock is a predetermined number of actual shares of stock that are granted to a recipient (Milkovich & Newman, 2002). Similar to stock options, the recipient’s right to sell or transfer the shares of stock is restricted for a certain amount of time. This restricted period is called a ‘vesting period’. Typically, the vesting period for restricted stocks is 3 to 5 years. Unlike stock options, however, restricted stocks do not have an exercise price. Therefore, the realized value of restricted stock at vesting generally equals the fair market value of a common stock. The recipient earns positive gains if the market price of the stock has increased since the date restricted stocks were granted.
Unlike stock options that have no accumulated value at granting, restricted stock contains accumulated value instantly on a grant date. For instance, a stock option contains accumulated value only when the market price of underlying stock exceeds its exercise price (in-the-money). Its value equals zero when the market price is equal to (at-the-money) or below its exercise price (out-of-the-money). On the other hand, the value of a restricted stock upon award is equal to the market value of a stock. Holders of restricted stock can face potential losses if the initial value of restricted stock decreases over time. This suggests that risk properties of restricted stocks are different from those of stock options. In particular, Parrino, Poteshman, and Weinbach (2005) state that “restricted shares force managers to bear both upside and downside risk” (p. 30). In fact, the risk properties of restricted stocks resemble those of equity ownership (Ofeck & Yermack, 2000; Hall & Murphy, 2002; Bebchuk & Fried, 2004; Devers et al., 2008). Sanders and Hambrick (2007) posit that equity ownership promotes more careful risk taking by CEOs as it involves both upside and downside risk.

Drawing on the notion of endowment effect and loss aversion, therefore, researchers insist that restricted stocks will aggravate risk aversion because 1) CEOs are inclined to endow the accumulated value of restricted stock owned with their personal wealth 2) CEOs will attempt to minimize risk to their personal wealth as the accumulated value of restricted stock increases (Wiseman & Gomez-Mejia, 1998; Bryan, Hwang, & Lilen, 2000; Parrino et al., 2005; Sanders & Hambrick, 2007; Devers et al., 2008, Lim, 2011). Therefore, it is reasonable that restricted stocks need to be considered separately from stock options. Empirical evidence has also shown that CEOs value stock options and restricted stock in dissimilar ways (Hall & Murphy, 2002; Devers et al., 2008; Lim, 2011).
The effects of EBC in the domain of gains

Most extant research has conceptualized that CEOs will perceive EBC in the domain of gains as the accumulated values of in-the-money stock options and restricted stock significantly increase (Wiseman & Gomez-Mejia, 1998; Sanders, 2001; Bryan et al., 2000; Parrino et al., 2005; Sanders & Hambrick, 2007; Larraza-Kintana et al., 2007; Devers et al., 2007; Devers et al., 2008; Wright et al., 2007; Lim, 2011). Empirical findings are summarized in table 2.1 and discussed in detail in the following sections.

Unexercisable stock options

Unexercisable stock options are argued to only have potential or theoretical value as they are not immediately accessible (Lim, 2011). Despite mixed findings, empirical evidence showed that the value of these options is not perceived to the same extent as excisable options. Devers et al. (2008) examined how individual EBC elements affect CEO risk preferences. They incorporated a behavioral agency perspective into their incentive alignment model and found that risk-taking behavior of CEOs varied relative to the accumulated value and vesting status of stock options. In particular, they found a positive linear relationship between the accumulated value of in-the-money unexercisable stock options and SRT. This suggests that CEOs invested more in risky projects as the value of these options increased. Consistent with endowment effect argument, they argued that CEOs will not endow their personal wealth with the accumulative value of unexercisable options. Thus, they may perceive less risk to their personal wealth, leading them to pursue riskier actions.

On the other hand, Lim (2011) investigated the accumulation effects of EBC and found an inverted U-shaped relationship between in-the-money unexercisable stock options and SRT.
She argued that CEOs are encouraged to be more risk-seeking at a low to moderate accumulated value of these options because they are not heavily endowed with these values. However, very high accumulated value of these options indicates that these options hold a large proportion of their personal wealth. CEOs will prefer to choose less risky strategies to prevent losses in their personal wealth at a high value. That is, CEOs will endow the value of unexercisable options with their personal wealth and become concerned about minimizing losses than maximizing gains (Larraza-Kintana et al., 2007; Devers et al., 2008). This is consistent with loss aversion arguments that CEOs will attempt to avoid risk when facing a gain context.

Therefore, this study argues that the accumulated value of in-the-money unexercisable stock options will induce risk aversion rather than risk-seeking in the gain domain. Specifically, the accumulated value of in-the-money unexercisable options will promote SRT at a low to moderate value because CEOs do not incorporate this value into their perceptions of personal wealth. However, the accumulated value of in-the-money unexercisable options will discourage SRT as CEOs start to perceive this value as gains. Thus, this study suggests the following hypothesis:

**Hypothesis 1 (a):** In the gain domain, there is an inverted U-shaped relationship between the accumulated value of in-the-money unexercisable stock options and SRT.

*Exercisable stock options*

CEOs holding in-the-money exercisable stock options are free to trade these options. Given these options are readily cashable, CEOs are more likely to consider them as part of their personal wealth (Larraza-Kintana et al., 2007). Coupled with loss aversion, this endowment effect can induce risk aversion as the accumulated value of in-the-money exercisable options
increase. Devers et al. (2008) found a curvilinear relationship between the accumulated value of in-the-money exercisable options and SRT. This curvilinear relationship indicates that the accumulated value of in-the-money excisable options also motivates risk-taking but at a decreasing rate. That is, the amount of risks that CEOs can take starts to diminish once the value of exercisable options reaches a certain point. Prospect theory also predicts that the influence of EBC will progressively decrease as its value increases (Kahneman & Tversky, 1979).

In a similar study, however, Lim (2011) found a positive linear relationship between the accumulated value of in-the-money exercisable stock options and SRT. She argued that high value of these options relates to consistently successful past firm performances. Past successes are likely to enhance CEO’s confidence, which in turn promotes riskier behaviors (Hayward & Hambrick, 1997; Anderson & Galinsky, 2006). Many scholars supported this positive association between managerial confidence and excessive risk-taking (Roll, 1986; Hayward & Hambrick, 1997; Gervais & Odean, 2002; Heaton, 2002; Baker et al., 2005; Ben-David et al., 2007; Malmendier & Tate, 2005a, 2005b, 2008; Gervais, 2010; Wowak & Hambrick, 2010; Lim, 2011). For instance, Malmendier and Tate (2005a, 2005b, 2008) posit that overconfident CEOs exhibit risk-seeking behaviors by holding onto their in-the-money exercisable stock options in anticipation of achieving high returns. Lim (2011), therefore, contends that it is not the high accumulated value of these options but high levels of CEO confidence that drives risk-seeking behaviors. This implies that a high accumulated value of these options alone may not motivate SRT if CEOs are not highly confident.

Therefore, this study argues that without the presence of high levels of CEO’s confidence, the accumulated value of in-the-money stock options will not encourage risk-seeking as agency theory predicts. It is predicted that the effect of the accumulated value of in-the-money
exercisable stock options will only increase SRT until the point where CEOs begin to heavily endow this value with their personal wealth. SRT will, then, start to decrease after this point as they attempt to lower risks to their personal wealth. Hence, these arguments suggest the following hypothesis:

**Hypothesis 1 (b):** In the gain domain, there is an inverted U-shaped relationship between the accumulated value of in-the-money exercisable stock options and SRT.

*Restricted stock*

CEOs holding restricted stock are argued to assess gains and losses more carefully as it contains both upside potential and downside risk (Hall & Murphy, 2002; Benchuk & Fried, 2004; Parrino et al., 2005; Sanders & Hambrick, 2007). More efficient risk preference alignment can be achieved by granting restricted stocks as considering downward risk helps prevent excessive and value-destroying investments by managers (Hall & Murphy, 2002). Ryan and Wiggins (2001) contend that restricted stock can influence CEOs’ personal wealth as its accumulated value increases. As a result, CEOs holding restricted stock become less inclined to implement risky projects that may cause losses in their personal wealth. Others scholars supported this view, arguing that CEOs become highly concerned with potential wealth losses as the accumulated value of restricted stock increases (Smith & Stulz, 1985; Bryan et al., 2000; Ryan & Wiggins, 2001; Wright et al., 2008). Therefore, CEOs with high levels of restricted stock may be less risk-seeking as they bear both upside and downside risk (Parrino et al., 2005).

Several studies examined the effect of restricted stock on SRT. Devers et al. (2008) found a negative linear relationship between restricted stock and SRT, suggesting the value of restricted stock aggravates CEOs’ risk aversion. This finding contradicts agency theory argument that EBC
aligns risk preferences of managers and shareholders. They maintain that CEOs include the value of restricted stock as personal wealth because this value is immediately realized upon award. Thus, CEOs will be less likely to take large risks as the accumulated value of restricted stock increases. Lim (2011), on the other hand, proposed a curvilinear relationship between restricted stock and SRT. This curvilinear relation suggests that CEOs’ risk-taking increases at low to moderate accumulated value of restricted stock but decreases at moderate to high accumulated value of restricted stock. She argued that CEOs will cautiously take risks when the accumulated value of restricted stock is low but will become risk-averse when holding high levels of restricted stock. However, she did not find significance of this curvilinear relationship.

Based on the findings of prior studies, this study predicts a negative linear relationship between the accumulated value of restricted stock and SRT in the gain domain. That is, restricted stock will aggravate strategic risk taking as its accumulated value increases. For instance, CEOs incorporate the accumulated value of restricted stock into calculations of their personal wealth as its value rises and seek to reduce the probabilities of losses. Higher value of restricted stock will, therefore, induce less risk-taking among CEOs (Larraza-Kintana, 2007). This is because CEOs will immediately perceive the accumulated value of restricted stock as gains which in turn induce risk aversion. Thus, the following hypothesis is proposed:

**Hypothesis 1 (c):** In the gain domain, restricted stock will decrease SRT as its accumulated value increases.

**The effects of EBC in the domain of losses**

Although prospect theory predicts risk behavior of individuals in the domains of both gains and losses, most previous compensation research has neglected the influences of EBC in
the domain of losses (Wiseman & Gomez-Mejia, 1998; Sanders, 2001; Bryan et al., 2000; Parrino et al., 2005; Sanders & Hambrick, 2007; Larraza-Kintana et al., 2007; Devers et al., 2008; Wright et al., 2008; Lim, 2011). That is, managers will be more risk-seeking in the loss context (Tversky & Kahneman, 1986, 1992). This study, therefore, creates loss frames by using stock price trends to empirically examine the influence of EBC on SRT in the loss context.

One of the advantages of stock options is that option holders are not obliged to exercise when the payoff is negative. Hence, scholars argued that downside risk from holding stock options is negligible (Wiseman & Gomez-Mejia, 1998; Sanders, 2001; Sanders & Hambrick, 2007; Devers et al., 2007). The assumption of limited downside risk is, however, no longer appropriate when using the accumulated value of stock options to examine the effects of EBC on SRT (Larraza-Kintana et al., 2007; Devers et al., 2007, 2008; Lim, 2011). CEOs who have accumulated their stock options for long periods of time may incorporate the accumulated value of these stock options into their personal wealth. Therefore, these CEOs may perceive losses in their personal wealth when the accumulated value of their stock options decreases as the market price of underlying stock drops (Devers et al., 2007). In other words, decrease in stock prices will effectively create loss frames for CEOs who have the accumulated value of stock options. Holmes et al. (2011) supported this view, arguing that “a person may frame an outcome as a loss, even if that outcome only reduces his or her gains” (p. 16). Using the exercise price of stock options as a reference point, Zhang et al. (2008) also asserted that CEOs frame stock options that are below their exercise price as possible losses. In particular, they investigated the effects of stock options on CEO earnings manipulation behaviors by using the number of CEO stock option holdings. Drawing on the prospect theory, they argued that the substantial number of out-of-the-money stock option holdings will put CEOs in the loss context encouraging them to adopt
greater risks. The results of their study revealed that there was a positive relationship between the number of CEO out-of-the-money options and earnings manipulation behaviors. This suggests that CEOs who face the loss context are more likely to engage in risky behaviors such as earnings manipulation to minimize and/or rectify losses (Kahneman & Tversky, 1979).

In sum, these arguments imply that CEOs who have accumulated stock options over time will perceive loss domains when underlying stock prices decrease (Devers et al., 2007; Holmes et al., 2011). As prospect theory explains (Kahneman & Tversky, 1979; Wiseman & Gomez-Mejia, 1998), the loss frames will then induce CEOs to take on more risks. Consistent with loss aversion arguments, hence, this study predicts CEOs are more likely to engage in risky actions in the domain of losses. Empirical findings are summarized in table 2.2 and discussed in detail next.

*Unexercisable stock options*

Experimenting with 112 MBA students who were also working as managers, Devers et al. (2007) examined managers’ subjective valuations of unexercisable, in-the-money stock options compared to normative valuation models, such as the Black-Scholes model. In their study, managers were asked to examine three graphs depicting different stock price trends: neutral; positive; or negative. The stocks described in each graph differed in degree of volatility (e.g. high vs. low) while having the same mean market performance. They argued that stock price volatility and stock price trends interactively affect managers’ subjective stock option valuation, causing the divergence from objective normative model valuations. For example, under rising (positive) stock price trends, managers will discount for stock volatility and assign a lower value to stock options whose underlying stocks are volatile. This is consistent with a preference for risk aversion in the positive domain. In contrast, under decreasing (negative) price trends, managers
will give a premium for stock volatility and assign a higher value to stock options whose underlying stocks are volatile. This corresponds to a preference for risk-seeking in the negative domain. They posited that managers’ risk preferences will systematically change in response to their subjective stock option valuations. Consistent with prospect theory predictions, this result indicates that managers exhibit risk-seeking behavior in the domain of losses in attempts to reduce the prospect of loss (Lopes, 1987; March & Shapira, 1987; Tversky & Kahneman, 1992).

In a similar vein, other scholars documented the influence of stock price trends on risk preferences of investors (Shefrin & Statman, 1984; Odean, 1998; Shapira & Venezia, 2001). For example, investors are risk-averse in that they sell winning stocks too quickly to secure the current gains in positive stock price trends. On the other hand, they are risk-seeking because they hold losing stocks too long to avoid losses in negative stock price trends. Based on these arguments, this study contends that decrease in the accumulated value of unexercisable stock options induced by negative stock price trends will create the loss domain for CEOs. In the loss domain, it is predicted that CEOs will take greater risks as their perceived losses in the accumulated value of unexercisable stock options increases. Therefore, this study proposes the following hypothesis:

**Hypothesis 2 (a):** In the loss domain, SRT will increase as the perceived losses in the accumulated value of in-the-money unexercisable stock options increase.

*Exercisable stock options*

It is argued that CEOs are likely to perceive the accumulated value of exercisable stock options higher than that of unexercisable stock options (Devers et al., 2007, Devers et al., 2008; Lim, 2011). This suggests that losses in the accumulated value of exercisable stock options may
loom greater than those in the accumulated value of unexercisable stock options. Prospect theory further suggests that CEOs will be more risk-seeking in the loss context (Wiseman & Gomez-Mejia, 1989).

Sawers et al. (2006) provided empirical evidence for this argument. They examined whether loss aversion and perceived risk affect managerial risk behavior by manipulating the decision context (gain or loss) and the type of equity-based compensation. In their experiment, 292 MBA students were given a choice between a risky and riskless project that vary in the amounts and probabilities associated with each. For instance, one of the choices is: (a) a sure net loss of $7,400,000, (b) a 75% probability of $10,000,000 net loss and 25% probability of zero net loss. Loss aversion predicts that participants will select the risky choice over the sure net loss in the loss context (Kahneman & Tversky, 1979). Consistent with the predictions of loss aversion, they found that more participants chose the risky projects in the loss context. In particular, more managers with at-the-money stock option holdings exhibited more risk-seeking behavior than those with in-the-money stock option holdings. In other words, decrease in the value of stock options effectively created the loss context for CEOs, leading them to take greater risks. However, they limited the types of stock options by setting them as fully exercisable and close to expiration.

