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The impact of Enterprise Risk Management and Corporate Governance on Firm Value

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Introduction

In the last years, the increasing complexity of the Economic World has highlighted the inadequacy of the existing risk management techniques. The evolution of risks and the increasing volatility in the market are the key factors marking the new century, showing the inefficiency of the past management strategies. If the Traditional hedging function of management treated the downside of risks, providing an ex-post mitigation, the Great Recession in 2008 showed the deficiency of this technique and the need for new management able to prevent negative events and create value for companies, moving from a conservative vision to the exploitation of the upside of risk.

This dissertation poses as main question the relation between Enterprise Risk Management, Corporate Governance and Firm Value. In particular, the empirical analysis firstly investigates the effects of integrated risk management and structured Corporate Governance with respect to Firm Value, and in the eventuality of positive result, focuses on the elements affecting the ERM adoption. The initial assumption concerns the positive connection among the highlighted factors, expecting both the increase in Firm Value when considering ERM and Corporate Governance, and the additional impact of Corporate Governance in the adoption of Enterprise Risk Management. The expectations are based on the theory regarding Risk Management, considering in particular the Framework on ERM proposed by the Committee of Sponsoring Organizations of the Treadway Commission that enhances the positive effects in the creation of value and highlights the connection between integrated risk management and Corporate Governance.

The study is divided into two major sections: the first part proposes the theory on Risk and Risk Management, in order to comprehend the evolution of the risk conception and the consequent adjustment of management. In the first two chapters, the passage from downside to upside risk is commented, focusing on the excursus of management from the Traditional, concentrating on hedging activities, to the most recent formulation of Enterprise Risk Management, where the opportunities deriving from an integrated structure indicate the detachment from the past management activity.

The second part of the study refers to the empirical analysis where all the theoretical assumptions are tested in order to prove the positive correlation between ERM, Corporate Governance and Firm Value. By utilizing a dataset containing both the financial and non-financial companies

composing the EURO STOXX 50 Index, an initial fixed effects panel regression provides the positive dependence between ERM, Corporate Governance and Firm Value. Furthermore, an additional logit panel regression investigates the influence of Corporate Governance on the adoption of an integrated risk management, providing a positive answer to the main question of the analysis, coherently to the theory assumptions. In conclusion, an analysis on the joint effect between ERM and CGindex variables is conducted in order to confirm the positive effects highlighted by the two regressions. Through the usage of interaction variables, the dependence between risk management and Corporate Governance is confirmed as well as the positive effect on Firm Value.

CHAPTER 1

Risk

1.1 What is risk?

“Risk, for most of us, refers to the likelihood that in life’s games of chance, we will receive an outcome that we will not like.”

Aswath Damodaran

The choice of starting the dissertation on what risk actually means with this type of “unorthodox” definition, is driven by the desire to express the simplistic definition that most of the times is given to risk. From this definition, risk appears as the likelihood of receiving an unexpected outcome that is also something that we do not like. By giving this, at first, simple definition, Damodaran perfectly exemplifies the negative meaning of risk that covers the larger one, at least when regarding the World of Finance and Economics in general. Although several definitions of risk have been given, each with different meaning and perception depending on the area of application, they all share the negative import that has always surrounded this word.

Furthermore, the absence of a unanimous definition in the literature, has contributed to the difficulty of identifying a unique and coherent meaning, enhancing the usage of the negative aspect, in particular in the financial area that is the one considered by this study. In the table below, a brief list containing definitions of risk in the literature is presented, in order to better comprehend the evolution and the different considerations regarding risk by authors.

Il rischio è l'eventualità di una perdita	Smith (1776)
Risk is the chance of damage or loss	Haynes (1895)
Risk is uncertainty + damage	Kaplan (1981)
Risk is the potential for realisation of unwanted, negative consequences of an event	Rowe (1977)
Risk equals the probability of an undesirable event	Campbell (2005)

Risk equals the expected loss	Verma et al. (2007) Willis (2007)
Risk is the effect of uncertainty on objectives. The effect may be positive, negative, or deviation from the expected.	ISO (2009a; 2009b)

Table 1. Definitions of risk in the Literature. (Source: personal elaboration)

If we look at the non-financial World, the Oxford Learner’s Dictionaries defines risk as “*the possibility of something bad happening at some time in the future*” and “*situation that could be dangerous or have a bad result*”. From these definitions, hazard and possible losses are presented as the principal aspects concerning risk.

As a result, giving an exhaustive definition for financial risks has been arguably difficult. However, depending on context, from Table 1 it is possible to notice an evolution on the concept of risk, changing from a strict negative representation to a more probabilistic one. In addition, concepts like “*(...) Risk is the combination of probability and extent of consequences*”¹, “*(...) Risk is an uncertain consequence of an event or an activity with respect to something that humans value*”² or “*(...) Risk means the likelihood of a specific effect originating from a certain hazard occurring within a specified period or in specified circumstances*”³, may be useful to point out the key connection between risk and uncertainty.

Understanding this relation means understanding the statistic view of risk, which is the product of the likelihood of an event and its outcome. Consequently, the word outcome becomes central in giving a new definition of risk, in which the hazard taken by an individual could lead with a certain probability to a negative or a positive, this time, result. In fact, risk results in the likelihood to receive a return on investment that is different from the expected return. However, in this way, risk could be seen as an opportunity for the subjects willing and capable to exploit the chances offered.

Following this argument, returns could be lower than the expected ones but at the same time even greater, translating into a positive acceptance of risk and evolving into an opportunity.

¹ Ale (2002)

² IRGC (2005)

³ Kirchsteiger (2002)



Figure 1. Chinese symbol for risk. (Source: A. Damodaran, *Applied Corporate Finance*, Fourth Edition)

Using again Damodaran's simple but efficient examples, the figure above, is the Chinese symbol for risk: the first symbol means danger, the second opportunity. This simple example "illustrates very clearly the trade-off that every investor and business has to take into account – between the higher reward that comes with the opportunity and the higher risk that has to be borne as a consequence of the danger⁴."

Despite the relation between risk and return is central for the investment economics, this theme is not the main focus of this analysis and will not be treated. There have been several studies and method propositions regarding risk-return models, in order to empirically highlight the danger deriving from taking the risk related to an investment, and translating it into an opportunity (or return). The key element that this study wants to concentrate on is, again, the opportunity that comes from risk and the positive view arising from it.

The chance of exploiting the "good side" of risk is the Risk Management area and duty.

A good management strategy, capable not only to identify but also to manage (as the World suggests) risks, is the instrument that allows the risk taker to actually exploit and take advantage of it.

After a brief excursus on risk definition, before continuing with the analysis on the most used Risk Management techniques, an introduction to the types of risks a company faces is of much relevance.

1.2 Types of Risk

Once introduced the concept of risk and the contradictory visions in the Literature, in order to better comprehend which side of risk firms will consider (downside or upside), and consequently

⁴ Aswath Damodaran, *Danger and Opportunity: Dealing with Risk*

which type of risk management they will adopt, a brief description on the types of risks firms face is provided.

Of course, a variety of risks exists, with each classification having a distinctive aspect that has to be treated in a different way. One first great distinction is between **pure** and **speculative** risks. Pure risks are the ones that cannot be anticipated by the firm, so they relate only to the downside of risk, where the company can only try to mitigate the negative effect; in other words, they are inevitable. Examples of pure risks are natural disasters or property damages, rare events but with severe impacts. On the other hand, speculative risks concern the upside of risk: events belonging to this area are identifiable ex-ante and could bring firms to exploit the positive effect that could derive from a good management. It is important however to point out the importance of a good management strategy, since types of events related to speculative risk are those concerning the normal routine of a company or market, like market price drops or decrease in the demand of products. Only an “on-point” management attitude could prevent from bad consequences of this kind of event, and eventually allow outperforming the market by exploiting the situation.

Another distinction could be between **systematic** or **unsystematic** risk. The first one is the undiversifiable risk, the risk that is inherent to the entire market. It is in fact called “market risk”, since it is unpredictable and cannot be controlled. On the contrary, the non-systematic risk is also known as the “residual risk” that is specific of the firm for each kind of investment. The events that carry this type of risk are also unpredictable and difficult to avoid, but contrarily to the market risk, it can be controlled: through diversification, risk can be reduced and through good management even exploited.

Other categories of risk, each with different characteristics and referring to different areas, could be described but, as concerns this study, the type of risks that result most important for the continuing of the analysis are the ones specific of the firm, i.e. **Business (or Enterprise) Risks**.

The risks a company may encounter are several and of different nature, each with different impact. In order to give a simplistic but clear outlook, a table with the four macro areas⁵ of risk has been provided.

Risk Types	Examples
Hazards (pure risks)	Property damage, business interruption, personal injury, natural disaster
Financial	Liquidity, credit, inflation, price variation, interest rates, currency

⁵ According to the Casualty Actuarial Society (CAS)

Operational	Product development, supply chain management, technology, external events
Strategic	Reputation, competition, compliance

Table 2. Four macro areas of risk provided by the Casualty Actuarial Society. (Source: personal elaboration based on *Enterprise Risk Management: Second Edition*, David L. Olson, Desheng Dash Wu, World Scientific Publishing Company, 2015)

As regards pure risks, a brief description has already been provided. However, analyzing the other three categories that the Casualty Actuarial Society presents as the most relevant macro areas of risk, could help in comprehending their meaning and the approach companies should use to face them.

- **Financial Risk:** as the term suggests, Financial Risk is the risk of possible financial losses or different returns on an initial investment. Usually, it generates from instability on the financial market that reflects at the same time in liquidity, credit, inflation and other risks. In particular, the most relevant financial risks are:
 - o **Liquidity risk:** it is the risk that the firm lacks of liquidity. This could arise from two situations: in the first scenario, the issue is the inability of the company to execute transactions; in the second scenario, time is the element that generates lack of liquidity. Again, to better comprehend:
 - In the first case, the company faces the difficulty in selling assets. The lack of buyers causes the company liquidity problems.
 - In the second case, the issue relates to the different time instants of revenues and expenditures, for which the company may have to pay creditors before having received clients' payments.
 - o **Credit risk** is the risk that the counterpart, in this particular case the borrower, is not able to respect the contract he signed with the company. The action of failing in the respect of the obligation assumed by the counterpart can reflect both in “strictly” monetary terms and in “related” ones. To better comprehend, the borrower could lack either in repaying capital and interests (actually monetary) or, for example, in the delivery of goods (related). However, the credit risk is influenced not only by the events related to the counterpart, but also by events related to the economic cycle, making this type of risk one of the most difficult risks to manage. An elevated credit

risk translates in the demand for a higher credit risk premium, indicating a higher interest demanded by the company in order to collaborate with the counterpart, as result of a higher probability of default. In the negative case of failure of the contract, the company suffers, in primis of a direct loss on capital and interests. In addition, an eventual loss in terms of downgrade by rating agencies has to be considered when negotiating the contract. In fact, when a firm suffers from a negative judgement by rating agencies, the market perceives this as a sign of difficulty in repaying debt or interests by the firm.

- **Price variation risk:** it is the risk of variation of commodity prices. This is the risk primarily faced by companies that operate with commodities. However, every firm suffers from a negative variation of commodity prices: an increment of the price of raw materials translates into higher production costs and consequently into a higher final cost of sale. The management role in this case, will be of quantifying the incidence of raw materials on the final product, in order to evaluate the increase of the cost of sale and the decrease of the gross margin.

- **Currency risk:** it is simply the risk of currency that firms operating in different countries are subject to. In this case, the risk consists in the appreciation⁶ or in the depreciation⁷ of the firm's national currency. Therefore, in case of **appreciation:** if the firm imports, an appreciation will be an opportunity for the company, since imports will be less expensive. On the contrary, export will be more expensive and appreciation will have negative effects on the firm.
In case of **depreciation:** if the firm imports, depreciation will have negative effects since import will be more expensive. On the other hand, export will be less expensive and depreciation will have a positive effect.

- **Interest rate risk:** it is the risk of changes in interest rates. It focuses mainly on firms that are willing to have access to debt, or are already levered. It follows the same reasoning of the currency risk: it depends on the variability of the rate. If the

⁶ Increase in the currency rate, indicating the greater need of foreign currency to buy a unit of domestic currency.

⁷ Decrease in the currency rate, indicating the lower need of foreign currency to buy a unit of domestic currency.

interest rates are variable, in fact, they could increase, resulting in higher payment of interests; on the contrary, if interest rates decrease, it results in savings for the company. However, the volatility of rates does not limit in affecting the amount of interests to be paid, but touches the computation of companies value. In fact, a firm's value is computed by actualizing the cash flows of that company to a certain rate. This rate is obviously influenced by the variability of the market rates. A decrease of the interest rates on the market has a negative impact on the total value of the firm. Depending on the cash flows a firm uses to compute its value (either Free Cash Flow to the Firm, Free Cash Flow to Equity or Dividends), the actualization is made at a rate (either WACC or Cost of Equity) that is computed with the Capital Asset Pricing Model, CAPM for simplicity. In the CAPM, the market interest rate is used in order to compute the risk premium that affects the value of the expected return of an asset. Therefore, the variation of interest rates affects companies not only in the process of obtaining debt or paying interests, but also in the process of valuation.

- **Operational Risk:** it is the internal risk of firms. With this definition, the aim is to highlight the non-financial nature of this risk that does not relate to market risk in any way. It is exclusively a type of risk regarding firms and their operation. Problems in management operation, production development or supply chain, just to name few examples, are the ones that cause the inefficiency of the firm.

A solid definition for operational risk, mostly used in the banking area but also with companies of different nature, is given by the Basel Committee. With the "Basel IV⁸", the operational risk is defined as "risk of loss resulting from inadequate or failed internal processes, people and systems or from external events". This definition includes human error, information and technology failures, fraud, management problems, accidents, natural disasters and more, translating into a very large definition of difficult practical application. In order to better comprehend the areas touched by the operational risk, a brief personal interpretation of the elements influencing its definition is given.

⁸ The term "Basel IV" refers to the new international banking standards introduced by the Basel Committee in 2017 with the Basel Accords, and by the European Union in 2019 with the banking package reform. This Framework indicates the prudential standards on banking management, and is considered an integration of the Basel III reform in 2011, that is itself an evolution of the first principles emanated in 2006 with the Basel II Framework.

- **Human error (people)** refers to the possibility of losses due to inability, inadequacy or lack of preparation of the staff.
 - **Strategy** refers to possible losses due to errors in the elaboration and in the implementation of the strategy. It originates both from external events that may affect the effectiveness of the strategy, or from human error.
 - **Internal processes** refers to inadequacy of internal procedures, inefficacy of internal controlling and combination of expertise and machinery obsolescence needed for the correct implementation and development of internal processes.
 - **Systems** indicates information and technology failure. Again, the lack of knowledge on IT systems could be reason of risk and losses for the company.
 - **External events** simply refers to events external to the company, that are unpredictable and of difficult management. In this category, it is possible to identify natural disasters, fraud, accidents but also political, economic and cultural changes.
- **Strategic Risk:** it does relate to the strategy definition given for the operational risk. However, rather than referring to the strategic risk as consequence of human errors or external events, that are key elements for the operational attribution of strategy, the Casual Actuarial Society refers to the “proper” strategic risk in terms of 3 indicators, that are Reputation, Competition and Compliance.
- **Reputation** and **Competition** can be attributed to the same category of effects deriving from a negative result of the strategy used by the company. In fact, the lack of efficacy of a strategy might present reputation problems, such as the downgrade by rating agencies, in the case of listed companies, or bad impression and consequent loss of clients. This obviously benefits the competitors, translating into an additional damage for the company that is the competitive loss.
 - **Compliance** is the risk coming from the disrespect of regulations. This results in sanctions that affects the value (in case of monetary sanctions) and the operation (in case of judiciary) of the firm. The role of compliance is usually related to the

Corporate Governance that will be treated in the following chapters of this study. However, is important to anticipate the complexity of the subject compliance when regarding firms' management. Especially with the changes in management that has evolved until the present Enterprise Risk Management, the need of compliance to regulate the adoption of a new type of risk management model was necessary, but, as we will see in the continue of this study, regulation has failed on that.

Kaplan and Mikes⁹ shared the idea about the complexity of the just exposed risk identification, so they proposed¹⁰ another view of risks in which risk is divided into 3 big categories:

- **Preventable Risks:** risks originating inside the firm that are preventable and should be avoided or mitigated.
- **Strategy Risks:** risks originating from the management strategy of the firm that are known and can be used in order to grow the business.
- **External Risks:** risks originating outside the firm that are unpreventable and difficult to avoid.

According to the authors, the idea was to simplify risk identification in order to achieve the main goal that is to facilitate risk management. In fact, by this distinction, they posed the attention on the difference between preventable-external and strategy risks. The key element that differentiate these two categories is the perception of risk a firm's management should have: preventable and external risks must be avoided, while strategy risk has to be embraced in order to grow the business. This research does not dwell on the Kaplan and Mikes theory, even if it is very interesting and useful for the continuing of this paper. The presentation of the different view of risk categories by Kaplan and Mikes has the intention to give the idea of the variety of expression regarding risks, and highlight the complexity in the process of identification, management and control. However, this "freedom" in the treatment of risk can be seen either in a negative or in a positive prospective. In fact, all relates to the risk management efficiency: except for pure risks, the other categories are affected by the strategy used by the company, giving much relevance to the adoption of a good management approach.

⁹ Harvard University

¹⁰ *Managing Risks: A New Framework*, Harvard Business Review, 2012

1.3 Risk Management

1.3.1 Modigliani-Miller

Modigliani and Miller first introduced the concept of Risk Management in 1958 with the “Risk Management Irrelevance Principle”. They claimed that, under perfect market conditions, the usage of any type of Risk Management strategy would not have affected firm value. The irrelevance of the financial structure of firms was justified by the hypothesis of an environment with no taxes, default risk, agency costs and asymmetry information, called market imperfections. Under these assumptions, the methodology firms adopt to finance themselves is irrelevant: in other words, a firm’s value will be determined on the quality of its investments, not by its financing mix. A brief explanation of how the model works is provided in figure 2.

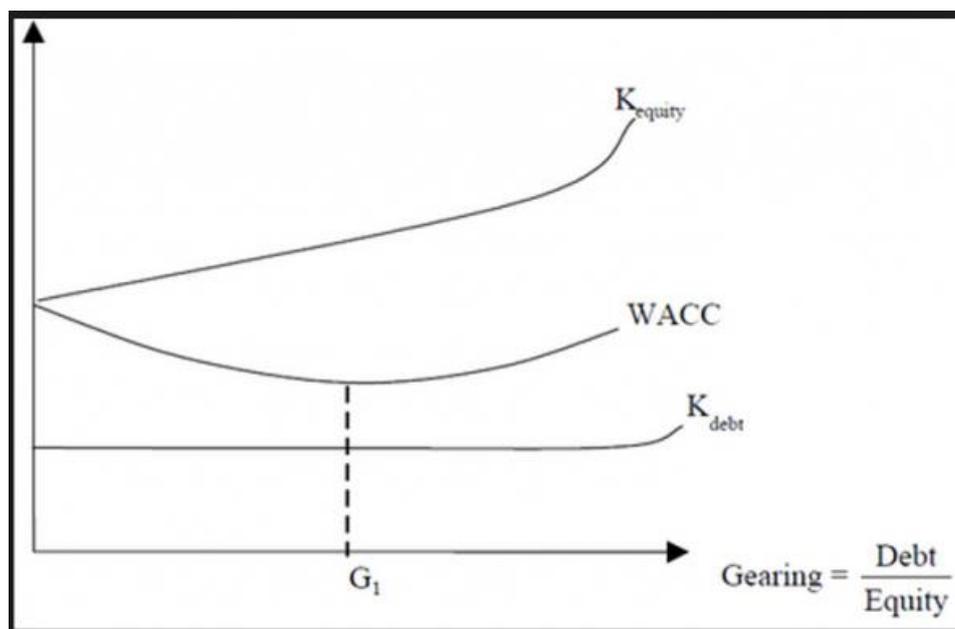


Figure 2. Behaviour of the Weighted Average Cost of Capital. (Source: Financial Times)

This figure represents the evolution of WACC, i.e. the Weighted Average Cost of Capital that is a weighted average between cost of debt (K_{debt}) and cost of equity (K_{equity}). Through this simple graph, it is possible to better understand the Modigliani and Miller theory, where the cost of capital of the firm does not change with leverage. As Damodaran says: “As a firm increases its leverage, the cost of equity will increase just enough to offset any gains to the leverage”.

