



The Impact of Executive Incentive Design on Risk-Taking: An Examination of Existing Scholarly Literature

Dr.Lingam Sampath¹,Dr.G.Naresh²,Dr.A.Gopi Krishna³,Mr.S.Phaneendra⁴

¹ Principal, Balaji Institute of Management Sciences, Narsampet, Warangal.Email id: lsp5683@gmail.com

² Associate Professor & HoD-MBA, Balaji Institute of Technology and Sciences, Narsampet, Warangal
Email id: nareshbies@gmail.com

³ Associate Professor & HoD -MBA , Balaji Institute of Management Sciences, Narsampet, Warangal

⁴ Associate Professor & HoD-ME, Balaji Institute of Technology and Sciences, Narsampet, Warangal

Abstract

This study includes a thorough evaluation of the literature on the effect of financial executive incentives on risk-taking behavior. The purpose of this research is to look at two important aspects of executive risk-taking behavior: (i) the effect of the compensation function's curvature (steepness, convexity, concavity), and (ii) the effect of reference points. This method improves upon and updates the data found in standard text books. Within this structure, we identify the core individual, organizational, and environmental factors that could be used to evaluate an incentive program's success. This paper looks at the real-world effects of incentive system design and recommends directions for future study.

Keywords: Incentives, Risk-Taking, Compensation, Conventional and Executive

DOI: 10.48047/ecb/2023.12.Si6.744

1. Introduction

To influence people's propensity to take risks, Sprinkle and Williamson (2008) suggest using financial incentives. Baiman (1990) argues that the need to manage risk-taking stems from a misalignment between employee risk preferences and those of employers. This is especially important for executives who must make important, long-term decisions for the organization. When an executive's risk preference is at odds with that of the firm's owners, Ittner and Laecker (2001) argue that suitable compensation structures are necessary to ensure that all parties' interests are aligned. The detrimental effects of improper incentives on company output are well documented in the literature of business. The fall of Lehman Brothers, a large financial institution was emblematic of the recession that occurred between 2007 and 2009, also known as the financial crisis. Excessive risk-taking can cause institutions' bankruptcy and ripple repercussions throughout the economy, as seen by a number of high-profile situations (Williams, 2010). The public and many national governments have since concluded that the "Wall Street bonus culture," the excessive

compensation given to bankers, played a significant role in encouraging excessive risk-taking that contributed to the 2008 financial crisis. Shapiro (1995) argues that a company's survival and its competitive edge depend on its willingness to take risks. Management's unwillingness to accept "economically reasonable" risks can have just as negative an effect as would excessive risk-taking on a company's viability. In their case study titled "Kodak and Xerox: How High Risk Aversion Impacts Organisational Performance," Cuthbertson et al. (2015) provide a thorough evaluation of the results of various risk strategies. The conclusion reached in the study is substantial and warrants further consideration. The authors claim that Kodak avoided major dangers because of this mindset. Kodak's major market was eroded by the rise of new technologies like digital photography, forcing the corporation to liquidate key parts of its core business. Similar trends were observed at Xerox, which faced a drop in its core markets. Xerox's success may be traced back to the company's willingness to invest in projects with higher risk and higher returns on investment, as well as in R&D. Using pay as a technique to encourage risk-taking and boost company success is supported by behavioural and economic theories. We review the literature that has been done before on the topic of CEO risk-taking and how it relates to compensation structure and key performance indicators. Our number one priority is to achieve the following aims.

At first, a theoretical framework is offered to investigate how choices about the structure of financial incentives affect people's willingness to take risks. Specifically, we look at the expected utility theory of agency, the prospect theory of agency, the security potential and ambition theory of agency, and the behavioural agency model of agency. To understand what motivates people to take risks and how to maximize the effectiveness of incentives, a firm grasp of the underlying theoretical implications is essential.

The second goal of this research is to identify and classify incentive design alternatives based on their potential to affect risk-taking behavior. It is widely acknowledged that the compensation function and reference elements are the primary drivers of risk-taking behavior.

We then proceed to examine, clarify, and compare studies from many other academic disciplines, including business, economics, finance, management, and even psychology. The significant moderating impacts and underlying mechanisms for each compensation scheme are also illustrated visually. We conclude by identifying and discussing possible future directions for exploration.

The theoretical and practical contributions included in this review are extensive. In the first stage, results from empirical studies are compiled and presented to improve and update the common understanding of the primary effect of incentives on risk-taking. Implementing capped compensation schemes results in a concave compensation function, which appears to have a moderating influence on risk-taking. We give a thorough analysis of the empirical research that supports this idea, and we also incorporate some unexpected findings. Researchers Kreilkamp et al. (2021) found that even among people who would not be directly affected financially by the cap, there was a significant reduction in the propensity to take risks because of the policy change.

In addition, we deepen our comprehension of conventional wisdom by determining the moderators that affect the connection between incentives and risk-taking. Companies must be aware of these moderators if they are to properly comprehend the idea that incentive systems are not suitable in all situations. It is generally accepted that stock options result in convex compensation functions that motivate individuals to take risks. Researchers found that stock options have a greater effect on risk in smaller companies than in larger ones. A thorough review of the existing academic literature reveals that there are several moderators that are more important than others. These include firm size, tenure, and leverage. The results of numerous studies corroborate this claim.