Zhang et al. (2008) also found evidence for higher risk-seeking tendency of CEOs in the loss context. They predicted that CEOs will engage more in risky actions such as earnings manipulation under the loss condition in attempts to rectify the situation. The number of out-of-the-money stock options that CEOs were holding was used to frame loss context because the larger the number of these options, the greater losses in their personal wealth (Devers et al., 2007; Devers et al., 2008). The findings of their study showed that there was a positive relationship
between the amount of out-of-the-money stock options and earnings manipulation. This suggests that decreasing value of the accumulated stock options will put CEOs in the loss context and lead to more aggressive actions to avoid losses (Kahneman & Tversky, 1979). Although they found evidence for more risk-taking in the loss condition, they raised a concern about using the number of options to measure the value of stock options. For example, there may be less favorable convergent validity between the number and the value of stock options.

In summation, these arguments suggest that CEOs are more likely to increase risk-taking as their perceived losses in the accumulated value of exercisable stock options increase. The arguments above suggest the following hypothesis:

**Hypothesis 2 (b):** In the loss domain, SRT will increase as the perceived losses in the accumulated value of in-the-money exercisable stock options increases.

*Restricted stock*

The risk properties of restricted stock are similar to those of stock ownership as it effectively bears downside risks (Devers et al., 2008; Lim, 2011). CEOs will perceive losses in the accumulated value of restricted stock when facing a decreasing stock price trend. Ofek and Yermack (2000) contend that restricted stock is more sensitive to firm value than stock options. As a result, the wealth of CEOs who are holding significant levels of restricted stock will be greatly reduced if firm value decreases. When facing this loss condition, CEOs will seek opportunities that can mitigate the prospect of loss even though they involve more risk (Wiseman & Gomez-Mejiz, 1998). Drawing on loss aversion arguments, hence, this study predicts that CEOs will increase risk-taking as they perceive losses in the accumulated value of restricted stock increase.
Hypothesis 2 (c): In the loss domain, SRT will increase as the perceived losses in the accumulated value of restricted stock increases.

Influence of overconfidence

Psychologists proposed a common bias in social comparison theory that individuals tend to rate their abilities better than average (Goethals, Messick, & Allison, 1991; Taylor & Brown, 1988). The better-than-average (BTA) effect has been described as closely related and sometimes equal to overconfidence (Alba & Hutchinson, 2000; Daniel, Hirshleifer, & Subrahmanyam, 1998; Hoelzl & Rustichini, 2005; Juslin, Wennerholm, & Olsson, 1998; Moore, Kurtzberg, Fox, & Bazerman, 1999). For example, individuals who overstate their abilities relative to the average are also more inclined to be overconfident when making decisions (Larrick, Burson, & Soll, 2007). Therefore, the term ‘overconfidence’ in this study is defined as the tendency of individuals to perceive their own abilities above average (Goethals et al., 1991; Taylor & Brown, 1988). Overconfidence is argued to directly influence individuals’ decision making (Gervais, Heaton, & Odean, 2011). For instance, Camerer and Lovallo (1999) showed how overconfidence affects individuals’ economic decisions. They created experimental entry games where payoffs of participants are determined by their skill. Their findings revealed that individuals overestimated the probability of success when they are overconfident about their own abilities. This led to miscalibrated beliefs about risk and excessive failure. Other scholars also documented that overconfidence induces individuals to underestimate the variation of risky processes (Shefrin, 2001, Heaton, 2002, Hackbarth, 2009).

Psychologists posit that individuals become overconfident when 1) they believe that they can control the outcomes 2) they are highly committed to success (Langer, 1975; Weinstein,
The tendency of overconfidence appears to be prevalent among top executives (Goel & Thakor, 2008; Gervais et al., 2011). CEOs are more likely to become overconfident because they often believe that they can control the outcomes (March & Shapira, 1987). In addition, CEOs are highly committed to their performances since their wealth, compensation and professional reputation rely on them (Malmendier & Tate, 2005a). The effect of overconfidence, thus, has been extended to study decision making of high rank executives (Roll, 1986; Camerer & Lovallo, 1999; Heaton, 2002; Gervais & Odean, 2001; Gervais & Heaton, 2003, 2011; Gervais & Goldstein, 2007; Melmendier & Tate, 2005a, 2005b, 2008; Brown & Sarma, 2007; Ben-David, Graham, & Harvey, 2007; Goel & Thakor, 2008; Gervais, 2010).

Specifically, several scholars argued that overconfident executives underestimate the volatilities of their firms’ future cash flows (Shefrin, 2001), overweight their private information relative to public information (Gervais, Heaton, & Odean, 2006), overestimate their own firms’ future returns (Malmendier & Tate, 2005b). As a consequence, they may implement more aggressive and risky policies. For example, overconfident CEOs tend to overinvest due to their underestimation of risk in investment projects (Gervais et al., 2006), pursue an aggressive capital structure (Hackbarth, 2006), engage more in mergers and acquisitions that are unsuccessful (Roll, 1986; Malmendier & Tate, 2005a), repurchase more shares under decreasing stock price trend (Ben-David et al., 2007). These findings generally suggest that overconfident executives are willing to take more risk.

Overconfidence in CEO compensation study

Empirical findings on risk behavior of overconfident CEOs have suggested important implications for CEO compensation. First, managerial overconfidence may interact with EBC in
aligning risk preferences between CEOs and shareholders (Gervais et al., 2011). That is, managerial overconfidence can moderate the relationship between EBC and SRT. Empirical studies showed aggressive risk-taking induced by managerial overconfidence in the context of investment policies (Roll, 1986; Heaton, 2002; Malmendier & Tate, 2005a, 2005b; Ben-David et al., 2007), indicating that overconfidence can interact with EBC in promoting risk-taking by CEOs.

Gervais et al. (2011) showed the interaction between overconfidence and EBC in a theoretical study. They developed a capital budgeting model where a risk-averse manager makes an investment decision using his private signal about the quality of an investment project. Assuming that an overconfident manager believes his signal is more precise than it actually is, he is more likely to: 1) undertake the project when receiving a positive signal 2) abandon the project when receiving a negative signal. Therefore, overconfidence allows him to be more aggressive and overinvest with the positive signal, and more conservative and underinvest with the negative signal. Further, they considered the interaction of overconfidence with the compensation contract in the model. The compensation contract is argued to effectively interact with overconfidence affecting CEO risk-taking. For instance, CEOs are more likely to overinvest (e.g. risk-seeking) when they are overconfident and receive a large amount of performance-based compensation. That is, risk-taking induced by overconfidence is enhanced by the compensation contract. In contrast, overconfident CEOs are more prone to underinvest when they receive a small proportion of performance-based compensation. They posit that compensation contracts properly adjusted to the manager’s behavioral traits such as overconfidence can eliminate these sub-optimal investment problems. In essence, their model showed that firms’ investment decisions are determined by the interaction of compensation contracts with managerial overconfidence.
Lim (2011) also maintained that “CEO confidence is a proximate cause of strategic risk-taking” (p. 26). She argued that risk-taking may be induced by high levels of CEO confidence when CEOs hold significantly high accumulated value of exercisable stock options. Therefore, managerial biases such as overconfidence need to be taken into account when investigating the effects of compensation on corporate policies (Hayward & Hambrick, 1997; Goel & Thakor, 2008; Gervais et al., 2011).

Second, firms can benefit from managerial overconfidence by effectively reducing agency problems (Palomino & Sadrieh, 2011; Gervais et al., 2011). CEO compensation such as stock options is offered to encourage risk-taking, aligning the interests of CEOs and shareholders (Jensen & Meckling, 1976). Overconfident CEOs may require less incentive compensation to be encouraged as they are relatively insensitive to risk (Camerer & Lovallo, 1999). That is, it may be less costly for firms to promote risky investments with overconfident CEOs. Based on the survey of Chief Financial Officers (CFO), Ben-David et al. (2007) argued that overconfident executives are willing to take on more risk without being offered compensation for taking such risk. Gervais et al. (2011) also predicted that less performance-based compensation is required for moderately overconfident CEOs because they perceive less risk. They further argued that firms can effectively design optimal compensation contracts when they know their CEOs are overconfident. For instance, firms can determine the appropriate form and amount of compensation dependent on the degree of CEO overconfidence.

The dynamic interactions between overconfidence and EBC provide a great opportunity to contribute to the existing literature. This study advances the extant literature in that it examines the moderating effects of overconfidence on the relationship between EBC and SRT, assuming CEOs are loss averse. Although a theoretical model by Gervais et al. (2011) discussed
the influence of the interaction of CEO compensation and overconfidence on corporate policies, they analyzed this in a setting where managers are risk-averse. This study extends their discussion by allowing for changes in managers’ risk preferences between the domain of gains and that of losses. Specifically, in the gain domain, this study predicts overconfidence will alleviate risk aversion caused by high accumulated value of EBC. That is, high levels of CEO overconfidence will diminish the negative relationship between EBC and SRT in the gain domain. As a result, overconfident CEOs are less likely to decrease strategic risk-taking even when they perceive high levels of gain in the accumulated value of EBC. Drawing on these arguments, therefore, this study proposes the following hypotheses:

**Hypothesis 3 (a):** In the gain domain, overconfidence will positively moderate the effect of the accumulated value of in-the-money unexercisable stock options on SRT.

**Hypothesis 3 (b):** In the gain domain, overconfidence will positively moderate the effect of the accumulated value of in-the-money exercisable stock options on SRT.

**Hypothesis 3 (c):** In the gain domain, overconfidence will positively moderate the effect of the accumulated value of restricted stock on SRT.

In the loss domain, on the other hand, this study expects overconfidence will augment risk-seeking induced by losses in the accumulated value of EBC. In other words, high level of CEO overconfidence will intensify the positive relationship between EBC and SRT in the loss domain. As a result, overconfident CEOs will continue to increase strategic risk-taking even when they perceive high levels of loss in the accumulated value of EBC. The following hypotheses are proposed:
**Hypothesis 4 (a):** In the loss domain, overconfidence will positively moderate the effect of the accumulated value of in-the-money unexercisable stock options on SRT.

**Hypothesis 4 (b):** In the loss domain, overconfidence will positively moderate the effect of the accumulated value of in-the-money exercisable stock options on SRT.

**Hypothesis 4 (c):** In the loss domain, overconfidence will positively moderate the effect of the accumulated value of restricted stock on SRT.

As discussed earlier, franchising has been used as a strategic alternative to reduce business risks for franchisors in several ways. First, Lafontaine and Bhattacharyya (1995) maintained that firms choose franchising primarily to share risks. Empirical evidence showed that franchised units are more risky and less profitable than company owned units (Martin, 1988; Combs & Castrogiovanni, 1994). Second, royalties received from franchisees help reduce the variability of operating cash flows as they are relatively stable (Bradach, 1998; Madanoglu et al., 2011). For example, revenue-based royalties greatly minimize the impact of cost inefficiencies in franchised units. Third, franchising provides firms with lower capital risk (Oxenfeldt & Kelly, 1969; Kaufmann & Dant, 1999). Lundberg (1989) maintains that franchisors can achieve business expansion and market penetration while minimizing required investments and risks. For example, a franchised unit does not require large fixed capital investments that could increase a firm’s leverage and operating risk. It is further argued that highly franchised restaurant firms would generate more favorable returns than non-franchised ones because of lower variability in the income stream and lower capital expenditure (Roh, 2002; Hoover, Combs & Ketchen, 2003; Combs et al., 2004). Lastly, many scholars argued that franchising provides a relatively safe method to grow even when firms do not have sufficient resources (Caves & Murphy, 1976;
McGuire & Staelin, 1983; Roh & Kwag, 1997; Sen, 1998; Combs & Ketchen, 1999; Roh, 2002). This implies that franchising allows firms to avoid more risky financing means such as debt or equity. Hsu, Jang and Canter (2010) compared franchised and non-franchised restaurant firms to find factors that might influence firms to initiate franchising. Their findings showed that resource scarcity is one of the reasons for franchising.

These arguments suggest that CEOs pursuing franchising are more likely to be risk-averse as they attempt to reduce the variance of their income stream and large investment risks. Based on these arguments, this study predicts that CEOs of greatly franchised firms are more likely to be risk-averse, resulting in lower levels of strategic risk taking. Thus,

**Hypothesis 5**: There is a negative relationship between franchising and SRT in the U.S. restaurant industry.

Proposed hypotheses are graphically described in figure 2.

**Conclusion**

EBC, as a means to align the interests of managers and shareholders, has been a fruitful frontier for research on agency problems related issues. In this chapter, both theoretical and empirical evidence has been provided to show why it is important to investigate the relationship between EBC and SRT in the hospitality industry where agency problems appear concerning. After comparing conventional and behavioral approaches to assessing the influence of EBC on SRT, it was revealed that the effect of EBC has not been fully tested in the context of loss aversion. The major challenge identified was that most existing studies concentrated on the domain of gains but neglected the domain of losses. Therefore, this study considers the effects of EBC on SRT in both domains of gains and losses. In addition, the evidence presented here
suggests both EBC and overconfidence are powerful levers in driving SRT. This study employs the interaction of EBC and overconfidence to further investigate what effectively drives SRT in the hospitality industry. Considering behavioral traits such as overconfidence, hence, will provide a more comprehensive understanding of the relationship between EBC and SRT.
CHAPTER 3

METHODOLOGY

In this section, empirical research methodologies employed in this dissertation are described. The cross-sectional time series regression is used to examine: (1) the effects of equity-based compensation (EBC) on strategic risk-taking (SRT), (2) the moderating effects of managerial overconfidence (OC) on the relationships between EBC and SRT. In particular, this study employs one-way clustering with the fixed-effects models to account for potential cross-sectional and serial correlations. This chapter proceeds as follows: first, data and sample are discussed, next, variables used in this study are described in detail, finally, the research design of this study is discussed.

Data and sample

The sample of this study comprises 42 publicly traded U.S. restaurant firms available in the COMPUSTAT and Execucomp database. The SIC (Standard Industrial Classification) code 5400 and 5812 for retail-food stores and retail-eating places, respectively, were used to identify these companies. Types of restaurants included are quick-service and full-service restaurants. The sample period ranges from 1992 to 2010 as the Execucomp database started to provide data in digital form after January 1992. CEOs for every firm and year during this period were identified based on two filters. First, only CEOs who started their tenure during or after 1992 were considered. Second, only CEOs who had more than five years of tenure were included. This study collected firm level data from COMPUSTAT and executive compensation data from Execucomp. The CRSP (Center for Research in Security Prices) database was used to collect
securities price information. In addition, more detailed information about each EBC package was collected from proxy statements such as DEF 14A and Insider Transaction 4. For instance, this study closely examines the portfolio of stock options for each CEO in the fifth year at which all of the packages are at least partially exercisable. Stock option data of CEOs collected from the first and fifth years of their tenures were used to measure CEO overconfidence. The five year estimation window is further explained in detail in the following section. Strategic risk taking was measured annually for each of the subsequent years of the CEO’s tenure (t+n, where n>0). This lagged data design allows independent variables temporal precedence over dependent variable. That is, EBC is expected to influence strategic risk taking in the subsequent year. The final sample consists of pooled cross-sectional time series, or an unbalanced panel data set with multiple observations on each CEO over time.

**Independent variables**

*Overconfidence.* Our main independent variable is managerial overconfidence. Following the study by Malmendier and Tate (2005a, 2005b, 2008), we developed an overconfidence measure based on the personal portfolio decisions of CEOs using stock options. A stock option is a contract in which CEOs are given the right to buy a pre-determined number of stocks for a pre-determined price. This price is called “exercise price”. Exercise price is usually equal to the stock price on the grant date. CEOs can exercise their stock options only after certain restricted period, called “vesting period”. In general, most executive stock options have a term of ten years and are fully exercisable after four years. When exercised, the executives can purchase a pre-determined number of shares of company stock at the exercise price. The payoff of the stock option is determined as the difference between the exercise price and the current market price of
underlying stock. Executives, therefore, should exercise their stock options only when this difference is positive.