The first proposition of the Modigliani and Miller theorem claims that the value of an unlevered firm is equal to the value of a levered one. In terms of formula, it is

$$V_{\text{Levered}} = V_{\text{Unlevered}}$$

It should be remarked that this result is a direct consequence of the perfect market assumption, where taxes and corresponding deduction are not considered. In other words,

$$V_L = \frac{FCFF}{WACC} = \frac{NOPLAT}{WACC} \text{ Or } V_L = \frac{NOPLAT}{R_A} + \frac{R_D * t_C * D}{R_D}$$

where:

- $\frac{NOPLAT}{R_A} = V_{\text{unlevered}}$
- $\frac{R_D * t_C * D}{R_D} = \text{Tax shield,}$
- t_c indicating tax rate,
- $R_A = \text{unlevered cost of capital}$
- $R_A = \text{WACC, constant,}$
- $FCFF = \text{NOPLAT given the perfect market condition,}$
- D indicating Debt,
- R_D stands for Rate of debt.

It is evident from the formula that the value of the levered firm is equal to the value of the unlevered one ($V_{\text{unlevered}}$) plus the tax shield, and that without taxes as in the perfect market assumption by Modigliani and Miller, the value of the levered and the unlevered firms is the same.

Therefore, the reason of the constant WACC is provided with the second proposition of Modigliani and Miller. It establishes the relationship between the equity cost of capital, for a levered firm, (R_E)¹¹ and the operating cost of capital, for an unlevered one, (R_A)¹², where is evident the key role of taxes (t_c) and leverage. Again, in terms of formula, it is

$$R_E = R_A + (R_A - R_D) * (1 - t_C) * \frac{D}{E}$$

Assuming perfect markets, the Modigliani and Miller formula simplifies in

$$R_E = R_A + (R_A - R_D) * \frac{D}{E}$$

¹¹ Also called “levered cost of capital” or “return of the equity”

¹² Also called “unlevered cost of capital” or “return of the assets”

Consequence of this formulation is that R_E (as R_D) decreases when debt is reduced and viceversa. This condition reflects on the cost of capital (WACC) that, due to a decrease (or increase) in both cost of equity and cost of debt, is not affected by a negative (or positive) variation in the financial leverage of a firm. Again, this result is possible with the assumption of perfect markets: the formula for the cost of equity, comprehensive of the tax rate, highlights the different value that would result with the application of taxation and then the different cost of capital that would be obtained, leading in this way to a substantial difference between the value of a levered firm and the value of an unlevered one.

1.3.2 Risk Management Evolution

The introduction of market imperfections was the main critique posed to the Modigliani and Miller model by authors and scholars. The presence of asymmetries, taxes and costs was the key element that brought to the usage of Risk Management. Risk Management helps firms to determine risk and manage it in order to reduce and minimize the real costs of the firm. However, this view was not “adopted” until the ‘70s. Before that period, Risk Management was interpreted only as the instrument capable to mitigate risk, rather than face it and manage it. Only in the recent years, this concept has developed and established as the actual Risk Management, in which strategy start to take possession over Insurance. The knowledge and the experience acquired over the years by managers led to different evolutions of models against risk. One of the first methods of Risk Management was the Traditional Risk Management (TRM). It was developed as managers started to understand the importance of having a solid function dedicated only to managing risk that could help in minimizing costs and improve the value of the company. At first, the Traditional Risk Management was related to a function business unit, almost excluded from the company itself, and performed a marginal activity with respect to the goal of the firm. With the evolution of the economy where volatility and risks were becoming key factors, it started to get increasing consideration as fundamental element in the persecution of the objectives of the firm. However, it was still perceived and adopted as hedging strategy rather than “proper” management. The beginning of implementation of an integrated risk management, that would collocate the risk management not only as function but also as an active part in the Corporate Governance of firms, arrived only in 2004, with the Enterprise Risk Management (ERM) model proposed by the Committee of Sponsoring Organizations of the Treadway Commission, named COSO through the study for simplicity. Still, the model of an integrated risk management, active participant in everyday actions of firms, has found difficult and rare application, even after the Great Recession in 2008

that strongly highlighted the inadequacy of the techniques used until that time. However, even if new documentation and revisited models about the Enterprise Risk Management have been published, such as COSO 2017 or ISO 31000, in order to give good international standards on the Framework of the ERM and how to implement it, still the majority of companies does not integrate this strategy in their governance.

1.3.3 Traditional Risk Management

One of the first Risk Management models was the Traditional Risk Management. It was developed, as said before, in the 70's and it is still used by the majority of firms. The main steps of analysis of this methodology comprise:

1. Inspection
2. Risk Identification
3. Risk Estimation and definition of a managing strategy
4. Controlling and monitoring

In order to describe the main characteristics (and limitations) of this approach, a brief table that compares Traditional Risk Management and Enterprise Risk Management is provided below. Although the ERM will be elaborated in depth in the next chapter, in this we identify the characteristics of TRM and anticipate the differences between the two models that will be point of discussion in the continuation of this study.

Traditional Risk Management	Enterprise Risk Management
Insurable	Non-Insurable
Risk as individual hazards	Risk in the context of business strategy
Focus on pure risks	Focus on speculative risks
Short period	Long period
Downside risk	Upside risk
Inspection, detection, reaction	Anticipation, prevention, monitoring, controlling

Table 2. Traditional Risk Management versus Enterprise Risk Management. (Source: personal elaboration based on *Financial Market Imperfections and Corporate Decisions: Lessons from the Transition Process in Hungary*, Emilio Colombo, Luca Stanca, 2006)

- **Insurable:** Traditional Risk Management treats only insurable risks, completely ignoring the non-insurable ones. To better explain this concept, with the TRM, events that are related to

the insurable “accident” but that are not “material” and of difficult identification, are not considered. An example could be the reputation of the firm after a problem to an infrastructure.

- Risk as individual **hazards**: TRM uses a traditional silo-based approach, in which each department treats risks independently. No connection between different offices, and consequently between risks, is applied. By using this approach, the risk is that of creating inefficiencies in the management procedure, since each business unit is looking at reducing its own risk, without looking at what should be the actual main goal that is the minimization of the entire firm risk. The firm achievement of its objective is the key result that each department should pursue, but the fragmentation of the Traditional Risk Management causes economical inefficiencies that reflect in the non-consideration of the interrelations between risks. Looking at risks separately is contradictory: if two risks are connected, treating them together is much more efficient and cheaper than looking at them individually. This simple example should be related to the entirety of risks a firm faces, in order to better comprehend the much greater results the Enterprise Risk Management retrieves from this approach, with respect to the Traditional one.
- Focus on **pure risks**: pure risks are the ones that cannot be anticipated by a firm, so that they are treated ex-post. This translates into a passive management, in which firms only care about the mitigation of risk, with no effort in obtaining and managing the opportunity that could derive from anticipating it.
- **Short period**: TRM adopts a short-term approach, focusing only on risks that might affect the firm in the short period, without considering the mid-long period. By doing this, the management shows lack of future vision while on the contrary the goal of a firm is, most of the times that of pursuing a long period result.
- **Downside risk**: as discussed before, one of the main issues with the Traditional Risk Management is the non-consideration of the opportunity that risk offers. A good management strategy could stem from taking risk, aiming not only to mitigate but also to exploit it. Risk could be seen as the probability to have different returns from those expected, either negative or positive. Anticipating might provide a good prevention strategy, in order

to protect from risk. Then, good strategy and management could result into positive returns, gaining in this way from the upside vision of risk.

- **Inspection, detection, reaction:** this category relates to the previous one. The methodology in which TRM evaluates and treats risk is an ex-post analysis, limiting the Traditional technique to supervision, not allowing to exploit the upside risk.

All these key elements, which can be seen at the same time as the main problems of this approach, make the Traditional Risk Management both easier to adopt with respect to the Enterprise Risk Management, and cheaper, since it does not require neither the establishment of a specific business unit nor to hire a Chief Risk Officer, one of the main indicators of ERM. Many authors have criticised the Enterprise Risk Management, mainly for its complexity and for the lack of clear and unanimous recognised guidelines. The main point is the word guidelines: big authorities and institutions like COSO, can give all the elements and Frameworks for the adoption of ERM, but they are still guidelines, i.e. non-compulsory. Another golden point, which will be discussed in the following chapters, is the difficulty of empirically proving the efficacy of the Enterprise Risk Management. Reasons are several:

- the absence of a unanimous index to measure ERM, to see if actually has a positive impact on the value of a firm,
- the short term results on ERM, considering its recent introduction and, as said before, being it a long term measure that should reflect its results in the future,
- the non-compulsory nature of the guidelines provided, that make the adoption of the ERM not only voluntary but also very adaptable and modified (differently) in each firm.
- the large definition and areas of adoption of ERM that reflects in a fragmentation in its application.

Several reasons against Enterprise Risk Management could be considered and have been used. The focus of this study however is to see how it influences the firm, possibly to see if it has a positive value. Before doing that, a deepening on the evolution and the characteristics of the ERM is necessary.

CHAPTER 2

Enterprise Risk Management

2.1 An overview on ERM

“La sopravvivenza di un’azienda è assicurata dalla sua capacità di creare valore per i suoi stakeholder.”¹³

“The survival of an enterprise is provided by its ability to create value for its stakeholders.”

This statement constitutes the philosophy standing behind Risk Management. Every firm faces uncertain events that cause risk. The challenge for Risk Management is to identify these events and quantify the total risks accepted by the firm in order to create value. As already said in the previous chapter, risk has a double implication: it could be either a downside risk providing negative results, or a positive connotation in the sense of upside risk. The statement opening this enhances the role of ERM, which implies efficiently dealing with events and risks faced by businesses, in order to increase the opportunities of creating value. In order to achieve this goal, management has to correctly identify events, as already said, but also to provide good strategy to manage the risks connected. When elaborating the strategy, management has to consider the main goal of the company that is the creation of value for its stakeholders. In order to do that, the elements to be considered are several: just to name a few of them, management should at first identify risk attitude, tolerance and threshold of the company, then find the optimal equilibrium between risk and profitability and ultimately allocate in an efficient way the available resources. In particular, according to the COSO’s definition of Enterprise Risk Management, the characteristics of a good ERM are:

¹³ “La gestione del rischio aziendale. ERM. Enterprise risk management: modello di riferimento e alcune tecniche interpretative”, Il Sole 24 Ore, 2006

- Strategy alignment to the accepted risk: management has firstly to identify and quantify the risk tolerance¹⁴ of the company, and then align strategy decisions to manage risk,
- Strategy identification: ERM first identifies several management strategies and opportunities and then chooses the most adequate one,
- Reduction of unexpected events and losses: ERM provides good strategy against unexpected events. If a firm has a good overall management, it is able to react to unpredictable events and to mitigate eventual losses arising,
- Identification and Management of correlated risks: ERM allows the firm not only to properly react to risks independently, but looks at the correlation between several risks. By managing risks as a portfolio, the firm looks at the connections between risks and is capable of eliminating costs and inefficiencies arising in the silo-based approach,
- Opportunities identification: By analysing all types of events and risks a company could face, ERM allows to identify also all the opportunities for the creation of value,
- Improvement on the Asset allocation: the gathering of information on the environment in which the company operates permits the management to have all the necessary information to correctly distribute firm's capital.

These characteristics highlight the relevance of the ERM. As the statement at the beginning of this chapter says, the survival of a company is possible only if it creates value for its stakeholders. With the usage of ERM, the firm has a strong support in the realization of its objective. However, many critiques have been moved. As mentioned in the analysis of Table 2, ERM is criticized mostly for the lack of proof regarding the value added, the elevated cost both in terms of time and capital, or for the lack of compulsory guidelines provided: these factors together have decreased the perception of the importance of ERM.

After this brief introduction, our study will concentrate on providing an exhaustive description of the ERM Frameworks given by the two major institutions when regarding ERM, which are the already mentioned Committee of Sponsoring Organizations of the Treadway Commission, COSO for simplicity, and the International Organization for Standardization with its ISO 31000 standards on Risk Management. With the objective to answer the final question of this work on the impact of ERM on firm value, the analysis will focus at first on the exhaustive definition and

¹⁴ Risk Appetite, Risk Tolerance and Risk Threshold are the basic risk management concepts. In few words, Risk appetite indicates the degree of uncertainty a company is willing to take. Risk Tolerance is the range on the desired uncertainty (Risk Appetite) a company accepts, i.e. how much risk the company can withstand. Risk Threshold indicates the maximum or minimum level of risk, respectively above or below a company rejects the uncertain event.

comprehension of the model proposed by the COSO, exploring its evolution from the first emanation to the present. Then, the study will concentrate on the differences between ERM and TRM, concluding with the analysis on the ISO 31000. The idea is to fully understanding ERM functions and capturing the variables that could be used in the empirical analysis.

2.2 ERM evolution

As already discussed in the previous paragraphs, the adoption of Enterprise Risk Management is recent and still very debated. Starting from the attribution of different definitions of ERM, moving through the different Frameworks, the uncertainty on ERM is still widespread. As a result, there is not a proper concept of what ERM is but only guidelines on what it should be. In fact, the implementation of ERM is different from each company, depending on the different factors regarding the nature of the firm, the knowledge of the management, the capital, the area in which it operates, etc.

During the years, several definitions of ERM have been provided. Examples are shown in Table 3 below:

Disciplines by which an organisation in any industry assesses, controls, exploits, finances, and monitors risks from all sources for the purposes of increasing the organisation’s short-term and long-term value to its stakeholders	Casual Actuarial Society (2003)
In contrast to the traditional “silo” based approach to managing risk, the ERM approach requires a company-wide approach to be taken in identifying, assessing, and managing risk.	Kleffner et al. (2003)
Unlike the traditional “silo-based” approach to corporate risk management, ERM enables firms to benefit from an integrated approach to managing risk that shifts the focus of the risk management function from primarily defensive to increasingly offensive and strategic.	Liebenberg and Hoyt (2003)
Integrated risk management is consideration of the full range of uncertain contingencies affecting business performance.	Miller and Waller (2003)
Decision-making discipline that addresses variation in company goals	Makomaski (2008)
The process of planning, organising, leading and controlling the activities of an organisation in order to minimise the effects of risk on an organisation’s capital and performance	Stulz(2008)

Table 3. Enterprise Risk Management definitions. (Source: personal elaboration)

Despite different periods and different visions of ERM, the common factor is the conception of management as systemically integrated, as a process that treats various types of risk, as it is shown in the figure below.

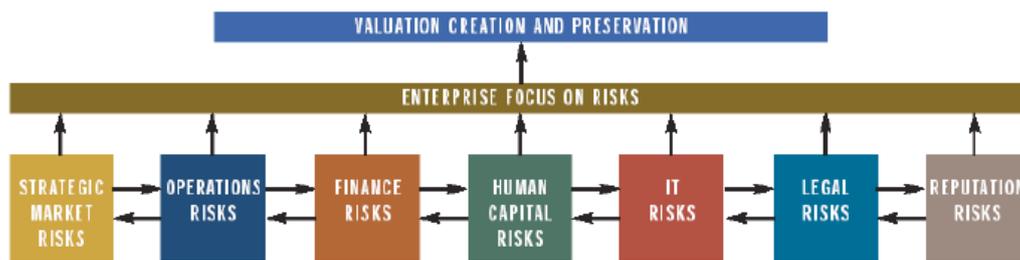


Figure 3. ERM concept representation. (Source: *Outsourcing? At your own risk*, M.Beasley, 2004)

Figure 3 confirms the integrated position of management and the detachment from the “silo” based approach of the previous management strategies. All types of risk described in Chapter 1 are no more considered as separated: the ERM bases its theory on the correlation between risks and treats them as a unique portfolio.

Facing the fragmentation of risk and ERM definitions, also the ERM Framework appears much diversified. ERM emerges as a Framework or structured approach combining strategies, resources, technology and knowledge to assess and manage the uncertainties that various enterprises face as value is being generated (Hoffman, 2009). Several ERM Frameworks have been presented by organizations around the World. The table below shows the variety of some Framework presentations, in order to express the different structure and guidelines given to ERM, reflecting again in a difficult application and monitoring at International level. In fact, having such a fragmented vision about Risk Management, leads to different interpretation and application of ERM depending on the standards adopted by each firm. In addition, compliance and legislation at International level, appears very complicated since the lack of a common Framework to consider.

STANDARD	AUTHOR	YEAR
CAN/CSA-Q850-97: Risk Management: Guideline for Decision- makers	Canadian Standards Association (CSA)	1997
BS IEC 62198:2001	British Standards (BS)	2001
JIS Q2001:2001 (E): Guidelines for Development and Implementation of Risk management System	Japanese Standards Association (JSA)	2001
CEI/IEC 62198:2001: International Standard, Project Risk	International Electrotechnical Commission, Switzerland	2001

Management: Application Guidelines		
FERMA Standard: 2003	Federation of European Risk Management Associations (FERMA)	2003
AS/NZA 4360:2004: Risk Management	Standards Australia/Standards New Zealand	2004
COSO	Committee of Sponsoring Organisations of the Treadway Commission	2004
BS31100:2008	British Standard, UK	2008
ISO31000:2009	International Standard Organisation (ISO)	2009
COSO	Committee of Sponsoring Organisations of the Treadway Commission	2017
ISO31000:2018	International Standard Organisation (ISO)	2018

Table 4. ERM Frameworks. (Source: personal elaboration based on Olajide Solomon Fadun, 2013)

From Table 4 it is possible to notice the fragmentation and the large amount of standards regarding ERM, but also, and most importantly for this study, that after the first proposition of the standards by the Committee of Sponsoring Organisations of the Treadway Commission in 2004, the World started recognizing this Framework as the one to be adopted. With the following introduction of standards published by the International Standard Organisation, for years the main Frameworks on Enterprise Risk Management have been the COSO ERM Framework and the ISO 31000, recognized by the World's big companies and institutions as coherent and efficient standards, worthy to be adopted and integrated in their governance.

2.3 COSO 2004: Enterprise Risk Management - Integrated Framework

As previously affirmed, in the last 15 years the most adopted standards regarding Enterprise Risk Management are those provided by COSO and ISO. In particular, the first Framework was by COSO in 2004. COSO ERM Integrated Framework has evolved since its first emanation, with a deep review in 2017 with the aim of eliminating and resolve the misunderstandings raised after the 2004 proposition. However, before continuing with the study on the evolution of COSO and ERM, a question should be posed: "What is COSO?" The term COSO, as already said, is an abbreviation for Committee of Sponsoring Organization of the Treadway Commission. As the

word suggests, it is an independent American Commission originally formed in 1985 as a joint initiative of five private sector organizations, sponsored by the major industrial and professional associations. If we have seen that in 2004 COSO provided the formulation of ERM's Integrated Framework that has been used until 2017, and still is the core of the actual ERM's Framework, it should be said that the first edition of COSO's report was in 1992. This version does not explicitly relate to Enterprise Risk Management but poses the bases for the future emanation in 2004. The report is named "Internal Control over Financial Reporting" and was one of the first studies to provide guidelines on Internal Controlling, introducing the subject of integrated management. This model was updated in 2004, according to COSO's words *"In response to a need for principles-based guidance to help entities design and implement effective enterprise-wide approaches to risk management, COSO issued the Enterprise Risk Management – Integrated Framework in 2004. This Framework defines essential enterprise risk management components, discusses key ERM principles and concepts, suggests a common ERM language, and provides clear direction and guidance for enterprise risk management. The guidance introduces an enterprise-wide approach to risk management as well as concepts such as: risk appetite, risk tolerance, portfolio view. This Framework is now being used by organizations around the World to design and implement effective ERM processes."*¹⁵

According to COSO 2004, ERM is the *"process, affected by an entity's board of directors, management and other personnel, applied in strategy-setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives"*.