Such modifiers should be assessed by businesses on three levels: the individual, the organization, and the external context. The compensation function is also the primary focus of the first part of our analysis. The next section elaborates on how the importance of compensation goes beyond the specifics of its monetary value, organizational design, and timing. However, it also incorporates how the salary compares to other relevant internal or external benchmarks, such as past salary levels and the salaries of similar employees. The research shows that all types of compensation systems, such as option-based pay and tournaments, share the trait of being dependent on a common reference point. The incentive structure and possible moderators are only part of the picture when trying to explain and anticipate an executive's behavior in a given situation. It is also important to figure out which standards this CEO is most likely to use. Supervisory boards might reasonably use indicators of possible excessive risk-taking by executives, such as a low ranking position or stock options priced at the current market price.

Finally, suggestions for further research are included in this article. Future studies could contrast and contrast methods for establishing a fixed level of risk-taking, such as restrictions and internal debt. It may also be instructive to investigate the role of context in influencing the relative efficacy of each mechanism.

Here we detail the remaining steps of this project. The framework is introduced and its theoretical foundations are clarified in Section 2. Following this part, we will present our review findings (3.2), and then describe the procedure we used to select the studies for our review (3.1). The implications for practice and future research are discussed in the final section. Our final thoughts are included in this section's conclusion.

2 Background

2.1 Risk and risk-taking

There are always dangers and pitfalls to be aware of when making managerial decisions. Risk, as described by Sitkin and Pablo (1992, p. 10), is the degree of apprehension one feels while contemplating the likelihood of potentially significant and/or undesirable outcomes emerging from decision-making. Libby and Fishburn (1977) pointed to the variety of possible decision outcomes as an illustration of uncertainty. These results might not always be negative and might even have some positive repercussions. The risk to the decision-maker must be substantial, however, thus it's important that these considerations be sufficiently large. Taking risks is described as exposing oneself to potential harm when making a decision (Sitkin & Pablo, 1992, p. 10).

Many different operationalizations are used to investigate risk and risk-taking phenomena in empirical research. Individual-based, firm-based, and market-based approaches are the three most frequently seen methods. In order to evaluate the efficacy of individual-based measures, experimental investigations frequently use risk elicitation tools (Kreilkamp et al., 2021). One might infer the respondents' risk-taking proclivities from how they understand the questions. Crosetto and Filippin (2013) provide a clear illustration with the explosive risk elicitation task. Researchers applying a firm-based approach investigate how a company's strategic decisions affect its exposure to risk. For instance, empirical research has shown that higher levels of firm risk and, by extension, a greater propensity of executives to engage in risk-taking behavior, are associated with increased spending on R&D (Sanders and Hambrick, 2007), reduced hedging activities (Knopf et al., 2002), or increased acquisition investments (Hou et al., 2020). Methods based on

the market are frequently used to put risk into practice. Market metrics like stock return volatility are used in these methods, as evidenced by Baixauli-Soler et al.'s (2015) research.

2.2 The theoretical link between incentives and risk-taking

Principals, who may be compared to corporate owners, and agents, who can be compared to corporate executives, have different goals and face an information gap, as argued by Baiman (1990). Asymmetry of information might exist either before or after a contract is put into action. Both adverse selection and moral hazard can be traced back to asymmetric knowledge before and after a contract is signed (Macho-Stadler & Pérez-Cárcel, 2001). Studies by Kadan and Swinkels (2008), Edmans and Liu (2011), and Laux (2015) demonstrate that the existing corpus of literature focuses primarily on the connection between managerial risk-taking and moral hazard. Both "hidden action" and "hidden information," in which the agent gains confidential knowledge after the contract is signed but before it is revealed to the principal, give birth to the moral hazard idea.

It is possible for an agent to make decisions regarding actions and risk levels that are not in the principal's best interests when the agent's activities and the associated risks are not observable or when the agent possesses sensitive information about the risks associated with their actions. This means that the principal must provide incentives to the agent in order to influence the latter's actions.

2.3 Determinants of risk-taking

Many economic models have been developed to analyze the elements that influence the connection between manager pay and risk taking. Managers' risk-taking and pay are examined, together with factors including managers' wealth, diversification, hedging options, the feasibility of performance targets, risk aversion, and other moderating variables. Smith and Stulz (1985), Lambert et al. (1991), Carpenter (2000), and Brisley (2006) are just a few of the researchers who have looked into these factors. In order to strengthen and improve the analysis, this study conducts a critical evaluation of the available empirical evidence. In order to accomplish this, it is necessary to have knowledge about the factors that influence risk-taking. A model for understanding how an individual's risk propensity and perception interact is provided by Sitkin and Pablo (1992). The term "risk propensity" is used to describe a person's natural tendency to take risks or avoid them, depending on their personal risk preferences, their level of inertia, and the results of their previous choices. An individual's perception of risk is the result of a series of mental operations that lead to an intuitive assessment of danger. According to Sitkin and Pablo (1992), the environment in which a person

experiences danger has a significant impact on their interpretation of that risk. One factor is the incentive and control structures in place inside a business, which can direct leadership's focus and energy. Therefore, it is essential to examine risk perception as a lens through which to examine the effect of incentive design decisions on risk-taking behavior.