Although the exact threshold for option exercise by executives relies on remaining option duration, their personal wealth, and degree of risk aversion, the shares acquired by stock option exercise are almost always immediately sold in the market (Ofek & Yermack, 2000; Malmendier & Tate, 2008). This is because unlike outside investors, executives cannot hedge the risk of their stock option holdings (Hall & Murphy, 2002). For example, CEOs are not allowed to (1) freely trade, sell, or short-sell company stock, (2) diversify their investment portfolios by purchasing shares of stock in a large number of companies. In addition, they may perceive higher firm risk as their personal wealth and human capital are mostly invested in their firms (Malmendier & Tate, 2005a, 2005b). Therefore, executives are argued to exercise their options immediately when the difference between the exercise price and the current market price is sufficiently high (Merton, 1973; Hall & Murphy, 2002).

Many scholars maintain that risk-averse executives exercise their stock options early in order to hedge against the risk of holding company stock (Heaton, 2002; Gervais, 2001; Hall & Murphy, 2002; Malmendier & Tate, 2005a, 2005b, 2008). However, this logic does not explain why some executives persistently fail to exercise their options when the payoff is significantly high. Malmendier and Tate (2005a, 2005b, 2008) argue that managerial overconfidence can provide alternative explanations for the failure to exercise highly in-the-money vested stock options. For instance, overconfident CEOs tend to overestimate the future cash flows of their investment projects. Overly positive prospects about future returns lead them to believe that the payoff of their stock options will grow as the prices of underlying stocks will continue to rise. Hence, they choose to hold onto their stock options even when their vested stock options are
highly in-the-money. That is, overconfident CEOs will continue to hold their stock options beyond rational thresholds for exercise (Malmendier & Tate, 2005a, 2005b, 2008).

Malmendier and Tate (2005a) developed the rational threshold for exercise based on the Hall and Murphy model (2002). Assuming that shares acquired through exercise are sold immediately, Hall and Murphy (2002) provided a framework for early exercise decisions by executives. They maintained that executives exercise their options at the price where they are indifferent between exercising early or holding for another period. Using different pairs of risk aversion and diversification, their model predicts this threshold price is lower for more risk-averse and less diversified executives. For example, the model suggests exercise when the option value is 40% in-the-money in the final year of duration although the median option value is over 200% in-the-money. Based on the model by Hall and Murphy (2002), Malmendier and Tate (2005a, 2005b, 2008) calibrated a range of rational thresholds for exercise. In particular, they adopted the threshold of 67% in-the-money option value. That is, if the value of in-the-money stock option is 67% higher than its granted value during the fifth year, executives must have exercised, if not all, at least some portion of their stock options during or before the fifth year. The year five is particularly selected because most executive stock options are fully vested after four years.

Using the threshold of 67% in-the-money option value, this study constructed a measure for overconfidence, OC, in the following way. First, this study identified CEOs whose accumulated option value was above the 67% in-the-money threshold more than two times during the fifth year. Then, this study searched for CEOs who: (1) failed to exercise such an option during or before the fifth year and, (2) subsequently failed to exercise at least one more time after his first failure during his tenure as CEO. A CEO was classified as overconfident from
the point of the first failure onwards. Therefore, OC is a dummy variable that equals one if the CEO fails to exercise the 67% in-the-money stock option with five years remaining before expiration. This is illustrated in figure 3. For example, an option (a) was granted to a CEO in 1992 (year 1) and this option became fully exercisable after four years in 1996 (year 5). The grant price was $100 in 1992 (year 1) but the market price of underlying stock increased to $200 in 1996 (year 5), indicating the price increase was higher than 67% threshold. If the CEO did not exercise this option during or before 1996 (year 5) and subsequently failed to exercise at least one more time in the following years during his/her tenure (e.g. 1997), he/she is considered overconfident.

**Figure 3. Estimation window for overconfidence**

<table>
<thead>
<tr>
<th>Option (a) granted</th>
<th>Option (a) fully exercisable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>1993</td>
</tr>
<tr>
<td>Year 1</td>
<td>Year 2</td>
</tr>
<tr>
<td>1994</td>
<td>Year 3</td>
</tr>
<tr>
<td>1995</td>
<td>Year 4</td>
</tr>
<tr>
<td>1996</td>
<td>Year 5</td>
</tr>
</tbody>
</table>

Notes: Option (a) grant price in 1992 = $100
Market price of the underlying stock in 1996 = $200
Percentage of in-the-money option value = ($200 - $100) / $100 = 100%, which is more than 67% threshold

For each CEO, the average exercise price for the accumulated exercisable stock options was computed by dividing the estimated option value by the number of options. This number represents the average of the difference between stock price and exercise price. Subtracting this number from the stock price at the fiscal year end is equal to the average exercise price for the accumulated exercisable stock options. In order to check whether the value of his option was higher than the 67% threshold, the percentage of in-the-money option value was calculated by
dividing the spread between the stock price and average exercise price by average exercise price.

This is illustrated in table 3.1 below.

**Table 3.1 Estimation of the percentage of in-the-money value**

<table>
<thead>
<tr>
<th>Fiscal year end</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated option value</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>Number of options</td>
<td>20,000</td>
</tr>
<tr>
<td>Average of the spread</td>
<td>$60</td>
</tr>
<tr>
<td>Market price of stock at year end</td>
<td>$110</td>
</tr>
<tr>
<td>Average exercise price</td>
<td>$50</td>
</tr>
<tr>
<td>Percentage of in-the-money option value = avg. spread / avg. exercise price</td>
<td>$110 – $50 / $50 = 1.2 or 120%</td>
</tr>
<tr>
<td>Percentage of the option value</td>
<td>Higher than 67% threshold</td>
</tr>
</tbody>
</table>

Note: Average of the spread equals to the average of difference between stock price and exercise price of the accumulated option package.

The number of observations is limited by classifying the CEO as overconfident only if he fails to exercise his stock option at least two times during the sample period. However, this helps avoid falsely identifying CEOs as overconfident due to high stock performance. In addition, the OC measure allows two types of variation. First, OC uses cross-sectional variation to identify the effect of overconfidence on strategic risk-taking across firms. Second, the effect of overconfidence on strategic risk-taking can also be identified by comparing overconfident and rational CEOs within the same firm.

**EBC.** Three types of equity-based compensation (EBC) are collected from 1992 to 2010 using ExecuComp database and proxy statements. First, the accumulated value of in-the-money
exercisable stock options is measured as the aggregate value of in-the-money stock options that are vested at fiscal year end. Second, the accumulated value of in-the-money unexercisable stock options is measured as the aggregate value of in-the-money stock options that are not vested at fiscal year end. This study uses the accumulated cash value of each option reported in the firm’s proxy statement. This value is calculated using the market value of the common stock on the last day of the fiscal year less the option exercise price multiplied by the number of exercisable or unexercisable option shares. Third, the accumulated value of restricted stock is measured as the aggregate value of restricted stock at fiscal year end. This value represents the market value based on the closing market price of the company’s common stock on the last day of the fiscal year. All of the values of EBC are on a pretax basis. These measures are divided by total compensation to represent the proportion of each pay component in the CEOs’ compensation package. Total compensation consists of the annual salary, cash bonus, other annual compensation, restricted stock, stock options, long-term incentive payouts and all other compensation. Further, this study predicts the accumulated values of exercisable and unexercisable stock options will have a curvilinear relationship with SRT in the gain domain. Therefore, the square terms are generated to test these hypotheses.

**Perceived loss.** As mentioned in the chapter 2, this study creates loss contexts by using the perceived loss by CEOs in the accumulated value of EBC. That is, CEOs will effectively perceive loss in their accumulated value of EBC under the decreasing stock price trends (Sawers & Wright, 2006; Devers et al., 2007; Zhang et al., 2008; Holmes et al., 2011). This study measures the perceived loss by comparing the accumulated value of EBC in t with the accumulated value in t-1. The perceived loss is presented in percent as a difference between the value in the current year (t) and the value in the previous year (t-1) divided by the previous year
value. For example, if the accumulated value of exercisable stock options is $100,000 in year t-1 but drops to $80,000 in year t due to decrease in the price of underlying stock, the perceived loss is 20 percent \([(100,000-80,000)/100,000]\). This study ensures the perceived loss is resulted from decreasing stock price trends by examining the quarterly stock prices, high and low prices during the period that the accumulated values of EBC decreased.

Franchise. The franchise is measured as the ratio of the number of franchise units to total units. As discussed earlier, franchising has been used as a strategic choice to reduce business risk in the restaurant industry. For example, restaurant firms can avoid more risky means to finance their expansion such as debt or equity. Franchise fees also help reduce the variability of operating cash flows for the franchisors as they are considered relatively stable (Madanoglu et al., 2011). This suggests that CEOs who pursue franchising are less inclined to take risks as they attempt to reduce the variance of investment risks. Hence, this study predicts that CEOs of greatly franchised firms are more likely to avoid risks, resulting in low levels of strategic risk taking.

Dependent variable

Strategic risk-taking (SRT). The extant studies have identified various measures, such as R&D investment, capital investment, and acquisition investment as proxies for risky and uncertain long-term investments (Larcker, 1983; Hoskisson et al., 1993; Beckman & Haunschild, 2002; Sanders & Hambrick, 2007; Devers et al., 2008). This study also includes long-term debt to reflect the specific characteristics of the restaurant industry (Andrew & Schmidgall, 1993; Upneja & Dalbor, 2001; Dalbor & Upneja, 2002; Singh & Upneja, 2008). The SRT variable is constructed by using the sum of R&D investment, capital investment, acquisition investment,
and long-term debt. R&D investment is measured as the total research and development expenditures. Capital investment is measured as the total capital expenditures of the company. Acquisition investment is measured as the total transaction values for all acquisitions during the year. Long-term debt is measured as long-term debt divided by the total assets. To achieve equal weighing for the four proxies, this study log transforms the value of each proxy after adding the constant 1 to all values. Adding the constant 1 to all values allows the log transformation for non-positive numbers. The four log transformed proxies are then summed to generate the dependent variable in this study.

**Control variables**

*Firm size.* Firm size is measured as the natural log of assets. Wright et al. (2007) argue that larger firms may have less constraints to gather information to reduce uncertainty about their investment projects, allowing them to take risky investment. This suggests that the size of a firm may be correlated to the SRT.

*Firm performance.* This study includes both accounting and market-based measures to control for this association. Accounting measure for firm performance is return on assets (ROA), measured by net income divided by total assets. Market-based measure is total shareholder returns (TSR), measured by the sum of adjusted stock price and adjusted dividends in t divided by adjusted stock price in t-1. The positive relationship between firm performance and CEO compensation has been debated by many scholars (Wiseman & Gomez-Mejia, 1997; Sanders, 2001; Sanders & Hambrick, 2007; Devers et al., 2008; Lim, 2011).

*Cash compensation.* Many scholars argued that the structure of compensation influences the degree of risk shared by CEOs and shareholders (Holmstrom, 1979; Shavell, 1979; Gomez-
Mejia, 1994). Cash compensation is generally considered as more consistent and assured than EBC (Gomez-Mejia & Wiseman, 1997). Therefore, it can provide CEOs with some protection against the risk associated with investment decisions that may result in decrease in the accumulated value of EBC (Garen, 1994). This implies cash compensation can promote greater risk-taking. Devers et al. (2008) partially supported this view, investigating how cash-based compensation interacts with the value of EBC to influence SRT. The findings of their study showed that cash-based compensation enhances the positive relationship between the unexercisable stock option value and SRT. Thus, this study includes cash compensation to control for its potential influence on SRT.

Stock ownership. It is argued that CEOs include the value of shares owned as personal wealth. (Sanders, 2001; Sanders & Hambrick, 2007; Devers et al., 2008; Lim, 2011). Contrary to EBC, stock ownership immediately allows CEOs to endow their perceptions of personal wealth with the accumulated value from stock holding (Sanders, 2001). This suggests that stock ownership may influence important investment decisions of the CEOs. This study measures CEO stock ownership as the number of shares owned by the CEO.

CEO characteristics. CEO tenure is the number of years the CEO has been employed as CEO. Hambrick and Fukotomi (1991) contend that the longer the tenure the less the CEO is inclined to taking greater risks. In a similar vein, entrenched managers have less incentive to pursue risky but value-maximizing investment projects (Shleifer & Vishny, 1989; Morck, Shleifer, & Vishny, 1990). In addition, age, gender, and education of CEOs are controlled as they have been argued to correspond to risk behavior of executives (MacCrimmon & Wehrung, 1986; Ben-David et al., 2007).
Research design

Data transformation and model specification are discussed next.

Standardization

This study combined variables that are on different scales. For example, CEO stock ownership ranges from 0 to 54.78 in percent form. The accumulated value of exercisable stock option has a minimum value of 0 and a maximum value of 134,196.5 million US dollars. Analyzing variables on different scales often leads to results dominated by the much larger variable. In order to establish a common scale, the variables in this study were standardized. The standard score ($z$) of a raw variable $x$ is

$$
z = \frac{x - \mu}{\sigma}
$$

where $\mu$ is the mean of the population and $\sigma$ is the standard deviation of the population. Standardized variables are centered around zero and scaled to have a standard deviation of 1. Standardization maintains variables numerically of similar magnitudes, allowing a direct comparison between estimated coefficients. Previous compensation studies also confirmed the effectiveness of standardization (Devers et al., 2008; Lim, 2011).

Centering variables

Next, to test for a relationship between EBC and SRT, moderated by CEO overconfidence, this study used multiple interaction and squared terms. Aiken and West (1991) argued that a regression equation with interaction and/or squared terms suffer from potential multicollinearity problems. Multicollinearity is problematic because it generally inflates the variance among the variables while they actually add very little independent information to the
When variables are multiplied to create an interaction or a squared term, the resulting product variables are highly correlated with original variables. Centering was used to remedy this problem. Centering is defined as subtracting the mean from each score (Aiken & West, 1991). It effectively takes care of multicollinearity by reducing the correlation between original variables and their interaction terms. For example, if two high positive numbers are multiplied to create an interaction term, their product becomes very high and thus, highly correlated with original variables. Centering the two variables at the mean will turn half their values to negative. Then, their product will not go up as high because half of the centered variables are negative. Many studies have demonstrated centered variables produce low intercorrelations (Belsely et al., 1980; Aiken & West, 1991; Tabachinik & Fidell, 1996; Dawson & Richer, 2006). Therefore, this study mean-centered six EBC variables that were used to create interaction and squared terms. They are the EX, UNEX, RS, PLEX, PLUNEX, and PRS.

The data transformation procedure is presented in table 3.2.
Table 3.2. Summary of data transformation

<table>
<thead>
<tr>
<th>1. Standardization</th>
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</thead>
<tbody>
<tr>
<td>$z$-score created for all raw variables: $z = \frac{x - \mu}{\sigma}$</td>
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<tr>
<td>e.g.) $Z_{EX} = \frac{EX - \mu_{EX}}{\sigma_{EX}}$</td>
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<table>
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<tr>
<th>2. Mean-centering</th>
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<tbody>
<tr>
<td>Variables were centered at their means.</td>
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<td>e.g.) $\text{UNEX}_{\text{center}} = \text{UNEX} - E(\text{UNEX})$</td>
</tr>
<tr>
<td>$\text{EX}_{\text{center}} = \text{EX} - E(\text{EX})$</td>
</tr>
<tr>
<td>$\text{RS}_{\text{center}} = \text{RS} - E(\text{RS})$</td>
</tr>
<tr>
<td>$\text{UNEX}^2_{\text{center}} = \text{UNEX}^2 - E(\text{UNEX}^2)$</td>
</tr>
<tr>
<td>$\text{EX}^2_{\text{center}} = \text{EX}^2 - E(\text{EX}^2)$</td>
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</table>

Then, centered variables were used to create interaction and quadratic terms.