This definition will be subject to contradictions and critiques by many authors and firms, causing misunderstandings and the necessity of the new formulation in 2017. However, this definition still provides revolutionary concepts with respect to the previous risk management models. The fundamental concepts are:

- the continuity of the process that involves all company's units and departments, at all levels,
- strategy-setting approach, moving from the hedging and insurance concepts of Traditional Management,
- designed to identify potential events that may affect the entity and manage risk to be within its risk appetite,
- designed to protect the firms in their totality, pursuing the achievement of firm's goal that is the maximisation of its stakeholders and consequently of its value.

¹⁵ COSO, 2004

This definition alone, defines the key concepts of ERM, indicating to companies the points they need to apply in managing risk. The definition of ERM is voluntary large and exhaustive, so that it can be across organizations, industries and sectors. Furthermore, with this definition, COSO affirms that the implementation of ERM could be different in each firm, depending in fact on its nature and its characteristics. It is evident that COSO with this definition, not only exposes the points to be respected in managing risk but aims directly at the achievement of firms' objectives, providing at the same time also the criteria to verify the efficacy of ERM. The pursue of objectives is of much relevance for COSO's ERM. In fact, it does not limit in giving companies good risk management guidelines that could lead to the realization of its targets, but gives also a classification of the business goals for which ERM is designed. The objectives desired from a company are distinguished in four big categories, which are: a) Strategic, b) Operative, c) Reporting and d) Compliance. In particular,

- Strategic: targets relating to the functioning of the entire firm in support of the business goal,
- Operative: targets on the efficient distribution of firms' resources,
- Reporting: targets on the reliability of information provided by the reporting unit,
- Compliance: targets on laws compliance.

Despite the fact that these targets are provided as separate categories, they are actually usually connected: a precise objective could be considered in more than one category. In these terms, the functioning of ERM becomes crucial. In fact, the four different categories concern different requirements and refers to different areas of the firms. The possibility for a single target of being part of more than one single category highlights the correlations not only between risks but also between firms' goals. Therefore, the coordination between areas and managers in firms is necessary to eliminate the risk of misunderstandings and errors in the management process that is indeed the key element of an integrated model as the Enterprise Risk Management. With the distinction in four categories of targets, COSO wants to point out the direct control that a firm has on Reporting and Compliance targets, for which the ERM can assure the achievement of these categories of objectives. On the other hand, Strategic and Operation goals are subjected to external events that might not be controlled in their totality by firms.

Moving to the components of the Enterprise Risk Management, COSO's 2004 ERM Framework provides a structure of ERM in eight components, each connected to the other and to the operation processes of firms.

- The first component is the **Internal Environment**. This provides the fundamental identity of an organization. It is the ideas, the philosophy, the capability, the knowledge and the techniques used to face risk by people operating in the company. It gives the information on the structure of the firm and its risk appetite.
- The second component is the **Objectives Definition**. This procedure refers to the idea of having a clear definition of its objectives. By having a clear vision, the firm can assure that its objectives are aligned with the mission of the firm and can analyse the implications and the risks of pursuing its targets.
- The third component is the **Events Identification**. External and Internal events that may affect the achievement of firm's objectives not only have to be identified, but have to be divided into risks and opportunities. The events classified as opportunity have to be exploited and considered in the strategy.
- The fourth component is the **Risk Evaluation**. The concept of risk assessment is a key element that requires the evaluation of the impact of a risk connected to the likelihood for that risk to happen. In order to verify the impact of a risk and the strategy used to mitigate it, a distinction is taken: risks could be evaluated in terms of risk in absence of strategy and residual risk (residual risk after the adoption of the strategy).
- The fifth component is the **Risk Response**. This procedure concerns the necessity of the elaboration of a strategy in response to risk: a firm's management has either to accept, reduce, avoid or share risk depending on its appetite or tolerance.
Options have been summarized into the four Ts¹⁶:
 - a. Treating a Risk: taking direction action to reduce impact or likelihood,
 - b. Terminate a Risk: discontinue activity exposing the organization to the risk,
 - c. Transfer a Risk: insurance or contracts,
 - d. Take (or tolerate) a Risk: accept risk.
- The sixth component is the **Control Activity**. The control activity ensures that the firm adopts the risk response strategies.
- The seventh component is the **Information and Communication**. This reflects to the importance for relevant information to be identified and shared in time inside the company, in order to allow all the personal in the firm to efficiently accomplish its duties. In order to respect this commitment, rapid and efficient communication needs to be present.
- The eighth component is the **Monitoring**. It differentiate from the Control Activity since it consists in a supervision activity on the entire process of Enterprise Risk Management. With

¹⁶ *New Frontiers in Enterprise Risk Management*, David L.Olson, Desheng Wu, 2008

this component, the ERM process is monitored and modified if necessary. This monitoring technique finds application both in actions integrated in the normal business activity and in external valuations.

The last concept in the COSO's Framework is the areas of application of ERM. Four different areas have been provided:

- Entity-level
- Division
- Business
- Subsidiary

The Committee does not dedicate an analysis on these four areas. The aim is simply that of illustrating the firm's areas in which ERM operates, highlighting the interconnection between the different areas and, more in general, the relation they have with all the business management functions. In fact, looking deeply at the four areas, they are constructed in a sort of pyramidal structure, in which, from the lower (Subsidiary) to the top (Division) level, they all work together in order to improve the firm in its totality (Entity-Level). However, that must be looked also in the opposite prospective: in this case, from the bottom the whole firm (Entity-Level) works in order to facilitate the other areas.

It is evident after the presentation that ERM is an integrated process. Each component is connected to the other and to the operation processes of the firm. *“Enterprise risk management is not strictly a serial process, where one component affects only the next. It is a multidirectional, iterative process in which almost any component can and does influence another”¹⁷.* In this sense, COSO uses a three-dimensional cube to optimally represent the model proposed. Its dimensions are:

- The eight components of ERM, i.e. the “lines” of the cube,
- The four objectives, i.e. “the columns”,
- The four firm's organizational levels, i.e. “the sections”.

¹⁷ COSO, 2014



Figure 4. COSO ERM cube. (Source: COSO, 2004)

This cube represents the Components, the Objectives and the Business Categories of effective ERM. In particular, the top indicates the objectives of ERM, the front indicates the components and the side is for the organizational levels of the firm. With this representation, the interconnection and the totality of the ERM process offered by COSO is evident. In this cube, each “side” is correlated to the other and must cooperate to properly work and achieve the targets of the firm. In addition, each element of each cube’s side is connected to one another. Starting from the top, where each objective is correlated to the other, moving to the front in which all the eight components are related, ending with the side containing the four correlated areas of ERM application, the uniqueness of this model is central for the correct management of companies. If a single element of this cube does not fit in the cube itself, it does not relate to the rest of the components, causing the malfunction of the cube that is the malfunction of the management. As a consequence, inefficiencies in the management process cause direct costs for the firm and the non-achievement of its objectives. For a company, this would mean being subjected to risk behaviour, not being the entity that controls it.

From this prospective now, the importance and at the same time the complexity of such a Framework is clearer. The costs for the adoption of this procedure are more elevated than those required for a Traditional Risk Management, and the problems that brought to a new formulation of the Framework in 2017 are several and will be discussed later on the study. However, just a mention of the most important one, in order to introduce the problem, is given. We have already said that with the COSO formulation of ERM in 2004, the aim was that of a clear separation from the previous Traditional models. Leaving out for a moment the completely different structure of

the model (the three dimensional matrix and the cube) and the abandonment of the silo approach, a key point was that of integrating the Enterprise Risk Management in the firm, integrating it with firm's strategy, performance and with the culture in its entity. However, a proposition as large and complex in its innovation, was of difficult application for companies. Instead of integrating ERM, firms that has adopted this method, have done it in a separate way by considering ERM as the previous TRM, a function rather than active unit of the business. This caused errors in its adoption and application, leading to different results from those expected with ERM. This is the reason why COSO in 2017 has provided a new version of Enterprise Risk Management, called "Enterprise Risk Management – integrating with strategy and performance" trying to solve this problem.

2.4 COSO 2004 vs TRM

As already said in the previous paragraphs, with the introduction of Enterprise Risk Management and especially with the formulation of the COSO 2004 Framework, a detachment between two different schools of thought was settled. The differences between the two models are both numerous and important in terms of concepts. It is possible to say in fact that the only thing they have in common is the Risk Management idea: a part from that, the subject is treated with completely different prospective. To resume, it is possible to affirm that the biggest innovations from COSO's Framework were respectively: 1) introduction of **speculative risks** and 2) abandon of the silo-based approach for an **integrated** vision of Risk Management.

Bromiley gives a perfect representation of the innovation introduced with ERM with this phrase: *"Firm's take a portfolio view of risk instead of managing in silos, they take into account strategic and more qualitative risks, and the focus is not solely on the downside of risk but also opportunity"* (Bromiley et al., 2014).

In the first case, the introduction of speculative risks coincides with a completely different vision of risk. Looking at speculative risks rather than focusing on pure ones means looking at strategy and opportunity. Pure risks are risks related to events that cannot be anticipated by the company. Elaborating a management strategy on them can be completed only in terms of an ex-post analysis, a conservative strategy that aims to mitigate risk and reduce negative consequences. If a firm instead looks at speculative risks, it looks at business strategy and opportunity. Speculative risks are in fact risks related to events that can be anticipated by the firm. In this case, thanks to an ex-ante analysis, risks of this genre can be individuated and a proper management strategy can be elaborated in order to exploit the opportunity to obtain a comparative advantage. It is possible to say then that if the Traditional approach considers only downside risk, an Enterprise Management relates on the

possibility of upside risk. However, this is possible only with a structured management system, factor that brings to the second big innovation introduced by COSO's ERM. In the second case in fact, COSO proposes the need for an integrated Risk Management, abandoning the silo-based approach used by the Traditional Risk Management. In the Traditional approach, risks were treated as separate from each other, without considering the presence of eventual correlation. In the same way, also the management process was considered as an external factor with respect to the company, relegated to the performance of minor tasks and as not part of the business unit. In this way, inevitable inefficiencies and real costs affected the performance and the value of companies in which, rather than looking at firm's target, each department looked at its own. In this sense, the ERM Framework established a complete different view, in which the management is integrated in the company and takes active part in the realisations of firm's objectives. Furthermore, COSO considered risks as correlated to each other and proposed a model able to assess these correlations and manage them. Therefore, what derives from this definition is that COSO considers not only the integration of the management process in the company or the integration between risks, but looks at integration as the central concept of Enterprise Risk Management. Despite all the "material" factors introduced, (that can be seen in Table 2 of Chapter 1) we can affirm that the main element of innovation by COSO's 2004 ERM Framework is the final target, that is the achievement of firm's objectives in its entity, aligned with its risk appetite. It detaches from the original management concept, for which Risk Management was only an instrument to transfer risk and had nothing to do with firm's targets. On the contrary, Enterprise Risk Management is the instrument that allows the business to achieve its objectives.

As regards the "material" factors that are element of distinction between the two models, they are essentially those provided in Chapter 1. In particular, in addition to speculative risks and integration, the most relevant are:

- **Insurable:** Traditional Risk Management treats only insurable risks, completely ignoring the non-insurable ones. To better explain, with the TRM, events that are related to the insurable "accident" but that are not "material" and of difficult identification, are not considered. An example could be the reputation of the firm after a problem to an infrastructure. For this particular case, in the evaluation of risks, ERM would consider also the eventual risk of reputation or all the non-material risks related to an event, resulting in a more accurate assessment of the total risk.

- **Short period:** TRM adopts a short-term approach, focusing only on risks that might affect the firm in the short period, without considering the mid-long term. By doing this, the management shows lack of future vision while on the contrary the goal of a firm is, most of the times that of pursuing a long period result. ERM would otherwise consider the totality of the period that is equivalent to the firm's life. By using this approach, the management provides a complete vision of risks with the aim of pursuing the firm's targets, creating in this way a long-run competitive advantage both in macro terms (advantage in the market) and in micro level (by creating a new firm culture¹⁸).

Last distinctive factor is the representation of the two models: if the ERM is represented with a three-dimensional matrix indicating a cube, the Traditional Risk Management has in this sense no representation at all, only an indication of the steps in the management procedure¹⁹. This final simple comparison confirms and highlights the differences between the two approaches. While the ERM confirms the strong ideals just proposed with an image that represents the concept of integrations between all its elements, the Traditional model provides only a four steps guideline.

2.5 COSO 2017: Enterprise Risk Management – Integrating with Strategy and Performance

2.5.1 Introduction

In 2017, COSO's board published a new formulation of the 2004 ERM Integrated Framework, named "Enterprise Risk Management – Integrating with Strategy and Performance". As already said, despite the critiques on COSO's previous Framework, the 2004 standards have been the most used standards regarding the Enterprise Risk theme. However, since its publication, the Economic World has evolved. New risks have in fact emerged, the complexity of the processes in Risk Management has augmented and boards have increased their knowledge on the argument, demanding for an improved Framework on ERM. In response to the new environment, COSO has published a revisited version of the 2004 Framework, aligned with the new business environment and updated with new concepts, aiming to eliminate the misunderstandings derived

¹⁸ The macro level benefits are related to Risk Management theories, the micro level to governance mechanisms.

¹⁹ 4 steps: 1) Events identification, 2) Risk identification, 3) Risk Measurement and 4) Monitoring

from the previous proposition. Starting with the title of the new guidelines, COSO wanted to clarify the role of Enterprise Risk Management in firms' governance. With this version, the ERM is completely integrated with the strategy and the performance of companies, making it central in the structure of the company and in the entire process of objectives achievement. This concept was also included in the 2004 version, but critiques has blamed the ambiguity of the formulation, which led to difficulties in implementation. Now, the Framework provides more explicit and clear guidelines, simplified with respect to the previous concept, trying to eliminate silo-based approach characteristic of the Traditional Management and still used after the COSO ERM Integrated Framework. Another key element is straight away retrievable from the title: the relationship between risk and strategy. In the updated version, risks are no more seen as exclusively connected to events. In the previous formulation, this point was ambiguous and not much treated by COSO. On the contrary, the new version explicitly provides a definition of risk related to strategy and discusses the contribution of a good management on the performance of the company. To better comprehend, in the previous vision risk was directly connected to events. Even if not explicitly described, what emerged from that consideration was that an appropriate Risk Management had to identify the risks deriving from preventable or unpreventable events and manage them in order to pursue firms' objectives. The new Framework on the other hand, emphasises the relationship of risk with strategy and performance: rather than concentrating on events, a good Risk Management should relate on risks that may affect firms' strategy and consequently negatively affect performance.

Despite this points of innovation will be analysed in deep during the continue of the study, the aim was that of introducing the new elements brought by the updated Framework. Just in the title in fact, we have noticed major changes in the structure but most of all, in the idea of Enterprise Risk Management. The idea will be a crucial point for the new ERM. These changes in fact, were made both to solve the doubts left by the old formulation, but primarily to create a new culture that can help the management in the present but also in the future. As COSO's Framework indicates itself, the necessity of a long-term strategy in line with the life of the company, is central in order to achieve the long-term objectives of the firm, which have not value in terms of material things, but in terms of culture and firm's identity.

2.5.2 Differences between 2004 and 2017 Frameworks

As introduced in the previous paragraph, the differences between the 2004 and the 2017 ERM Frameworks are several and of much impact on the concept of Enterprise Risk Management.

However, the two formulations of standards are not as distant as may seem. In fact, the 2017 Framework is the updated version of the 2004 standards, so the key elements provided in the 2004 remain also in the 2017 version. The newest Framework then should be seen as an integration, or better, an adaptation of the Enterprise Risk Management in an evolved Economic World, more complex and driven by technology. This concept firstly reflects on the different titles, where two different ideas of ERM are provided, but where the core of Risk Management integration is a common factor. The new element is the view on risk: it is no more risk as consequence of events, but related to strategy. If in the Integrated Framework Risk Management was related to events in order to achieve firm's objectives, in the new Framework, risk is managed in relation to the impact it may have on strategies. Depending on the impact of risk, the firm considers if the strategy is still the most appropriate or needs to be changed in order to achieve the firm's objectives. The change then is substantial, but according to COSO, was necessary in order to enhance the concept of implementation of ERM in the company. Integration in fact, is a concept that has always been highlighted by COSO, as the main tool in order to accomplish firm's targets. Despite the pressure on this element, in the decade of application of the 2004 Framework, ERM has always been considered as an external function that may contribute to the achievement of firm's objective, in this sense, as the Traditional Risk Management. In the 2017 update, COSO aimed to establish the importance of integration as it should have been since the first publication of the Framework. Looking more in focus to the role of risk in strategy selection, COSO says: "*Strategy selection is about making choices and accepting trade-offs. So it makes sense to apply enterprise risk management to strategy as that is the best approach for untangling the art and science of making well-informed choices.*²⁰". COSO continues the analysis pointing out that risk is usually considered in terms of already adopted strategies, but the areas of application for ERM concern also the possibility of the adopted strategy of not being the correct one and the consequences of this situation. To better comprehend this central point of innovation in the definition of ERM's Framework, the figure below contextualizes these considerations in firms' mission, vision, core values and its performance.

²⁰ COSO, 2017



Figure 5. ERM connection with strategy. (Source: COSO ERM Framework, 2017)

From figure 5, it is possible to notice the centrality of ERM in the business strategy identification and application, theme based on the key element of a company that is the creation of value. Through effective oversight of strategy and consequent performance, the management can have a clear vision of the risks that may affect companies' mission, vision and core values. The role of ERM is firstly to identify risks. However, it does not reduce to the simple identification of risks for a certain strategy; it also assesses the impact of those risks on strategies, questioning the possibility that the strategy adopted may not align with the mission of the company. In addition, thanks to the exhaustive risk analysis, ERM as a clear vision of the environment in which the company is operating, so is able also to evaluate all the alternative strategies that may be aligned with the mission, vision and core values of the company and may allow to enhance performances. After the selection of the most appropriate strategy according to the analysis just exposed, the ERM firstly indicates the implications deriving from the strategy chosen and then monitors the performance of the strategy adopted.

With this explanation, it is possible to understand why the centrality of ERM is strongly highlighted in the updated version of the Framework. The completeness of the ERM analysis is a competitive tool that allows not only to create but also to protect value for the company: it increases the overall performance of the company and permits to have a clear vision of the environment in which the management is operating, aspect that gives a comparative advantage to the company. COSO itself answers to question regarding the real value of ERM with *“If you attempt to answer that question with a separate, not aligned ERM activity, the answer is often unclear. If ERM is understood and positioned as described by COSO, however, the answer becomes clear; its benefit is improved decision making and ultimately improved performance of the organization as it strives to meet its mission and achieve its strategies and business objectives.”*²¹ In this sense, the new Framework gives much more relevance to the role of Boards. COSO affirms that every board has oversight role, in order to support the firms' creation and protection of value.

²¹ COSO, 2017

With respect to the 2004 formulation, Boards' supervision on ERM becomes crucial. It is Boards' role to control on identification and adoption of strategy, with the aim of increasing value. The Board have the crucial role of overseeing on ERM, meaning not only oversight on strategies and its consequences, but on the integration of ERM in the business. As already said, the centrality of ERM in the business functioning is fundamental in order to improve decision making, performance and meeting firm's objectives. If one of the biggest concerns about the 2004 formulation was the lack of integration of ERM and the remaining attachment to the silo-based approach used by Traditional Management, in the updated version it is explicitly affirmed not only the importance of ERM's integration inside the business, but also that the adoption of this concept is Boards' role. Consequently, questions on Board, its nature, composition and role have been made, to which COSO has provided exhaustive answers, as it will be discussed in the continue of the study.