Decisions are typically heavily influenced by mental heuristics (Luft & Shields, 2009). Many seemingly unreasonable actions when it comes to taking risks have their roots in the theoretical framework known as cumulative prospect theory (CPT).

According to the aforementioned theory, an S-shaped utility function centered on a given reference point can be used to explain a person's propensity to engage in risky behavior (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). According to prospect theory, people are risk-averse when it comes to potential rewards but risk-seeking when it comes to potential setbacks.

The person's frame of reference could shift over time as well. This may arise as a result of the presentation of the circumstance or other external factors. Organizations must consider the executives' reference points and the potential framing effects when designing executive compensation. The SP/A theory extends the research from prospect theory by focusing on the emotional components of wanting something (Lopes, 1987; Lopes & Oden, 1999). The S stands for safety, P for possibility, and A for ambition, according to the SP/A hypothesis. The desire to avoid poverty is linked to the idea of safety. The desire to reach a certain goal or benchmark is what we mean when we talk about aspiration, whereas the desire to reach greater heights of success is what we mean when we talk about potential. When compared to the Cognitive Process Theory (CPT), the SP/A theory proposes that managers' risk assessment behaviors vary depending on whether they are activated in a security or potential focus. The degree of focus is determined by how likely it is that the goal will be attained. When managers believe they can reliably earn a certain salary, they are more likely to take calculated risks in pursuit of even greater payoffs. There is also the possibility that managers will resort to risky behavior in order to achieve their desired level of reward. A manager's propensity for risk-taking is thus influenced by factors like performance targets that have an effect on the stability of the manager's income and goals.

According to Gomez-Mejia and Wiseman (1997) and Wiseman and Gomez-Mejia (1998), The BAM disputes the idea of universal risk preferences and proposes that risk-taking is conditional on a number of extrinsic circumstances. External factors are taken into account explicitly in the model. There are a number of elements that might affect an individual's propensity to take risks, such as the kind and intensity of their

supervision, their track record, their compensation, and evaluation criteria connected to behavior (such as the way problems are framed and the amount of money at stake).

2.4 Configuration and design of executive incentives

If we want to make educated suggestions for incentive design and learn how compensation is related to the tendency for risky behavior, we need a methodical approach to organizing performance-based remuneration. Risk-taking behavior was investigated in a study by Beck et al. (2020), with a particular emphasis on the effects of various design elements. The primary goal of this study, however, is to examine the moderating influences of human, organizational, and environmental variables on the aforementioned relationship.

Companies wishing to implement a performance-based pay system must first establish transparent criteria for measuring performance, define the characteristics of the compensation mechanism, and specify the various forms of awards that will be made available to employees (Merchant and Van der Stede, 2017). Sundaram and Yermack (2007) and Merchant and Van der Steen (2017) both look at the numerous forms of compensation that businesses might use, such as cash, stock options, and debt. Cash is a common component of both short-term and long-term incentive programs, as stated by Beck et al. (2020). The disbursement of funds is frequently tied to the achievement of measurable objectives. Stock options and other forms of compensation tied to the success of a company's stock are examples of equity-based compensation. Commonly held by a small group of people, restricted stock is a form of stock ownership. Merchant and Van der Stede (2017) state that the CEO is not required to make a payment for the shares, but rather is given permission to transfer them at a later date. Phantom shares are a type of restricted stock that have no physical manifestation but represent the stock's value in some other way.

Stock options are an additional equity-based remuneration mechanism. Prior to the expiration of the option, the executive will have the opportunity to purchase shares of the firm at a predetermined price for a period of time known as the vesting period. If the stock price rises over the option's strike price, the CEO can benefit by selling the option or buying stock at the higher price. According to Merchant and Van der Stede (2017), stock market investing allows people to make money with little to no risk of losing it. Debt-based compensation, often known as internal debt (Sundaram and Yermack, 2007), is another type of remuneration. Many other types of compensation, like as pensions and deferred pay, fall under the umbrella of "internal debt," often known as "management-owned debt." Some have argued that executives might benefit from being incentivized to think about the possibility of insolvency and the value of assets by include internal debt in their compensation packages.

In the presence of stock options, the compensation function is convex, whereas in the presence of debt compensation, it is concave. Executive compensation is said to display convexity when it shows a more noticeable increase when the firm's performance transitions from medium to high levels than a reduction as the firm's performance transitions from low to medium. Pay for executives is said to be "concave" when it rises less sharply from medium to high levels of performance than it does from low to medium levels of performance. The term "convexity" is used to define the ratio of fixed to performance-based compensation since it sounds similar to option payments. Our investigation is based less on the actual payment than on the compensation function. The results are consistent with prior empirical studies evaluating the connection between the compensation function and people's propensity to take risks, suggesting a direct link. It is possible to formulate a theoretical framework based on performance objectives and metrics, one that is consistent with the view of Wiseman and Gomez-Mejia (1998) that the presentation or framing of performance goals and measures is the primary mediator of their effect on risk-taking behavior. User-generated information has a lower potential for scholarly modification because of its brevity.