<table>
<thead>
<tr>
<th>Interaction terms</th>
<th>Quadratic terms</th>
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<tbody>
<tr>
<td>$\text{UNEX}_{\text{center}} \times \text{OC}$</td>
<td>$\text{UNEX}^2_{\text{center}}$</td>
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<tr>
<td>$\text{EX}_{\text{center}} \times \text{OC}$</td>
<td>$\text{EX}^2_{\text{center}}$</td>
</tr>
<tr>
<td>$\text{RS}_{\text{center}} \times \text{OC}$</td>
<td>Quadratic interaction terms</td>
</tr>
<tr>
<td></td>
<td>$\text{UNEX}^2_{\text{center}} \times \text{OC}$</td>
</tr>
<tr>
<td></td>
<td>$\text{EX}^2_{\text{center}} \times \text{OC}$</td>
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</tbody>
</table>

Adjusting standard errors

The data of this study consists of multiple observations for restaurant firms and CEOs over time. The observations may be associated with each firm or time period in panel data. As a result, ordinary least square (OLS) will not produce correct $t$-statistics due to correlations of regression disturbances over time and between firms. Ignoring these potential correlations can
lead to biased statistical inference. In particular, the lack of independence in the regression models results in small standard errors and, therefore, large \( t \)-values. Thus, the standard errors of the coefficient estimates need to be adjusted for cross-sectional and time-series correlations. This study used two techniques to adjust standard errors for the spatial and temporal correlations: clustering and fixed-effects.

**Clustering.** The standard errors were first estimated by cluster-robust method which is robust to heteroskedasticity and autocorrelation (Stock & Watson, 2008). Unlike OLS estimation, it allows error terms to be heteroscedastic and correlated within the same cluster. Cameron and Miller (2010) argue that correlated errors naturally arise within each panel unit so that each panel unit could be considered as a cluster. For instance, if CEOs are sampled to model SRT as a function of EBC measured at the individual level, EBC and their effects on SRT may be correlated within firms. That is, the errors may be arbitrarily correlated across time for a given firm. This is temporal dependence and called “firm effects” (Peterson, 2009; Thompson, 2011). Consider common effects that could arise at the firm level. For example, EBC policies or board of director preferences for a certain type of EBC in a given firm might cause a firm effect. Then, the errors of EBC in the same firm are more likely to be correlated with each other. This will result in clustered errors at the firm level. In this case, the cluster-robust circumvents potential intra-cluster correlation of errors. Let the standard regression for a panel data set

\[
Y_{it} = X_{it} \beta + \varepsilon_{it}
\]

(1)

where \( i \) denotes firms and \( t \) denotes years. Assuming that the errors consist of a firm specific component \( (\gamma_i) \) and an idiosyncratic component that is unique to each observation \( (\eta_{it}) \), the errors can be decomposed into:
\[ \varepsilon_{it} = \gamma_i + \eta_{it} \]  

(2)

Suppose that there are 3 firms \((i=1, 2, 3)\) and 3 years \((t=1, 2, 3)\). Under the OLS assumption, the errors \((\varepsilon_{it})\) are independent and identically distributed. That is, there is no firm specific shock \((\gamma_i = 0)\) and thus, the errors are uncorrelated over time between observations in the same firm. Figure 4 presents the covariance matrix of the errors under the OLS estimation. However, when there is a firm effect, the OLS underestimates the true standard errors, leading to find false statistical significance even when there isn’t.

**Figure 4. Covariance matrix of the OLS residuals**

<table>
<thead>
<tr>
<th></th>
<th>Firm 1</th>
<th>Firm2</th>
<th>Firm3</th>
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<tbody>
<tr>
<td><strong>Firm1</strong></td>
<td>(\varepsilon_{11}^2) 0 0</td>
<td>0 0 0</td>
<td>0 0 0</td>
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<tr>
<td></td>
<td>0 (\varepsilon_{12}^2) 0</td>
<td>0 0 0</td>
<td>0 0 0</td>
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<tr>
<td></td>
<td>0 0 (\varepsilon_{13}^2)</td>
<td>0 0 0</td>
<td>0 0 0</td>
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<tr>
<td><strong>Firm2</strong></td>
<td>0 0 0</td>
<td>(\varepsilon_{21}^2) 0 0</td>
<td>0 0 0</td>
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<td>0 0 0</td>
<td>0 (\varepsilon_{22}^2) 0</td>
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<td></td>
<td>0 0 0</td>
<td>0 0 (\varepsilon_{23}^2)</td>
<td>0 0 0</td>
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<tr>
<td><strong>Firm3</strong></td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>(\varepsilon_{31}^2) 0 0</td>
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<td>0 0 0</td>
<td>0 0 0</td>
<td>(\varepsilon_{32}^2) 0</td>
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<td>0 0 0</td>
<td>0 0 0</td>
<td>0 0 (\varepsilon_{33}^2)</td>
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If observations within firm 1 are correlated, the standard errors are assumed to be correlated across observations within firm 1, but independent across different firms 2 and 3. In matrix form, because the standard errors are no longer independent within the same firm, the off-diagonal elements of the matrix within the same firm are non-zero. Given the assumption of independence across firms, all terms involving errors in different firms are zero, ruling out any
across-firm error correlations such as common shocks. Figure 5 shows a covariance matrix of the clustered errors. The correlation of the errors within the same firm could be problematic if unaccounted. The standard OLS assumes that the off-diagonal terms are zero. However, the clustered standard errors assume that the off-diagonal terms within the same firm may be non-zero. This means that there are less independent errors and thus, less information. Clustering adjusts the standard errors for this problem and produces larger standard errors and correct t-values. In fact, the clustered standard errors are almost always greater than those of the OLS.

**Figure 5. Covariance matrix of the clustered errors**

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<th>Firm 1</th>
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<td>Firm1</td>
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<tr>
<td></td>
<td>$\varepsilon_{12}\varepsilon_{11}$</td>
<td>$\varepsilon_{12}^2$</td>
<td>$\varepsilon_{12}\varepsilon_{13}$</td>
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<td>0</td>
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<td></td>
<td>$\varepsilon_{13}\varepsilon_{11}$</td>
<td>$\varepsilon_{13}\varepsilon_{12}$</td>
<td>$\varepsilon_{13}^2$</td>
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<td>Firm2</td>
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The data set of this study contains 42 restaurant firms. By clustering at the firm level, we assumed that there were 42 uncorrelated observations in our model. Firm-level clustering was more rigorous as it allows all of the firm’s errors to be correlated. On the other hand, if observations were clustered at the CEO level, observations of different CEOs within the same firm are assumed to be independent. This is unrealistic as CEOs from the same firm are likely to
be more similar than CEOs from different firms. Figure 6 graphically describes clustering at the firm level.

**Figure 6. Firm-level clustering**

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<th>Firm 1</th>
<th>Firm 2</th>
<th>Firm 3</th>
<th>Firm 4</th>
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<tbody>
<tr>
<td>Data 1</td>
<td>Data 1</td>
<td>Data 1</td>
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<td>Data 2</td>
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<tr>
<td>correlated</td>
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<td>correlated</td>
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Note: firm-level clustering relaxes assumption of independence within the same firm but leaves both the noise associated with differences between CEOs and noise associated with difference between firms in the error term. This partially explains why clustered standard errors are large.

The errors may be correlated across different firms at a moment in time. This is spatial dependence and called “time effects” (Peterson, 2009; Thompson, 2011). For instance, market-level shocks such as economic recession in a given year can induce a time effect. The errors in the same year are more likely to be correlated with each other, resulting in clustered errors at the year level. However, given that EBC varies more significantly by firm than by time, time-level clustering was initially omitted. Double-clustering in both dimensions was, indeed, found to be unnecessary in the specification tests. Peterson (2009) argued that results estimated by both firm and time clustering do not differ from those by firm clustering if there is only small number of
clusters in time dimension. He further maintained that a common approach to address correlations on time dimension in panel data sets is to include time dummy variables. Other finance researchers also posited that including the year dummies could effectively eliminate the correlation between observations in the same year (Peterson, 2009; Gow et al., 2010; Thompson, 2011). Assuming that the panel data structure only includes a time effect, the resulting regression model is

\[ Y_{it} = X_{it} \beta + \tau_t + \eta_{it} \]  \hspace{1cm} (3)

where \( \tau_t \) \((t=1…n)\) is the unobserved time-specific component that vary over time but not across firms. If time dummy variables are included to bring the unobserved effect explicitly into the model, the equation (3) can be rewritten

\[ Y_{it} = X_{it} \beta + \delta_2 T_2 + \delta_3 T_3 + \delta_4 T_4 + \cdots + \delta_T T_T + \eta_{it} \] \hspace{1cm} (4)

\( T_t \) is time as dummy variable where \( T_t \) is equal to 1 in the case of an observation relative to time \( t \) and 0 otherwise. \( \delta_t \) is the coefficient for the time dummy variables. Because \( T_t \) is binary there are \( t-1 \) time periods. Then, the unobserved time effect is treated as the coefficient of the time dummy variable. Hence, the \( \delta_T T_T \) term represents a fixed effect that is constant across firms within the same time. This technique is known as the fixed effect approach and explained in further detail next.

*Fixed-effects model.* This study combined firm-level clustering with the fixed-effects model to reduce potential omitted variable bias. Omitted variable bias occurs when error terms are correlated with one of the independent variables. For instance, if EBC variables are correlated with unobserved (omitted) variables such as CEO ability, then the coefficient on EBC variables are biased. Clustering cannot solve this problem because it only deals with error terms
not being independent from each other. The fixed-effects model can parametrically address this problem. The equations (1) and (2) can be rewritten

\[ Y_{it} = X_{it}\beta + \gamma_i + \eta_{it} \]  

(5)

If the firm-specific component \((\gamma_i)\) is constant over time and correlated with elements of \(X_{it}\), the regression estimates are subject to unobserved heterogeneity. The fixed-effects model can overcome this problem by calculating the mean values of the variables in the observations on a given individual and subtract them from the data for that individual. This eliminates individual-specific unobserved effects. If we average equation (5) over time for each firm \(i\),

\[ \bar{Y}_{it} = \bar{X}_{it}\beta + \bar{\gamma}_i + \bar{\eta}_{it} \]  

(6)

Subtracting equation (6) from equation (5),

\[ Y_{it} - \bar{Y}_{it} = (X_{it} - \bar{X}_{it})\beta + (\gamma_i - \bar{\gamma}_i) + (\eta_{it} - \bar{\eta}_{it}) \]  

(7)

The unobserved effect \((\gamma_i - \bar{\gamma}_i)\) disappears in the equation (7). The fixed-effects model is also known as within-groups regression model. It explains the variations about the mean of the dependent variables in terms of the variations about the means of the explanatory variables. That is, by subtracting the means all of the variations in the regression are restricted to within-group variations.

In panel data, there are two types of variations: cross-sectional and within variation. Because the fixed-effects model eliminates all the across-group variation and relies solely on the within-group variation a sufficient amount of within variation is required to use the fixed-effects model. In fact, the fixed-effects model cannot estimate the effect of variables that vary little within groups (Greene, 2002). Variables that do not change over time are actually removed as
shown in equation (7). Hence, the use of fixed effects estimation was determined based on the amount of intra-group variation. Because EBC varies by firm and by time, both firm and time fixed-effects were included to test the effects of EBC on SRT (Hypotheses 1 and 2). However, to test the moderating effects of OC on the relationship between EBC and SRT (Hypotheses 3 and 4), only time fixed-effects were used. Although our overconfidence measure, OC, contained two types of variation, across-firm and within-firm variation, most of the variation was across firms. Firm fixed-effects may not effectively estimate the effects of OC and its interaction terms with EBC as they had little within-firm variation. Time fixed-effects specification estimated the moderating effects of OC using only variation between overconfident and non-overconfident CEOs within years. Previous studies corroborated that clustering at the firm level with time fixed-effects could effectively eliminate the bias if most of the variation is across firms (Lamont & Polk, 2001; Anderson & Reeb, 2004; Gross & Souleles, 2004; Sapienza, 2004; Faulkender & Peterson, 2006; Peterson, 2008; Gow et al., 2010; Thompson, 2011). Figure 7 shows how the standard errors were estimated in this study.
Regression models

In summary, the standard errors were adjusted by using clustering and fixed-effects model. First, this study ran pooled OLS with standard errors clustering at the firm level. Next, as an alternative specification, the fixed-effects model with firm-level clustering was used.
Including the fixed-effects parameters could effectively partial out unobserved fixed-effects while clustering could correct for any remaining within group correlation. For each regression model, the Hausman specification test was conducted to confirm if the use of the fixed-effects model was appropriate. All variables were standardized to allow a direct comparison among estimated coefficients. The variables were further mean-centered to avoid multicollinearity before introducing the interaction and squared terms into the models. Finally, outliers were removed using the three standard deviation cutoff for standard errors. The following multiple regression models are proposed to implement this research design:

**Domain of gains.** Regression model (1) was used to examine the effects of EBC on SRT (Hypotheses 1 (a)-(c)). Regression model (2) was used to investigate the moderating effects of managerial overconfidence on the relationship between EBC and SRT (Hypotheses 3 (a)-(c)).

Independent variables and most control variables (except for OC and CEO characteristics) were lagged one year because the effects of EBC on SRT were expected to occur in the subsequent year. In model (2), this study included three interaction terms. These interaction terms were generated by multiplying each EBC measure by overconfident measure (OC). To avoid high multicollinearity between the interaction terms and the original variables, the original variables were mean-centered before introducing their interaction terms with OC into the model (2).

\[
\text{SRT}_{i,t} = \beta_0 + \beta_1 \text{UNEX}_{i,t-1} + \beta_2 \text{EX}_{i,t-1} + \beta_3 (\text{UNEX}_{i,t-1})^2 + \beta_4 (\text{EX}_{i,t-1})^2 + \beta_5 \text{RS}_{i,t-1} + \beta_6 \text{FRAN}_{i,t-1} + \beta_7 \text{SIZE}_{i,t-1} + \beta_8 \text{PER}_{i,t-1} + \beta_9 \text{CASH}_{i,t-1} + \beta_{10} \text{OWN}_{i,t-1} + \beta_{11} \text{TEN}_{i} + \beta_{12} \text{AGE}_{i} + \beta_{13} \text{GEN}_{i} + \varepsilon_{i,t} \quad (1)
\]

\[
\text{SRT}_{i,t} = \beta_0 + \beta_1 \text{UNEX}_{i,t-1} + \beta_2 \text{EX}_{i,t-1} + \beta_3 (\text{UNEX}_{i,t-1})^2 + \beta_4 (\text{EX}_{i,t-1})^2 + \beta_5 \text{RS}_{i,t-1} + \beta_6 \text{OC}_{i,t-1} + \beta_7 (\text{UNEX}_{i,t-1} \times \text{OC}_{i,t-1}) + \beta_8 (\text{EX}_{i,t-1} \times \text{OC}_{i,t-1}) + \beta_9 (\text{RS}_{i,t-1} \times \text{OC}_{i,t-1}) + \beta_{10} [(\text{UNEX}_{i,t-1})^2 \times \text{OC}_{i,t-1}] + \beta_{11} [(\text{EX}_{i,t-1})^2 \times \text{OC}_{i,t-1}] + \beta_{12} \text{FRAN}_{i,t-1} + \beta_{13} \text{SIZE}_{i,t-1} + \beta_{14} \text{PER}_{i,t-1} + \beta_{15} \text{CASH}_{i,t-1} + \beta_{16} \text{OWN}_{i,t-1} + \beta_{17} \text{TEN}_{i} + \beta_{18} \text{AGE}_{i} + \beta_{19} \text{GEN}_{i} + \varepsilon_{i,t} \quad (2)
\]
Where

\( SRT_{i,t} \) = strategic risk taking of firm \( i \) at time \( t \).

\( \text{UNEX}_{i,t-1} \) = the accumulated value of unexercisable stock option of firm \( i \) at time \( t-1 \).

\( \text{EX}_{i,t-1} \) = the accumulated value of exercisable stock option of firm \( i \) at time \( t-1 \).

\( (\text{UNEX}_{i,t-1})^2 \) = the accumulated value of unexercisable stock option squared.

\( (\text{EX}_{i,t-1})^2 \) = the accumulated value of exercisable stock option squared.

\( \text{RES}_{i,t-1} \) = the accumulated value of restricted stock of firm \( i \) at time \( t-1 \).