To resume then, the biggest two updates of the 2004 ERM Integrated Framework, are the new area of application of risk and the consequent integration of ERM in the business. In addition, a greater importance to Boards has been given, and a slightly different title comprehensive of these changes has been provided. Another difference between 2004 and 2017 Frameworks is the definition of Enterprise Risk Management. In the newest version in fact, according to COSO, ERM Is defined as *"The culture, capabilities, and practices, integrated with strategy-setting and its execution, that organizations rely on to manage risk in creating, preserving, and realizing value"*. In relation to the previous definition of ERM²², slightly similar aspects differentiate the two definitions and the ideas behind them. In particular:

- The first element of innovation is the term **culture**: with this word, COSO wanted to emphasize the idea that ERM is not a process or a department, but is something more, consolidated in the business and applied in correlation to all the other units of the company, with the purpose of managing risk and creating value. This term, reflects also the look at future needs. This formulation of ERM has taken experience of the evolution of risks in a short period of time, so COSO wanted to propose guidelines adaptable in the future.
- The second element regards **integration** with strategy-setting and its **execution**: with this formulation, COSO wanted to highlight the importance of ERM's integration in the process

²² According to COSO 2004, ERM is the *"process, affected by an entity's board of directors, management and other personnel, applied in strategy-setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives"*.

of strategy identification and execution. There is no reference to the application of ERM on events, indicating a different approach to Risk Management that concentrates on strategies rather than events, and consequently emphasizes one more time the importance of an integrated ERM in the business.

- The third element is about **creating, preserving** and **realizing** value: also in this case, COSO wanted to innovate the previous definition, in which the only reference was the achievement of firm's objectives. In the new formulation, ERM aims not only to achieve firm's objective, but looks at the culture idea given by COSO. By creating, preserving and realizing value, ERM acts across the enterprise, in a cyclical process that not only creates value but also protects it. The enhancement of the performance is achieved by remaining coherent to the business strategy, aligned itself to mission, vision and core values.

Despite the clarification of some misconceptions, there are still several points that have been cause of misunderstanding and problems in the adoption of the 2004 ERM Integrated Framework. In order to give an explanation to these contradictory factors, COSO have tried to briefly clarify some of these aspects in a resuming table, as it is possible to see in the Figure 6

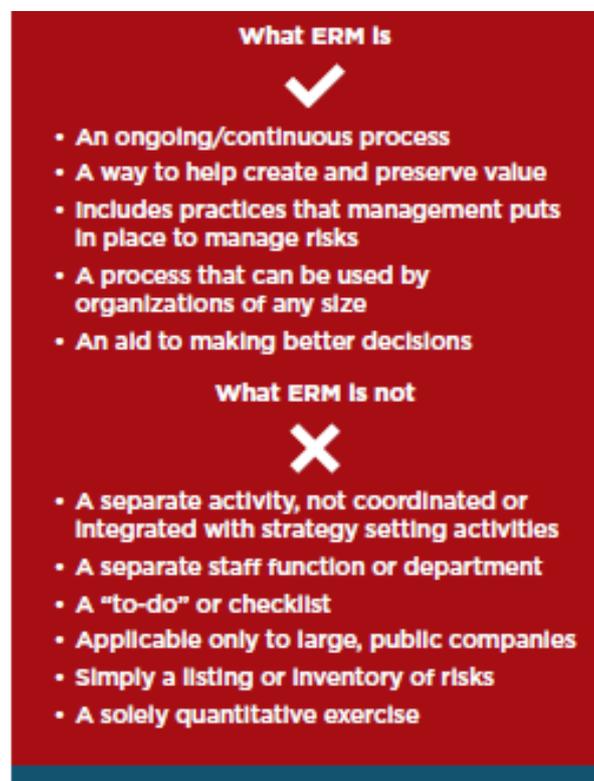


Figure 6. ERM misconceptions. (Source: COSO, 2017)

From the Figure, it is possible to notice that the concepts provided by the 2004 update, left several doubts on ERM's functions and implementation, making the image of Enterprise Risk Management very similar to that of Traditional Risk Management. The focus emphasizes also the fact that these concepts were already present in the previous formulation of the Framework. Furthermore, they were the revolutionary points that distinguished the Enterprise Risk Management from the Traditional one, but the complexity and the ambiguous representation of its concepts through the three-dimensional matrix has left boards and executives with uncertainty and difficulties in its application. For these reasons, the updated version of the ERM Framework, in addition to the reformulation and clarification of basilar concepts like the integration of ERM, has also proposed a different graphical representation of the Framework.



Figure 7. ERM Framework updated representation. (Source: COSO, 2017)

As it is possible to see in Figure 7, the transition from the cube illustrating the interconnections among the four categories of objectives²³, the eight components of the risk management²⁴ and the four areas of operation of ERM²⁵, to a completely different diagram structured in helical tapes that connects to five elements during the lifecycle of an organization strategy process, reflects the substantial change. The helical tapes are essentially two tapes, respectively made of three and two components that together constitute the new five components of the Enterprise Risk Management Framework. Each component is supported by a set of principles, for a total of twenty principles, that cover every aspect of the components. They are completely mutable and adaptable, in order to be applied in different ways and to different organizations, depending on nature, size or sector. Focusing for a moment on the components, which will be analysed in deep in the next paragraph,

²³ Strategic, operation, reporting and compliance
²⁴ Internal Environment, Objectives Definition, Events Identification, Risk Evaluation, Risk Response, Control Activity, Information and Communication, Monitoring
²⁵ Entity-level, Division, Business and Subsidiary

we have said that COSO have constructed this helical structure where the two tapes are continuously present in the lifecycle of an organization strategy process. In the representation of this concept, the lifecycle is characterised by five key elements that coincide with those already seen in the Risk Management interconnection with strategy, which are: Mission, Vision & Core Values, Strategy, Business Objective, Performance and Enhanced Value. This representation again enhances the importance of the centrality of ERM in the business strategy of the company and, more in general, of its integration in the firm in its entity. A proof to this statement is an additional representation of the updated ERM Framework, in which the key elements in an organization lifecycle happens to be only three, with ERM represented as a circle surrounding the strategy area. In addition, the three elements represented are indeed those seen in the risk-strategy analysis, as can be noticed in Figure 8 below.



Figure 8. ERM Framework alternative representation. (Source: COSO, 2017)

2.5.3 Updated Framework

The evolution in the graphic representation of the ERM Framework was substantial and reflected the need of change raised with the increasing complexity of Risk Management. Of course, the

change from the three-dimensional cube to the helical structure is a direct consequence of the implementation of new concepts and the enhancement of already existing ideas. As previously stated, the new helical model is essentially made of two tapes, respectively composed by three and two components that together constitute the five components of the updated Enterprise Risk Management. Each of the five components is then supported by principles containing the fundamentals of the components, from the area of application to its functions, for a total of twenty principles. Finally, the two tapes, or equivalently the five components, cyclically surround the lifecycle of the business strategy that, depending on the model representation considered, is resumed in five or three key points.

Focusing on the principal representation of the Framework that is the one illustrated in Figure 7, to better comprehend the updated version of ERM, a deep analysis on the five components and their principles will be provided. In addition, the analysis continues with the procedure for the successful integration of ERM in the business, and finally with the benefits that derive from the adoption of ERM.

Therefore, the first distinctive character of the new graphical representation of ERM is the passage from eight to five components, with the scope to simplify the overall idea of ERM's Framework, but then specified in deep with the attribution of twenty principles in support. One of the critiques moved to the previous cube representation was that of being too complicated and ambiguous, causing difficulties not only in comprehension but also in adoption. In the helical structure, the five components are:

- **Governance and Culture:** together constitute the core elements of an efficient Enterprise Risk Management. In particular, Governance defines the structure of the organization and assures, through the definition of responsibilities and supervision, the efficacy of Enterprise Risk Management. The first principle attributes the role of oversight to the Board that has the responsibility of supervision on Risk Management, strategy respect and integration of ERM. Culture on the other hand, refers to ethical values, integrity, transparency, accountability and understanding of risk shared inside the company.
- **Strategy & Objective-Setting:** this component concentrates on strategy and objectives identification of the firm. In this phase, ERM identify both internal and external risks that may affect the strategy of the business, and consequently affect the objectives of the firm. In particular, the four principles supporting the component, give indications on the steps to follow, that are: a) Analysis of business environment. b) Risk appetite definition, c)

Alternative strategies valuation and d) Business objectives setting. Risk appetite and strategy have to be aligned in order to manage risk and achieve firm's objectives.

- **Performance:** After the organization has developed its strategy aligned with the risk appetite, this component focuses in the identification and assessment of risks that may affect the achievement of objectives and the correlated performance. Principles add to the component the need for the classification of risks in terms of their severity and to prioritize them in relation to the impact they may have on the business. In particular, the last principle encourages the holistic vision of risk: after the adoption of risk responses, the organization looks at the total risks assumed as a portfolio of risks, abandoning the silo based approach characteristic of the Traditional Management.
- **Review & Revision:** By reviewing of organizations' performance, the management can evaluate the impact of the Enterprise Risk Management. If deviations in performance are present, revision of the strategies selected may allow to achieve objectives, to improve ERM and can be also a good opportunity to understand how to improve the process in its entity.
- **Information, Communication and Reporting:** to properly work, Enterprise Risk Management requires the continuous sharing and the timely communication of information about risk. Reporting on the performance of ERM, on risks and objectives achieved then, is fundamental to improve and continuously evolve the management culture of the firm.

Moving to the principles supporting these five components, an exhaustive representation is given in the figure below.



Figure 9. ERM principles. (Source: COSO, 2017)

As it is possible to notice, the principles under each component are nothing but a support, an explanation of the definitions given by the components. Since their concepts have already been provided in the analysis of the five components, they will not be treated in this study: Figure 9 itself is a good explanatory of their meanings.

About the five components, an important element should be pointed out. It has already been said about the future vision concerning the updated formulation of ERM. The idea that concepts are mutable and adaptable is a distinctive aspect not only of the applicability to all types of organizations, but also of the new Framework that tries to follow the main idea of achieving a business identity in terms of culture. In pursuing the culture idea, COSO specifies that the five components are not fixed and immutable principles: the areas just explored are in fact areas that must be studied and improved. COSO Principle 17 states: “*Pursues Improvement in Enterprise Risk Management*” and again “*Management pursues continual improvement throughout the entity (functions, operating units, divisions) to improve the efficiency and usefulness of enterprise risk management at all levels.*” The goal is clearly that of a continual improvement process that will allow the ERM to be adapted and adopted in the future, reflecting the inevitable changes that will happen in the economic environment of Risk Management. Therefore, the studies that brought to the updated formulation of ERM must be seen not as a point of arrival, but as a starting point for the future and continuous analysis.

Moving with the analysis on the updated ERM Framework, another important point severely criticised in the 2004 formulation of the ERM was the ambiguity of the guidelines regarding the implementation of ERM in the company. Already stated that the implementation of ERM relates in particular to the business strategy area, COSO provides Board with a six steps procedure that should help in the implementation process. These steps are called by COSO “Keys to success” and should help directors and management in avoiding the difficulties and the errors encountered in the implementation process. It is important to explicit that COSO does not provide “proper” guidelines to the actual implementation of ERM. According to COSO in fact, ERM consists in series of standards that can be adapted to each organization, depending on its nature, size and capability. The ERM Framework gives a general view on the characteristics that ERM brings to the company that utilises this culture, but the ways to adopt are several. Depending on the ability and on the possibility of each organization, the adoption could be total or partial, reflecting all the guidelines or only a part, could request the existing Board or hiring a Chief Risk Officer; the possibilities are numerous. Therefore, the “Keys to success” to the implementation of ERM can be resumed in:

- The first key to success is **Board** and senior management: as already seen, COSO attributes oversight role to the Board. Its duties are not only the oversight of strategy but also the definition of the culture of an organization. Having a solid risk culture in the organization

helps the company in identifying, assessing and managing risk. With an affirmed ideology, the firm can easily implement ERM in its business strategy and adapt it to the firm's culture. In fact, COSO suggests that implementing ERM usually concerns in implementing it in an existing management, adapting and achieving compromise between the two ideas. Constructing from nothing a management structure to adopt ERM ends in defective results so, focusing on enhancing the culture and the already adopted strategies of a firm, thanks to the oversight role of the Board, and then implement the ERM, will provide the efficacy promised by COSO.

- The second key to success is having understood the **ERM role**: COSO explicitly states that the role of ERM is to enhance organizations' value and performance. This point aims to clarify the misconceptions about the definition of ERM's role, previously considered as an isolated function allowing the organization to manage risk and achieve its objectives. Despite the obviously role of ERM in managing risk and achieving objectives, COSO wanted to clarify that a key to successfully adopt ERM was to look at a bigger picture, where ERM enhances value and performances. This means that an individual should look not only at "paper" results, but also at elements like the establishment of a long-term culture, a better comprehension of the environment in which the firm operates, comparative advantage and more.
- The third key to success is the **integration** of ERM: the concept of ERM's centrality has been already discussed, so no more time is spent. Just to briefly explain, as for the ERM role, this point make sure that every individual in an organization has clear that the only way to successfully adopt ERM is to fully integrate it in the business.
- The fourth key to success is the focus on **strategies** and **objectives**: again, one of the keys to success is an aspect that has already been discussed. In the new ERM Framework, it is explicitly provided the concept of risk connected to strategies rather than events. For COSO, focusing on identifying the objectives of the firm and then elaborating a strategy aligned with its risk appetite is the concept to have in mind for a correct adoption of ERM. In this way, ERM relates on all the business strategy procedure, moving the firm from a "risk-centric" to a "strategy-centric" idea.
- The fifth key to success focuses again on **risk** conception: with this element, COSO highlights the importance of understanding the nature of risks. Again, risk must be looked in a strategic way, meaning that the management should look to risks that affect the strategy adopted. Managers should look at the way risks impact of the strategy, the possible responses

and the alternative strategies that, aligned with the risk appetite, could ensure the company to achieve its objectives.

- The last key to success is the gradual **level of implementation** that should be used: this point answers the idea of complexity around ERM. The key derives from the idea that the implementation of ERM should be completed all in one single step, whereas it requires an integration by gradual levels. The gradualism regards all the levels of an organization, from the Board to the strategy used. Companies in fact, need to slowly implement new characteristics of ERM after the complete comprehension of the existing ones. A company where the Board knows all the information regarding ERM but where the rest of the management team lacks in certain aspects, will be inefficient in adopting the ERM. In the same way, ERM strategies must be adapted to the existing ones and, more in general, ERM ideas must be adapted to the existing culture.

To conclude, to better comprehend the updates provided with the 2017 Framework, a look to the benefits organizations have by including ERM is given. Concerning this point, COSO presents a brief list with all the benefits deriving from investing in ERM, which are:

- Increase of opportunities by considering both the positive and negative aspects of risk,
- Increase positive outcomes and advantages while reducing negative surprises,
- Enhance ability to identify and manage entity-wide risks,
- Reduce performance variability,
- Improve resource deployment,
- Improve in decision-making process.

As can be noticed, the benefits all concern the improvement of Risk Management. There is no reference to achievement of objectives or culture development. The improvement COSO wants to highlight is essentially that already contained in the 2004 formulation, which is the change from the Traditional Management that COSO was not able to clearly formulate in the previous Framework.

2.6 ISO 31000

Before continuing the study with the analysis on the impact of ERM on firms' value, a brief description of the second major international standards regarding the Enterprise Risk Management, next to those given by COSO, is provided.

ISO, namely International Organization for Standardization, is “*a Worldwide federation of national standards bodies (ISO member bodies)*”²⁶. As concerns Risk Management, with the ISO 31000 Risk Management – Guidelines, ISO has published one of the most used international standards programme that proposes principles and guidelines for correct Risk Management. As for the COSO Framework, the ISO standards were first published in 2009 while an updated version has followed in 2018. The two models, respectively named ISO 31000:2009 and ISO 31000:2018, aim to give the possibility to every type of organization to identify, prevent and manage all the risks related to the company, through a structured approach.

In particular, the new version of the ISO 31000 is the result of the revision of the previous version published in 2009, an update whose principal characteristics are:

- Update of risk management principles,
- Highlight of top management's role of leadership and need of Risk Management Integration in the organizations' governance,
- Greater emphasis on the importance of the iteration procedure in the Risk Management,
- Simplify guidelines and principles in order make the updated model easier to be adopted by different organizations.

In addition, the ISO 31000:2018 aims to highlight more the upside risk, the positive side of risk, seen as a chance for the organizations with ad adequate Risk Management, able to exploit the opportunities arising from risk. In this sense, the updated version affirms that the standards support Risk Management to create and protect value, reflecting in an enhanced performance of the firm. The similarities between COSO and ISO continue, with the ISO claiming and highlighting the need of integration of Risk Management in the governance of the organization. Again, other common factor is the adaptability of the standards. For ISO in fact, the principles proposed are standards: in order to be efficient, they must be adapted according to the company in which they are implemented. Only the integration between the new standards proposed by ISO and the already used standards by the company can result in efficient performance.

²⁶ ISO 31000:2018 Risk Management - Guidelines

Moving to the structure of the ISO 31000:2018, the overall configuration of the ISO 31000:2009 has been maintained: the distinction between three aspects (Principles, Framework and Process) remains. However, the principles have been revisited and decreased from eleven to eight in order to simplify concepts and highlight the central element of the updated version, which is the value creation and protection. As regards the Framework, as can be noticed from the comparison of Figures 10 and 11, it emphasizes the cyclicity and the interconnections added between phases, and the commitment and the leadership asked in the Risk Management. The only point that substantially has been untouched is the Process structure that remains the same exposed in the 2009 proposition. The only change in the Process is in fact, the greater integration it has with the other two components, and the greater relevance of cyclicity that is central in the entire model.