3. Review

3.1 Study selection process

The literature review was conducted in accordance with the principles outlined by Tranfield et al. (2003). The comprehensive assessment conducted by Fischer (2007) is of utmost importance. The first step involves analyzing scholarly articles of high caliber that have showcased substantial research from the years 2013 to 2018. Subsequently, relevant works are identified and integrated into the study. The user's text is deemed insufficient for academic purposes. This study was enriched by the contributions of other researchers who conducted comprehensive searches across numerous databases and library catalogues, employing a diverse range of additional selection criteria. The titles and abstracts of the research are subjected to a keyword search in order to select the relevant ones. The bibliographies are subject to increased scholarly scrutiny. Indexing services play a crucial role in the realm of scientific citations by facilitating the identification of fresh references to previously published works. There is a total of five. Ultimately, a comprehensive examination is conducted on all pertinent scholarly articles pertaining to the research inquiry, with a particular focus on empirical investigations. There are precisely six in all. The omission of a theoretical framework in the investigation was neglected. A total of 76 sensors have been identified. The vast majority of these research have been published in the last fifteen years.

3.2 Empirical findings

3.2.1 Compensation function steepness

The relationship between the pay function's gradient and the company's future performance is indicative of the extent to which the financial stability of its top executives influences organizational outcomes. The modification of inclination can be achieved through two distinct methods: firstly, by directly altering the gradient of the compensation function, and secondly, by introducing additional variables, such as an increased number of share alternatives. In light of the uncertainties that businesses face, it is plausible for senior executives to perceive a more pronounced incline in a mathematical function as a potential sign of heightened risk. Nevertheless, the examination of theoretical aspects provides insights into the correlation between an intensified compensating mechanism and propensity for risk, and the comprehensibility of this connection relies on the fundamental assumptions of an individual's risk inclinations.

The impact of risk on the performance of a group of mutual fund managers was investigated by Massa and Patgiri (2009). The results of their study provide empirical evidence that engaging in risk-taking behavior may have a positive impact on productivity. Based on the outcomes of their research, it can be inferred that a heightened correlation between managers' remuneration and their performance tends to engender a greater propensity for risk-taking. Consequently, this inclination towards risk-taking contributes to an overall enhancement in fund returns. The present study investigates the existing body of literature pertaining to the association between the steepness of compensation function and individuals' propensity for engaging in risk-taking behavior. The examination of CEO stock ownership is a prevalent practice within academic research, with particular emphasis often placed on the delta factor. In their study, Chava and Purnanandam (2010) employ the variable "Delta" to denote the alteration in CEO wealth resulting from a 1% fluctuation in the stock price. The research conducted by Armstrong and Vashishtha (2012) reveals a favorable correlation between the delta variable and the inclination of managers to augment both systematic and idiosyncratic risks. Alessandri et al. (2018) found that firms that have a significant level of family participation are able to reduce the negative effects of risk-increasing factors. Uhde (2016) conducted a study between 2000 and 2010, examining a sample of European institutions. The research findings revealed a positive correlation between individuals exhibiting a heightened degree of compensatory function and their propensity to partake in risky behaviors. The study conducted by Guo et al. (2015) provides support for the inferences drawn in this analysis. The authors of this study have successfully established a noteworthy association between incentives and the propensity of the banking sector to engage in risk-taking, both prior to and during the occurrence of the financial crisis. The study conducted by Boyallian and Ruiz-Verd (2018) provided empirical evidence that supports a positive correlation between precrisis deltas and the likelihood of

financial crisis failure. Nevertheless, this correlation is solely apparent inside firms that own significant levels of debt. In contrast, the research conducted by Iqbal and Vahamaa (2019) employs data that was gathered from prominent American financial institutions throughout the period spanning from 2005 to 2010. Based on their empirical investigation, the researchers have found no discernible association between the variable delta and managers' inclination towards risk-taking. Conflicting research findings indicate that there exists an inverse correlation between the slope of the compensation function and the inclination towards impulsive behavior. Devers et al. (2008) present empirical findings that demonstrate a negative correlation between limited ownership of stocks and the inclination to engage in strategic risk-taking.

In their study, Hou et al. (2020) examined the risk-taking tendencies exhibited by a sample of 1,500 CEOs listed in the S&P index. The researchers discovered a significant association between higher levels of stock ownership and a diminished likelihood of encountering substantial financial losses. Based on the outcomes of the study, it may be inferred by the authors that investors exhibiting a greater delta value tend to make portfolio decisions characterized by less variance. Knopf and colleagues (2002) arrive at a comparable finding, noting that an escalation in delta is associated with a reduction in risk exposure and a simultaneous increase in hedging endeavors. In the context of business spinoffs, Mazur and Salganik-Shoshan (2019) identified a negative link between delta and firm risk. According to Kim and Lu (2011), the incorporation of external governance should be considered as a moderating element. The association between CEO equity ownership and the probability of high-risk R&D efforts undertaken by their respective companies is identified by the authors. This correlation is valid solely in cases when external governance mechanisms exhibit weakness, but not in instances where they demonstrate strength. Therefore, the potential aversion to risk resulting from the ownership of a significant number of shares can be reduced by adopting external governance mechanisms. Despite the provision of incentives aimed at enhancing the pay-performance sensitivity (delta) for executives, the existing research has yielded ambiguous results, indicating that executives' risk-taking behavior may not consistently coincide with the interests of shareholders. Hence, it is justifiable to contemplate alternate approaches to risk management, such as the utilization of convexity (concavity).