\( \text{FRAN}_{i,t-1} \) = degree of franchising of firm \( i \) at time \( t-1 \).

\( \text{OC}_{i,t-1} \) = CEO overconfidence of firm \( i \) at time \( t-1 \)(=1 if overconfident, =0 otherwise).

\( \text{SIZE}_{i,t-1} \) = size of firm \( i \) at time \( t-1 \).

\( \text{PER}_{i,t-1} \) = performance of firm \( i \) at time \( t-1 \).

\( \text{CASH}_{i,t-1} \) = the accumulated value of CEO cash compensation of firm \( i \) at time \( t-1 \).

\( \text{OWN}_{i,t-1} \) = the amount of CEO stock ownership of firm \( i \) at time \( t-1 \).

\( \text{TEN}_{i,t-1} \) = the number of years employed as CEO of firm \( i \) at time \( t \).

\( \text{AGE}_{i,t} \) = CEO age of firm \( i \) at time \( t \).

\( \text{GEN}_{i} \) = gender of CEO of firm \( i \).

\( \text{UNEX}_{i,t-1} \times \text{OC}_{i,t-1} \) = the product of the accumulated value of unexercisable stock option and overconfidence of firm \( i \) at time \( t-1 \).

\( \text{EX}_{i,t-1} \times \text{OC}_{i,t-1} \) = the product of the accumulated value of exercisable stock option and overconfidence of firm \( i \) at time \( t-1 \).

\( \text{RS}_{i,t-1} \times \text{OC}_{i,t-1} \) = the product of the accumulated value of restricted stock and overconfidence of firm \( i \) at time \( t-1 \).

\[ (\text{UNEX}_{i,t-1})^2 \times \text{OC}_{i,t-1} \] = the product of the accumulated value of unexercisable stock option squared and overconfidence.

\[ (\text{EX}_{i,t-1})^2 \times \text{OC}_{i,t-1} \] = the product of the accumulated value of exercisable stock option squared and overconfidence.

\( \varepsilon_{i,t} \) = error term with \( \text{E}(\varepsilon_{i,t}) = 0 \).

### Hypotheses tests for the gain domain.

To test the significance of changes in strategic risk-taking (SRT) in the gain domain, pooled OLS and fixed-effects model with one-way clustering were used. The level of significance was reported at 0.05, 0.01 and 0.001 levels.

- Hypothesis 1(a) tests the effect of the accumulated value of in-the-money unexercisable stock option on SRT in the gain domain.

- Hypothesis 1(b) tests the effect of the accumulated value of in-the-money exercisable stock option on SRT in the gain domain.
- Hypothesis 1(c) tests the effect of the accumulated value of restricted stock on SRT in the gain domain.
- Hypothesis 3(a) tests the moderating effect of overconfidence on the relationship between unexercisable stock option and SRT in the gain domain.
- Hypothesis 3(b) tests the moderating effect of overconfidence on the relationship between exercisable stock option and SRT in the gain domain.
- Hypothesis 3(c) tests the moderating effect of overconfidence on the relationship between restricted stock and SRT in the gain domain.

**Domain of loss.** This study used the perceived loss in the accumulated value of EBC to create loss frames for CEOs. Perceived loss is decrease in the accumulated value of EBC under decreasing stock trends, measured by the accumulated value of EBC in t-1 less the accumulated value of EBC in t divided by the value in t-1. Other things being equal, proxies for the accumulated value of each EBC in model (1) and (2) were replaced with the perceived loss in model (3) and (4). Regression model (3) examined the effects of EBC on SRT (Hypotheses 2(a)-(c)). Regression model (4) investigated the moderating effects of managerial overconfidence on the relationship between EBC and SRT (Hypotheses 4(a)-(c)).

\[
SRT_{it} = \beta_0 + \beta_1 \text{PUNEX}_{it} + \beta_2 \text{PEX}_{it} + \beta_3 \text{PRS}_{it} + \beta_4 \text{FRAN}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{PER}_{it} \\
+ \beta_7 \text{CASH}_{it} + \beta_8 \text{OWN}_{it} + \beta_9 \text{TEN}_{it} + \beta_{10} \text{AGE}_{it} + \beta_{11} \text{GEN}_{i} + \epsilon_{it} \quad (3)
\]

\[
SRT_{it} = \beta_0 + \beta_1 \text{PUNEX}_{it} + \beta_2 \text{PEX}_{it} + \beta_3 \text{PRS}_{it} + \beta_4 \text{OC}_{it} + \beta_5 (\text{PUNEX}_{it} \times \text{OC}_{it}) \\
+ \beta_6 (\text{PEX}_{it} \times \text{OC}_{it}) + \beta_7 (\text{PRS}_{it} \times \text{OC}_{it}) + \beta_8 \text{FRAN}_{it} + \beta_9 \text{SIZE}_{it} + \beta_{10} \text{PER}_{it} \\
+ \beta_{11} \text{CASH}_{it} + \beta_{12} \text{OWN}_{it} + \beta_{13} \text{TEN}_{it} + \beta_{14} \text{AGE}_{it} + \beta_{15} \text{GEN}_{i} + \epsilon_{it} \quad (4)
\]

Where
- \( SRT_{it} \) = strategic risk taking of firm \( i \) at time \( t \).
- \( \text{PUNEX}_{it} \) = the perceived loss in the accumulated value of unexercisable stock option of firm \( i \) at time \( t-1 \).
PEX_{i,t-1} = the perceived loss in the accumulated value of exercisable stock option of firm i at time t-1.
PRSi_{i,t-1} = the perceived loss in the accumulated value of restricted stock of firm i at time t-1.
FRAN_{i,t-1} = degree of franchising of firm i at time t-1.
OC_{i,t-1} = CEO overconfidence of firm i at time t-1 (=1 if overconfident, =0 otherwise)
SIZE_{i,t-1} = size of firm i at time t-1.
PER{i,t-1} = performance of firm i at time t-1.
CASH_{i,t-1} = the accumulated value of CEO cash compensation of firm i at time t-1.
OWN_{i,t-1} = the amount of CEO stock ownership of firm i at time t-1.
TEN_{i,t-1} = the number of years employed as CEO of firm i at time t.
AGE_{i,t} = CEO age of firm i at time t.
GEN_{i} = gender of CEO of firm i.
PUNEX_{i,t-1} \times OC_{i,t-1} = the product of the perceived loss in the accumulated value of unexercisable stock option and overconfidence of firm i at time t-1.
PEX_{i,t-1} \times OC_{i,t-1} = the product of the perceived loss in the accumulated value of exercisable stock option and overconfidence of firm i at time t-1.
PRSi_{i,t-1} \times OC_{i,t-1} = the product of the perceived loss in the accumulated value of restricted stock and overconfidence of firm i at time t-1.
\epsilon_{i,t} = error term with E(\epsilon_{i,t}) = 0.

Hypotheses tests for the loss domain. This study used pooled OLS and fixed-effects model clustering at the firm level to test the significance of changes in strategic risk-taking (SRT) in the loss domain. The level of significance was reported at 0.05, 0.01 and 0.001 levels.

- Hypothesis 2(a) tests the effect of perceived loss in the accumulated value of unexercisable stock option on SRT in the loss domain.
- Hypothesis 2(b) tests the effect of perceived loss in the accumulated value of exercisable stock option on SRT in the loss domain.
- Hypothesis 2(c) tests the effect of perceived loss in the accumulated value of restricted stock on SRT in the loss domain.
- Hypothesis 4(a) tests the moderating effect of overconfidence on the relationship between unexercisable stock option and SRT in the loss domain.
- Hypothesis 4(b) tests the moderating effect of overconfidence on the relationship between exercisable stock option and SRT in the loss domain.

- Hypothesis 4(c) tests the moderating effect of overconfidence on the relationship between restricted stock and SRT in the loss domain.

**Hypothesis test for franchising.** The significance of relation between franchising and strategic risk-taking (SRT) was tested by using pooled OLS and fixed-effects model with one-way clustering. The level of significance was reported at 0.05, 0.01 and 0.001 levels.

- Hypothesis 5 tests the relationship between franchising and SRT.
CHAPTER 4

RESULTS

The findings of analyses are presented in this chapter. First, the descriptive statistics are discussed. Second, the results of the multiple regressions to test hypotheses proposed in chapter three are provided. Third, the robustness of the results are tested and discussed.

Descriptive statistics

The dataset of this study includes 42 restaurant companies for the time period between 1992 and 2010. A combination of 42 cross-section (firm) and 18 time-series (year) data consists of unbalanced panels with 532 firm year observations. Table 4.1 presents the descriptive statistics on variables in our model.

The results of the Pearson’s correlation analysis among the variables in our model are presented in table 4.2. The findings of correlation analysis indicated that CEOs may increase strategic risk-taking (SRT) as the values of exercisable and unexercisable options increase in the gain domain. Meanwhile, CEOs may increase SRT as the perceived loss in the values of unexercisable options and restricted stock increase. However, there were no interaction effects of overconfidence and equity-based compensation (EBC) on SRT in both gain and loss domains. As described in the previous chapter, this study contains multiple interaction and squared terms, suggesting the problem of potential multicollinearity in our model. However, the Pearson’s correlation test did not find any high levels of correlations among the variables. This indicates that there may be no significant multicollinearity problem. To correct for potential...
multicollinearity issues, however, all EBC variables were mean-centered to reduce correlations before creating interaction and square terms (Tabachnik & Fidell, 1996; Lim, 2011). As a result, correlations between raw variables and interaction and squared variables were reduced alleviating potential multicollinearity problem.

Comparisons of correlations

It is insightful to show changes in correlations before and after centering. Table 4.3 summarizes the correlation changes between EBC variables and their quadratic terms. The correlation between unexercisable stock option (UNEX) and its quadratic term was 0.867. This correlation dropped to 0.471 after centering UNEX at its mean. This correlation is relatively low enough to not induce severe multicollinearity. Table 4.4 also exhibits correlation changes between EBC variables and their interaction terms with overconfidence. Most correlations were manageable before centering but further decreased after centering. For instance, the correlation between exercisable stock option (EX) and its interaction term with overconfidence (OC) was 0.499 before it was centered. It dropped to 0.231, indicating centering reduced inter-correlation.

Therefore, the analyses of correlations suggested that centering successfully eliminated the multicollinearity problem. We further ran regressions using both uncentered and centered variables and compared their variance inflation factors (VIF). In all regressions, VIFs dropped to acceptable levels when centered variables were used. The comparison of VIFs, therefore, confirmed that the degree of multicollinearity decreased after centering. These findings were shown in tables 4.5-4.8.
Table 4.3. Correlation changes of quadratic terms

<table>
<thead>
<tr>
<th>Quadratic term</th>
<th>UNEX</th>
<th>EX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uncentered</td>
<td>Centered</td>
</tr>
<tr>
<td>UNEX</td>
<td>0.867</td>
<td>0.471</td>
</tr>
</tbody>
</table>

Notes: UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation.

Table 4.4. Correlation changes of interaction terms

<table>
<thead>
<tr>
<th>Interaction term with OC</th>
<th>UNEX</th>
<th>EX</th>
<th>RS</th>
<th>UNEX²</th>
<th>EX²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U</td>
<td>C</td>
<td>U</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>UNEX</td>
<td>0.339</td>
<td>0.287</td>
<td>0.499</td>
<td>0.231</td>
<td>0.617</td>
</tr>
<tr>
<td>EX</td>
<td>0.387</td>
<td>0.273</td>
<td>0.416</td>
<td>0.285</td>
<td></td>
</tr>
</tbody>
</table>

Notes: UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. UNEX² is the accumulated value of unexercisable stock option squared. EX² is the accumulated value of exercisable stock option squared. RS is the accumulated value of restricted stock divided by the total compensation. OC is a binary variable measuring CEO overconfidence (=1 if overconfident, =0 otherwise).

Model specification

Analyzing the panel data models requires particular caution due to unobserved heterogeneity and serial correlation. In order to control for these issues, this study estimated regression models (1)-(4) in the following way. First, this study ran a baseline OLS regression with uncentered variables. Next, OLS with standard errors clustered at the firm level was conducted. To address the issue of multicollinearity, all equity-based compensation (EBC) variables were mean-centered before introducing their interaction terms and the squared terms into the model. As a result, the variance inflation factors (VIFs) for all variables were less than the conventional threshold of 10 (Tabachinik & Fidell, 1996). Comparing and interpreting the results of the two regression models provided clarity in the use of centering and clustering. However, the pooled OLS regression does not account for unobserved factors that may be correlated with explanatory variables in the model. As an alternative specification, the fixed-effects model was further used to produce unbiased and consistent estimates in the analyses. The
time fixed-effects also controls for serial correlation. That is, the time series of observations within the firm were estimated as a single observation and thus any serial correlation could be eliminated. The Hausman specification test was conducted individually for four regression models to determine if the use of the fixed-effects models was appropriate.

**The effect of equity-based compensation on strategic risk-taking**

**Gain domain**

Table 4.5 presents the results for the tests of the effects of equity-based compensation on strategic risk-taking in the domain of gain.

*OLS.* Model (1) was analyzed without centering. Model (2) was analyzed with standard errors clustered at the firm level, using centered variables. It is shown that centering slightly reduced VIF. Interpreting results with uncentered variables may be erroneous due to potential multicollinearity. Indeed, statistical significance was found for quadratic terms in centered regressions. Hence, the findings of model (2) were interpreted. Hypothesis 1(a) argues that there is an inverted U-shaped relationship between the accumulated value of unexercisable stock options (UNEX) and strategic risk-taking (SRT). Consistent with this prediction, the coefficient of UNEX was positive and significant (t=3.90; p<0.001) while the coefficient of its squared term was negative and significant (t=-3.94; p<0.001). Hypothesis 1(b) predicts an inverted U-shaped relationship between the accumulated value of exercisable stock options (EX) and SRT. The results showed that coefficient of EX was positive and significant (t=3.16; p<0.01) and that of its squared term was negative and significant (t=2.35; p<0.05). These findings imply that CEOs may indeed gradually decrease SRT especially as the value of their exercisable and unexercisable stock options increase. Hypothesis 1(c) expected a negative relationship between
the accumulated value of restricted stock (RS) and SRT. However, this hypothesis was not supported, finding a positive relationship (t=2.44; P<0.05) between the accumulated value of RS and SRT.

*Fixed-effects.* Panel data models suffer from heteroskedasticity and autocorrelation which can lead to biased and inconsistent results. To control for these issues, model (3) was analyzed using the both firm and time fixed-effects with cluster robust standard errors. The results of Hausman specification test confirmed that fixed-effects model was a better choice over random-effects model ($\chi^2=333.74; p<0.001$). Hypothesis 1(a) suggests there is an inverse U-shaped relationship between the accumulated value of unexercisable stock options (UNEX) and strategic risk-taking (SRT). This was supported as the coefficients of UNEX and its squared terms were positive and negative, respectively, at the 5 percent significance level. Hypothesis 1(b) was also supported, finding a significant inverse U-shaped relationship between the accumulated value of exercisable stock options (EX) and SRT. The coefficient of EX was positive and significant (t=2.12; p<.05) and its squared term showed a negative and significant coefficient (t=-2.75; p<0.05). However, hypothesis 1(c) did not receive support as the coefficient of the accumulated value of restricted stock (RS) was not significant. As predicted by our model, CEOs may increase SRT from low to moderate levels of the accumulated values of exercisable and unexercisable stock options but decrease SRT at high values.

*Summary of findings.* The results from both cluster-robust OLS and fixed-effects models showed that there is an inverted U-shaped relationship between the accumulated value of stock options and strategic risk-taking. This relationship was constant regardless of stock option exercise status. However, unlike we expected, both regression models found a positive
relationship between restricted stock and strategic risk-taking while it was significant only in cluster-robust OLS model.

**Loss domain**

This study further investigated the effects of equity-based compensation on strategic risk-taking in the domain of loss. The results of OLS regression and fixed-effects model are presented in Table 4.6.