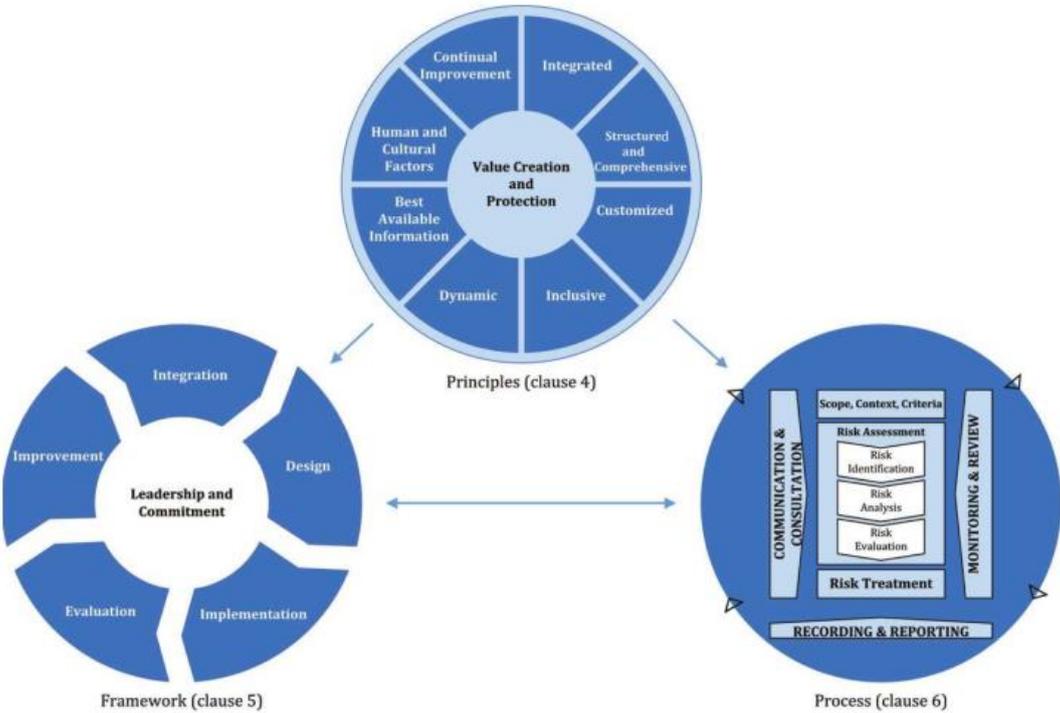


Figure 10. ISO 31000:2018 structure. (Source: ISO, 2018)

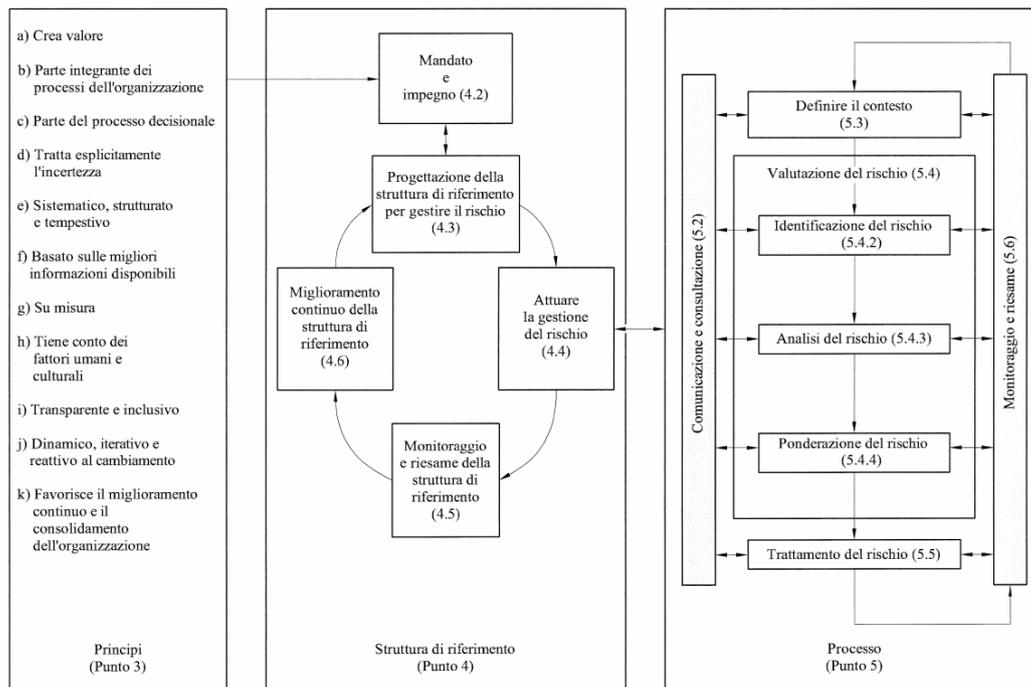


Figure 11. ISO 31000:2009 structure. (Source: ISO, 2009)

Again, the concepts that the updated standards want to provide, are those of integration, cyclicity, value creation and protection and leadership. In addition, another element present both in COSO's Framework and in the ISO standard is the look at the future: the Risk Management structure proposed is a starting point that needs continuous study and development to adapt to the continuously evolving risk World. As concerns principles, we have already said that the main change regards the decrease in the number, from eleven to eight. The message underlying this decision is clear: in order to create value and efficiently protect it, an efficient Risk Management model is necessary, and the only way to obtain an efficient Risk Management is to base the approach on the principles proposed by ISO. In other words, principles describe how a Risk Management process should be in order to be efficient and consequently allow the creation and protection of value. In particular, it should be:

1. **Integrated** in the governance,
2. **Structured** and **comprehensive** in order to provide coherent and comparable results,
3. **Customised** on each organization,
4. **Inclusive** of all the members of the company in order to have a clear comprehension of Risk Management,
5. **Dynamic** in order to be adaptable to changes in the organization and in the environment in which is operating,
6. Have the **Best Available Information**,

7. Consider **Human** and **Cultural factors** that affect the organization at all levels,
8. **Continuously Improved.**

All these principles constitute an efficient Risk Management process that would lead to creation and protection of value, which in the previous formulation was provided as part of the principles, but that in the updated version becomes the main objective.

Moving to the Framework comparison, the 2018 version has maintained the scope of the previous standard: the goal for the Framework is to support the organization in the integration of Risk Management in its governance. In this sense, the updated Framework emphasises the importance of stakeholders, in particular of the top management. This point may constitute a small difference with respect to the COSO's Framework. In fact, COSO never explicitly states the importance of neither stakeholders nor top management; it certainly refers to the importance for a good risk management on the Board, but not explicitly defining roles and attributing the importance ISO does with the top management. For the ISO 31000:2009, the top management becomes central in the Risk Management model, as guarantee of leadership and commitment. The Board in this sense has more than oversight power. Its duties concern the alignment of Framework's components to the company by distributing resources, statement of policies on Risk Management, indicating roles and responsibilities. Benefits deriving from a good top management behaviour are:

- a) the alignment of Risk Management objectives with the objectives, strategy and culture of the company,
- b) the identification of risk appetite,
- c) the monitoring of risks,
- d) the guarantee on the adequacy of Risk Management.

Again, the role of top management is clearly of much relevance, but ISO points out the necessity of the entire business management unit in the Risk Management process. As ISO states, "*Everyone in an organization has responsibility for managing risk*", specifying the need of this process to be dynamic, iterative and adaptable to each organization culture.

To conclude, the ISO 31000:2018 ends his revision with the process of Risk Management. As can be noticed in the illustration of the model, the process has almost remained untouched by the revision. The aim of ISO in fact, was to simplify the process but maintaining its basilar concepts. According to its objective, ISO has schematized the model with respect to the previous formulation

and translated it into an easier comprehension and adoption, with the structure remaining the same: communication, identification, assessment and risk treatment, monitoring, revision and reporting. In this sense, of course with differences, the scheme reminds the phases of the lifecycle strategy proposed by COSO in the ERM Framework. The overall similarity between the two model (COSO and ISO), probably due also to the similar periods of presentation of guidelines, have defined the two Frameworks as the most adopted standards in terms of Risk Management. The innovations introduced in the first decade of 2000 and the consequent updates, has changed the subject of Risk Management, giving much relevance to the integration of the process across the entire company, looking however at the future, considering the new visions on Risk Management as a starting point for development of techniques and improvement of performances of firms. An important aspect introduced by the two standards is the adaptability of the models, different for each company. In this sense, the role of Boards and top management has acquired much importance in the last years, requiring a separate analysis that is given in the next chapter.

CHAPTER 3

Corporate Governance and Enterprise Risk Management alignment

The importance of Corporate Governance for a good Risk Management strategy developed especially in the period post Great Recession in 2008. As Kirkpatrick stated, *“the financial crisis can be to an important extent attributed to failures and weaknesses in Corporate Governance arrangements which did not serve their purpose to safeguard against excessive risk taking in a number of financial services companies”*²⁷ From this statement, it can be retrieved the connection given to Corporate Governance and risk. In particular, the author emphasises the role of safeguard against excessive risk taking that Corporate Governance had even before the financial crisis. The lack in Corporate Governance’s purpose and the failure in the traditional Risk Management approaches, not able to neither prevent nor mitigate risk, were one of the main reasons that brought to the catastrophic consequences of the Financial Crisis. As response to the weak Risk Management, regulators and risk assessment agencies started to demand for more systematic risk strategies and disclosure. Before the 2008 crisis, an example of the disclosure system was the Sarbanes-Oxley Act (SOX) in the United-States. With this law, published in 2002, public listed company officials, such as CEO to give the idea, must confirm the accuracy and the validity of the information provided in the public financial statements. Furthermore, the Law requires listed companies also confirming the Risk Management adoption and the efficiency of their internal control. In Italy for example, the law 58/1998²⁸ introduced the expression of internal control system in the Italian legislation, valid for public listed companies, and in which is introduced the theme of oversight. With the 6/03 Legislative Decree then, the Board started assuming the authority and the responsibility on governance that will be enhanced especially after the crisis, and established the need of cooperation in the Internal Governance. Therefore, as for USA and Italy cases, propositions on regulation have been different for each country, so, especially after 2008, the more bindings requirements demanded by regulators and rating agencies, and the need for common rules at International level, brought to the adoption of Enterprise Risk Management, an integrated approach aligned with the increasing demand for integration and structure. In this sense, Corporate Governance takes a role of much relevance: with

²⁷ Grant Kirkpatrick, *The Corporate Governance Lessons from the Financial Crisis*, OECD, 2009

²⁸ “Legge Draghi”

Enterprise Risk Management, the concept of integration relates also on the integration of the management process in the governance of the organization, becoming internal to the business. Furthermore, only a strong Corporate Governance could permit, firstly, the implementation of ERM in the organization, and secondly, the efficiency of the risk management process. In fact, Enterprise Risk Management is principally synonymous with integration – taking a portfolio view of firm risks (Bromiley, McShane, Nair, & Rustambekov, 2014). This type of managing technique requires a good governance to be implemented and provide results. However, as for risk and Risk Management, giving an exhaustive definition of Corporate Governance, is the very first obstacle. In the Literature, discordant definitions have been provided, clearly affected by the different periods of proposition and by the evolution of the concept of risk, to which governance is correlated. Despite the various ideas on what Corporate Governance actually indicates, in the present, it is considered *“the system by which companies are directed and controlled”*²⁹. In other words, Governance refers to the actions, processes, traditions and institutions by which authority is exercised and decisions are taken and implemented (International risk governance council).

The correlation between management and governance is then at the centre for the achievement of the objectives for a firm. In this sense, a term used to identify the connection between Risk Management and Corporate Governance is Risk Governance: it indicates the application of the good governance principles to the identification, assessment and management of risk. However, the relationship between the two subjects must be looked from opposite sides. If on one side the relationship asks for a structured Corporate Governance in order to implement ERM and improve performances, on the other, the Enterprise Risk Management has to adapt to the culture of the organization. In this sense, changes both in Corporate Governance, such as institution of an executive risk committee or hire of a Chief Risk Officer, and in ERM Framework, indicating the adaptability to different organizations, have been adopted and will be discussed in the continue of the analysis. However, before going on, important concepts when talking about Corporate Governance are those given by the Organization of Economic Cooperation and Development, namely OECD. The principles provided by OECD were developed in order to help governments in evaluating and improving the legal, regulatory and institutional Frameworks for Corporate Governance in their countries. In this sense, with the proposition of common principles, OECD reflected the already mentioned need of International common standards, in order to align countries regulations and facilitate the adoption of Enterprise Risk Management in more standardised method. First published in 1999 and then reviewed in 2004, it consists in six principles, from which the importance of shareholders and Board assume much relevance.

²⁹ The Cadbury Report, 1992

In particular, the OECD Principles³⁰ are:

1. Ensuring the basis of an effective Corporate Governance Framework: *“The Corporate Governance Framework should promote transparent and efficient markets, be consistent with the rule of law and clearly articulate the division of responsibilities among different supervisory, regulatory enforcement authorities”*
2. The rights of shareholders and key ownership: *“The Corporate Governance Framework should protect and facilitate the exercise of shareholders’ rights.”*
3. The equitable treatment of shareholders: *“The Corporate Governance Framework should ensure the equitable treatment of all shareholders, including minority and foreign shareholders. All shareholders should have the opportunity to obtain effective redress for violation of their rights.”*
4. The role of stakeholders in Corporate Governance: *“The Corporate Governance Framework should recognise the rights of stakeholders established by law or through mutual agreements and encourage active co-operation between corporations and stakeholders in creating wealth, jobs, and the sustainability of financially sound enterprises.”*
5. Disclosure and transparency: *“The Corporate Governance Framework should ensure that timely and accurate disclosure is made on all material matters regarding the corporation, including the financial situation, performance, ownership, and governance of the company.”*
6. The responsibilities of the Board: *“The Corporate Governance Framework should ensure the strategic guidance of the company, the effective monitoring of management by the board, and the board’s accountability to the company and the shareholders.”*

The importance of the OECD principles would require an entire study to better comprehend their entire meaning. However, of much relevance for this analysis, is in particular the sixth principle on the responsibilities of the Board. With the last principle, after providing the characteristics of a good Corporate Governance Framework, the OECD explicitly enhances the importance of the Board. In particular, the key element that can be retrieved from the definition of Board’s responsibilities is the oversight on organization’s management and the “intermediary” role between

³⁰ OECD Principles of Corporate Governance, OECD, 2004

management and stakeholders. The Board in fact, should ensure the strategic guidance of the company, being in this way responsible for its management, its performances and consequently becoming the referent for stakeholders. A Board's role is that of providing oversight of not only conformance with laws, regulations and standards, but also oversight on performance to create long-term value. Again, if we look at the definition of ERM given by the Institute of Internal Auditors, *"The goal of ERM is to create, protect and enhance shareholder value by managing the uncertainties surrounding the achievement of the organization's objectives"*³¹, the relationship between ERM and Corporate Governance is strengthened: sharing the same final objective of creating value is the connection between them. Therefore, a good integration of ERM inside the organization is necessary and during the years, companies have used several techniques in adopting ERM. Depending on firm's size, nature and capability, some have instituted an executive risk committee with the hiring of a Chief Risk Officer, others have continued with the existing Risk Management structure enhancing the authorities of the present Senior Manager. Different responses have been adopted, but arguably, the most used one is indeed the institution of a risk committee: the hiring of a Chief Risk Officer (CRO) has mostly been used in order to implement Enterprise Risk Management. Furthermore, several studies have tried to look at the effect of ERM adoption on firm's value and the hiring of a CRO is usually considered as the best proxy for the implementation of ERM. In this sense, the use of a proxy introduces a new consideration on ERM that is the lack of legislation. If an organization decides to implement Enterprise Risk Management in fact, no compulsory of disclosure is present in the market. Despite all that have been said on the requirements by rating agencies and regulators, subject become of much relevance especially after the Great Crisis in 2008, no legislation provides the obligation to indicate if an organization is adopting a new Risk Management strategy. The existing laws, as the already discussed Sarbanes-Oxley Act (SOX) in the United-States, only ask for requirements in terms of disclosure in the financial statements, and most of all, regard only public listed companies. Again, taking the already mentioned Italian case, the article 2086 of the Civil Code, states: *"The entrepreneur, operating as society or corporate business, must institute an organizational, administrative and bookkeeping structure, aligned to the nature and the size of the business, also as a function of the timely detection of the enterprise crisis and the loss of business continuity, as well as activating with no procrastination for the adoption and the execution of one of the instruments planned by the system for passing the crisis and the recovery of the business cyclicity"*³². From these examples, the absence

³¹ Thomas L. Barton, William G. Shenkir, and Paul L. Walker, *Enterprise Risk Management: Pulling it All Together*, the Institute of Internal Auditors Research Foundation, 2002

³² Translated from the original version. *"L'imprenditore, che operi in forma societaria o collettiva, ha il dovere di istituire un assetto organizzativo, amministrativo e contabile adeguato alla natura e alle dimensioni dell'impresa, anche in funzione della rilevazione tempestiva della crisi dell'impresa e della perdita della continuità aziendale, nonché di attivarsi senza indugio"*

of specific indications about Risk Management is highlighted: the need of a non-specified management structure and the need for disclosure are the key elements of the legislation, but no point regarding Risk Management is provided. In this sense, the use of a proxy in the continue of this study, and the diversity of ways in which companies decide to implement ERM in its governance, are effect of the absence of regulation. Therefore, ERM's Framework and Corporate Governance might reflect the uncertainty in the regulation, referring to themselves as mutable ad adaptable structures, and offering, especially ERM, only guidelines and no precise rules to follow. In this sense, having a set of rules regulating adoption and disclosure, might have reflected in a more standard formulation of ERM.

However, the aim of this analysis is not questioning the legislation, but to see how firms have implemented Enterprise Risk Management in their governance. We have said that the common way to adopt ERM is through the establishment of an executive risk committee and especially the hiring of a Chief Risk Officer. This is the method assumed in this analysis, acknowledging that other methodologies are present but considering the usage of the CRO proxy as the most adequate for studying the impact of ERM in firms' value. In particular, Figures 12 and 13 below show respectively the overall structure of the governance Framework and the structure of the executive risk committee, in order to fully represent the process of Risk Management.

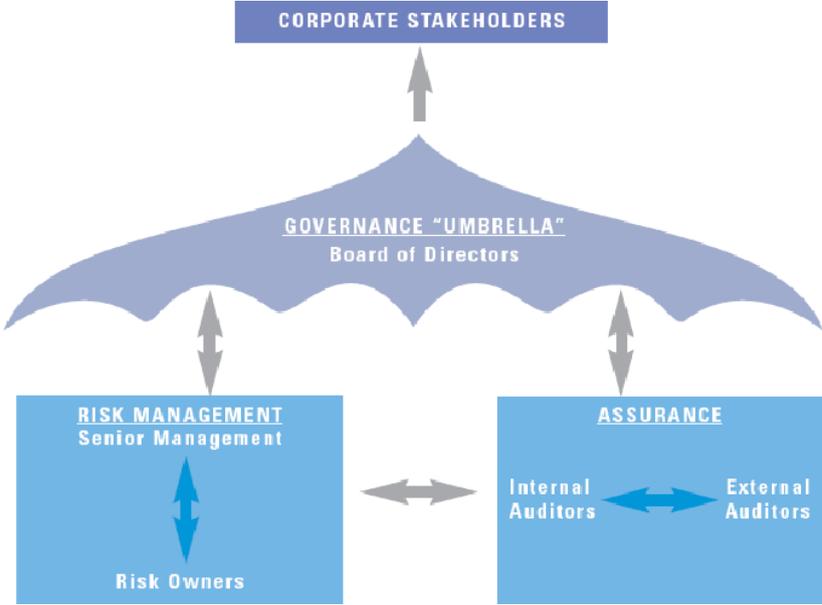


Figure 12. Governance Framework. (Source: Aligning Corporate Governance with Enterprise Risk Management, 2004)

per l'adozione e l'attuazione di uno degli strumenti previsti dall'ordinamento per il superamento della crisi e il recupero della continuità aziendale”.

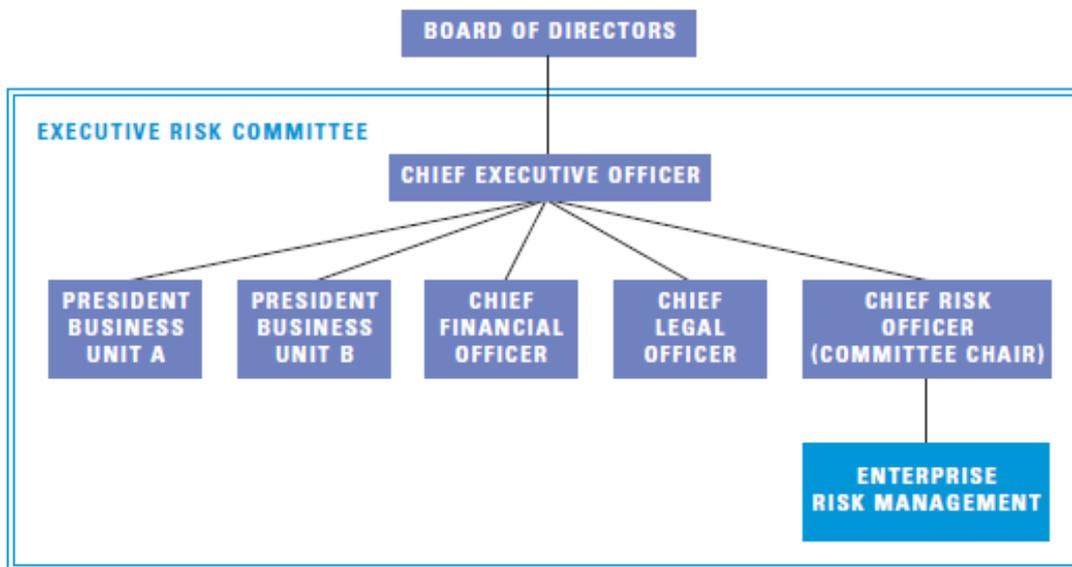


Figure 13. Executive Risk Committee structure. (Source: *Aligning Corporate Governance with Enterprise Risk Management*, 2004)

As it is possible to see in Figure 12, at the top of the Corporate Governance structure there are the stakeholders, who are the main beneficiaries of a good Corporate Governance. Then it is possible to see the so called “umbrella” function of the Board, which protects management and assurance from the requirements of stakeholders. In other words, the Board can be seen more as an intermediary between management, assurance and stakeholders, rather than a protecting agent. His role is in fact, to elaborate the requirements of stakeholders and provide them to the risk management unit, and vice versa, resume the results of the risk strategy applied and propose them to the stakeholders. The term umbrella then can be seen in a different way: it can be seen as the responsibility and the “mea culpa” the Board of directors takes for the other areas of the company. It protects the subsidiary units of the organization that actually have the responsibility for the strategy applied. To better comprehend, the Board of directors has not direct responsibility on Risk Management. Its role is that of providing to Risk Management directions, expertise, assign authority, define risk tolerance and oversight. The direct responsibility however, relies on senior management and on the individual risk owners that compose the executive risk committee. On the contrary, the Board has direct responsibility for the entire Corporate Governance process. Again, the Board should value the work and the performance of the senior management, who has the direct responsibility on Risk Management. In particular, the main responsibilities of the senior management are: delegates risk management authority to the executive risk committee, specifies

risk threshold, supervises on risk owners and report to the Board. The single risk owners compose the executive risk committee and can be considered the actual “engine” of the Framework. In particular, under senior management oversight, they develop, implement, evaluate and monitor the Risk Management strategies adopted by the organization. Furthermore, they refer on the results to the senior management that reports itself to the Board of directors. In the last stage then, the Board will provide to stakeholders the results of the strategy adopted and will assume the responsibility for the overall Corporate Governance Framework.