3.2.2 Compensation function curvature

The properties of convex and concave functions are examined using the compensating function paradigm. The primary focus is placed on convex functions, wherein improvements in company performance lead to incremental raises in executive salaries. Given that the firm's performance increases, it is observed that the marginal compensation lowers. Consequently, our attention will be directed towards concave functions.

The presence of convexity is apparent in the functions being examined.

The utilization of convexity as a strategic approach can effectively mitigate the risk aversion that may arise due to probable losses in stock investments. Based on Guay's (1999, p. 66) findings, it can be inferred that the economic value of common stock's convexity is restricted for the majority of chief executive officers. According to Guay, the current system of stock ownership fails to sufficiently motivate CEOs to engage in risk-taking activities. Organizations often implement risk mitigation measures that minimize potential losses for chief executive officers (CEOs), while concurrently maintaining the potential for significant financial gains.

The convexity of executive compensation functions can be assessed by temporarily replacing the fixed pay ratio with performance-based pay. Long-term stock options, sometimes referred to as "long call" options, serve as a viable substitute for the issuance of restricted shares to executives.

Based on the existing data, it can be observed that compensation functions characterized by a convex collection of parameters have a tendency to amplify levels of uncertainty. According to the findings of Wright et al. (2007), there exists a positive correlation between heightened exposure to performance-based pay and an increased propensity to engage in risk-taking behavior. The researchers linked this association to the theoretical construct of short-term convexity. Moreover, the study conducted by Brink et al. (2017) offers empirical support for the notion that heightened levels of performance-based remuneration can lead to the manifestation of unwarranted risk-taking behaviors.

3.2.3 The Comparability of Executive Compensation

According to Hack and Von Bieberstein (2015), Behavioral theories, such as the Behavioral Agency Model (BAM), place importance on the subjective judgment of executives' compensation in relation to predetermined criteria. This pertains to the probable ramifications of executives' complete wealth on their propensity for engaging in risky activity. References may be influenced by a combination of internal and external influences. Therefore, these criteria can be categorized. The act of comparing oneself to peers or engaging in competitive activities can be identified as external influences. Conversely, internal determinants encompass elements such as one's prior year's remuneration or self-determined goals. Primary attention will be directed towards the designated internal points of reference.

Larraza-Kintana et al. (2007) successfully distinguished several forms of risk-taking by employing the internal reference points framework. The authors present evidence of a positive relationship between

compensation variability and a higher inclination towards risk-taking. Conversely, they find that the inherent risk linked to the intrinsic value of stock options is associated with a reduced tendency for risk-taking. The study done by Wiseman and Gomez-Mejia in 1998 shed information on the differential effects of incentives in contexts involving loss versus gain. It is of utmost importance to acknowledge the differentiation in the functioning of incentives between a context of loss and a setting of gain.

The research conducted by Devers et al. (2008) reveals that there exists a non-linear correlation between the utilization of exercisable options and the propensity for engaging in strategic risk. In the year 2013, Martin et al. conducted a study. The outcomes of this study elucidate the inherent trade-off that chief executive officers (CEOs) encounter when contemplating projected future revenues and losses. Lim (2015) argues that utilizing R&D expenditures as a metric for risk assessment reveals that variations from a reference point have an impact on individuals' propensity to take risks. The determination of this was made by employing research and development expenditures as a criterion for assessing risk. Research has indicated that positive deviations are linked to a decrease in risk-taking behavior, whereas negative deviations are associated with an increase in risk-taking inclinations. In a comparable manner, it has been noted that stock options with an at-the-money strike price tend to incentivize higher levels of risk-taking when compared to stock options with an in-the-money strike price. This phenomenon can be attributed to the exercise of all stock options that are currently at-the-money. Sawers et al. (2011) argue that this phenomenon can be attributed to the association between the latter and a gain frame. This phenomenon may be attributed to the association of the latter with a gain frame. Lim's (2017) research provides support for the idea discussed earlier, since it illustrates that the impact of options on CEOs' risk-taking behavior is contingent upon their wealth relative to their reference points. Recent findings indicate that a higher probability of financial insolvency induces individuals to engage in riskier behavior, specifically when there is a negative deviation from a benchmark, particularly in scenarios involving financial losses. This phenomena has been observed in the setting of a negative divergence from a reference point.

4. CONCLUSION

The objective of this subparagraph is to engage in a comprehensive examination of the subject matter. Research has shown that implementing performance-based compensation for executives is a viable strategy for ensuring that their objectives are in line with the overall mission and vision of the organization. The present study aims to examine the correlation between an individual's risk propensity and the incentives provided to executives. Our comprehensive analysis reveals that stock options have a complex impact on individuals' inclination to engage in risky behavior. This implies that organizations aiming to influence

employees' risk-taking tendencies through financial incentives should explore alternative approaches. The lack of clarity about the ramifications of these alternatives is the reason behind this. On one hand, the implementation of a convex compensation function may potentially incentivize CEOs to undertake more risks. Conversely, the existence of concavity within the compensation function has the potential to deter individuals from engaging in risk-taking behavior. When formulating remuneration schemes for their chief executive officers, corporations should consider the elements elucidated by scholarly investigations.