**OLS.** The results of cluster-robust OLS showed that the perceived loss in the accumulated value of unexercisable stock options (PUNEX) positively impacted strategic risk-taking (SRT) (t=2.06; p<0.05). Thus, hypothesis 2(a) was supported. Hypothesis 2(b) states that CEOs will increase SRT as the level of loss in their exercisable stock options increases. This was not supported as the coefficient of the perceived loss in the accumulated value of exercisable stock options (PEX) was negative and significant (t=-2.62; p<0.01). Hypothesis 2(c) predicts that there was a positive relationship between the perceived loss in the accumulated value of restricted stock (PRS) and SRT. The PRS variable had a negative and insignificant coefficient, providing no support for hypothesis 2(c).

**Fixed-effects.** The second regression model was analyzed using the fixed-effects model. The Hausman test statistics confirmed that the fixed-effects model was suitable for this regression model ($\chi^2=182.98; p<0.001$). Consistent with our argument, there was a positive relationship between PUNEX and SRT (t=2.70; p<0.01). Thus, hypothesis 2(a) received support. The coefficient of PEX was negative and insignificant, not supporting hypothesis 2(b). Finally, hypothesis 2(c) was not supported because the effect of PRS on SRT was not statistically significant at the 5 percent level (t=-1.88). The findings of the two regressions suggested that
CEOs may increase the magnitude of SRT even when the loss in the value of unexercisable stock options increases.

**Summary of findings.** Both cluster-robust OLS and fixed-effects models found support for the positive effect of the perceived loss in the accumulated value of unexercisable stock options on strategic risk-taking. However, neither the perceived loss of the accumulated value of exercisable stock options nor restricted stock had a significantly positive effect on strategic risk-taking in the two models.

**The moderating effect of overconfidence**

**Gain domain**

Table 4.7 presents the results for the tests of the moderating effect of CEO overconfidence on the relationship between equity-based compensation and strategic risk-taking in the domain of gain.

**OLS.** First, OLS regression was used to test hypotheses 3(a)-(c). Uncentered variables were used in model (1) and centered variables in model (2). Comparing VIFs between models (1) and (2) suggested that model (1) may provide false interpretation of interaction effects. Hence, findings of model (2) were interpreted. Hypothesis 3(a) posits that CEO overconfidence (OC) will mitigate the negative effect of the accumulated value of unexercisable stock options (UNEX) on strategic risk-taking (SRT) at high values of UNEX. Consistent with this argument, the interaction term of OC and UNEX squared was positive and significant (t=2.12; p<0.05).

Hypothesis 3(b) predicts that OC will positively moderate the relationship between the accumulated value of exercisable stock options (EX) and SRT. However, the interaction term of OC and EX squared was not statistically significant, failing to provide support for hypothesis
3(b). Finally, the moderating effect of OC on the relationship between the accumulated value of restricted stock (RS) and SRT was not found significant. Hypothesis 3 (c), hence, did not receive support.

**Fixed-effects.** The findings of fixed-effects model are shown in column 3. The Hausman test revealed that the use of fixed-effects model was appropriate for this regression model ($\chi^2=189.75, p<0.001$). Year dummy variables were included to control for a time effect. Hypothesis 3(a) was supported as the interaction term of OC and UNEX squared was positive and significant ($t=2.64; p<0.01$). This suggests that overconfident CEOs will continue to increase SRT even at high values of UNEX. Hypothesis 3(b) argues that OC will positively moderate the relationship between EX and SRT. This was not supported. The interaction term between OC and EX squared was negative and not significant. Although the interaction variable of OC and RS was positive, this was not statistically significant. Therefore, hypothesis 3(c) did not receive support.

**Summary of findings.** The positive moderating effect of overconfidence on the relationship between the accumulated value of unexercisable stock options and strategic risk-taking was found significant in both cluster-robust OLS and fixed-effects models. However, the sign and significance of the coefficients on the interaction and quadratic terms of exercisable stock options were inconsistent in the two regression models. The interaction term between the accumulated value of restricted stock and overconfidence was positive but not significant in both models. Analyzing the moderating effect of overconfidence showed that CEOs may still take greater risks even when they perceive high levels of gain in the accumulated value of unexercisable stock options. To illustrate and interpret the effect of overconfidence on the relationship between the accumulated value of unexercisable stock options (UNEX) and strategic
risk-taking (SRT), we plotted this moderation effect in figure 8. As figure 8 indicates, the relationship between UNEX and SRT appears to be inverted curvilinear. The relationship was plotted for overconfident and non-overconfident CEOs, individually. For both CEOs, SRT initially increases with UNEX but it levels off and decreases at moderate to high levels of value. A slightly less steep slope of the curve for overconfident CEOs indicates that overconfident CEOs appear to experience a slower decrease in SRT with high levels of UNEX. In addition, the maximum of the curve for overconfident CEOs is shifted to the right compared with that of non-overconfident CEOs. This finding suggests that overconfident CEOs are more tolerable for risk-aversion bias even when they perceive high levels of value in UNEX.

Loss domain

The analyses were conducted separately using an OLS and fixed-effects model. The results are presented in table 4.8.

**OLS.** The first regression was analyzed using uncentered variables and without clustering. The second regression used centered variables and cluster robust standard errors to correct for heterogeneity. Although VIFs did not differ after centering, the regression model (2) provided more statistically significant findings. Hypothesis 4(a) posits that CEO overconfidence (OC) will positively moderate the relationship between the perceived loss in the accumulated value of unexercisable stock options (PUNEX) and strategic risk-taking (SRT). The coefficient of the interaction of OC and PUNEX was negative and statistically insignificant. Thus, hypothesis 4(a) was not supported. Hypothesis 4(b) predicts the positive moderating effect of overconfidence on the relationship between the perceived loss in the accumulated value of exercisable stock options (PEX) and SRT. This was not supported as the interaction term had a statistically insignificant
coefficient. Finally, hypothesis 4(c) failed to receive support because the interaction term of OC and the perceived loss in the accumulated value of restricted stock (PRS) was not significant.

**Fixed-effects.** The second regression was analyzed using the time fixed-effects. The result of Hausman test indicated that the fixed-effects model would perform better than the random-effects model ($\chi^2=42.27; p<0.001$). The interaction term of OC and PUNEX was negative and insignificant, finding no support for hypothesis 4(a). However, the coefficient of the PUNEX was positive and significant ($t=2.53; p<0.01$). This is consistent with the findings from the regression model (2) in table 4.6, confirming the main effect of PUNEX on SRT. It implies that CEOs may increase SRT even when they perceive increased losses in the value of unexercisable stock option. The interaction term of OC and PEX was not significant, failing to support hypothesis 4(b). Hypothesis 4(c) predicts that overconfidence will intensify the positive effect of PRS on SRT. In contrast, overconfidence appeared to negatively moderate the relationship between them ($t=-2.03; p<0.05$). Hypothesis 4(c), therefore, did not receive support.

**Summary of findings.** Both cluster-robust OLS and fixed-effects models did not find the positive moderating effect of overconfidence on the relationship between all three types of equity-based compensation variables and strategic risk-taking. In fact, the signs of the interaction terms between equity-based compensation variables and overconfidence were consistently negative in both models.

**The relationship between franchising and SRT**

Hypothesis 5 predicts that there is a negative relationship between the degree of franchising (FRAN) and strategic risk-taking (SRT). The findings in table 4.5, 4.7, and 4.8 provided consistent evidence that franchising had a negative effect on strategic risk-taking. The
results were also robust to both OLS and fixed-effects models. The coefficients of the FRAN variables were negative and significant at either 5 or 1 percent significance level. Although not significant, the coefficient of the FRAN variable in the fixed-effects regression model in table 4.6 was also negative. Therefore, hypothesis 5 was partially supported.

**Robustness checks**

The robustness of the findings was checked by using alternative measures of EBC in the fixed-effects models. This study re-estimated regression models in table 4.5 and 4.7, using the natural log of the accumulated value of EBC. Table 4.9 exhibits the results of the two regression analyses. The Hausman specification tests were run separately and the results confirmed the use of fixed-effects model was appropriate for both models ($\chi^2 = 591.31$ and $\chi^2 = 254.39$, respectively; p<0.001). In column (1), the effect of EBC on SRT in the gain domain was tested. The effects of UNEX and UNEX squared on SRT was positive and negative, respectively, (p<0.05). The effects of EX and EX squared on SRT was positive and negative, respectively, but not statistically significant. The effect of RS on SRT was negative but not significant. Finally, the relationship between franchising and SRT was negative and significant (t=-2.25; p<0.05). The second regression analyzed the moderating effects of OC on the relationship between EBC and SRT in the gain domain. The interaction effect of OC and UNEX squared on SRT was positive and significant (t=2.47; p<0.05). This confirmed that overconfidence positively moderated the relationship between UNEX and SRT. The interaction effect of OC and EX squared on SRT was positive but not significant. In contrast to our argument, the interaction term between OC and RS was negative and insignificant. Lastly, franchising showed a negative relationship with SRT (t=-2.14; p<0.05). In sum, these findings were qualitatively similar to earlier findings.
Further, this study repeated all regression analyses with two-way clustering. Peterson (2009) argued that clustering on year may be redundant and unnecessary if the year dummy variables could completely remove the correlation between observations in the same time period. Although untabulated, the standard errors clustered by firm and year did not change significantly, suggesting firm clustering is sufficient in our models. The results were qualitatively similar to those of previous analyses. Finally, all regressions were re-estimated using different control variables. For instance, size was measured as the log of assets instead of the log of sales. Return on assets (ROA), an accounting performance measure, was substituted with a market-based measure, total shareholder returns (TSR). The results were qualitatively consistent with the previous findings.

**Summary of overall findings**

In this chapter, the main findings of the analyses are presented. This study empirically tested proposed hypotheses using two different regression specification models: cluster-robust pooled OLS and fixed-effects model. The results of hypotheses testing are summarized in table 4.10.

**The effect of equity-based compensation on strategic risk-taking**

*Gain domain.* This study found evidence for hypotheses 1(a) and 1(b): the inverse U-shaped relationship between the accumulated value of unexercisable stock options and strategic risk-taking, and between the accumulated value of exercisable stock options and strategic risk-taking in the domain of gain. In the gain domain, CEOs increase strategic risk-taking as the accumulated values of both exercisable and unexercisable stock options increase but decrease risk-taking at their high values protect their wealth attached to their stock options. Hypothesis
1(c) was not supported. Although the effect of the accumulated value of restricted stock on strategic risk-taking in the gain domain was significant in pooled OLS regression specification, its relationship was positive.

Loss domain. As predicted, the positive relationship between the perceived loss in the accumulated value of unexercisable stock options and strategic risk-taking in the loss domain was found, supporting hypotheses 2(a). However, this study did not find support for hypotheses 2(b) and 2(c). The test statistics for these hypotheses were not significant in both cluster-robust pooled OLS and fixed-effects model.

The moderating effect of CEO overconfidence

Gain domain. Hypothesis 3(a) was supported as CEO overconfidence positively moderated the relationship between the accumulated value of unexercisable stock options and strategic risk-taking in the gain domain. This finding indicates that overconfident CEOs are less likely to become risk-averse even when they perceive significant increase in value in their unexercisable stock options. Hypotheses 3(b) and 3(c) did not receive support.

Loss domain. Although hypotheses 4(a)-(c) predicted the positive moderating effect of overconfidence on the relationship between equity-based compensation and strategic risk-taking in the loss domain, no statistically significant evidence was found for these hypotheses.

The relationship between franchising and strategic risk-taking

Finally, hypothesis 5 was partially supported. The effect of franchising on strategic risk-taking was found consistently significant except for the fixed-effects model in table 4.6. The
negative relationship between franchising and strategic risk-taking suggests that restaurant companies with a high level of franchising are less likely to take greater risks in investments.
Figure 1. An overview of the research questions

Overconfidence

Gain domain
Increase in the accumulated value of EBC perceived as gain.

Loss domain
Decrease in the accumulated value of EBC perceived as loss.

Equity-based compensation (EBC)

Strategic risk-taking (SRT)

Franchising
Figure 2. Description of proposed hypotheses

Equity-based compensation (EBC)

Gain domain

H1a
Exercisable option

H1b
Unexercisable option

H1c
Restricted stock

Loss domain

H2a
Exercisable option

H2b
Unexercisable option

H2c
Restricted stock

Overconfidence

Strategic risk-taking (SRT)

H3a

H3b

H3c

H4a

H4b

H4c

Franchising

H5
Figure 7. Overconfidence moderation effect

Notes: SRT is strategic risk-taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. OC is CEO overconfidence (=1 if overconfident, =0 otherwise).
Table 1. Comparison of agency and behavioral agency models

<table>
<thead>
<tr>
<th></th>
<th>Agency model</th>
<th>Behavioral agency model (BAM)</th>
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<tbody>
<tr>
<td>Decision situations</td>
<td>Not considered</td>
<td>Gain</td>
</tr>
<tr>
<td>Risk preferences</td>
<td>Constant risk-aversion</td>
<td>Risk-averse</td>
</tr>
<tr>
<td>Effect of EBC</td>
<td>EBC encourages managers to take greater risks to increase firm value.</td>
<td>EBC induces more risk aversion as managers want to lower risk to their personal wealth.</td>
</tr>
<tr>
<td>Expected effect of overconfidence</td>
<td>Not considered</td>
<td>Alleviates risk aversion.</td>
</tr>
<tr>
<td>Study</td>
<td>Type of EBC</td>
<td>Effect of EBC</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rajgopal and Shevlin (2001)</td>
<td>Executive stock options</td>
<td>Executive stock options have a positive relation with future exploration risk-taking.</td>
</tr>
<tr>
<td>Sanders and Hambrick (2007)</td>
<td>Stock option pay (as the proportion of total compensation paid)</td>
<td>CEO stock options engender high levels of investment spending while delivering extreme performance.</td>
</tr>
<tr>
<td>Sanders (2001)</td>
<td>Stock options granted during a given year</td>
<td>CEOs with high level of stock option pay are more likely to engage in acquisitions and divestitures.</td>
</tr>
<tr>
<td>Devers, Wiseman, and Holmes (2008)</td>
<td>Exercisable, unexercisable stock options and restricted stock</td>
<td>A positive relation between unexercisable options and SRT. A negative relation between exercisable options squared and SRT. A negative relation between restricted stock and SRT.</td>
</tr>
<tr>
<td>Lim (2011)</td>
<td>Exercisable, unexercisable stock options and restricted stock</td>
<td>A positive relation between unexercisable options and SRT. A negative relation between unexercisable options squared and SRT. A positive relation between exercisable options and SRT.</td>
</tr>
</tbody>
</table>

Notes: EBC and SRT refer to equity-based compensation and strategic risk-taking, respectively.
Table 2.2. A summary of empirical evidence: the effects of EBC in the loss domain

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<tr>
<th>Study</th>
<th>Type of EBC</th>
<th>Effect of EBC</th>
</tr>
</thead>
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<tr>
<td>Zhang, Bartol, Smith, Pfarrer, and Khanin (2008)</td>
<td>Number of out-of-the-money stock options</td>
<td>CEOs are more likely to manipulate firm earnings when they perceive loss.</td>
</tr>
<tr>
<td>Devers, Wiseman, and Holmes (2007)</td>
<td>Unexercisable in-the-money stock options</td>
<td>Under decreasing price trends, managers will give a premium for stock volatility, indicating risk-seeking behavior in the loss domain</td>
</tr>
<tr>
<td>Sawers and Wright (2006)</td>
<td>In-the-money and at-the-money stock options</td>
<td>Participants in the experiment choose riskier projects when they perceive loss.</td>
</tr>
</tbody>
</table>

Note: EBC refers to equity-based compensation.
Table 4.1 Summary of descriptive statistics