As can be seen in Figure 13, the authority on the Executive Risk Committee relies on the Chief Executive Officer (CEO) who has the responsibility on the overall operate. In the risk committee, there are other officers that are not directly related to Risk Management, such as the Chief Financial Officer who is responsible for all financial operations, but that provide crucial information to evaluate company’s objectives, resources and risks. In this sense, the cooperation across all firm’s sectors required from the Enterprise Risk Management reflects its utility and application. In the CFO example, his duties require the responsibility on financial transactions, but in this way, also on the factors correlated, for example the feasibility of an investment, the resources required and the risks connected are just few of the considerations made by the CFO. Therefore, the analysis made by the Chief Financial Officer when considering an investment summed to the analysis made by the other officers in the risk committee, are all relevant and helpful in the elaboration of the total Risk Management process. The actual and direct responsible for the Enterprise Risk Management process and implementation is the Chief Risk Officer, who transmits the authority and the guidelines initially provided from the Board of directors to individual risk owners, and oversees on their work. The CRO refers to the Chief Executive Officer, who is the referent for the chiefs of the different functions across the organization. Finally, the CEO refers ultimately to the senior management or directly to the Board of directors.

To conclude, the last element of the Corporate Governance Framework is the assurance. This role is duty of auditors, both internal and external, who refer to senior management or directly to the Board of directors, and have the responsibility of providing objective assurance on the efficiency of Risk Management, monitoring and governance processes. Despite the oversight role auditors have, assurance does not provide Risk Management responsibilities. The assurance process can be completed in two different ways: internal and external auditing. In the case of internal evaluation, auditors judge on the ERM process either in first person, based on fixed criteria or by evaluating the risk owners’ individual reports. In the external case, auditors can examine either financial statements or directly firm’s internal control. In both cases, auditors elaborate their evaluation and

refer to senior management or to the Board of directors, who take actions according to the performance of the strategy adopted. Important point to highlight on auditors is the knowledge they have on the organization: through their activity, they evaluate the correctness of the internal activity performed by the company. In fact, the responsibility of reporting on the performance of Risk Management, allows auditors to analyse all the aspects of the company, from the structure of the governance to the strategy adopted by the firm. In this sense, it has already been said that the executive risk committee has been used in the implementation of Enterprise Risk Management, but that before its introduction the role attributed to the Chief Risk Officer was given to other individuals of the company, such as the Senior Risk Manager. Other subjects that have covered the role of responsible for the Risk Management have been the Chief Executive Officer, the Chief Financial Officer and even the Auditors; furthermore, in certain realities those authorities still perform this activity nowadays. However, the endorsement of such authorities could lead to different results from those expected by the management strategy. For example, the training and the objectives of a Chief Financial Officer are not aligned to those required by the Enterprise Risk Management, and more in general, each unit of a company has different knowledge on different aspects affecting the correct functioning of an organization. Of course, all units across the enterprise cooperate to efficiently run the organization, as claimed by ERM and Corporate Governance principles, but it is obvious that attributing the responsibility of ERM to a CFO will result in inefficient strategy. The CFO in fact, will look more to the financial aspect of the Risk Management, aiming for profit maximization rather than completely valuating the risk assumed. To expand the consideration, the same works also for Auditors or other units of an organization, which simply lack the competencies required from a responsible of Enterprise Risk Management. The relevance of the Chief Risk Officer is now evident: the development, the efficiency and the monitoring of the risk strategy is responsibility of the CRO and its team. As Liebenberg and Hoyt (2003) affirm,

“[The CRO] will be responsible for identifying, assessing, reporting and supporting the management of [the company’s] Worldwide risk issues and opportunities. [He] will be responsible for recognizing and evaluating [the company’s] total corporate risk, [and] will be charged with identifying and assessing risks that cut across the organization and then advising the best way to manage them. [Therefore,] risk and opportunity will be measured and managed as a cornerstone of how we do business³³.”

³³ Liebenberg A.P., Hoyt R.E., op. cit. 2003

However, what is even more evident from the structure represented in Figure 13, is the interconnection of different sectors across the organization. The relationship between the chief officers, both at same (CFO and CRO) and different (CRO and CEO) levels, is the key for a good Risk Management procedure. It is possible to say then, that the major impact of the Enterprise Risk Management on the Corporate Governance Framework is the enhancement of cooperation of all units across the company. We previously stated that both ERM and Corporate Governance had to change and adapt in order to properly work and provide an efficient Risk Management process, enhancing performances and bringing a long-term culture to the firm. In this sense, the governance has evolved in its “risk Framework”. In the past, the role of risk manager appeared as a unified authority, alone responsible for the strategies selected and following the Traditional Management approach. With the implementation of Enterprise Risk Management, the governance Framework changed and adapted to a new concept of Risk Management, in which all risks are treated as a portfolio, abandoning the silo based approach, and in which a more complex organizational structure is required. In this sense, the figure of the Chief Risk Officer is relative young, as the ERM, and its adoption is not unanimously accepted by all the organizations adopting ERM. However, since no legislation provides the obligation to indicate the type of management a firm is adopting, the CRO hiring is usually considered as sign for the implementation of this technique, and will be one of the basis ideas underlying the quantitative analysis on the effect of Enterprise Risk Management on firm’s value. In addition to the absence of legislation, other elements could have a negative impact on the hiring of a specific figure for the Enterprise Risk Management coordination. The elevated costs in fact, do not stop with the hiring of a CRO, but reflect on the entire Framework evolution required by the Risk Management model. The argument can be expanded to the implementation of the entire ERM process and to the difficulties faced by a firm that may lead the company to continue with the existing Risk Management. Although several causes could be cited against the adoption of ERM, the most relevant are the elevated costs, the complexity of the model, the lack of legislation and the absence of evidence of ERM’s efficacy. While the first two points have been refuted and the legislation absence is a problem of legal nature, several studies on the ERM’s efficacy have been made, with uncertainty and no evidence of Enterprise Risk Management impact on organizations value.

CHAPTER 4

Empirical Analysis

4.1 Introduction

Organizations like COSO and ISO have idealistically affirmed that the real impact of Enterprise Risk Management is the creation of value, the enhancement in performances and the creation of enterprise culture. Despite the definition may seem easy and indicate a straight assessment of the effects of ERM, the reality provide a slightly different picture. Since the introduction of the ERM in 2004 in fact, and especially after the Crisis in 2008, researches on Enterprise Risk Management impact on firms have been made, but no evidence of its effect have been found. Actually, to be more precise, answers have been found, but providing different results: if some authors found the positive impact with an increase of firms' value after the adoption of ERM, others have found evidence for negative results. Furthermore, the majority of the studies have found no evidence at all, pointing out the absence of ERM impact on companies.

Despite previous studies affirmed that the CRO is usually used as sign of ERM, this statement should be modified. In fact, while it is true that the figure of Chief Risk Officer is one of the most used indicators for ERM, it is also true that it does not fully represent the ERM characteristics and sometimes might be a “false” indicator of ERM adoption. Therefore, using only the CRO hiring as a proxy for ERM implementation could provide misleading effects: in fact, the CRO, does not analyse the determinants of ERM, does not represent the level of adoption of ERM and not always coincides with the adoption of ERM. For these reasons, this study has been conducted with the introduction of an index, called Corporate Governance index, with the aim of representing the adoption and the effects of Enterprise Risk Management in the most complete way. The index, as the name suggests, is based on Corporate Governance characteristics and is considered independently from ERM. However, the two variables are naturally correlated, as explained in the previous chapters, and to reflect this connection the CRO adoption is considered has one of the five elements constituting the Corporate Governance index. In this way, the Chief Risk Officer figure is again considered as indicator of ERM adoption but is related to a bigger contest in order to weight the importance of this element with the other factors affecting ERM, Corporate Governance and Firm Value. As highlighted in the previous ERM theory studies, the

interconnection of different elements and areas in the company is the key factor to adopt ERM and correctly aligning it with the firm governance and culture: in this sense, the consideration of different variables rather than focusing only on the CRO shall represent the core idea of ERM. Therefore, the strategy relies on the idea that considering only the CRO adoption or other proxies for ERM, but remaining closed on the ERM area without taking into consideration the areas related to ERM, would have been restrictive and would have provided irrelevant results regarding the real impact on firm value. Furthermore, in the Literature several authors have tried to investigate the ERM effect on firm value utilising only elements reflecting ERM, so the adoption of a different strategy including the Corporate Governance relationship, as emphasised in the COSO Framework, is intended to give a different point of view on the theme.

4.2 Variables description

The empirical analysis is based on a dataset, manually constructed, containing data regarding the firms of the EURO STOXX 50 Index. The index refers to the Europe's blue-chip³⁴, the 50 biggest listed firms in the Eurozone. The dataset has been constructed by retrieving the information from the annual reports of each single firm part of the index, for the period going from 2011 to 2019. Both financial and non-financial firms have been considered, with the only exception for insurance companies that have been excluded from the analysis due to the different regulation in terms of legislation and disclosure. Furthermore, the dataset has been modelled in order to have panel data³⁵ allowing considering the multi-dimensional data obtained from the annual reports.

The overall analysis is based on two major linear regressions that take as dependent variables respectively the Tobin's Q and the ERM variables. By utilising two different regression models with two different dependent variables, the study looks at two diverse aspects regarding the adoption of Enterprise Risk Management. With the Tobin's Q, the aim is to investigate the impact of ERM on firm value. In fact, the Tobin's Q is usually adopted in the Literature as the principal proxy for better representing firm value. Through the consideration of market value of equity, book value of assets and liabilities in fact, an initial and satisfying preview of the firm is provided in a slightly accurate way. The formula is equal to the sum of the market value of equity and the

³⁴ The term blue-chip refers to companies with the greater value. When referring to the biggest companies, the aspects taken into consideration for the blue-chip terminology are several. It does not only refer to companies with the higher market capitalization or the most expensive ones, but it is a mix of stability, size, dividends distribution and other characteristics.

³⁵ A panel data refers to time series and cross-sectional data, allowing to analyse the different variables of each firm in different periods of time.

book value of liabilities, divided by the book value of assets, from which can be seen the large but acceptable representation of the firm's characteristics through a simple indicator. On the other hand, the ERM usage as dependent variable refers to the need of studying the interest variables that affect the probability for a firm to adopt ERM. Therefore, before giving the exhaustive indications about the empirical analysis development and the regressions used, a description of the independent variables utilised is needed to understand the overall analysis. In this sense, the variables of interest adopted to look for the impact on firms' value are:

- **ERM:** the Enterprise Risk Management variable is a dummy variable that reflects whether the firm is adopting ERM. If the firm uses ERM, the dummy takes value 1, otherwise 0. Reflecting the previous assumptions, indicators of ERM adoption are considered specific key words researched in the annual reports of each firm, such as "Enterprise Risk Management", "ERM", "Integrated Risk Management", "Holistic Risk Management", "Enterprise wide Risk Management", "Group wide Risk Management" and finally the CRO presence. As already stated, the CRO figure is part of the Corporate Governance index but is still used as main proxy in the Literature to identify the ERM adoption, so in this study takes double role both in the ERM variable and in the CGindex. Based on the previous considerations, the effect of the ERM variable should be positive and coincide with an increase in the firm value. The implementation of an integrated risk management should provide firms an increase in value, risk culture and tan overall improvement in the decision-making.
- **Price Volatility (Pricevolatility):** the price volatility variable refers to the annual change for the stock price of each firm in every period from 2019 to 2011. This measure should have a positive effect on the Tobin's Q, reflecting the relationship between volatility and value: when the volatility increases, the value of every investment project increases too (consequently increasing the risk connected). Therefore, when price volatility increases, the investments value should increase and consequently the firm value.
- **Beta:** is the measure of riskiness of each single company compared to the riskiness of the market. It is also a measure of the volatility of the company compared to the market, so it should have the same result as the price volatility variable: if the beta increases, the Tobin's Q should increase too. In the Beta case, this connection is even more evident, being itself a measure of riskiness and volatility.
- **Firm Size (FirmSize):** the firm size variable is intended to indicate the size of each firm, based on its total assets. In particular, the variable is computed as the natural logarithm of

the book value of assets, and it is expected to have a positive impact on the Tobin's Q, since greater firms are more likely to have higher value.

- **Leverage:** the leverage has been calculated following the debt-equity ratio as the ratio between the book value of liabilities and the book value of equity. This measure indicates how much debt the firm has in its capital and assesses the ability of the firm to meet its financial obligations such as the repayment of debts. In this sense, the predicted result for this variable is uncertain: it could have either a positive impact on the Tobin's Q, providing the idea of an active firm willing to invest in new projects, or a negative impact, related to the possibility of bankruptcy and default risks. To reinforce the negative expectations on leverage, the lack of flexibility due to higher debt is a key factor for investors, so the overall expected result on the firm value should be negative.
- **Dividends:** the dividends are represented as a dummy variable, which takes value 1 if dividends are distributed and 0 otherwise. Also in this case the expected output on the dependent variable is uncertain: it could reflect an increase in firm value, being an indicator of an healthy firm able to pay dividends, or have a negative impact, reflecting this time the absence of new profitable investments.
- **Board monitoring (Boardmonitoring):** Gordon introduced this variable in 2009, affirming that an active Board, participant in the operations of the firm, should positively affect the value of that firm. In order to represent the active participation of the Board, Gordon constructed the variable as the ratio between the number of directors and the natural logarithm of sales: the higher this value, the more positive the impact on firm value.
- **COSO:** the COSO variable indicates the adoption of the COSO Framework on ERM, independently on the reference year³⁶. The variable is then a dummy that takes value 1 if COSO is declared in the annual reports of each firm, 0 otherwise. To conclude, it should have a positive effect on firm value: when COSO is used in fact, it usually indicates that the firm is adopting the ERM, so that the combined structure should emphasize even more the ERM positive effect.
- **Corporate Governance Index (CGindex):** the Corporate Governance variable is constructed as an index that takes values from 1 to 5. The index represents the structure and the complexity of the Corporate Governance of each firm, where the minimum value 1 indicates a "weak" Corporate Governance structure and the maximum value 5 stands for the highest level of Corporate Governance completeness. An important assumption made in this study is that the third level of the index should be seen as a relevance point. In fact,

³⁶ Either the 2004 or 2017 formulation of the Framework

the first 3 levels of the index are considered to indicate a moderate level of Corporate Governance, of course increasing from 1 to 3, while the fourth and fifth levels are thought to reflect a complex and complete Corporate Governance. Therefore, several computation will be made with respect to the third level of the CGindex to look for average or stronger level of complexity. In this sense, taking it to the extremes, rather than considering a scale from “weak” to “strong”, the level of Corporate Governance would be treated as a separation between complex and non-complex. The effect of the index should be positive on the Tobin’s Q, indicating an increase in firm value when using a structured Corporate Governance. Therefore, the index is positive connected to the ERM, so the idea regarding its effect is enhanced. The index has been constructed looking for the presence in the single annual reports of the 5 key elements that are mostly used in the Literature and that have been thought to better represent the idea of Corporate Governance for this study:

- **Board Size (Boardsize):** a greater board is considered having a positive impact on Corporate Governance. The board size can be considered as a dummy variable that takes value 1 if the board size is relevant, 0 otherwise. Therefore, the number of directors composing the board have been computed for each firm in each year, and again, for each year the average number of directors between the totalities of boards has been calculated. In this way, the firms that have a board size greater than the average are considered to have a significant board size and so the dummy variable takes value 1.
- **Risk Committee (Riskcommittee):** the risk committee indicates the presence of an independent³⁷ committee that has the responsibility for risk management oversight. This subject studies and evaluates risk management and governance processes, and has the objective of assuring the board of directors about the effectiveness of the procedures. Therefore, when a firm indicates the adoption of a separate figure such as “Risk Committee” or mostly, the Audit Committee, the dummy variable for risk committee takes value 1, otherwise 0.
- **Duality:** duality refers to the separation between the Chairman and CEO figures. When a firm has two different personalities occupying the position of Chairman and Chief Executive Officer, the dummy variable for duality takes value 1, otherwise 0.
- **Board Independence (BoardIndependence):** a board is considered to be independent when the majority of the directors composing the board is independent.

³⁷ Either external or internal

Therefore, when a company declares that at least the 51% of directors composing the board are independent, the dummy variable takes value 1, otherwise 0.

- **CRO**: when a company hires a Chief Risk Officer, the dummy variable takes value 1, otherwise it will be 0.

As can be seen, the 5 components of the Corporate Governance index are all dummy variables. In this sense, the index can be considered itself a dummy variable that takes value 1 if at least one of the 5 elements, or dummies, are used and 0 otherwise, indicating the absence of a structured Corporate Governance overall. Furthermore, the index can take value from 1 to 5 independently on the specific element considered. This means that all the 5 characteristics of the CGindex are equal and have same weight and importance. To simplify, if a firm has an independent board and duality, it will have an index equal to 2; however, if a firm has on the other hand hired CRO and Risk Committee, the value for the CGindex will be again 2, with no distinction between the elements constituting the index. Furthermore, each level of the index can be treated as a dummy variable: when a firm has an index equal to 3, the dummy variable for this level of the index will have value 1, while the other dummies for the remaining index levels will have value 0. Last point to notice, is the inclusion of the CRO figure in the index. The Chief Risk Officer is already considered as an implicit indication of ERM adoption, so that its presence is already taken in the ERM variable. However, considering it also in the Corporate Governance index, has the aim of enhancing the strong relationship between Enterprise Risk Management and Corporate Governance already expressed in the theory. If a firm hires a CRO in fact, it should adopt an Enterprise Risk Management procedure. At the same time however, the Corporate Governance has to change and adapt to the ERM introduction, as well as the ERM should adapt to the Corporate Governance structure already active in the firm. In this sense, the CRO properly identifies the improvement in the Corporate Governance structure required by the CGindex, and so the consideration of the CRO in both the ERM and Corporate Governance variables appears to be correct.

- **Corporate Governance Index squared (CGindex²)**: the variable is obtained by simply squaring the Corporate Governance index. The aim of this variable is to look for the presence of non-linear relation between the Corporate Governance index and the dependent variable. Since the Corporate Governance is built as an index, the non-linear relation with the Tobin's Q should be evident. In fact, the index takes different values depending on the number of governance characteristics respected by each firm. In this sense, the relationship

cannot be linear for the CGindex, due to the variation in the value of the variable itself. On the contrary, when analysing the possible non-linear effects, the CGindex is separated into the 5 elements that constitute the index, meaning that the index is replaced by the 5 dummy variables composing it. These 5 dummy variables on the contrary are each linearly related to the dependent variable, allowing to investigate the significance of every single level of the Corporate Governance complexity structure.

