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**"HOW DO CEOs MANAGE RISKY DECISIONS? A SURVEY OF THE
LITERATURE"**

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ABSTRACT

Il ruolo delle imprese nel mondo è creare benessere e fornire alle persone i beni e servizi di cui hanno bisogno. Esse hanno un enorme impatto economico, politico e sociale a livello mondiale. Le aziende più grandi e che hanno l'impatto maggiore sul mondo sono gestite dai CEO. I CEO sono i soggetti che prendono le decisioni più importanti a livello societario. L'ambiente in cui gli amministratori delegati operano è altamente incerto e, dato il grande impatto che le loro decisioni possono avere, diventa di fondamentale importanza capire quale sarebbe il comportamento che permetterebbe loro di assolvere alla funzione per cui vengono assunti: massimizzare il valore per gli shareholders. Nel mio studio dimostro che la Teoria dell'Utilità Attesa, teoria classica di decisione in condizioni di incertezza, comporta che i CEO, per massimizzare il profitto degli shareholders, debbano essere neutri al rischio e agire come massimizzatori dell'utilità attesa. Assumo che gli shareholders siano a loro volta neutri al rischio e agiscano come massimizzatori dell'utilità attesa. È semplice intuire il perché di questa assunzione fondamentale: la maggior parte degli investitori delle medio- grandi imprese sono a loro volta grandi investitori con portafogli ricchi e fortemente diversificati il cui unico obiettivo è spesso la ricerca del profitto. Di fondamentale importanza è l'allineamento tra gli obiettivi dei CEO e degli investitori. Dopo aver analizzato diversi studi e ricerche che dimostrano come gli amministratori delegati nella realtà non siano né neutri al rischio né massimizzatori dell'utilità attesa, individuo i tre motivi principali che rendono i CEO inefficienti: preferenze relative al rischio, soggettività delle conseguenze e preferenze temporali. Individuate le conseguenze trovo rimedi potrebbero aiutare gli shareholders ad avvicinare i CEO al comportamento ottimale, neutralità al rischio e massimizzazione dell'utilità attesa, per massimizzare il loro valore e ridurre il disallineamento tra gli obiettivi delle parti.

1. INTRODUCTION

1.1 INTRODUCTION TO THE ROLE OF THE COMPANIES IN THE WORLD

Thousands of companies are registered daily all over the world. The total amount of businesses in the world is approaching to 200 million. Their total value is counted in thousands of billions of dollars. This being said we can safely assume that companies have a huge economic, political, social and environmental impact in the world.

Any business is a risky endeavour with an uncertain life expectancy. It has been, and should remain, a driver of innovation, a creator of wealth, a harbinger of economic freedom. The core mission of a profit-driven enterprise is not to fulfil some philanthropic duty but rather to maximize shareholders value.

The fundamental role of business has remained relatively constant: providing the goods and services that people need or want. What has changed dramatically over time are the expectations placed on them. Boards of directors, management and investors of large corporations are now expected to address an array of social, economic and ecological challenges.

A company derives its social legitimacy and right to operate from the economic value it creates for society at large, from its performance for both investors and a wider network of constituencies, its partnership with governments and other agents in solving social problems, and the trust its leadership inspires in employees and society as a whole.

The vast majority of medium and large sized companies, that are the ones that have the biggest impact on the world, are managed by CEOs.

1.2 CEO AND HIS ROLE IN THE COMPANY

A CEO, which stands for Chief Executive Officer, is the highest-ranking individual in a company or organization. The CEO is responsible for the overall success of a business entity or other organization and for making top-level managerial decisions. They may ask for input on major decisions but they are the ultimate authority in making them.

In addition to the overall success of an organization or company, the CEO is responsible for leading the development and execution of long-term strategies, with the main goal of increasing shareholders' value.

In larger companies, the executive usually only deals with high-level corporate strategy and major company decisions. Other tasks are delegated to other managers or departments.

All being said we can assume that the single most important role for which CEOs are hired by companies is to maximize shareholders value and they do so by taking the most important decisions for the businesses.

1.3 DECISION MAKING OF CEOs HAPPENS UNDER UNCERTAINTY

The economic environment in which CEOs act is usually unpredictable and uncertain.

Individuals concerned with the management of hazardous activities are regularly confronted with different forms of uncertainty. Some of these uncertainties concern the nature of the dangers associated with production, transport, or research activities, in particular when new technologies or innovations are introduced. Other types of uncertainty are caused by changes in the organizational, financial and legal context to which the activities must adapt. Another category of uncertainties arise given changes in the human, social, political and natural context of hazardous activities, in particular structural modifications and the new role played by stakeholders. Nonetheless new forms of uncertainty are being introduced by the increased level of concern for human and organizational factors of safety and the need to consider the complexity of socio-technical systems in a global manner.

As we could imagine, taking important and impactful decisions under uncertainty is very complicated.

1.4 THE IMPACT THAT CEOs DECISIONS HAVE AND WHY THE TOPIC IS SO IMPORTANT

As we anticipated, companies, therefore CEOs, can have a huge impact on the world and its functioning. Therefore this topic is of extreme importance to better understand some of the causes that shape the world around us.

The impact of CEOs decisions is not limited to the economical space but it extends also to any imaginable field, helped by the constant growth of globalization and interconnection between different fields.

- a) Economic impact. As one should expect economic impacts of companies are huge. In any market economy, business plays a big role. Business is the engine of an economy. It provides jobs that allow people to make money and goods and services that people can buy with the money they make. Without business, the economy would be very inefficient and/or very primitive.

Companies' decisions affect: national income, firms output, consumption levels, unemployment rates, inflation rates, savings, investments, energy, international trades, and international finances.

They have also a crucial impact on technology and progress that furthermore affects the economy. Through the constant competition between firms, companies have to innovate if they want to make profits and therefore "survive" in the market. Innovation brings new technologies, goods and services that overall contribute to the creation of new business spaces and opportunities. Obviously also cooperation could bring the same if not more satisfying results and progresses.

- b) Political impact. Politics is largely shaped by the impacts that companies have on economy. Governments may make policy changes in response to economic conditions. Government regulation of the economy is frequently used to engineer economic growth or prevent negative economic consequences. During periods of weak growth, economists recommend lowering interest rates to encourage borrowing and restore economic growth. In response to inflation concerns, governments may decide to increase interest rates. Government policies may use tax incentives to direct economic conditions also. The active use of these strategies demonstrates government interest in preserving particular economic circumstances to further the economic well-being of important stakeholders and the society.

On a national level, politicians try to reach the highest possible well-being of the state reducing unemployment rates, controlling inflation, managing retirement, incentivizing investments, stimulating national economy, managing fiscal policies, encouraging exportations.

On an international level, politicians try to reach agreements promoting international cooperation, stability, safety and more in general collective well-being.

Generally speaking, economic growth is beneficial to those in political power who may also be seeking re-election. Strong growth typically translates into more hiring and higher wages for some workers, although not always. Strong economic growth can also lead to higher corporate profits, which is a positive for the stock market.