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<th>Mean</th>
<th>Median</th>
<th>S.D.</th>
<th>Min</th>
<th>Max</th>
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<td>32452.39</td>
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<td>535703</td>
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<tr>
<td>UNEX ($ in thousands)</td>
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<td>6098.057</td>
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<td>66357.66</td>
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<tr>
<td>EX ($ in thousands)</td>
<td>5473.009</td>
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<td>13001.53</td>
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<td>134196.5</td>
</tr>
<tr>
<td>RS ($ in thousands)</td>
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<td>2151.954</td>
<td>0</td>
<td>20310.75</td>
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<tr>
<td>PUNEX</td>
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<td>1</td>
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<td>ASSET ($ in millions)</td>
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<td>444.7895</td>
<td>4371.656</td>
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<td>CASH ($ in thousands)</td>
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<td>OWN (%)</td>
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Note: SRT is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. RS is the accumulated value of restricted stock divided by the total compensation. PUNEX is the perceived loss in the accumulated value of unexercisable stock option. PEX is the perceived loss in the accumulated value of exercisable stock option. PRS is the perceived loss in the accumulated value of restricted stock. The perceived loss variables are presented in percent as a difference between the value in the current year t and the value in the previous year t-1 divided by the value in the previous year t-1. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. TSR is the total shareholder returns, measured by the sum of adjusted stock price and adjusted dividends in year t divided by adjusted stock price in t-1. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female). OC is CEO overconfidence (=1 if overconfident, =0 otherwise).
Table 4.2 Summary of Pearson correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>SRT</th>
<th>OC</th>
<th>EX_{t-1}</th>
<th>UNEX_{t-1}</th>
<th>RS_{t-1}</th>
<th>PEX</th>
<th>PUNEX</th>
<th>PRS</th>
<th>ROA_{t-1}</th>
<th>TSR_{t-1}</th>
<th>TEN</th>
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<tr>
<td>OC</td>
<td>532</td>
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<tr>
<td>UNEX_{t-1}</td>
<td>532</td>
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<td>-0.112*</td>
<td>0.116*</td>
<td>1.000</td>
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<td>RS_{t-1}</td>
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<td>PEX_{t-1}</td>
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<td>0.095*</td>
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<td>0.001</td>
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<td>PRS_{t-1}</td>
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<td>0.115*</td>
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<td>0.253**</td>
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<td>-0.203**</td>
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<td>-0.028</td>
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<td>-0.131**</td>
<td>-0.042</td>
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</table>

Note: SRT is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. EX is the accumulated value of exercisable stock option divided by the total compensation. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. RS is the perceived loss in the accumulated value of exercisable stock option. PEX is the perceived loss in the accumulated value of restricted stock. The perceived loss variables are presented in percent as a difference between the value in the current year t and the value in the previous year t-1 divided by the value in the previous year t-1. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. TSR is the total shareholder returns, measured by the sum of adjusted stock price and adjusted dividends in year t divided by adjusted stock price in t-1. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female). OC is CEO overconfidence (=1 if overconfident, =0 otherwise).

* significant at 0.05, ** significant at 0.01
Table 4.2 Summary of Pearson correlations (Continued)

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<tr>
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<th>TSR&lt;sub&gt;t-1&lt;/sub&gt;</th>
<th>REV&lt;sub&gt;t-1&lt;/sub&gt;</th>
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<th>CASH&lt;sub&gt;t-1&lt;/sub&gt;</th>
<th>OWN&lt;sub&gt;t-1&lt;/sub&gt;</th>
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<td>-0.219**</td>
<td>-0.168**</td>
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Note: SRT is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. PUNEX is the perceived loss in the accumulated value of unexercisable stock option. PEX is the perceived loss in the accumulated value of exercisable stock option. PRS is the perceived loss in the accumulated value of restricted stock. The perceived loss variables are presented in percent as a difference between the value in the current year t and the value in the previous year t-1 divided by the value in the previous year t-1. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. TSR is the total shareholder returns, measured by the sum of adjusted stock price and adjusted dividends in year t divided by adjusted stock price in t-1. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female). OC is CEO overconfidence (=1 if overconfident, =0 otherwise). * significant at 0.05, ** significant at 0.01
Table 4.5 Results of pooled OLS and fixed-effects analysis: The effects of EBC on SRT in the gain domain

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<td>(0.93)</td>
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<td>(9.97)</td>
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<td>Adj. R(^2)</td>
<td>0.43</td>
<td>0.41</td>
<td>0.66</td>
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</table>

Note: STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. UNEX\(^2\) is the accumulated value of unexercisable stock option squared. EX\(^2\) is the accumulated value of exercisable stock option squared. RS is the accumulated value of restricted stock divided by the total compensation. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. OC is CEO overconfidence (=1 if overconfident, =0 otherwise). SIZE is the natural log of revenues. PER is return on asset (ROA), measured by the net income divided by total assets. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female).

* significant at 0.05, ** significant at 0.01, *** significant at 0.001
Table 4.6 Results of pooled OLS and fixed-effects analysis: The effects of EBC on SRT in the loss domain

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<th>Centered VIF</th>
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<td>PRS</td>
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<td>-0.044</td>
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<td>Adj. R^2</td>
<td>0.43</td>
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Note: STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. PUNEX is the perceived loss in the accumulated value of unexercisable stock option. PEX is the perceived loss in the accumulated value of exercisable stock option. PRS is the perceived loss in the accumulated value of restricted stock. The perceived loss variables are presented in percent as a difference between the value in the current year (t) and the value in the previous year (t-1) divided by the value in the previous year (t-1). FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. OC is CEO overconfidence (=1 if overconfident, =0 otherwise). SIZE is the natural log of revenues. PER is performance, measured by the net income divided by total assets (ROA). CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female).
* significant at 0.05, ** significant at 0.01, *** significant at 0.001
Table 4.7 Results of pooled OLS and of fixed-effects analysis: The moderating effect of overconfidence on the relationship between EBC and SRT in the gain domain

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Note: STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. UNEX$^2$ is the accumulated value of unexercisable stock option squared. EX$^2$ is the accumulated value of exercisable stock option squared. RS is the accumulated value of restricted stock divided by the total compensation. UNEX*OC is the product of the accumulated value of unexercisable stock option and overconfidence. EX*OC is the product of the accumulated value of exercisable stock option and overconfidence. RS*OC is the product of the accumulated value of restricted stock and overconfidence. UNEX$^2$*OC is the product of the accumulated value of unexercisable stock option squared and overconfidence. EX$^2$*OC is the product of the accumulated value of exercisable stock option squared and overconfidence. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. OC is CEO overconfidence (=1 if overconfident, =0 otherwise). SIZE is the natural log of revenues. PER is return on asset (ROA), measured by the net income divided by total assets. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female).

* significant at 0.05, ** significant at 0.01, *** significant at 0.001
Table 4.8 Results of pooled OLS and of fixed-effects analysis: The moderating effect of overconfidence on the relationship between EBC and SRT in the loss domain

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<td>(0.05)</td>
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<td>0.033**</td>
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<td>-0.096</td>
<td>0.032</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(-2.25)</td>
<td>(0.72)</td>
<td>(0.24)</td>
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<tr>
<td>PRS</td>
<td>0.051</td>
<td>0.038</td>
<td>-0.009</td>
</tr>
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<td></td>
<td>(1.17)</td>
<td>(0.81)</td>
<td>(-0.43)</td>
</tr>
<tr>
<td>PUNEX*OC</td>
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<td>0.044</td>
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<td>(1.05)</td>
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<td>PEX*OC</td>
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<td>-0.031</td>
<td>-0.010</td>
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<td>(-0.29)</td>
<td>(-0.73)</td>
<td>(-0.44)</td>
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<td>-0.036*</td>
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<td>(10.20)</td>
<td>(17.05)</td>
<td>(6.06)</td>
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<tr>
<td>ROA</td>
<td>0.045</td>
<td>0.051</td>
<td>0.010</td>
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<tr>
<td></td>
<td>(0.64)</td>
<td>(1.40)</td>
<td>(0.30)</td>
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<td>CASH</td>
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<td>-0.390***</td>
<td>-0.103***</td>
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<td>(-4.57)</td>
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<td>(-3.54)</td>
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<tr>
<td>OWN</td>
<td>0.041</td>
<td>0.007</td>
<td>0.012</td>
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<tr>
<td></td>
<td>(0.51)</td>
<td>(0.16)</td>
<td>(0.41)</td>
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<tr>
<td>FRAN</td>
<td>0.254</td>
<td>-0.141***</td>
<td>-0.182*</td>
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<tr>
<td></td>
<td>(1.90)</td>
<td>(-4.02)</td>
<td>(-2.25)</td>
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<tr>
<td>TEN</td>
<td>-0.111</td>
<td>-0.100*</td>
<td>-0.051</td>
</tr>
<tr>
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<td>(-1.28)</td>
<td>(-2.56)</td>
<td>(-0.66)</td>
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<tr>
<td>AGE</td>
<td>0.105</td>
<td>0.130***</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>(1.06)</td>
<td>(3.76)</td>
<td>(1.31)</td>
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<td>0.011</td>
<td>0.006</td>
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<td>(0.37)</td>
<td>(0.28)</td>
</tr>
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<td>N</td>
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<td>427</td>
<td>476</td>
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<tr>
<td>Adj. $R^2$</td>
<td>0.39</td>
<td>0.40</td>
<td>0.59</td>
</tr>
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</table>

Note STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. PUNEX is the perceived loss in the accumulated value of unexercisable stock option. PEX is the perceived loss in the accumulated value of exercisable stock option. PRS is the perceived loss in the accumulated value of restricted stock. The perceived loss variables are presented in percent as a difference between the value in the current year (t) and the value in the previous year (t-1) divided by the value in the previous year (t-1). PUNEX*OC is the product of the accumulated value of unexercisable stock option and overconfidence. PEX*OC is the product of the
accumulated value of exercisable stock option and overconfidence. PRS*OC is the product of the accumulated value of restricted stock and overconfidence. FRAN is degree of franchising of firm, measured by the ratio of the number of franchise units to total units. OC is CEO overconfidence (=1 if overconfident, =0 otherwise). SIZE is the natural log of revenues. PER is performance, measured by the net income divided by total assets (ROA). CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female).

* significant at 0.05, ** significant at 0.01, *** significant at 0.001
Table 4.9 Robustness check: The effect of EBC on SRT and the moderating effect of OC on the relationship between EBC and SRT in the gain domain

<table>
<thead>
<tr>
<th></th>
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<th>(2) FE</th>
<th>VIF</th>
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<td>OC</td>
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<td>0.023*</td>
<td>1.67</td>
<td>0.081*</td>
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<td></td>
<td>(2.72)</td>
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<td>(2.17)</td>
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<tr>
<td>EX</td>
<td>0.025</td>
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<td></td>
<td>(0.37)</td>
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<tr>
<td>RS</td>
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<td>-0.004</td>
<td>1.81</td>
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<tr>
<td></td>
<td>(-0.12)</td>
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<tr>
<td>UNEX2</td>
<td>-0.090*</td>
<td>1.37</td>
<td>-0.021</td>
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<td>EX2</td>
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<td>0.020</td>
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<td>(-1.16)</td>
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<td>(0.49)</td>
<td></td>
</tr>
<tr>
<td>UNEX*OC</td>
<td>0.111*</td>
<td></td>
<td>2.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.37)</td>
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<td></td>
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<tr>
<td>EX*OC</td>
<td>0.056</td>
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<td>4.73</td>
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<tr>
<td>RS*OC</td>
<td>-0.034</td>
<td></td>
<td>1.91</td>
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</tr>
<tr>
<td></td>
<td>(-0.99)</td>
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<td></td>
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</tr>
<tr>
<td>UNEX^2*OC</td>
<td>0.066*</td>
<td></td>
<td>1.87</td>
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<tr>
<td></td>
<td>(2.47)</td>
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<tr>
<td>EX^2*OC</td>
<td>0.033</td>
<td></td>
<td>4.81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.76)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.547***</td>
<td>2.44</td>
<td>0.550***</td>
<td>2.08</td>
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<td></td>
<td>(5.35)</td>
<td></td>
<td>(5.11)</td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>0.021</td>
<td>1.41</td>
<td>0.017</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>(0.72)</td>
<td></td>
<td>(0.59)</td>
<td></td>
</tr>
<tr>
<td>CASH</td>
<td>-0.014</td>
<td>1.52</td>
<td>-0.015</td>
<td>1.56</td>
</tr>
<tr>
<td></td>
<td>(-0.47)</td>
<td></td>
<td>(-0.61)</td>
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</tr>
<tr>
<td>OWN</td>
<td>0.026</td>
<td>1.57</td>
<td>0.007</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td></td>
<td>(0.14)</td>
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</tr>
<tr>
<td>FRAN</td>
<td>-0.164*</td>
<td>1.27</td>
<td>-0.161*</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>(-2.25)</td>
<td></td>
<td>(-2.14)</td>
<td></td>
</tr>
<tr>
<td>TEN</td>
<td>-0.019</td>
<td>1.78</td>
<td>-0.028</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>(-0.24)</td>
<td></td>
<td>(-0.33)</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>-0.064</td>
<td>1.28</td>
<td>-0.058</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>(-1.01)</td>
<td></td>
<td>(-0.87)</td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>-0.022</td>
<td>1.13</td>
<td>-0.006</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td>(-0.98)</td>
<td></td>
<td>(-0.23)</td>
<td></td>
</tr>
</tbody>
</table>
Note: STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. RS is the accumulated value of restricted stock divided by the total compensation. UNEX$^2$ is the accumulated value of unexercisable stock option squared. EX$^2$ is the accumulated value of exercisable stock option squared. UNEX*OC is the product of the accumulated value of unexercisable stock option and overconfidence. EX*OC is the product of the accumulated value of exercisable stock option and overconfidence. RS*OC is the product of the accumulated value of restricted stock and overconfidence. UNEX$^2$*OC is the product of the accumulated value of unexercisable stock option squared and overconfidence. EX$^2$*OC is the product of the accumulated value of exercisable stock option squared and overconfidence. FRAN is degree of franchising, measured by the ratio of the number of franchise units to total units. OC is CEO overconfidence (=1 if overconfident, =0 otherwise). SIZE is the natural log of revenues. PER is return on asset (ROA), measured by the net income divided by total assets. CASH is the accumulated value of CEO cash compensation of firm, divided by the total compensation. OWN is the amount of CEO stock ownership, expressed as the as a percentage of total shares outstanding. TEN is the number of years employed as CEO. AGE is CEO’s age. GEN is the gender of CEO (=0 if male, =1 female).

* significant at 0.05, ** significant at 0.01, *** significant at 0.001
### Table 4.10 Summary of hypotheses testing

<table>
<thead>
<tr>
<th>Hypotheses tests</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H1(a)</strong> There is an inverted U-shaped relationship between UNEX and SRT in the gain domain.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>H1(b)</strong> There is an inverted U-shaped relationship between EX and SRT in the gain domain.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>H1(c)</strong> There is a negative relationship between RS and SRT in the gain domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H2(a)</strong> SRT will increase as PLUNEX increases in the loss domain.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>H2(b)</strong> SRT will increase as PLEX increases in the loss domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H2(c)</strong> SRT will increase as PLRS increases in the loss domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H3(a)</strong> Overconfidence will alleviate the negative effect of UNEX on SRT in the gain domain.</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>H3(b)</strong> Overconfidence will alleviate the negative effect of EX on SRT in the gain domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H3(c)</strong> Overconfidence will alleviate the negative effect of RS on SRT in the gain domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H4(a)</strong> Overconfidence will intensify the positive effect of PLUNEX on SRT in the loss domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H4(b)</strong> Overconfidence will intensify the positive effect of PLEX on SRT in the loss domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H4(c)</strong> Overconfidence will intensify the positive effect of PLRS on SRT in the loss domain.</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>H5</strong> There is a negative relationship between franchising and SRT.</td>
<td>Partially supported</td>
</tr>
</tbody>
</table>

Note: STR is strategic risk taking, constructed by the sum of the log of R&D investment, capital investment, acquisition investment, and long-term debt. UNEX is the accumulated value of unexercisable stock option divided by the total compensation. EX is the accumulated value of exercisable stock option divided by the total compensation. RS is the accumulated value of restricted stock option divided by the total compensation. OC is CEO overconfidence (=1 if overconfident, =0 otherwise).
CHAPTER 5

DISCUSSION AND CONCLUSION

Discussion

The purpose of this study is to: 1) examine the effect of equity-based compensation on strategic risk-taking, and 2) the moderating effect of overconfidence on the relationship between equity-based compensation and strategic risk-taking in the U.S. restaurant industry. Based on loss aversion arguments, this study specifically focused on investigating these effects in different decision situations: gain and loss. The findings of this study provided meaningful empirical evidence to understand the relationship between EBC and SRT and behavioral impact on this relationship in the U.S. restaurant industry.