Independent Variables	Expected Sign	Definition
ERM	+	Dummy variable. If 1=ERM adoption, if 0=no ERM adoption
Pricevolatility	+	Δ Stock Price
Beta	+	Measure of riskiness of the company compared to the market
FirmSize	+	Log(book value of assets)
Leverage	+/-	Book value of liabilities/book value of equity
Dividends	+/-	Dummy variable. If 1=Dividends distributed, if 0=no Dividends distributed
Boardmonitoring	+	N directors/log(sales)
COSO	+	Dummy variable. If 1=COSO Framework adoption, if 0=no COSO adoption
CGindex	+	Index on Corporate Governance complexity
CGindex2	+/-	CGindex ²

Table 5. Independent variables summary. (Source: personal elaboration)

In Table 5, a summary of the above-described independent variables is provided. Once analysed the independent variables considered, the dependent variables used are then described. With respect to the first category of regressions regarding the analysis on the impact of Enterprise Risk Management on Firm Value, the main and initial dependent variable used is the Tobin's Q³⁸. It is a measure mostly used in the Literature as proxy for firm value, since it accounts both for market

³⁸ Measure popularised by Nobel laureate James Tobin in 1977 but firstly proposed in 1966 by Nicholas Kaldor as the Kaldor's V

and book effects, which is essentially equal to the ratio between the market value of the firm and its replacement value. This ratio translates into the formula:

$$\text{Tobin's } Q = \frac{\text{Market Value of Equity} + \text{Book Value of Liabilities}}{\text{Book Value of Assets}}$$

The numerator gives the market value of the firm, as the sum between market value of equity and book value of liabilities, while the denominator provides the so-called replacement value, represented by the book value of assets. In other words, the market value of the firm stands for its market valuation, indicating the value of the firm given by the market. The replacement value of the firm on the other hand, indicates the “book” value of the firm, i.e. the cost to pay in order to replace the firm’s stocks at the market price. In a simplistic vision, the market value indicates the “imaginary” value of the firm that could be evaluated as higher by the market with respect to its “actual” value, which is the replacement value. In this sense, this formula provides a good indication on whether the firm is overvalued or on the contrary undervalued: the assumption is that the two values, market and book, should be the same with a Q equal to 1. On the contrary, the Tobin’s Q could be greater than 1, indicating that the market values more the firm with respect to its book value, or have a value lower than 1, sign of undervalue and indicating an incentive in buying the firm. Although its simplicity and diffusion, several authors have criticised the use of this variable as proxy for firm value for its limitations and problems of inaccuracy, bias and variability. Taking into consideration the critics on the Tobin’s Q, other proxies to represent firm value have been used in this study in order to provide a complete analysis. If the starting point was the consideration of the Tobin’s Q, the same regressions have been run also with two different dependent variables used as proxies for the profitability of a firm: ROA and ROE. In this sense, the results have been compared and the most significant one has been selected as the main dependent variable for the rest of the analysis.

With the term ROA, we refer to the Return on Assets, obtained from the formula:

$$ROA = \frac{\text{Net Income}}{\text{Book Value of Assets}}$$

ROA is usually used as a measure of performance of the firm: it provides in fact indications about the profitability of the capital invested, and so information about the ability of a firm to generate profit from the total assets at its disposal. This variable seems then ideal to represent a proxy for the firm value index, since it provides information about the economic health of the firm.

Furthermore, it considers the management ability of the firm in creating profit so that it should have a positive relationship with the ERM variable. The term ROE on the other hand, refers to the Return on Equity that is again a measure of the performance of the firm, both in profit and management terms, but without taking into consideration the debt considered in the total assets by the ROA. The formula is:

$$ROE = \frac{\text{Net Income}}{\text{Book Value of Equity}}$$

ROE shares with ROA the ability of representing the firm's economic health and its ability in generating profit from investments, but differs from ROA on the level of capital invested. If in the ROA formula, the denominator accounts for the total assets, which are the sum of equity and liabilities, ROE considers only the shareholders equity, without any form of debt. Therefore, if ROA represents the ability of a firm in generating profit from the total assets, ROE indicates the ability of the management in creating profit only from shareholders' investment. Although the differences, both the indices appear to be ideal for the approximation of firm value, and in the analysis are compared to the Tobin's Q in order to select the most significant dependent variable. Moving to the second type of regressions regarding the variables affecting the adoption of ERM by a firm, the dependent variable must be obviously the ERM variable itself. The changes in this case are the type of regression, that will be discussed later on, and the different independent variables used in the regression. Rather than focusing on the missing variables that have already been described, it is important now to introduce the 2 new variables that are supposed to influence the adoption of ERM.

- **ΔEBIT (Ebitchange):** this variable represents the annual change of the earnings before interests and taxes. The impact of such variable is however uncertain: a reduction of volatility in EBIT should have a positive effect on Enterprise Risk Management and vice versa, a good risk management should eventually reduce the volatility on EBIT.
- **Sales growth (Salesgrowth):** the variation in the annual sales is the second new variable introduced for the ERM adoption regression. The relationship with a better risk management should be positive and increase the growth on sales.

Now, having a complete vision on the variables adopted, it is possible to move to the actual empirical analysis, to the study of the regressions and to the commentary of the results.

4.3 Data Description

As previously stated, the overall analysis is based under two main multivariate linear regressions. As regards the first type, the regression investigates the described independent variables and their effect on firm value initially identified with the Tobin's Q. Then, two other proxies are introduced, ROA and ROE, in order to investigate which dependent variable could be more significant and approximate at its best the firm value hypothesis. The second type of regression on the other hand, regards the impact of determined independent variables on the probability for a company to adopt ERM. As already introduced, all the computations are based on the panel data retrieved from the single annual reports of the firms contained in the EURO STOXX 50 Index. The time period considered goes from 2011 to 2019 and takes into account the 50 biggest companies in the Eurozone, with the exception for insurance companies due to the different regulation. The overall work follows the panel data analysis, which is the most used method when dealing with panel data. Therefore, before starting with the regressions, a brief description of the data used is provided.

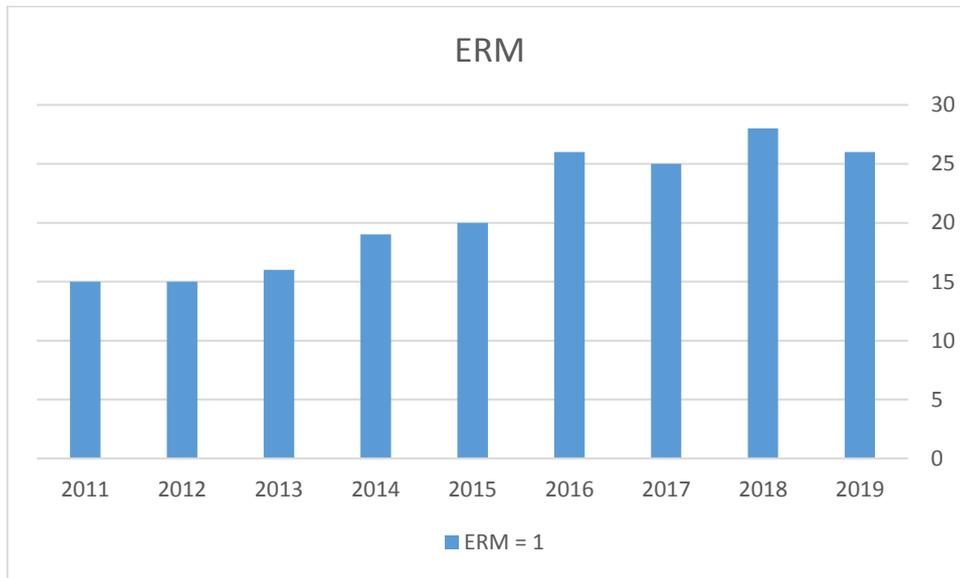
	2019	2018	2017	2016	2015	2014	2013	2012	2011	TOTAL
ERM = 1	26	28	25	26	20	19	16	15	15	190
%	61,90%	65,12%	58,14%	60,47%	46,51%	44,19%	38,10%	35,71%	37,50%	49,87%
ERM = 0	16	15	18	17	23	24	26	27	25	191
%	38,10%	34,88%	41,86%	39,53%	53,49%	55,81%	61,90%	64,29%	62,50%	50,13%
TOTAL	42	43	43	43	43	43	42	42	40	381
%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%

Table 6. ERM adoption. (Source: personal elaboration)

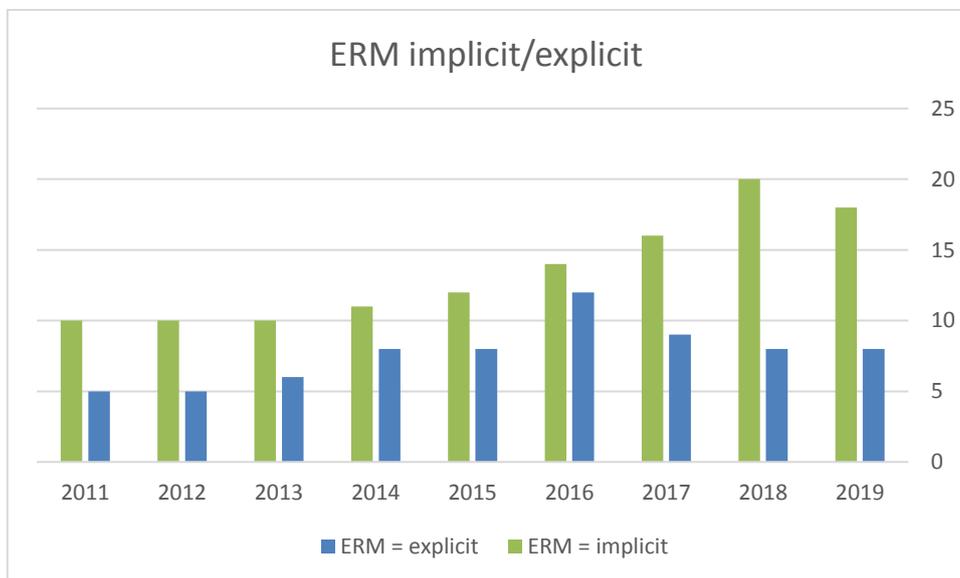
	2019	2018	2017	2016	2015	2014	2013	2012	2011	TOTAL
ERM = explicit	8	8	9	12	8	8	6	5	5	69
%	30,77%	28,57%	36,00%	46,15%	40,00%	42,11%	37,50%	33,33%	33,33%	36,32%
ERM = implicit	18	20	16	14	12	11	10	10	10	121
%	69,23%	71,43%	64,00%	53,85%	60,00%	57,89%	62,50%	66,67%	66,67%	63,68%

TOTAL	26	28	25	26	20	19	16	15	15	190
%	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %	100,00 %

Table 7. ERM implicit/explicit. (Source: personal elaboration)



Graph 1. ERM adoption evolution (Source: personal elaboration)



Graph 2. ERM implicit/explicit evolution. (Source: personal elaboration)

From the illustrations, it is evident the increasing evolution of ERM adoption. Although the average number of firms adopting ERM is equal to the number of firms not utilising it in the period from 2011 to 2019, Table 6 and Graph 1 highlight the increasing development of Enterprise Risk

Management especially in the last 4 years. The number has in fact evolved from the 15 firms acknowledging it in 2011 to the 26 over the total 42 firms constituting the index and representing almost the 62% of the total. Furthermore, the 2019 has seen a small decrease in ERM adoption and if we look at 2018 the number of positive firms was even higher, achieving the peak of 65% of total firms. The increase in the adoption of a more structured management might also be seen as an initial indication of positive relation between firm value and ERM. Another important element coming from Table 7 is the implicit adoption of ERM: most of the companies still do not explicitly provide indication about Enterprise Risk Management in their annual reports, but refer to an improved risk management structure through the hiring of a Chief Risk Officer. In this sense, the implicit case has always overcome the explicit one, achieving its peak in 2018 with almost the 72% of firms, but actually by constantly being a value higher than the explicit, as it is possible to see looking at the average total numbers for the entire period. Reason for this could be the lack of disclosure regulation already mentioned in the theory chapter: no set of rules imposes firms to explicitly provide information about the risk management they are utilising. In this sense, the usage of CRO as a proxy for ERM implicit adoption has allowed to have a more significant dataset, since most of the firms implicitly adopt ERM and a great part of them would have been excluded from the analysis, causing the study to lack in significance.

After an initial description of the database, the panel data analysis continues with the definition of the variables, where the dependent variable is the Tobin’s Q and the independent are: ERM, Price Volatility, Beta, Firm Size, Leverage, Dividends, Board Monitoring, COSO and the Corporate Governance index. Furthermore, a brief summary of the variables is provided in Figure 14.

```
. summarize $id $t $ylist $xlist
```

Variable	Obs	Mean	Std. Dev.	Min	Max
ID	387	22	12.42574	1	43
year	387	2015	2.585331	2011	2019
TobinsQ	381	2.455045	2.433631	.8712452	14.05886
ERM	381	.4986877	.5006557	0	1
Pricevolat~y	340	3.874568	17.40264	-73.71	156
Beta	367	1.002699	.19628	.5515304	1.846319
FirmSize	381	11.04659	.5879801	9.860984	12.43379
Leverage	381	4.569315	5.965331	.0879142	29.43072
Dividends	381	1	0	1	1
Boardmonit~g	381	1.154452	.2790882	.3786937	1.835643
COSO	381	.5249344	.5000345	0	1
CGindex	381	3.299213	.9317355	1	5

Figure 14. Variables summary. (Source: personal elaboration)

From the figure above, relevant values regarding primarily the Tobin's Q, the ERM, the COSO and the CGindex variables can be noticed. In particular, we see that the firms analysed are actually good in terms of firm value. In fact, a value for the Tobin's Q greater than 1 indicates that the market overvalues the firms and considers them healthy and profitable firms: with a mean of 2.455 the goodness of the sample is relevant. Second element of interest is the mean of the ERM measure, which combines with the average value of firms adopting Enterprise Risk Management indicated in Table 6. As regards the COSO variable, its value reflects more or less the ERM adoption with a mean of 0.5249, indicating that in average half of the firms considered declare and apply the COSO Framework, independently on its version. Final element of relevance is the Corporate Governance index (CGindex). As already said, it reflects the complexity and the completeness of the Corporate Governance structure. A value around 3 indicates an average complexity level, while values of 4 and 5 identify a complex Corporate Governance structure. The variable mean is 3.299 so that in average, the firms considered appear to have a moderate level of Corporate Governance in terms of complexity and completeness.

The following step is finding the Pearson's correlation among the variables. The results are provided in the figure below.

	TobinsQ	ERM	Pricevolat~y	Beta	FirmSize	Leverage	Divide~s
TobinsQ	1.0000						
ERM	-0.2701*	1.0000					
Pricevolat~y	0.1616*	-0.1653*	1.0000				
Beta	-0.2333*	0.1707*	0.0181	1.0000			
FirmSize	-0.5010*	0.3509*	-0.2276*	0.4338*	1.0000		
Leverage	-0.2407*	0.3291*	-0.1367*	0.4878*	0.6797*	1.0000	
Dividends	1.0000
Boardmonit~g	0.0428	-0.1791*	0.1653*	0.1037*	0.0843	0.1448*	.
COSO	-0.0649	0.2866*	-0.1979*	0.0316	0.1730*	0.0897*	.
CGindex	-0.0869*	0.2265*	-0.1811*	0.2390*	0.5058*	0.5216*	.

	Boardm~g	COSO	CGindex
Boardmonit~g	1.0000		
COSO	-0.3259*	1.0000	
CGindex	0.4206*	0.0800	1.0000

Figure 15. Pearson's correlation. (Source: personal elaboration)

In fact, before inserting the variables in the regression model, we have to find the correlations among the variables to look eventually for multicollinearity problems. When taking about multicollinearity we refer about the presence of strong correlation among different independent variables. In other words, when there is multicollinearity, an independent variable is strongly

correlated³⁹ to more than one single independent variable. If this problem occurs, the solution would require eliminating the variable causing the anomaly in order to have a correct regression. Therefore, looking at Figure 15, the only variable that may present multicollinearity problems is the CGindex, having a moderate correlation of 0.4992 and 0.5411 with FirmSize and Leverage. The value of the correlation indicates a positive moderate correlation, so no problem of multicollinearity should take place, but to assure the regularity of the variables, the VIF test for multicollinearity is run. The term VIF stands for Variance Inflation Factors and it is an indicator used to detect multicollinearity. As stated by Jamal Daoud in its *Multicollinearity and Regression Analysis*, “When correlation exists among predictor’s the standard error of predictors coefficients will increase and consequently the variance of predictor’s coefficients are inflated. The VIF is a tool to measure and quantify how much the variance is inflated”. The formula for the VIF indicator is:

$$VIF = \frac{1}{1 - R^2}$$

The R-squared is a measure that denotes the portion of the variance in the dependent variable that is explained by the independent variables, indicating in this sense the goodness of the model fitted. Therefore, having a VIF equal to 1 would indicate no correlation between the variables, with an R-squared of 0, sign of the bad fit of the model. On the contrary, VIF indicating a high correlation and consequent multicollinearity problems have values greater than 5. In order to compute the VIF for each variable, it is sufficient to regress the variable of interest against the other variables. In our case, as shown in Figure 16, after running the simple linear regression of the Tobin’s Q against all the independent variables, the VIF values appear to be lower than the critical value 5, with a mean significantly low of 1.64, indicating no multicollinearity problems.

Variable	VIF	1/VIF
Leverage	2.25	0.444275
FirmSize	2.22	0.450367
CGindex	1.98	0.504465
Boardmonit~g	1.63	0.611622
ERM	1.34	0.748848
Beta	1.30	0.772151
COSO	1.28	0.784072
Pricevolat~y	1.15	0.867155
Mean VIF	1.64	

Figure 16. VIF indicator. (Source: personal elaboration)

³⁹ We refer to strong correlation when the coefficient assumes value greater than 0.7.