- c) Social impact. The effects that enterprise activity has on society is overwhelming. Companies, based on the goods and the services they offer, shape society's preferences, beliefs, values, usages and cultures.

The times in which it was society to “impose” to companies what to produce based on its preferences are changed thanks to the globalization and innovation. Nowadays companies are the ones that create new needs in people rather than waiting for them to externalize their needs.

The role companies have in society has amplified even more in the last decades due to the diffusion of Corporate Social Responsibility and its importance. Corporate social responsibility (CSR) is a self-regulating business model that helps a company be socially accountable — to itself, its stakeholders, and the public. By practicing corporate social responsibility companies can be conscious of the kind of impact they are having on all aspects of society including economic, social, and environmental. To engage in CSR means that, in the normal course of business, a company is operating in ways that enhance society and the environment, instead of contributing negatively to them. All of business actors and stakeholders utilize environmental resources, that have had to be extracted, and produce pollution that further affects the environment. Though businesses can either implement processes that reduce these environmental effects or have positive environmental effects. However, the processes that create these positive effects will themselves have negative effects, making it all a very complicated mechanism.

1.5 AN INTERESTING EXAMPLE OF CEOs DECISION MAKING AND THE HUGE EFFECTS THAT IT HAD

The Volkswagen emissions scandal represents a great example of the impact that a company’s CEOs decisions can have in various areas of interest.

The Volkswagen emissions scandal began in September 2015, when the United States Environmental Protection Agency (EPA) issued a notice of violation of the Clean Air Act to German automaker Volkswagen Group. The agency had found that Volkswagen had intentionally programmed turbocharged direct injection (TDI) diesel engines to activate their emissions controls only during laboratory emissions testing which caused the vehicles' NO₂ output to meet US standards during regulatory testing, but emit up to 40 times more NO₂ in real-world driving. Volkswagen deployed this programming software in about eleven million cars worldwide, including 500,000 in the United States, in model years 2009 through 2015. Regulators in multiple countries began to investigate Volkswagen.

German prosecutors have charged VW's ex-CEO Martin Winterkorn over his role in the Dieselgate scandal. Winterkorn is accused of knowing about the conspiracy as early as 2014 but failing to inform regulators or consumers. The former VW CEO is thought to have played a substantial role in the scandal. Along with four others, he's also accused of unfair competition, embezzlement, tax evasion, and giving false witness. If convicted, he faces up to 10 years in prison, as well as substantial fines and the return of nearly €11 million (\$12 million) in salary and bonuses.

The scandal had huge consequences on various levels:

- a) Health consequences. A study conducted by Berntsen, Aamaas, Lund and Tanaka (2018) estimated that approximately 59 premature deaths will be caused by the excess pollution produced between 2008 and 2015 by vehicles equipped with the defeat device in the United States. The study also found that making these vehicles emissions compliant by the end of 2016 would avert an additional 130 early deaths.
- b) Environmental consequences. Ground-level Ozone which damages vegetation and crop yields, as well as health implications; acid rain; water quality deterioration; contributions to global warming had been facilitated by the pollution of out-norm vehicles.
- c) Legal and financial repercussions. Many countries in which the scandal vehicles were sold pursued legal actions against Volkswagen for billions of dollars. Many private stakeholders and shareholders sued the company as well.
- d) Decrease of the company's value (by almost a quarter) and number of sales (leading profits to drop by 20%).
- e) Transgressions by other manufacturers. The Volkswagen scandal more generally raised awareness over the high levels of pollution being emitted by diesel vehicles built by a wide range of carmakers, including Volvo, Renault, Mercedes, Jeep, Hyundai, Citroen, BMW, Mazda, Fiat, Ford and Peugeot.
- f) Industry consequences. After the scandal, various companies announced plans to make major investments into the production of electric vehicles.
- g) Political consequences. Political figures have been accused of knowing about the scandal or similar scandals put into action by other car manufacturers, while others

exploited the scandal to promote their election promising complete political transparency and control.

2. THE CLASSICAL THEORY

How should CEOs act and take decisions to fulfil the function which they are hired for by the companies (hence maximize the utility of the shareholders of the company)?

2.1 CLASSICAL THEORY OF DECISION MAKING UNDER UNCERTAINTY: EXPECTED UTILITY THEORY INTRODUCTION

The expected utility theorem is the reference model of choice under uncertainty of the last half century. It was developed by Daniel Bernoulli (1738) and expanded by John von Neumann and Oskar Morgenstern (1947). The expected utility theory deals with the analysis of situations where individuals must make a decision without knowing which outcomes may result from that decision, this is, decision making under uncertainty. As we saw, decision making under uncertainty is exactly the situation in which CEOs find themselves at the moment of making important choices.

How to deal with uncertainty?

First of all we need to define the different factors in play in decision making under uncertainty.

- a) There are states of nature or states of the world- all possible configurations of the world. One and only one state s will realize.
- b) There are probabilities- p_s : probability that state s occurs.
- c) There are actions- a set of possible action that the decision maker can take.
- d) There are outcomes- states and actions jointly determine consequences (outcomes).

A lottery is a discrete distribution of probability on a set of states of nature. The elements of a lottery correspond to the probabilities that each of the states of nature will occur. It is basically a distribution over consequences. We could simply assume that the DM has rational preferences over a set of lotteries but we would not take advantage of the fact that lotteries have special structures. We know that, not only the DM has utility function over lotteries, but also that this is somehow related to utility over consequences. In fact, the DM eventually cares about the final consequences, so preferences over lotteries should have something to do with preferences over consequences.

One very convenient way to relate preferences over consequences to preferences over lotteries is through the Expected Utility theorem. The basic idea of the EU model is that if an agent's preferences satisfy three axioms – ordering, continuity, and independence – then her behaviour can be modelled as if she is maximizing expected utility. Ordering implies preferences are complete (for all T,S: either $T>S$ or $S>T$ or both. If the answer is both, then the subject is indifferent between T and S) and transitive (if $T>R$ and $R>S$, then $T>S$). Continuity means that if lottery R is preferred to lottery S, and S is preferred to lottery T, then there are real numbers α and β between zero and one such that $\alpha R + (1-\alpha)T$ is preferred to S, while S is preferred to $\beta R + (1-\beta)T$. Independence means that if two lotteries R and S are equally liked by the agent, the gamble composed of a p chance of R or a 1-p chance of T must be equally liked as the gamble composed of a p chance of S or a 1-p chance of T.