The effect of equity-based compensation in the gain domain

First, the results showed that there was an inverted U-shaped relationship between the accumulated value of stock options and strategic risk-taking in the U.S. restaurant industry. This relationship was consistently and statistically significant whether stock option was exercisable or unexercisable.

As behavioral agency model (BAM) predicted, stock options may not encourage CEOs to increase risky investments especially when their accumulated value is sufficiently high. Hence, the intended effects of stock option grant may not occur when CEOs perceive the potential gains stemming from their stock options are great. For instance, CEOs might want to choose to delay risky strategic investment projects following significant increases in their stock option values.
This corroborates the loss aversion arguments that CEOs will exhibit more risk-averse behaviors when they frame high accumulated value of stock option as gains. These findings imply that value increase in stock options resulted from strong firm performance could engender undesired effects on future firm investments. Nevertheless, the inverse U-shaped relationship between stock option and strategic risk-taking provides an important understanding regarding firm investment behaviors. Upon granting stock options, restaurant companies should, therefore, carefully consider conditions whether stock options can promote risk-averse behaviors of CEOs.

**The effect of equity-based compensation in the loss domain**

This study found a positive linear relationship between the perceived loss in the accumulated value of unexercisable stock options and strategic risk-taking. That is, the perceived loss in the accumulated value of unexercisable stock options positively impacted strategic risk-taking in the U.S. restaurant industry. Given that declining stock prices effectively creates loss frames for CEOs, they exhibited risk-seeking behaviors when they perceived decrease in the value of unexercisable stock options. Although statistically insignificant, the relationship between the perceived loss in the accumulated value of exercisable stock option and strategic risk-taking was negative. These findings may indicate that CEOs will take greater risks only when they perceive loss in the value of unexercisable stock options. In contrast to loss aversion arguments, however, it may be because CEOs might be less sensitive to losses in the value of unexercisable stock options. For example, losses in the value of unexercisable stock options cannot be realized and technically zero at the time of loss. They can implement risky investment strategies in anticipating dramatic improvement in firm performance. In turn, CEOs may be less likely to take greater risks if losses can be immediately realized. For instance, potential losses that can result from highly risky investment projects may loom more realistic with exercisable
stock options. In a similar vein, the relationship between the perceived loss in the accumulated value of restricted stock and strategic risk-taking was negative. However, this relationship was not statistically significant. Matta and McGuire (2008) supported this view, arguing that CEOs tend to reduce their share holdings when performance is poor. These findings provide valuable insights into the association between equity-based compensation and risk behaviors of CEOs. In particular, granting stock options to CEOs when firm performance is poor (e.g. in the loss domain) may help promote SRT because recently granted stock options are unexcisable.

**Moderating effect of overconfidence in the gain domain**

Although the results found support for only one of the interaction hypotheses 3(a)-(c), the mixed findings provided interesting implications. We found that in the gain domain, overconfidence will positively moderate the relationship between the accumulated value of unexcisable stock options and strategic risk-taking. As shown in figure 8, it appeared that the effect was most pronounced at higher levels of value in unexcisable stock options. In particular, strategic risk-taking dropped more rapidly for non-overconfident CEOs than for overconfident CEOs at higher levels of value. The effect of overconfidence was a facilitation of strategic risk-taking at high value, which led to a less pronounced curvilinear relationship. Moreover, the maximum of the curve for overconfident CEOs was placed to the right of that for non-overconfident CEOs, indicating that they are less sensitive to potential losses stemming from high levels of value in unexcisable options. Hence, we might expect overconfident CEOs to be more tolerant to risk aversion bias. Because the negative effect of unexcisable stock options on strategic risk-taking decreased in magnitude for overconfident CEOs, considering behavioral aspect of CEOs appears to be an effective approach to compensation strategy.
On the other hand, overconfidence failed to positively moderate the effect of exercisable stock options on strategic risk-taking. From the endowment perspective (Kahneman et al., 1990), CEOs are more likely to endow value from exercisable options into their perceptions of personal wealth. This indicates that the concern for downside risk becomes stronger as these options take on increasing value. We argue that this concern is much greater than the influence of overconfidence in relation to strategic risk-taking. That is, the concern for losses and/or downside risk may outweigh the influence of overconfidence, suppressing risky behaviors. Therefore, these results suggest that the influence of overconfidence is complex, varying between unexercisable and exercisable stock options.

**Moderating effect of overconfidence in the loss domain**

In the loss domain, this study expected to find the positive moderating effect of overconfidence on the relationship between perceived loss in the accumulated value of equity-based compensation and strategic risk-taking. However, we did not find any significant positive moderating effects. All interaction terms between perceived loss in the accumulated value of equity-based compensation and overconfidence were negative. These findings indicate that the influence of overconfidence in the loss domain may be minimal. Instead, CEOs could focus on more realistic and immediate concerns such as survival (Devers et al., 2008). Some researchers argued that CEOs perceive survival as a reference point when firm performance is poor (Lopes, 1987; Shapira, 1995). They further posited that CEOs who focus on the survival reference point tend to be risk-averse and engage in less risky actions such as initiating cost reduction measures, downsizing and delaying long-term investment projects.
Franchising and control variables

Finally, we found partial support for the negative effect of franchising on SRT. The relationship between franchising and strategic risk-taking was consistently negative in all regressions. This finding indicates that CEOs pursuing franchising tend to be more risk-averse. Franchisors usually bear no contingent liabilities greatly reducing risks involved in restaurant operations. Franchising can also help CEOs pursue growth at much lower cost as it requires relatively small capital investments. Hence, restaurant companies can strategically adopt franchising as a means to constrain their risks and more effectively use their capital. Among control variables, we found that firm size positively affected strategic risk-taking. This is consistent with our arguments that larger restaurant firms are less constrained to take risky investments. Unlike our expectation, however, CEO cash compensation was found negatively related to strategic risk-taking. In general, cash compensation is granted following successful firm performance. CEOs may choose to restrain risky investments that can significantly harm firm performance in order to continue their past successes.

Contributions

The goal of this study was to provide a more comprehensive understanding of the effect of equity-based compensation on strategic risk-taking. This study makes several important theoretical and practical contributions to this goal.

First, this study found partial support for the role of loss aversion and endowment effect in understanding the behavioral effects of equity-based compensation. Our results showed that CEOs’ willingness to take risk relied on: 1) whether they are loss-averse, and 2) whether they establish full ownership of EBC. Although prior compensation research addressed both loss
aversion and the endowment of stock option value, their effects on risk behaviors remain equivocal (Hall & Murphy, 2002; Sanders & Hambrick, 2007; Devers et al., 2007; Devers et al., 2008; Lim, 2011). We found that the divergence between the endowment of unexercisable and exercisable stock option value played an important role in better explaining the effect of equity-based compensation. Therefore, developing models that can test both loss aversion and endowment effect may offer more accurate insights into the relationship between equity-based compensation and strategic risk-taking.

Second, this study could provide U.S. restaurant companies with a guideline for executive compensation plans. The inverted curvilinear association between the accumulated value of stock options and strategic risk-taking implies that stock option as an incentive in increasing strategic risk-taking may be limited in the gain domain. Especially, granting stock options to CEOs who are holding highly profitable stock options may not be very effective. Additional increments of stock options will provide less of an incentive for CEOs to take greater risks (Holmes et al., 2011). Because CEOs may develop concern for the potential losses stock options at considerably high levels of value could exacerbate risk aversion. To alleviate this concern for downside risk, the board can proactively provide insurance against market price fluctuations. For example, firms can reduce the exercise price for out-of-the-money stock options (repricing) or replace expired stock options with new ones (reloading). Devers et al. (2008) also argued that awarding cash compensation, instead of stock options, may motivate risky behaviors. Firms may want to consider using these alternative compensation plans to promote strategic risk-taking. Therefore, shareholders and board of directors of the U.S. restaurant companies should carefully analyze the status of CEO stock options and execute compensate plans accordingly to achieve the intended purpose of equity-based compensation.
Third, this study could provide more comprehensive explanations for the effect of equity-based compensation on strategic risk-taking by empirically testing this effect in the loss domain. Although most previous compensation studies assumed risk-seeking behaviors in the loss frames (Sanders & Hambrick, 2007; Larraza-Kintana et al., 2007; Devers et al., 2008; Lim, 2011), this was rarely tested empirically. We tested risk behaviors by creating loss frames using CEOs’ perceived loss in the value of equity-based compensation. This study found evidence for risk-seeking behaviors in the loss domain when CEOs perceived loss in the accumulated value of unexercisable stock options. Although we did not provide full support for arguments in prospect theory, the results of this study suggest more extensive research may be required to develop a holistic understanding about the effect of equity-based compensation on strategic risk-taking in varying decision situations.

Lastly, understanding CEOs’ characteristics may help U.S. restaurant companies design more efficient compensation packages. We argued that considering behavioral factors such as overconfidence could offer a partial remedy to overcome risk-averse behaviors. The positive moderating effect of overconfidence in the gain domain suggests that overconfidence may help align risk preferences between managers and shareholders even when equity-based compensation fails to do so. Especially, we found that overconfidence will mitigate the negative effect of the accumulated value of unexercisable stock options on strategic risk-taking. This indicates that overconfident CEOs would consider a risky option with potential negative outcomes that can reduce their equity-based wealth. One possible explanation is that the potential losses stemming from the risky choice may not provide much concern for these CEOs since they tend to overestimate future success and underestimate risk involved (Heaton, 2022; Hackbarth, 2009; Malmendier & Tate, 2005, 2008, Ben-David et al, 2007; Gervais et al., 2011). In addition,
unexercisable stock options are argued to be not entirely endowed with the personal wealth of CEOs (Devers et al., 2008; Lim, 2011). Overconfident CEOs could continue to engage in risky investments so long as they perceive their wealth safe from the losses. For instance, CEOs may face no actual risk to their personal wealth when the value of unexercisable stock options drops because these options have no actual value unless exercised. However, the positive moderating effect was not found between the accumulated value of exercisable stock options and strategic risk-taking. This further suggests that firms may encourage CEOs to take greater risks by allowing longer vesting periods rather than granting additional stock options. Shareholders and/or investors can benefit from managerial overconfidence as reduced executive pay may contribute to improving firm value (Keiber, 2005; Gervais et al., 2011). Thus, the findings of this study could provide important implications for practitioners to improve firm value by efficiently designing executive compensation packages.

**Limitations**

This study has several limitations. First, the proxy for overconfidence used in this study could be improved in the future studies. Malmendier and Tate (2005, 2008) developed several different proxies for overconfidence, allowing overconfident and non-overconfident CEOs to vary between/within firms and within CEOs. For example, they compared overconfident and non-overconfident CEOs across different firms and within the same firm. However, our dataset did not allow much within firm variation. Future studies could utilize alternative methods, such as surveys and/or interviews, to measure CEO overconfidence to improve our findings.

Second, a more precise definition of strategic risk may be required. Although the proxy for strategic risk-taking used in this study has been widely adopted in empirical studies (Sanders,
2001; Sanders & Hambrick, 2007; Devers et al., 2008; Lim, 2011), the definition of strategic risk in the restaurant industry remains unclear. For instance, restaurant firms rarely incur spending on research and development, one of the components of strategic risk-taking (Slattery & Olsen, 1984). This suggests that industry specific definition for strategic risk might be needed to provide better understanding of its association with equity-based compensation.

Third, the effects of equity-based compensation may be limited. This study assumed that equity-based compensation of corporate executives matters significantly to strategic risk-taking of their firms. More generally, it was assumed that CEOs have the ultimate say in corporate strategic decisions. However, organizational theory argues that corporate strategic choices are affected by various environmental, organizational and individual factors (Hannan & Freeman, 1977; Lawrence & Lorsch, 1967; Child, 1972). For example, we cannot assume risk structures are relatively constant across firms. Firms holding excessive amounts of debt experience a larger financial risk than those holding a substantial amount of cash. Thus, the impact of equity-based compensation on strategic risk-taking for highly risky firms may exhibit different patterns. In addition, the amount of accumulated personal wealth varies by CEOs. The accumulated wealth of CEOs from their entire tenure may also influence their behaviors. CEOs with high levels of accumulated wealth may not be very interested in the payoff from their newly granted equity-based compensation. As a result, risk-taking may not be attractive for these CEOs as new stock options have very little impact on their wealth. Hence, investigating organizational and individual level variances could help improve our findings. For instance, future research could categorize firms based on their risk structures and/or the accumulated wealth of CEOs and investigate their effects in relation to equity-based compensation.
Fourth, our sample represents relatively a small group of CEOs in the restaurant industry because it was selected based on CEO equity-based compensation information. For example, the average tenure of the sampled CEOs was relatively longer (14 years). Collecting data on managers at various levels may help create more representative sample.

Finally, our examination was limited to the valuation of in-the-money equity-based compensation. In particular, loss frames were created by assuming that CEOs perceive decrease in value of the in-the-money equity-based compensation as losses. Although the literature found some support for this argument (Devers et al., 2007; Holmes et al., 2011), the results of our study did not find full support for risk-seeking behaviors in the loss domain. We expect that out-of-the-money equity-based compensation might validate prospect theory arguments. Out-of-the-money stock options refer to those whose market price is lower than its exercise price. Hence, the value from out-of-the-money stock options can be immediately perceived as losses, facilitating stronger loss-averse behaviors. Zhang et al. (2008) found evidence that earnings manipulations were more frequent among CEOs whose stock options are out-of-the-money. The valuation of this form of stock options appears to be complex and challenging because its value is technically zero. However, exploring the valuation of out-of-the-money EBC and its effect may provide an interesting avenue for future research.

**Future research directions**

This study has led to calls for two important future research opportunities. First, the findings of this study suggest that investigating individual behavioral aspects can improve our understanding of corporate decision making processes and their implications. Although we assumed that managerial behaviors reflect firm strategic behaviors, there are criticisms about
how organizational behaviors can be explained by predictors at the individual-level (Homels et al., 2011). Building on these critiques, we intend to find more direct outcomes of managerial behaviors. While it is challenging to construct measurements of direct outcomes of managerial behaviors, Devers et al. (2007) provided valuable insights. They conducted a scenario-based survey for middle-level managers on their risk behaviors and found evidence for loss-aversion. More meaningful implications can be drawn by building a direct connection between managers and their behavioral outcomes. For example, investigating middle-management and their risk behaviors in the restaurant industry might provide useful insights into behavioral finance research stream as their behaviors have more direct impact on daily operations.

Second, we believe that the relationship between franchising and strategic risk-taking needs to be further explored. Although we found the negative relationship between franchising and strategic risk-taking, our sample was selected based on CEO overconfidence. Franchising might induce different risk behaviors in more general samples. While we assumed high levels of franchise reduces operational and financial risks, it may also be reasonable to assume that franchise firms seek risky investments because they require less leverage (Shane, 1996; Sen, 1998). Thus, future research could further pursue investigating the relationship between franchising and strategic risk-taking.

Conclusion

This study explored the effect of equity-based compensation on strategic risk-taking in the U.S. restaurant industry. Unlike what agency theorists argued, our results indicated that equity-based compensation might not be an efficient driver to promote strategic risk-taking. We also found that CEOs in restaurant firms pursuing high degrees of franchising are less likely to
engage in strategic risk-taking. These findings are particularly important for the restaurant industry as franchising is one of the unique characteristics in the restaurant industry. Further, it was found that understanding behavioral aspect of CEOs could provide more realistic explanations for the association between equity-based compensation and risk behaviors. In the hospitality literature, there has been very limited research on compensation and/or CEO decision-making from a behavioral perspective. Therefore, the findings of this study could provide industry and academia with valuable insights into understanding of the complex association between equity-based compensation and its impact on strategic risk-taking.
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