It is recommended that firms incorporate both convexity and concavity elements into their executive compensation structures to mitigate the probability of executives partaking in overly risky conduct. As a result, organizations will be presented with an increased potential to mitigate the inclination of chief executive officers (CEOs) to engage in unjustified risk-taking. Future research will greatly benefit from examining the methods by which the key attributes that lead to the most favorable CEO remuneration can be identified. The fundamental focus of this study pertains to the phenomenon of risk-taking; yet, it is imperative to acknowledge the importance of endeavor. Hence, it is imperative for businesses to exercise prudence in their decision-making process while formulating compensation systems, drawing upon existing research that investigates the influence of incentive systems on employees' propensity for risk-taking and voluntary exertion of effort.

References

1. Anantharaman D, Fang VW, Gong G (2014) Inside debt and the design of corporate debt contracts. *Manag Sci* 60:1260–1280. <https://doi.org/10.1287/mnsc.2013.1813>
2. Anderson JD, Core JE (2018) Managerial incentives to increase risk provided by debt, stock, and options. *Manag Sci* 64:4408–4432. <https://doi.org/10.1287/mnsc.2017.2811>
3. Armstrong CS, Vashishtha R (2012) Executive stock options, differential risk-taking incentives, and firm value. *J Financ Econ* 104:70–88. <https://doi.org/10.1016/j.jfineco.2011.11.005>
4. Bennett RL, Güntay L, Unal H (2015) Inside debt, bank default risk, and performance during the crisis. *J Financ Intermediation* 24:487–513. <https://doi.org/10.1016/j.jfi.2014.11.006>
5. Bettis JC, Bizjak J, Coles JL, Kalpathy S (2018) Performance-vesting provisions in executive compensation. *J Acc Econ* 66:194–221. <https://doi.org/10.1016/j.jacceco.2018.05.001>
6. Billings BK, Moon JR Jr, Morton RM, Wallace DM (2020) Can employee stock options contribute to less risk-taking? *Contemp Acc Res* 37:1658–1686. <https://doi.org/10.1111/1911-3846.12562>
7. Bolton P, Mehran H, Shapiro J (2015) Executive compensation and risk taking. *Rev Finance* 19:2139–2181. <https://doi.org/10.1093/rof/rfu049>
8. Bothner MS, Kang JH, Stuart TE (2007) Competitive crowding and risk taking in a tournament: evidence from NASCAR racing. *Adm Sci Q* 52:208–247. <https://doi.org/10.2189/asqu.52.2.208>
9. Boyallian P, Ruiz-Verdú P (2018) Leverage, CEO risk-taking incentives, and bank failure during the 2007– 10 financial crisis. *Rev Finance* 22:1763–1805. <https://doi.org/10.1093/rof/rfx051>

10. Chen CR, Steiner TL, Whyte AM (2006) Does stock option-based executive compensation induce risk-taking? An analysis of the banking industry. *J Bank Finance* 30:915–945. <https://doi.org/10.1016/j.jbankfin.2005.06.004>
11. Chi S, Huang SX, Sanchez JM (2017) CEO inside debt incentives and corporate tax sheltering. *J Acc Res* 55:837–876. <https://doi.org/10.1111/1475-679X.12169>
12. Cohn A, Engelmann J, Fehr E, Maréchal MA (2015) Evidence for countercyclical risk aversion: an experiment with financial professionals. *Am Econ Rev* 105:860–885. <https://doi.org/10.1257/aer.20131314>
13. Coles JL, Daniel ND, Naveen L (2006) Managerial incentives and risk-taking. *J Financ Econ* 79:431–468. <https://doi.org/10.1016/j.jfineco.2004.09.004>
14. Coles JL, Li Z, Wang AY (2018) Industry tournament incentives. *Rev Financ Stud* 31:1418–1459. <https://doi.org/10.1093/rfs/hhx064>
15. Colonnello S, Curatola G, Hoang NG (2017) Direct and indirect risk-taking incentives of inside debt. *J Corp Finance* 45:428–466.
16. Dong Z, Wang C, Xie F (2010) Do executive stock options induce excessive risk taking? *J Bank Finance* 34:2518–2529. <https://doi.org/10.1016/j.jbankfin.2010.04.010>
17. Doukas JA, Mandal S (2017) CEO risk preferences and hedging decisions: a multiyear analysis. *J Int Money Finance* 86:131–153. <https://doi.org/10.1016/j.jimonfin.2018.04.007>
18. Edmans A, Liu Q (2011) Inside debt. *Rev Finance* 15:75–102. <https://doi.org/10.1093/rof/rfq008>
19. Elsilä A (2015) Trade credit risk management: the role of executive risk-taking incentives. *J Bus Finance Account* 42:1188–1215. <https://doi.org/10.1111/jbfa.12130>
20. Eriksen KW, Kvaløy O (2014) Myopic risk-taking in tournaments. *J Econ Behav Organ* 97:37–46. <https://doi.org/10.1016/j.jebo.2013.10.004>
21. Fischer D (2017) *Eskalation und Deeskalation von Commitments*. Springer, Wiesbaden
22. Francis BB, Hasan I, Hunter DM, Zhu Y (2017) Do managerial risk-taking incentives influence firms' exchange rate exposure? *J Corp Finance* 46:154–169. <https://doi.org/10.1016/j.jcorpfin.2017.06.015>
23. Gomez-Mejia L, Wiseman RM (1997) Reframing executive compensation: an assessment and outlook. *J Manag* 23:291–374. <https://doi.org/10.1177/014920639702300304>
24. Guay WR (1999) The sensitivity of CEO wealth to equity risk: an analysis of the magnitude and determinants. *J Financ Econ* 53:43–71. [https://doi.org/10.1016/S0304-405X\(99\)00016-1](https://doi.org/10.1016/S0304-405X(99)00016-1)
25. Guo L, Jalal A, Khaksari S (2015) Bank executive compensation structure, risk taking and the financial crisis. *Rev Quant Finance Account* 45:609–639. <https://doi.org/10.1007/s11156-014-0449-1>
26. Hack A, Von Bieberstein F (2015) How expectations affect reference point formation: an experimental investigation. *Rev Manag Sci* 9:33–59. <https://doi.org/10.1007/s11846-014-0121-0>
27. Hagedorff J, Vallasca F (2011) CEO pay incentives and risk-taking: evidence from bank acquisitions. *J Corp Finance* 17:1078–1095. <https://doi.org/10.1016/j.jcorpfin.2011.04.009>
28. Hvide HK (2002) Tournament rewards and risk taking. *J Labor Econ* 20:877–898. <https://doi.org/10.1086/342041>
29. Iqbal J, Vähämaa S (2019) Managerial risk-taking incentives and the systemic risk of financial institutions. *Rev Quant Finance Account* 53:1229–1258. <https://doi.org/10.1007/s11156-018-0780-z>
30. Ittner CD, Larcker DF (2001) Assessing empirical research in managerial accounting: a value-based management perspective. *J Acc Econ* 32:349–410. [https://doi.org/10.1016/S0165-4101\(01\)00026-X](https://doi.org/10.1016/S0165-4101(01)00026-X)
31. Jensen MC, Meckling WH (1976) Theory of the firm: managerial behavior, agency costs and ownership structure. *J Financ Econ* 3:305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
32. Jia N (2018) Tournament incentives and stock price crash risk. *Acc Horiz* 32:101–121. <https://doi.org/10.2308/acch-52120>