Suppose that there are three consequences or events. Let $y_1, y_2,$ and y_3 represent the monetary magnitudes of the events, where $y_1 < y_2 < y_3$. That is, the first possible outcome is the worst event, while the third outcome is the best event. Let p_i reflect the probability that outcome y_i will be realized, for $i = 1, 2,$ or 3 . Then the lottery p is the vector of probabilities (p_1, p_2, p_3) . The expected utility hypothesis says that there is an increasing function $u(\bullet)$ over wealth, typically called the von Neumann – Morgenstern utility function, such that the an agent prefers lottery p to lottery q if and only if $V(p) > V(q)$, where

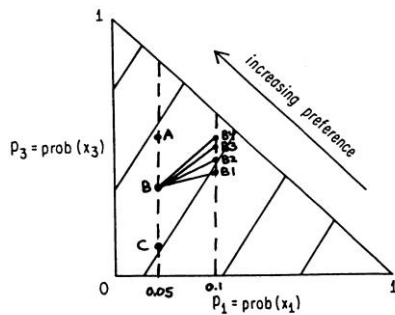
$$V(p) = \sum_{i=1}^3 u(y_i) p_i. \quad (1)$$

The function $V(\bullet)$ is called the expected utility representation. Since the three probabilities must sum to one, eq. (1) can be simplified to

$$V(p) = [u(y_1) - u(y_2)]p_1 + [u(y_3) - u(y_2)]p_3. \quad (2)$$

Note the values $u(y_i)$ are constants, once the magnitudes of the outcomes are specified. Correspondingly, the representation $V(\bullet)$ is linear in the probabilities. Since $y_1 < y_2 < y_3$ and $u(\bullet)$ is increasing in y , the coefficient on p_1 is negative, while the coefficient on p_3 is positive.

One can plot level curves for the representation in eq. (2) using a two-dimensional diagram. An example of this plot, which is known as the Marschak-Machina triangle, is provided in the following figure.



The slopes of indifference curves within this diagram can be found by implicitly differentiating (2) to get

$$0 = dV = [u(y_1) - u(y_2)]dp_1 + [u(y_3) - u(y_2)]dp_3 \quad (3)$$

$$\leftrightarrow dp_3/dp_1 = -[u(y_1) - u(y_2)] / [u(y_3) - u(y_2)].$$

Since the $u(y_i)$ are constants, dp_3/dp_1 is a constant. That is, indifference curves are parallel straight lines. An indifference curve is a graph that shows a combination of two outcomes that give a decision maker equal satisfaction and utility, thereby making the DM indifferent.

The vNM utility functions of the agents are shaped by their risk attitudes. There are three different types of risk attitudes:

- Risk averse. A decision maker is strictly risk averse if she always prefers a sure wealth level w to a risky lottery with expected value equal to w .
- Risk neutral. A decision maker is neutral if she is always indifferent between a sure wealth level w and a risky lottery with expected value equal to w .
- Risk loving. A decision maker is strictly risk loving (risk seeking) if she always prefers a risky lottery with expected value equal to w to a sure wealth level w .

We can finally conclude stating that the expected utility of a decision is a weighted average of the utilities of each of its possible outcomes, where the utility of an outcome measures the

extent to which that outcome is preferred, or preferable, to the alternatives. The final state represents the situation in which the DM will finally find herself into based partly on her choices.

2.2 HOW CEOs SHOULD BEHAVE ACCORDINGLY TO THE EUT

We have defined the concept of expected utility theory in decision making under uncertainty. Given the theory, how should CEOs behave according to the EUT to maximize the value for shareholders and fulfil their role?

Primarily all CEOs should act as expected utility maximizers. That means that they should: consider their actions, compute their consequences, attach to every consequence a probability and then rate them accordingly to their utility function shaped by their risk attitude. Finally the executives choose the best alternative that gives them the highest utility. This alternative should in theory align with the highest possible utility of the shareholders that the CEO works for as well (we will discuss this later).

Secondly since in the economical world there are very few certainties, CEOs should be able to attach to risky lotteries the right value they have. If a CEO is risk averse he is always willing to pay a risk premium to reduce risk. This results in a loss of potential gain for shareholders. On the other hand if the DM is risk loving she always refuses a certain gain to choose a lottery with the same expected value but riskier. This results in a loss of efficiency and probably also in a loss of potential gain for shareholders. As we saw a risk neutral individual evaluates solely potential gains and potential losses, compare the two and take decisions based on that.

I assume that shareholders are also risk neutral and expected utility maximizers. It is simple to realize the reasoning behind this fundamental assumption: the majority of medium and large sized companies' investors are in turn big investors with rich and diversified portfolios and their objective is often the research of profit.

An important result that shareholders should try to archive is the alignment between CEOs' objectives and investors' goals. This implies that also CEOs, as the shareholders, should be risk neutral and expected utility maximizers (as we previously explained). We already defined the main objectives of shareholders as "maximization of their profit". While shareholders objectives is usually the same, executives objectives are usually very different between one another. In hiring a CEO, shareholders have to pay particular attention to a moral hazard issue. Moral hazard is a situation in which one party gets involved in a risky event knowing that it is protected against the risk and the other party will incur the cost. It arises when both the parties

have incomplete information about each other, the so-called information asymmetry. Shareholders must align their maximization objectives with the objectives of the CEO they decide to hire, clearing immediately the situation, being very transparent about the roles and the tasks the executive will need to cover. We will discuss about how this alignment could potentially be archived in chapter 4.

3. ACTUAL BEHAVIOUR OF CEOs AND REASONING

3.1 HOW CEOs ACTUALLY BEHAVE

Does EUT describe well enough how decision makers make decisions under uncertainty?

The analytically convenient expected utility model has come under increasing suspicion for many choices and does not align with the decisions that are actually made in conditions of uncertainty. An abundance of experimental evidence points to a particularly strong tendency for the expected utility model to fail representing and explaining choices that are actually taken.

So how do CEOs actually behave and why?

From an analysis of different papers and researches I found out that CEOs have risk averse preferences and that they are not expected utility maximizers.

I will proceed explaining how I found these results and explain why executives behaviour differs so drastically from what the expected utility theory predicts.

The analysis revealed that there are three main reasons to why CEOs do not behave as the classical theory would predict:

- I. Risk preferences;
- II. Subjective beliefs of outcomes;
- III. Time preferences.

3.2 WHY THEY BEHAVE DIFFERENTLY THAN THEY SHOULD IN ACCORDANCE WITH EUT

- I. Risk preferences

Multiple studies have been conducted to test if the expected utility theory holds.

One particular study conducted by List and Mason (2009) helps us to get a better grasp about the EUT lacks.

In this study they advance the literature by exploring CEO's preferences over small probabilities- high loss lotteries. Traditional benefit/cost analyses of economical hazards typically compare the expected costs and benefits of various decisions, an approach that implicitly assumes agents maximize expected utility. Since many important economic and public policy decisions involve small probability- high loss events, it is important to understand individual preferences over lotteries for considerable losses; and since the cost- benefit approach is linked critically to ability to pay, it is of great import to understand affluent citizens' preferences over small probability- high loss events.