33. Kim EH, Lu Y (2011) CEO ownership, external governance, and risk-taking. *J Financ Econ* 102:272–292. <https://doi.org/10.1016/j.jfineco.2011.07.002>
34. Kini O, Williams R (2012) Tournament incentives, firm risk, and corporate policies. *J Financ Econ* 103:350–376. <https://doi.org/10.1016/j.jfineco.2011.09.005>
35. Kirchler M, Lindner F, Weitzel UTZ (2018) Rankings and risk-taking in the finance industry. *J Finance* 73:2271–2302. <https://doi.org/10.1111/jofi.12701>
36. Knopf JD, Nam J, Thornton JH Jr (2002) The volatility and price sensitivities of managerial stock option portfolios and corporate hedging. *J Finance* 57:801–813. <https://doi.org/10.1111/1540-6261.00442>
37. Kreilkamp N, Matanovic S, Sommer F, Wöhrmann A (2021) The effect of compensation caps on risk-taking. *J Manag Account Res* 33:77–95. <https://doi.org/10.2308/JMAR-18-053>
38. Laux V (2015) Executive Pay, Innovation, and Risk-Taking. *J Econ Manage Strat* 24(2):275–305. <https://doi.org/10.1111/jems.12090>
39. Libby R, Fishburn PC (1977) Behavioral Models of Risk Taking in Business Decisions: A Survey and Evaluation. *J Acc Res* 15:272–292. <https://doi.org/10.2307/2490353>
40. Lim E (2017) CEO option wealth and firm risk-taking: an analysis of multiple reference points. *Long Range Plan* 50:809–825. <https://doi.org/10.1016/j.lrp.2016.12.013>
41. Lim E (2018) Social pay reference point, external environment, and risk taking: an integrated behavioral and social psychological view. *J Bus Res* 82:68–78. <https://doi.org/10.1016/j.jbusres.2017.08.001>
42. Lim ENK (2015) The role of reference point in CEO restricted stock and its impact on R&D intensity in high-technology firms. *Strateg Manag J* 36:872–889. <https://doi.org/10.1002/smj.2252>
43. Liu Y, Gan H, Karim K (2020) Corporate risk-taking after adoption of compensation clawback provisions. *Rev Quant Finance Account* 54:617–649. <https://doi.org/10.1007/s11156-019-00801-y>
44. Lopes LL (1987) Between hope and fear: the psychology of risk. *Adv Exp Soc Psychol* 20:255–295. <https://doi.org/10.1016/S0065->
45. Ma M, Pan J, Stubben SR (2020) The effect of local tournament incentives on firms' performance, risk-taking decisions, and financial reporting decisions. *Acc Rev* 95:283–309. <https://doi.org/10.2308/accr-52506>
46. Martin GP, Gomez-Mejia LR, Wiseman RM (2013) Executive stock options as mixed gambles: revisiting the behavioral agency model. *Acad Manag J* 56:451–472. <https://doi.org/10.5465/amj.2010.0967>
47. Massa M, Patgiri R (2009) Incentives and mutual fund performance: higher performance or just higher risk taking? *Rev Financ Stud* 22:1777–1815. <https://doi.org/10.1093/rfs/hhn023>
48. Mazur M, Salganik-Shoshan G (2019) The effect of executive stock option delta and vega on the spin-off decision. *Q Rev Econ Finance* 72:132–144. <https://doi.org/10.1016/j.qref.2018.11.003>
49. Milidonis A, Nishikawa T, Shim J (2019) CEO inside debt and risk taking: evidence from property-liability insurance firms. *J Risk Insur* 86:451–477. <https://doi.org/10.1111/jori.12220>
50. Milidonis A, Stathopoulos K (2014) Managerial incentives, risk aversion, and debt. *J Financ Quant Anal* 49:453–481. <https://doi.org/10.1017/S0022109014000301>
51. Murphy K (2013) Executive compensation: where we are, and how we got there. In: Constantinides G, Harris M, Stulz R (eds) *Handbook of the economics of finance*. Elsevier, Amsterdam, Netherlands, pp 211–356
52. Nieken P, Sliwka D (2010) Risk-taking tournaments – Theory and experimental evidence. *J Econ Psychol* 31:254–268. <https://doi.org/10.1016/j.joep.2009.03.009>
53. Oblak K, Ličen M, Slapničar S (2017) The role of cognitive frames in combined decisions about risk and effort. *Manag Acc Res* 39:35–46. <https://doi.org/10.1016/j.mar.2017.07.001>
54. Patel PC, Li M, Del Carmen Triana M, Park HD (2018) Pay dispersion among the top management team and outside directors: its impact on firm risk and firm performance. *Hum Resour Manag* 57:177–192. <https://doi.org/10.1002/hrm.21872>