The goal was to get a subject pool that would be on the opposite end of the "experience spectrum" from undergraduate students in terms of evaluating and dealing with risky outcomes, while at the same time allowing an analysis of high stake decision making among the relatively affluent. The perfect opportunity for them to conduct the experiment came when the Costa Rica Coffee Institute (ICAFE) extended an invitation to their annual conference, at which they had access to chief executive officers and conference time and floor space on ICAFE grounds to carry out experiments.

By the way their experiments were designed, by examining the pattern of subjects' choices, they could determine whether their choices are consistent with expected utility representation. And, they were provided with a sense of the preference structure of economic actors who are in prestigious roles within the international economy.

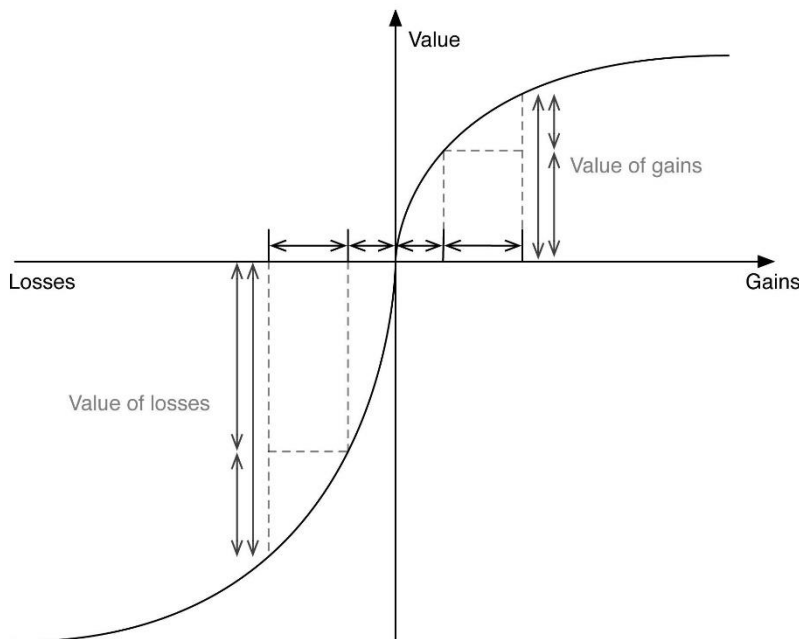
The structure of the experiment was this:

- Stage 1: subjects participated in unrelated treatments in which they earned a monetary sum;
- Stage 2: Once earned their funds, subjects were presented with 40 pairs of lotteries called options. Each option was made of 3 lotteries to choose from that had certain p_1 loss of 80\$, p_2 loss of 30\$, p_3 loss of 0\$. Subjects had to choose the best lottery for each pair of lotteries.
- Stage 3: The monitor had a subject choose one slip of paper out of an envelope that contained 40 slips of paper numbered from 1 to 40 that represented the option to play. Once the option was determined a different subject drew a slip of paper from a different envelope that contained 100 slips of paper numbered from 1 to 100. The number of the slip determined the actual outcome (for example if it was 17 it represented the probability that contained that percentage and the outcome related).

- Stage 4: Subjects were paid.

From the analysis of the data collected in the experiments they found that both CEO and student subject pools exhibit frequent and large departures from expected utility theory.

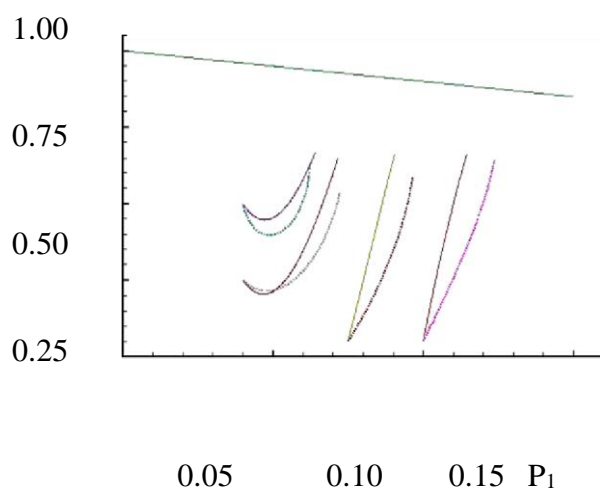
First of all their results suggest that use of the expected utility paradigm in decision making substantially underestimates executive's willingness to pay to reduce risk in small probability-high loss events. What does that mean? Well it means that CEOs and students both showed tendencies of risk aversion and they were both willing to pay some sort of "premium" to reduce risk in these types of situations that are ubiquitous in economic decisions exactly as risk averse individuals are willing to do. Also it means that the premium that they are willing to pay is not well predicted by the EUT model, proving furthermore that CEOs are not expected utility maximizers. As I already said, this behaviour would lead to losses for shareholders in terms of possible value gained (or not lost in our case). While these earlier experimental results are intriguing, virtually all of the previous evidence is based on lotteries over gains. Evidence that people may regard gains and losses differently is fairly compelling. Prospect theory, an alternative model of choice under uncertainty, explicitly points to differences in risk attitudes between gains and losses. This aligns perfectly with the results found and explains why EUT substantially underestimates executive's willingness to pay to reduce risk: simply the losses are perceived more drastically than gains unlike the classical model predicts. This is well represented by the following figure:



Also there are other interesting implications I can deduct from their work. Although willingness to pay to reduce the chance of the worst event for CEOs is very similar to the corresponding willingness to pay for a typical student we do find some important differences in behaviour across subject pools.

While the results I discuss above point to statistical differences in behaviour, they do not imply important economic differences in a sense that the final behaviour of the two groups is very similar. From a geometric perspective, such differences are manifested in clear differences in the preference maps for the two groups. To investigate the possibility of such a phenomenon, they used a regression models studied before to numerically generate indifference curves within the Machina- Marschak probability triangle (a graphical tool to estimate indifference curves).

P_3



There are two noteworthy features:

(1) CEOs are “less risk averse” than students. There seems to be an indication that students are slightly less likely than CEOs to choose options with a larger probability on the worst outcome. This might indicate an overall pattern of students exhibiting a greater degree of risk aversion than CEOs, or it might be associated with differences in tendencies to exhibit non- expected utility maximization between two groups, or more simply could also come from characteristics personal to CEOs as expectancy of the future, experience, competitiveness, trust etc. (all of which we will discuss later).

(2) it appears that the level curves for CEOs are more convex than the level of curves of the students, suggesting that CEOs may exhibit akin to grater aversion to risk at probability combination where p_2 (the medium loss event) is relatively small. As the extreme payoffs become more likely CEOs exhibit greater aversion to risk than students. It is interesting to contrast this observation with earlier studies, which tended to find that the most important

departures from expected utility paradigm appear in the corners of the triangle, where one probability is quite large and the others are quite small. Under the EU approach the preferences representation would be linear in the probabilities; the representation is non-linear if the subject does not maximize expected utility. They found that nonlinearities are statistically and economically important for a substantial percentage of their subjects. Subject behaviour indicates that the probability of the worst possible event enters into the preference representation in a non-linear fashion- indifference curves over lotteries are often concave. Consider a scenario in which a decision-maker initially faces substantial risk. Suppose there are two possible outcomes: no loss or a very large loss. Such a combination corresponds to $p_2 = 0$ in their framework. Now imagine that an “insurance contract” is available, one that reduces the chance for the best event, but also lowers the chance of the worst event. Suppose also that such an arrangement lies below the tangent line to the indifference curve at the initial lottery. Under expected utility, such a policy would be regarded as unambiguously bad. But if the representative agent has concave indifference curves it is possible that such a policy leads to an improvement in well-being. Neglecting the potential for non-linear preferences could result in the under-provision of risk reducing safeguards that are attractive from a collective perspective.

The Allais Paradox is a well-known example of violation of parallel linear indifference curves. As initially presented (Allais, 1953), an individual has to choose between a_1 or a_2 and between a_3 or a_4 , where a_1 , a_2 , a_3 , and a_4 are represented as

a_1 : 1.00 chance of \$1,000,000;

a_2 : .10 chance of \$5,000,000, .89 chance of \$1,000,000, .01 chance of \$0;

a_3 : .10 chance of \$5,000,000, .90 chance of 0;

a_4 : .11 chance of \$1,000,000, .89 chance of \$0.

Notice that the lines connecting a_1 to a_2 and a_3 to a_4 are parallel. If an agent’s indifference curves are straight lines, then he would prefer a_1 to a_2 *and* a_3 to a_4 , or he would prefer a_2 to a_1 *and* a_4 to a_3 . However, laboratory experimentation has shown that subjects usually choose a_1 and a_3 , so that indifference curves cannot be parallel straight lines.

Resuming we found that:

-EUT substantially underestimates executives’ willingness to pay to reduce risk in low probability- high loss events;

-People (CEOs included) consider losses and gains differently;

-CEOs are less risk averse than the control group of students, for various reasons;

-CEOs may exhibit akin to greater aversion to risk at probability combination where p_2 (the medium loss event) is relatively small;

Our final conclusion is that CEOs are risk averse, even though less than “regular people”, and that they are not EU maximizers.

II. Subjective beliefs of outcomes

As we already said, to maximize expected utility, CEOs need to compute the expected value of the choices they have and then rate them accordingly to their utility function. Expected value, that is the goodness the DM can count on getting, is the product of two simple things: (odds of gain) \times (value of the gain). The problem is that people, even CEOs, are not that good at estimating the two parts of the equation. There are two types of errors people do when estimating the EV, and therefore the outcome of their actions. Errors in estimating odds that they are going to succeed and errors in estimating the value of their success.

- a) Errors in calculating odds. Calculating odds could seem very easy at first glance: there are 6 sides of a dice, there are two sides of a coin, 52 cards in a deck... The problem is that in everyday life decisions calculating odds is not that easy and regular as for example knowing the odds of getting a two throwing a dice. Why is that? We take a simple test conducted by Dan Gilbert in which he asks to US citizens to estimate how many people in the us die every year a certain way: tornado, fireworks, asthma, drowning. The results of this simple paper are quite interesting. People believe that deaths cause by tornado are 564 (against 90 actual deaths), by fireworks are 160 (against 6), by asthma are 506 (against 1886), by drowning are 1684 (against 7380). Why are two things widely underestimated while the other two are widely overestimated? Simply, the fact is that death by asthma and drowning do not get much coverage in the news since they are in fact very common and uninteresting while death by tornado or fireworks get more coverage and come way quicker to mind. What comes quicker to our mind could significantly change our perception of odds. This is not the only factor that counts when calculating odds, in fact, there are numerous factors that influence every single decision. We found from empirical research that subjects generally have an S-shaped probability weighting function. We infer that entrepreneurs are uniformly more optimistic about the probability of the best outcome than non-entrepreneurs.

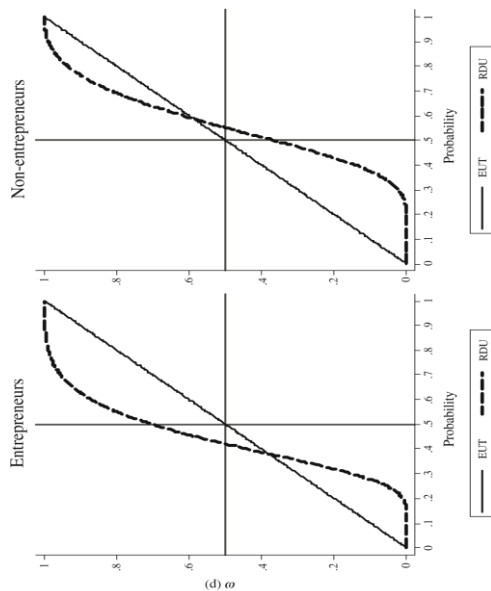


Fig.1 Prelec probability weighting function

With greater probability optimism however comes a greater aversion to variability of outcomes, and there is an increase in the concavity of the utility function of entrepreneurs. This could help us explain why CEOs and regular people seem to exhibit the same degree of aversion to risk in decision making under uncertainty. In reality the reasoning behind the risk aversion of the two groups is different.

- b) Errors in estimating the value of the gain (or loss). People usually compare the gain in value they are likely to get (possible gain) with the gain they once had from the same investment (past gain). This is a big error because it does not take into account the context of the decision. For example, if I were to offer someone a sandwich at a price of €20 they would probably say that they would refuse it because people know that a sandwich is not worth €20. However if I offered the same sandwich to the same individual in a day where all shops were close and they had an empty fridge and were very hungry they would be happy to pay €20 for it. Comparing with the past causes many of the problems that behavioural economists identify in people's attempt to assigning value. But even when people compare with the possible instead of comparing with the past they make some mistakes. For example comparison changes the value of things. This trick is often used by marketing specialists. They would put on the shelf different types of products inducing people to compare them and choose the deal that in comparison seems the better deal. The fact is that when taken out of the comparison perspective, the experience of the products do not differ in the end, irrelevantly to the

fact that they were compared with one product rather than the other. This line of reasoning stays the same when taking decisions over different things (even economical decisions).

In economical decision making calculating odds and estimating values is even more difficult due to the troubled context in which economical choices are taken.

It is clear to see that evaluating outcomes is a very subjective task and not objective at all.

Subjective beliefs of outcomes are also affected by individual behaviour under uncertainty. How do CEOs behave under different types of uncertainty and what differentiates them from regular people?