55. Rajgopal S, Shevlin T (2002) Empirical evidence on the relation between stock option compensation and risk taking. *J Acc Econ* 33:145–171. [https://doi.org/10.1016/S0165-4101\(02\)00042-3](https://doi.org/10.1016/S0165-4101(02)00042-3)
56. Rego SO, Wilson R (2012) Equity risk incentives and corporate tax aggressiveness. *J Acc Res* 50:775–810. <https://doi.org/10.1111/j.1475-679X.2012.00438.x>
57. Rogers DA (2002) Does executive portfolio structure affect risk management? CEO risk-taking incentives and corporate derivatives usage. *J Bank Finance* 26:271–295. [https://doi.org/10.1016/S0378-4266\(01\)00222-9](https://doi.org/10.1016/S0378-4266(01)00222-9)
58. Sauset J, Waller P, Wolff M (2015) CEO contract design regulation and risk-taking. *Eur Acc Rev* 24:685–725. <https://doi.org/10.1080/09638180.2015.1071275>
59. Savaser T, Şişli-Ciamarra E (2016) Managerial performance incentives and firm risk during economic expansions and recessions. *Rev Finance* 21:911–944. <https://doi.org/10.1093/rof/rfw013>
60. Sawers K, Wright A, Zamora V (2011) Does greater risk-bearing in stock option compensation reduce the influence of problem framing on managerial risk-taking behavior? *Behav Res Account* 23:185–201. <https://doi.org/10.2308/bria.2011.23.1.185>
61. Smith CW, Stulz RM (1985) The determinants of firms' hedging policies. *J Financ Quant Anal* 20:391–405. <https://doi.org/10.2307/2330757>
62. Sprinkle GB, Williamson MG (2008) Experimental research in managerial accounting. In: Chapman CS, Hopwood AG, Shields MD (eds) *Handbooks of management accounting research*. Elsevier, Amsterdam, Netherlands, pp 415–444
63. Srivastav A, Armitage S, Hagendorff J (2014) CEO inside debt holdings and risk-shifting: evidence from bank payout policies. *J Bank Finance* 47:41–53. <https://doi.org/10.1016/j.jbankfin.2014.06.016>
64. Sundaram RK, Yermack DL (2007) Pay me later: inside debt and its role in managerial compensation. *J Finance* 62:1551–1588. <https://doi.org/10.1111/j.1540-6261.2007.01251.x>
65. Thaler RH, Tversky A, Kahneman D, Schwartz A (1997) The effect of myopia and loss aversion on risk taking: an experimental test. *Q J Econ* 112:647–661. <https://doi.org/10.1162/003355397555226>
66. Tranfield D, Denyer D, Smart P (2003) Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *Br J Manag* 14:207–222. <https://doi.org/10.1111/1467-8551.00375>
67. Van Bakkum S (2016) Inside debt and bank risk. *J Financ Quant Anal* 51:359–385. <https://doi.org/10.1017/S0022109016000168>
68. Volkswagen AG (2020) The future on hand. Annual report 2020. https://www.volkswagenag.com/presence/investorrelation/publications/annual-reports/2021/volkswagen/Y_2020_e.pdf. Accessed 20 January 2022
69. Wei C, Yermack D (2011) Investor reactions to CEOs' inside debt incentives. *Rev Financ Stud* 24:3813–3840. <https://doi.org/10.1093/rfs/hhr028>
70. Wright P, Kroll M, Krug JA, Pettus M (2007) Influences of top management team incentives on firm risk taking. *Strateg Manag J* 28:81–89. <https://doi.org/10.1002/smj.548>
71. Wu J, Tu R (2007) CEO stock option pay and R&D spending: a behavioral agency explanation. *J Bus Res* 60:482–492. <https://doi.org/10.1016/j.jbusres.2006.12.006>