A very interesting paper regarding this topic was advanced by Holm, Opper and Nee (2013a). This study reports findings from the first large-scale experiment investigating whether entrepreneurs differ from other people in their willingness to expose themselves to various forms of uncertainty. A stratified random sample of 700 chief executive officers from the Yangzi delta region in China is compared to 200 control group members. Why entrepreneurs routinely accept the high uncertainties associated with entrepreneurial activities has fascinated social scientists over centuries. Two broad explanations can be identified. One focuses on the ability to develop strategic responses in the presence of uncertainty embedded in the environment, the other emphasizes behavioural traits that distinguish entrepreneurs from non-entrepreneurs in their willingness to accept uncertainty. Their approach aims to elicit behavioural differences between entrepreneurs and non-entrepreneurs. They also introduce two methodological innovations: First, instead of relying on convenience samples, their study is the first that utilizes large-scale samples of entrepreneurs and non-entrepreneurs randomly selected from firm and household registers. Second, they employ a multidimensional analysis incorporating two types of uncertainty rather than just one behavioural trait (non-strategic uncertainty and strategic forms of uncertainty).

They then proceed to form hypothesis to why CEOs could differ from regular people in decision making.

Non-strategic forms of uncertainty comprehend risk and ambiguity.

Risk

In the equilibrium, less risk-averse agents become entrepreneurs or CEOs, and more risk-averse agents become wage earners.

Hypothesis 1A. CEOs differ from others with respect to risk taking.

Prospect theory suggests that people put too little weight on outcomes not obtained with certainty. This phenomenon—denoted as “subcertainty” or as “certainty effect”—explains risk aversion in choices involving sure gains. Because it is plausible that executives differ from others in their certainty preference, they compare entrepreneurs with ordinary people when choosing between a certain and a risky alternative

Hypothesis 1B. When facing a risky alternative, CEOs have a different preference for guaranteed outcomes compared to ordinary people.

Ambiguity

Knight (2006) does not claim that executives have a higher or lower aversion to uncertainty than others but asserts that entrepreneurs may have a high “capacity for forming correct judgments,” implying that entrepreneurs behave differently from others when acting under uncertainty. To reserve “uncertainty” as the more general concept, they use in the following the term ambiguity for situations where the probability distributions of the outcomes are completely or partially unknown. Their hypothesis is therefore as follows:

Hypothesis 2. CEOs have a different degree of ambiguity aversion than others.

Strategic forms of uncertainty comprehend competitiveness and trust.

Willingness to Compete

An essential feature of entrepreneurship is exposure to competition, which involves a risk contingent on the CEO’s performance in comparison to the competitors. There are at least two conceivable mechanisms behind differences in the executive’s willingness to compete with others. It is possible that they are more optimistic than others or may even be overconfident. The other possible mechanism is that entrepreneurs may have a preference for competition per se.

Hypothesis 3. CEOs have a different willingness to compete than others.

Trust

Situations involving trust constitute a subclass of those involving risk. They are situations in which the risk one takes depends on the performance of another actor.” Trust is the willingness to expose oneself to such uncertainty. A delicate task here is to strike a balance between trust and control, a task CEOs may be particularly good at. They may in a given situation have a different level of trust than others.

Hypothesis 4. Trust behavior among CEOs is different from that among others.

The results of the experiment report as follows.

-Risk

Contrary to what many would expect, the CEOs are not more risk taking than other people. (as we already discussed the reasons for having a risk averse behaviour are different).

-Ambiguity

The results do not suggest that there are any notable differences on the level of ambiguity aversion between the groups.

Non- strategic uncertainty is faced the same way by executives and regular people. This type of uncertainty is not controllable by the subjects and that could explain why CEOs act exactly as regular people.

-Willingness to Compete

Willingness to compete is generally slightly higher among CEOs. There is also a tendency that the executives' distribution of switching points has a slightly lower variance. Higher willingness to compete among CEOs therefore seems to be driven by a preference for competition per se.

-Trust

CEOs are more willing to expose themselves to social risks than the control group. Executives routinely rely on ongoing personal ties in upstream and downstream transactions with their suppliers and distributors.

Strategic uncertainty is threatened very differently by CEOs and regular people, this seems reasonable and explains that executives have different approaches to decision making than regular people, due to their experience and their entrepreneurial spirit. They seem to be more willing to bear uncertainties involving a strategic element. First of all, executives are significantly more willing to enter situations involving multilateral competition than members of the control group. Second, the findings suggest that executives are more willing to accept uncertainties related to trusting an anonymous other.

Clearly entrepreneurship is not a purely individualistic endeavor and requires the willingness and ability to cooperate. Trust may therefore provide the glue that makes business networks actually work. For this reason we will now focus briefly on cooperation and trust.

We analyse another study conducted by Holm, Opper and Nee (2015b).

Guanxi appears to permeate the world of business in China. It is nearly inescapable in business-to-government exchanges, and ever present in business-to-business transactions. Conceptually, Guanxi is defined both as a form of social capital encapsulated in dyadic, particularistic ties and as a relational strategy at the organizational level.

Here their focus is on the strategic utilization of personal relationships as a means of achieving organizational goals. In China, the strategic use of personal relationships is pervasive in transactions with government authorities as well as in inter-firm relations. Explanations as to when and why firms rely on *guanxi* emphasize a close link between organizational resources, environment and corporate strategic choices.

Investing time and energy in *guanxi* activities may open doors to opportunities to alleviate resource constraints, but also involves distinct risks that not all decision-makers are equally willing to accept. The utility of organizational *guanxi* activities rests on the idea that strategic utilization of personal relationships generates benefits otherwise not achievable through institutionalized channels. *Guanxi* activities promise neither certain returns nor certain insurance effects. Essentially “*guanxi* are a futures transaction with unspecified delivery time”. Also there is no guarantee in terms of the value or quality of the benefit”. Some CEOs seem to have an unlimited appetite for investing in *guanxi* activities, while others claim to limit investments in *guanxi* to a minimum.

From this paper we understand that:

- a) CEOs' risk aversion is negatively associated with *guanxi* activities with government officials. That means that the more a CEO is risk averse, the less he will invest in *guanxi* activity with governments (trust activity).
- b) CEOs' risk aversion is negatively associated with *guanxi* activities with other business firm leaders. That means that the more a CEO is risk averse, the less he will invest in *guanxi* activity with other firms (trust activity).
- c) The negative association of CEOs' risk aversion with *guanxi* activities will relate more strongly to *guanxi* with other business firm leaders than to *guanxi* with government officials.

That means that collaborating with governments is “easier” for risk averse individuals than collaborating with other companies.

d)The negative relationship between CEOs’ risk aversion and guanxi activities with government officials and other business firm leaders will be weaker for younger firms than for more established firms, *ceteris paribus*. That means that new firms try to be part of the guanxi to benefit of the advantages it gives.

e)The negative relationship between CEOs’ risk aversion and guanxi activities with government officials and with other business firm leaders will be weaker for firms with a local market orientation than for firms with a non-local (provincial, national or international) market orientation, *ceteris paribus*. That means that local firms are willing to invest more in guanxi activities than non-local firms.

What this paper shows us is that trust activities are very important for different types of companies in reaching their objectives and can help considerably the decision making of CEOs with respect to their risk preferences.

However, a close analysis of the paper also brings to light a quite interesting fact: there is a strong argument supporting the view that risk-averse individuals perform better than the risk-prone when responding to strategic risks. The underlying logic is simple: At the margin, for any given risk, highly risk-averse individuals demand a higher expected return to get involved in a risky strategy than people who are not as risk-averse; and in parallel, for any given return, they will accept a lower risk. Consequently, highly risk-averse CEOs are likely to build a portfolio of *guanxi* activities yielding higher returns for a given risk or involving lower risks for a given return than their less risk-averse competitors. The expectation of positive performance effects is reinforced by strategy research suggesting that executives who perceive uncertainty in business transactions often respond by seeking more information to clarify the circumstances surrounding the deal. However we can argue that at the same time there is a huge downside to being risk averse in *guanxi* activities: risk averse individual will pass on a bigger number of potential great deals than more risk neutral individual because the lack of information, lack of time to do research, their diffidence etc. leading to the loss of a final positive value for the shareholders in the end.

III. Time preferences

In economics, time preference is current relative valuation placed on receiving a valuable entity at an earlier date compared with receiving it at a later date. What may induce a consumer, or decision maker in our case, to delay consumption is called discount rate. It represents the amount of money that will compensate him or her for foregoing current consumption. This rate corresponds with the market interest rate and depends on the consumer or CEO expectation of

the future income. If the future income is expected to be higher than the current income, he or she will have a high rate of time preference; thus, the interest rate has to be high enough to induce savings instead of spending. This simply means that the utility of receiving a valuable entity today has to be smaller than the utility of receiving an even more valuable entity in the future. There is no absolute distinction that separates "high" and "low" time preference, only comparisons with others either individually or in aggregate. Someone with a high time preference is focused substantially on their well-being in the present and the immediate future relative to the average person, while someone with low time preference places more emphasis than average on their well-being in the further future.

How do time preferences of CEOs conflict with the EUT and how do their preferences differ from those of regular people?

To answer these questions we analyse a paper from Andersen, di Girolamo, Harrison and Lau (2014).

They have conducted a set of field experiments in Denmark that will allow a direct characterization of small business entrepreneurs in terms of these traits. For control, they sampled the general adult population of Denmark.

Time preferences are examined by asking subjects to make a series of choices, in this case over outcomes that differ in terms of when they will be received. The typical findings from these experiments are that subjects have discount rates between 7 and 11% on an annual effective basis. The evidence also points to considerable heterogeneity in time preferences across identifiable segments of people: CEOs and control group.

Their results suggest that CEOs are more oriented toward future outcomes and willing to wait longer for a certain return than the general population. This is coherent with what we should expect. To be expected utility maximizers CEOs should compare future returns with current returns as expected values and utilities and then choose the one that gives the highest expected return based on the utility functions, acting this way as risk neutral agents. This would allow them to maximize profits for shareholders. We already showed that CEOs are actually risk averse, so maximization of the shareholders value is not possible. This way we demonstrated even further that CEOs do not behave as EUT suggests and are not expected utility maximizers. However the paper we analysed also proves that CEOs behaviour is closer to the optimal behaviour to maximize utility than that of regular people.

4. WAYS TO CORRECT (AT LEAST AT SOME DEGREE) THEIR BEHAVIOUR.

We proved that CEOs are neither expected utility maximizers nor exhibit risk neutral behaviour. We already discussed why, to fulfil the role they are hired for and maximize shareholders value, they should act as risk neutral agents and follow the expected utility theorem.

Is there any way shareholders can resolve the problem or at least find a way to move the CEOs closer to the ideal behaviour they should have and try to align their and executives' objectives?

There are different solutions that could possibly help make executives less risk averse and closer to expected utility maximizers.

4.1 COMPANIES GUIDELINES AND RULES FOR INVESTMENTS AND PROJECTS

Companies can reduce the effects of risk aversion by promoting an organization-wide attitude toward risk that guides individual executive decisions. More specifically, companies should explore the following:

- Up the investment on risky projects. Risk-averse CEOs often discard attractive projects before anyone formally proposes them. To encourage managers and senior executives to explore innovative ideas beyond their comfort levels, shareholders might regularly ask them for project ideas that are risky but have high potential returns. They could then encourage further work on these ideas before formally reviewing them. They could also require managers to submit each investment recommendation with a riskier version of the same project with more upside or an alternative one.

- Consider both the upside and downside. Executives should require that project plans include a range of scenarios or outcomes that include both failure and dramatic success. Doing so will enable project evaluators to better understand their potential value and their sources of risk. These scenarios should not simply be the baseline scenario plus or minus an arbitrary percentage. Instead, they should be linked to real business drivers such as penetration rates, prices, and production costs. For example, when evaluating the introduction of a new consumer-goods product, managers should explicitly consider what a "home run" scenario would look like- one with high market share or high realized unit prices. They should also look at a scenario or two that captures the typical experience of product introductions, as well as one scenario where it flops. By forcing this analysis, executives can ensure that the likelihood of a home run is factored into the analysis when the project is evaluated—and they are better able to thoughtfully reshape projects to capture the upside and avoid the downside.

-Avoid overcompensating for risk. CEOs should also pay attention to the discount rates they use to evaluate projects. We repeatedly encounter planners who errantly use a higher discount rate simply because an outcome is more uncertain or the range of possible outcomes is wider. Higher discount rates for relatively small but frequent investments, even if they are individually riskier, do not make sense once projects are pooled at a company level. Instead, if companies are concerned about risk exposure, they might adopt a rule that any investment amounting to a certain percentage of the company's total investment budget must be made in a risk-neutral manner—with no adjustment to the discount rate.

-Evaluate performance based on portfolios of outcomes, not single projects. Wherever possible CEOs should be evaluated based on the performance of a portfolio of outcomes, not punished for pursuing more risky individual projects. In oil and gas exploration, for example, executive rewards are not based on the performance of individual wells but rather on a fairly large number of them—as many as 20, in one company. Hence, it may not be surprising to find that oil and gas executives pool risks and are more risk neutral.

-Reward skill, not luck. Companies need to better understand whether the causes of particular successes and failures were controllable or uncontrollable and eliminate the role of luck, good or bad, in structuring rewards for executives. They should be willing to reward those who execute projects well, even if they fail due to anticipated factors outside their control, and also to discipline those who manage projects poorly, even if they succeed due to luck. Although not always easy to do, such an approach is worth the effort.

Shareholders, or more in general the corporate centre, must play an active role in implementing such changes- in setting policy, facilitating risk taking, and serving as a resource to help pool project outcomes. They will need to become enablers of risk taking, a philosophy quite different from that currently expressed by many corporate centers. The office of the Chief Financial Officer should also be involved in oversight, since it is particularly well suited to serve as manager of a company's portfolio of risks, making trade-offs between them and taking a broader view of projects and the effects of risk pooling.

4.2 CEOs COMPENSATION METHODS

A-Pay for performance contracts

CEOs compensations methods is a very controversial topic. People like to speculate on how much CEOs are paid and how much they actually deserve.

Jensen and Murphy (1990) analysed and studied the real issue with CEOs compensations.

There are serious problems with CEO compensation, but “excessive” pay is not the biggest issue. The relentless focus on how much CEOs are paid diverts public attention from the real problem- how CEOs are paid. In most publicly held companies, the compensation of top executives is virtually independent of performance. On average, corporate America pays its most important leaders like bureaucrats. Is it any wonder then that so many CEOs act like bureaucrats rather than the value-maximizing entrepreneurs companies need to enhance their standing in world markets?

Compensation policy is one of the most important factors in an organization’s success. Not only does it shape how top executives behave but it also helps determine what kinds of executives an organization attracts. This is what makes the vocal protests over CEO pay so damaging. By aiming their protests at compensation levels, uninvited but influential guests at the managerial bargaining table intimidate board members and constrain the types of contracts that are written between managers and shareholders. As a result of public pressure, directors become reluctant to reward CEOs with financial gains for superior performance. Naturally, they also become reluctant to impose meaningful financial penalties for poor performance. The long-term effect of this risk-averse orientation is to erode the relation between pay and performance and entrench bureaucratic compensation systems. This could easily be one of the causes of risk aversion in CEOs that our empirical data revealed.

More aggressive pay-for-performance systems (and a higher probability of dismissal for poor performance) would produce sharply lower compensation for less talented managers. Over time, these managers would be replaced by more able and more highly motivated executives who would, on average, perform better and earn higher levels of pay. Existing managers would have greater incentives to find creative ways to enhance corporate performance, and their pay would rise as well.

These increases in compensation—driven by improved business performance—would not represent a transfer of wealth from shareholders to executives. Rather, they would reward managers for the increased success fostered by greater risk taking, effort, and ability. Paying CEOs “better” would eventually mean paying the average CEO more. Because the stakes are so high, the potential increase in corporate performance and the potential gains to shareholders are great.

B-Stock ownership and stock options

A used method to incentivize performance is compensation through stock ownership or stock options.

Stock ownership means that a part of the compensation of the CEOs is given in shares belonging to the company they work for. Stock options means that a CEO can eventually decide to redeem stocks belonging to the company if he wants to or could even refuse to do so. Compensating with ownership may be especially likely to backfire in firms that already face high risk, such as those close to bankruptcy. Stock options, on the other hand, should reduce executives' tendency to play it safe. Options motivate executives to increase the stock's value above a certain strike price, which often requires taking smart risks. This should theoretically incentivize executives to perform better.

However, as Lefebvre and Vieider (2013) argue in their paper, stock ownership may in fact encourage executives to play it safe and stock options may encourage CEOs to take excessive amounts of risk. This paper helps us understand how companies could potentially guide the risk preferences of the CEOs through incentives in a way to maximize the outcomes of the companies themselves. As we saw CEOs are tendent to risk aversion. Compensation of CEOs through stock options renders executives less risk averse. This happens because they can exert the option to buy those stocks as well as not. In this case they will prefer to try and maximize as much as possible the value of the stock to then exert the rebuy option, even risking to incur in a big loss. In this later case they would not redeem the stocks. In the same way, if compensated through restricted company stock ownership, experimental CEOs take large amount of risks. This contradicts classical financial theory but can be explained through risk preferences that are not uniform over the probability and outcome spaces, and in particular, risk seeking for small probability gains and large probability losses.

We can conclude that shareholders should find the right amount of stock ownership and stock options to offer to CEOs to guide them towards risk neutrality, avoiding them to be too cautious or too incautious. Obviously finding these sweet spots is not easy, but it could lead to a growth in shareholders' final value and is definitively worth it.

4.3 FIRM TAKEOVERS

Takeovers are seen as a disciplining force that makes managers less likely to run firms in a suboptimal way.

How so? Consider a scenario in which a firm creates 100 dollars of value. If someone else, running the firm differently, could create 110 dollars, than the firm is at risk of being purchased by that other party, perhaps for 105 dollars. Because the takeover would probably involve replacing management, the mere threat of a takeover keeps managers working hard to make sure no one can run the firm more profitably.

4.4 CEOs SELECTION

Hanqing Wang (2015) studied the best CEOs selection process. He discovered some interesting results. He found out that less risk-averse candidates are more likely to be hired as CEOs, thereby CEOs tend to be less risk-averse than other senior executives. He also found that CEOs hired from outside the companies are less risk-averse on average. He finally found that companies run by outside CEOs have more volatile performance. These companies also invest more heavily in R&D and have higher leverage ratio. These results suggest, due to the low risk-aversion of outside CEOs, that these companies pursue more risky corporate strategies thereby have more volatile performance. The advantages enjoyed by less risk-averse candidates identified in the paper have important real-world effects on company strategies and performances as we discussed previously.

5. CONCLUSION

Every day the number of companies in the world grows. Companies satisfy a large number of fundamental needs people have and their economic, political and social impact on the world is huge. CEOs are in charge of running firms. Their main objective is to maximize the value for the shareholders that hired them and their main role is to take the most important decisions for the companies. The environment in which CEOs make their choices is very uncertain. It is of crucial importance to understand how executives take decisions under uncertainty since their impact can have remarkable effects on the world around us. To prove the importance of this topic I dealt with the example of a real case of decision making of a CEO and the huge and various consequences his bad decision making had.

In this paper I show that in order to maximize the value for shareholders and fulfil the role they are hired for, CEOs should be expected utility maximizers and risk neutral. I assume that shareholders are also risk neutral and expected utility maximizers. It is simple to realize the reasoning behind this fundamental assumption: the majority of medium and large sized companies' investors are in turn big investors with rich and diversified portfolios and their objective is often the research of profit. A very important problem not to underestimate involves the alignment between CEOs' and shareholders' objectives. Shareholders should be transparent from the beginning in order to avoid moral hazard issues whit executives. To ensure an alignment between shareholders and CEOs objectives, CEOs should be risk neutral and EU maximizers (as we already explained) as the investors.

What I actually found out through the analysis of countless papers and empirical experiments is that CEOs are neither expected utility maximizers nor risk neutral. Through this in-depth research I noticed some similarities in the papers. I managed to classify the three main reasons why executives do not act as predicted by the expected utility theory. They are risk preferences, subjectivity of outcomes and time preferences. All of these causes are complementary and interconnected one another and isolating them does not provide all the information needed to understand the departures from the EUT in CEOs behaviour under uncertainty.

At that point I wondered if there was any way shareholders could encourage CEOs to be risk neutral and expected utility maximizers (or at least reduce the deviation from EUT) and therefore maximize their utility.

I discovered that the methods that shareholders could take advantage in order to try to encourage CEOs to behave as they would like involve: companies guidelines and rules for investments and projects, CEOs compensation methods, firms takeover, CEOs selection process. Obviously making use of these methods is not easy and could require some investments from the shareholders, but the results achieved through using them add to investors' final value and make them definitively worth it.

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