4.4 Regression Models

4.4.1 Firm Value

The first type of regression used in the analysis is a multivariate linear regression in order to investigate the effect of the independent variables described in the previous chapter on firm value. We have already said that initially the firm value is represented by the Tobin's Q and eventually compared with the ROA and ROE variables. However, the type of regression used has yet to be decided: in fact, the main element is dealing with panel data, so the normal regression analysis would be inefficient. When dealing with panel data, the Literature proposes 2 types of regressions: fixed effect panel regression and random effect panel regression. The two models are the most efficient ones since they account for both the characteristics of the panel data, which are the time variation and the cross-sectional dimension of the data. The panel data provide information on individual behaviour, both across individuals and over time, having in this way both cross-sectional and time-series dimensions. Furthermore, when considering panel data, we must consider also the presence of heterogeneity across individuals, which is the unobservable characteristics of each subject that make every individual differ from the other. These characteristics, as said, are unobservable but must be considered in the model, aspect that the "usual" linear regressions as the Ordinary Least Squares (OLS) regression cannot value. The OLS regression in fact is a model used in cross-sectional analysis but does not capture the variation over time among individuals. In terms of formula, it can be represented as:

$$OLS: Y_i = \alpha + \beta X_i + \mu$$

Furthermore, OLS models do not work when dealing with correlated errors and heteroskedasticity in the residuals, aspects that might be present in panel data and that are instead considered by the individual-specific models that are the fixed and random effects panel regressions. A version of the OLS regression, which considers the time variation is the Pooled OLS, built as:

$$OLS: Y_{it} = \alpha + \beta X_{it} + \mu_{it}$$

However, this is still a restrictive model, since it assumes constant coefficients ignoring in this way the heterogeneity among the individuals. As concerns the individual-specific effects models, they both assume heterogeneity across individuals by capturing it in the intercept α_i that will be different

for each firm. The main difference between the fixed and random effect models is whether the individual-specific effects α_i are correlated with the regressors: if they are correlated there are fixed effects, if they are not correlated the random effects is the best model.

$$\textit{Fixed effects: } Y_{it} = \alpha_i + \beta X_{it} + \mu_{it}$$

$$\textit{Random effects: } Y_{it} = \beta X_{it} + (\alpha_i + e_{it})$$

From the formulations of the models, we can retrieve the different idea on the correlation between regressors and the intercepts. While the fixed effects model considers the dependence between the independent variables and the intercepts, the random effects takes $\textit{Corr}(X_i, \alpha_i) = 0$, getting rid of the independence problem and introducing the individual-specific effect α_i in the composite error term $\varepsilon_{it} = \alpha_i + e_{it}$. In our case study, we decided to confirm by calculation this theoretical assumption on the models and then use the most adequate regression. Therefore, the first step is to prove the presence of heteroskedasticity in the residuals obtained with the pooled OLS model. In order to show the non-constant variance in the error terms, an initial graph illustrates the presence of possible heteroskedasticity, with several values outstanding, and then the Breusch-Pagan test for heteroskedasticity and the equivalent White's test for homoskedasticity are run: the results are equal, suggesting to reject the null hypothesis of constant variance.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of TobinsQ

chi2(1)      =    164.14
Prob > chi2  =    0.0000
```

Figure 17. Breusch-Pagan test. (Source: personal elaboration)

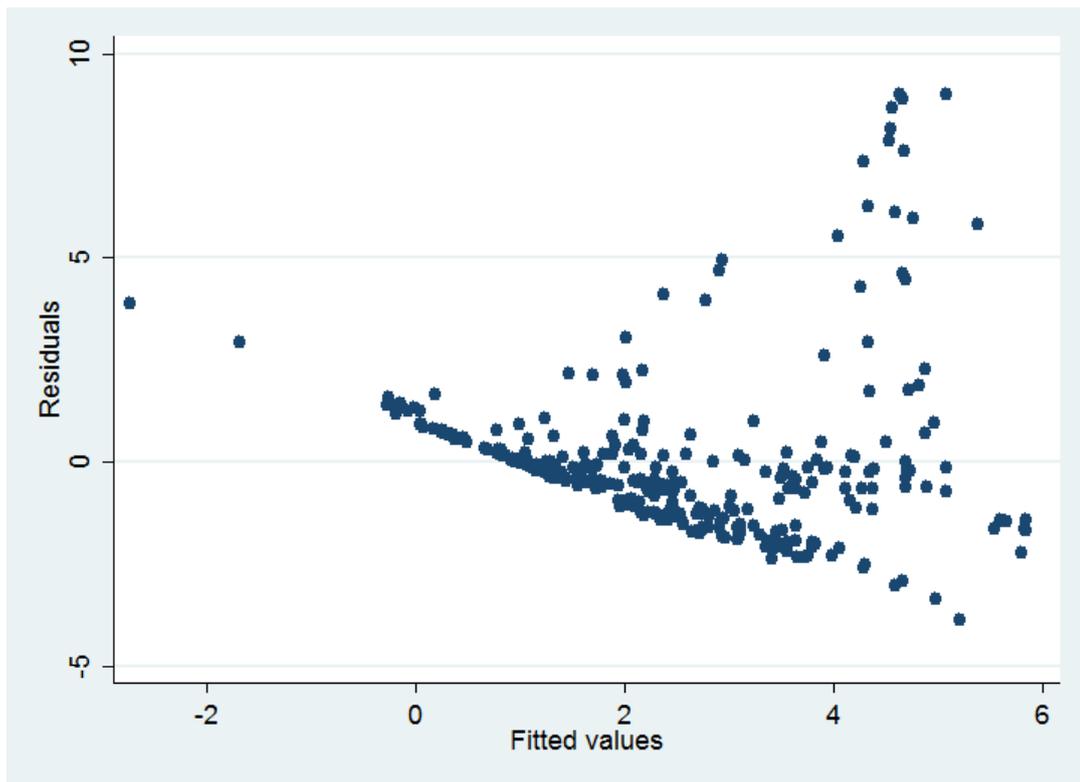


Figure 18. Residuals plot. (Source: personal elaboration)

```

White's test for Ho: homoskedasticity
      against Ha: unrestricted heteroskedasticity

      chi2(42)      =    101.91
      Prob > chi2   =    0.0000

```

Figure 19. White's test. (Source: personal elaboration)

Therefore, although the theory itself rejects the adoption of the OLS regression to model panel data, a statistical confirmation has been retrieved: adopting the OLS model with presence of heteroskedasticity will provide biased estimators. A more complex evidence of the inability of the pooled OLS model to represent the panel data is using the Breusch and Pagan Lagrangian multiplier test for random effects. This test compares the pooled OLS model to the random effects panel regression, with the null hypothesis suggesting the goodness of the OLS fit. As can be seen in Figure 20, the result allows to reject the null hypothesis, suggesting the random effect regression as the best model and confirming therefore the irrelevance of the OLS regression.

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{TobinsQ}[\text{ID},t] = Xb + u[\text{ID}] + e[\text{ID},t]$$

Estimated results:

	Var	sd = sqrt(Var)
TobinsQ	6.21839	2.49367
e	.4518806	.6722206
u	4.332595	2.081489

Test: Var(u) = 0

chibar2(01) = 863.26
 Prob > chibar2 = 0.0000

Figure 20. Lagrangian multiplier test for random effects. (Source: personal elaboration)

Once highlighted the goodness of the individual-specific regressions, the study concentrates in finding the model that best represents the panel data considered. As already stated, the two individual-specific models when dealing with panel data are the fixed effects and the random effects models. In order to select the most adequate model, firstly, we need to run the two regressions, and then the Hausman test will provide the results for the best approach. The Hausman test assumes in the null hypothesis that the difference in the coefficients is not systematic, indicating a random effect variation. Therefore, a high p-value will indicate the non-rejection of the null hypothesis, confirming the random effects model as the most adequate one, and vice versa. Therefore, the regressions are run, followed by the test which provides a p-value of 0.8799 that indicates the random effects as the model to be used in the continue of the analysis.

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
ERM	.0697648	.040298	.0294667	.0260304
Pricevolat~y	.0086312	.0086168	.0000144	.0003043
Beta	-.1720102	-.1754963	.0034861	.0488939
FirmSize	-1.952066	-2.084395	.1323298	.1204161
Leverage	.0418212	.0388098	.0030114	.0095592
Boardmonit~g	.2887053	.2574201	.0312851	.0841838
COSO	-.2731406	-.2321882	-.0409524	.0323516
CGindex	.2602018	.2673885	-.0071867	.0282691

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 3.76
 Prob>chi2 = 0.8779

Figure 21. Hausman test with Tobin's Q. (Source: personal elaboration)

Although the random effects model has been confirmed as the most efficient model, if we look at the results of the regression shown in Figure 22, it is evident that this type of regression is not the best model for the specific data used in this study. The main question of this study concerns the ability of ERM to influence firm value and if we look at the regression output, the ERM variable loses its significance.

```

note: Dividends omitted because of collinearity

Random-effects GLS regression           Number of obs   =       326
Group variable: ID                     Number of groups =        42

R-sq:                                  Obs per group:
  within = 0.2409                       min =           1
  between = 0.3181                       avg =           7.8
  overall = 0.3120                       max =           8

corr(u_i, X) = 0 (assumed)              Wald chi2(8)    =       104.58
                                           Prob > chi2     =        0.0000

```

TobinsQ	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
ERM	.040298	.1392176	0.29	0.772	-.2325635 .3131596
Pricevolatility	.0086168	.0024339	3.54	0.000	.0038465 .0133872
Beta	-.1754963	.305839	-0.57	0.566	-.7749297 .4239371
FirmSize	-2.084395	.2528061	-8.25	0.000	-2.579886 -1.588905
Leverage	.0388098	.0226462	1.71	0.087	-.0055759 .0831954
Dividends	0	(omitted)			
Boardmonitoring	.2574201	.3362767	0.77	0.444	-.40167 .9165103
COSO	-.2321882	.1486152	-1.56	0.118	-.5234685 .0590922
CGindex	.2673885	.1018103	2.63	0.009	.067844 .466933
_cons	24.38072	2.793526	8.73	0.000	18.90551 29.85593
sigma_u	2.0814887				
sigma_e	.67222062				
rho	.90555276	(fraction of variance due to u_i)			

Figure 22. Random effects panel regression with Tobin's Q. (Source: personal elaboration)

Before commenting the results for the ERM variable, several things might be highlighted from the output of the random effects regression. Initial element are the omitted Dividends, cancel out from the regression because of collinearity. This is a consequence of the dummy variable for the dividends, which takes for every firm in each period a value of 1, indicating that all firms have distributed dividends in every year since 2011. Then, it is possible to notice the random effects assumption indicated by the correlation between the intercept and the regressors equal to zero, and the good fit of the model through the significant p-value. Another important point to be highlighted is the nature of the random effects model, which refers to a Generalized Least Squares linear regression. The GLS model is a more general model compared to the OLS that accounts for

eventual correlation among dependent variables and presence of heteroskedasticity, as for the panel data considered. However, despite the overall goodness of the model, the major variables of interest such as ERM and COSO lose their relevance: at a 5% level of significance, the p-values are above 0.05, value that would give significance to the variables. Therefore, no relation between the dependent variable for firm value and Enterprise Risk Management is evident, ignoring in this way the main question of this entire study regarding the effect of ERM on firm value. In order to solve this problem, the study concentrates on finding the best dependent variable to reflect firm value. In fact, the random effects regression has been already proved the best model in order to investigate the dataset, while Tobin's Q has been criticised and might be the reason for the lack of dependence between firm value and risk management. To this purpose, the solution could require the adoption of a more adequate proxy for the dependent variable such as ROA or ROE. Initially, ROA is used as the new dependent variable, while the independent variables remain untouched. The computation is therefore equal to the previous analysis with the Tobin's Q, starting with a brief description of the variables, the correlation and the focus on eventual multicollinearity. While the results provide no multicollinearity with a mean VIF value of 1.64, the fixed and random effects regressions are run, followed by the Hausman test that again indicates the random effect as the best model.

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ERM	.0127813	.0128268	-.0000455	.0029985
Pricevolat~y	.0000109	.0000145	-3.58e-06	.000025
Beta	.0245542	.0285575	-.0040032	.0049504
FirmSize	-.0582536	-.0660414	.0077878	.0111164
Leverage	-.0025608	-.0022868	-.000274	.0008949
Boardmonit~g	.0074801	.0049766	.0025035	.009554
COSO	-.0093729	-.0101064	.0007334	.0036171
CGindex	.0076727	.0117241	-.0040514	.003251

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2(8)} &= (\text{b-B})' [(\text{V}_b - \text{V}_B)^{-1}] (\text{b-B}) \\ &= 4.64 \\ \text{Prob} > \text{chi2} &= 0.7951 \end{aligned}$$

Figure 23. Hausman test with ROA. (Source: personal elaboration)

As for the Tobin's Q case, the output of the regression highlight the inadequacy of the dependent variable selection: both ERM and COSO variables have non-significant p-values at the 5%

significance level. Therefore, the null hypothesis of the variables coefficients equal to zero cannot be rejected and the dependence between firm value and Enterprise Risk Management is still to be investigated.

```

note: Dividends omitted because of collinearity

Random-effects GLS regression              Number of obs   =       325
Group variable: ID                        Number of groups =       42

R-sq:                                     Obs per group:
  within = 0.0760                          min =           1
  between = 0.4816                          avg =           7.7
  overall = 0.3764                          max =           8

Wald chi2(8) = 56.75
Prob > chi2 = 0.0000

corr(u_i, X) = 0 (assumed)

```

ROA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ERM	.0128268	.0075516	1.70	0.089	-.0019741	.0276277
Pricevolatility	.0000145	.0001366	0.11	0.916	-.0002533	.0002823
Beta	.0285575	.0168941	1.69	0.091	-.0045544	.0616693
FirmSize	-.0660414	.0113441	-5.82	0.000	-.0882754	-.0438074
Leverage	-.0022868	.0010664	-2.14	0.032	-.004377	-.0001966
Dividends	0	(omitted)				
Boardmonitoring	.0049766	.0172765	0.29	0.773	-.0288847	.0388379
COSO	-.0101064	.0078599	-1.29	0.199	-.0255115	.0052988
CGindex	.0117241	.0054847	2.14	0.033	.0009743	.0224739
_cons	.7287339	.1223138	5.96	0.000	.4890033	.9684645
sigma_u	.04694726					
sigma_e	.03807195					
rho	.60326637	(fraction of variance due to u_i)				

Figure 24. Random effects panel regression with ROA. (Source: personal elaboration)

To this purpose, the final dependent variable considered is ROE. The same procedure as for the two previous cases is adopted and again, no multicollinearity problems are present but there is a substantial change with respect to the Tobin's Q and ROA analysis: the Hausman test in fact indicates that the fixed effects regression has to be considered the best model. A p-value smaller than 0.05 indicates the possibility to reject the null hypothesis over the randomness of the coefficients difference and provides the fixed effect as the best suitable model.

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ERM	.0464856	.0258223	.0206633	.0087202
Pricevolat~y	.0005912	.0005056	.0000856	.000057
Beta	.0355924	.0228514	.012741	.0141981
FirmSize	-.1921518	-.2308569	.038705	.0326437
Leverage	.0046113	.0049707	-.0003594	.0026581
Boardmonit~g	.0112052	-.0087512	.0199563	.0288483
COSO	-.0200388	.0020687	-.0221075	.0107894
CGindex	.0579899	.0597541	-.0017641	.0086169

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(8) &= (b-B)' [(V_b-V_B)^{-1}] (b-B) \\ &= 22.83 \\ \text{Prob}>\text{chi2} &= 0.0036 \end{aligned}$$

Figure 25. Hausman test with ROE. (Source: personal elaboration)

Therefore, the fixed effects regression output is provided in Figure 26. In this case, while the COSO variable does not provide relevance with respect to firm value, the Enterprise Risk Management becomes significant at the 5% level of significance. The relation with the dependent variable is positive even if the coefficient is a small value, coherently with the weak correlation between the two variables shown in the Pearson's correlation. Therefore, the model appears to be the best one, capable of representing the relationship between Firm Value and Enterprise Risk Management and provide an answer to the main question of this study. The coefficient for the ERM variable indicates a positive impact on value for the firms that adopt an integrated management approach, confirming the initial idea that the increasing number of firms adopting ERM over the last years was probably linked to an increase in their value. The dummy variable indicating the COSO Framework does not have an impact on ROE, allowing to the possibility that firms either follow the guidelines provided by COSO but do not explicitly declare them, or create their own guidelines over an improved management structure. Anyways, the positive relationship between ERM and Firm Value respects in a sense the past studies in the Literature and what have been supposed in the previous chapter with the theory, and allows to give a positive answer to the main question of this thesis. The adoption of Enterprise Risk Management should provide a new risk culture, better decision-making process, an improved management and finally new value, all aspects that can gain importance either in the short term or in the long period. In this sense, an aspect that would suggest attention and a deeper investigation is the weak correlation between the two variables that reflects in the small coefficient of the ERM variable. This factor could be due to the uncertainty about the

time-effect of Enterprise Risk Management. The relation between the two variables could appear in the long period, not captured by this analysis. Furthermore, another important element that may reflect on the weak effect of ERM is indeed the difficulty in capturing the effects of ERM. As already said, the areas that benefit from the adoption of an integrated management are several and difficult to numerically represent. If Firm Value could be an identifiable area in terms of numbers, the risk culture or the decision-making process are of difficult representation. Therefore, these aspects provide the starting point for a future analysis, maybe with a large set of data or an improved proxy for firm value. In fact, several studies have been made, by Lienberg & Hoyt, Pagach & Warr, Mcshane just to name few of the most important authors, but all using the Tobin's Q or the CRO announcement as proxy for firm value. Another aspect improving the overall analysis would be referring to the ERM variable as an index reflecting the complexity of the ERM structure, following the S&P index for insurance companies built in 2006, idea that has been followed in the composition of the Corporate Governance index. However, the fixed effects regression with ROE has provided an important result, successfully proving the positive impact of ERM on firm value, so that, despite all the possible issues listed, the goodness of this analysis is relevant.

```

note: Dividends omitted because of collinearity

Fixed-effects (within) regression              Number of obs   =          326
Group variable: ID                           Number of groups =           42

R-sq:                                         Obs per group:
  within = 0.1358                             min =           1
  between = 0.3598                            avg =           7.8
  overall = 0.2893                            max =           8

                                         F(8,276)        =          5.42
corr(u_i, Xb) = 0.1105                       Prob > F        =          0.0000

```

ROE	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ERM	.0464856	.0225122	2.06	0.040	.0021682	.090803
Pricevolatility	.0005912	.0003899	1.52	0.131	-.0001764	.0013587
Beta	.0355924	.0492305	0.72	0.470	-.0613226	.1325074
FirmSize	-.1921518	.0445092	-4.32	0.000	-.2797725	-.1045312
Leverage	.0046113	.0039072	1.18	0.239	-.0030803	.0123029
Dividends	0	(omitted)				
Boardmonitoring	.0112052	.0551008	0.20	0.839	-.097266	.1196763
COSO	-.0200388	.0241757	-0.83	0.408	-.0676309	.0275533
CGindex	.0579899	.016795	3.45	0.001	.0249273	.0910526
_cons	2.026967	.4932369	4.11	0.000	1.055983	2.997952
sigma_u	.12875451					
sigma_e	.1068497					
rho	.59217614	(fraction of variance due to u_i)				

F test that all u_i=0: F(41, 276) = 9.02 Prob > F = 0.0000

Figure 26. Fixed effects panel regression with ROE. (Source: personal elaboration)

Proceeding with the commentary on the regression outputs, the CGindex, which comprehends the Corporate Governance features, is significant with a positive coefficient. This result indicates that firms that have a more important Corporate Governance structure, have an increase in value. The output confirms also the relation between ERM and Corporate Governance. As already said, when adopting an integrated risk management structure, the firm has to adapt its governance to properly implement ERM and vice versa, has to adapt the ERM guidelines to the existing Corporate Governance structure. Furthermore, one of the corporate index elements is the CRO, feature indicating the implicit ERM adoption. Therefore, the two variables are naturally related, as the Pearson's correlation confirms, and the positive and similar coefficient of the CGindex compared to the ERM, enhances this aspect. In this sense, having a Corporate Governance able to positively impact firm value, is coherent with the assumptions made in the theory chapter. A structured governance in fact, as for the ERM, should provide positive results not only concerning the creation of value, but in the overall management process, in creating a firm culture, in reducing risks and in several other areas that are of difficult numerical identification. Therefore, the positive but low value for the coefficient reflects the ERM situation, where the positive impact of the variable does not limit to a specific area, firm value, and might provide results in the long term. In addition, the Corporate Governance measure is constructed as an index, so that a deeper analysis regarding the components of the index and the individual levels of the structure might reflect the impact of the overall index, and will be made in the continue of the analysis. As regards the other variables, the only significant one is FirmSize, which has a negative impact on firm value and indicating that larger firms are more likely to have a smaller value. This aspect could indicate that firms excessively large might have inefficiencies, be more difficult to manage and occur higher risks that are the case of smaller value. Therefore, the final restricted fixed effects panel regression is:

$$ROE_{it} = \alpha_i + \beta_0ERM + \beta_1FirmSize + \beta_2CGindex + \mu_{it}$$

To this regression, a new variable is added, the CGindex2. This measure is simply the CGindex variable squared and is generated in order to investigate for non-linear relationship between the Corporate Governance index and ROE. We have seen that the CGindex is positive significant with respect to firm value, so it is necessary to investigate every degree of the index and the impact of each on firm value. Being an index, where the lower value of 1 indicates the simplest structure of Corporate Governance and the highest value of 5 stands for the more complex one that results from the consideration of all the previous 4 levels, the relation indeed should be non-linear. In other words, the effect on firm of the first level of the index will be different from the effects of

the other levels, and that is valid for all the 5 levels of the index. The easiest method to investigate for non-linearity is to square the variable and run the regression, looking for the significant value of the CGindex2.

```

Fixed-effects (within) regression      Number of obs   =      381
Group variable: ID                   Number of groups =      43

R-sq:                                Obs per group:
  within = 0.1208                    min =          6
  between = 0.3296                   avg =         8.9
  overall = 0.2670                   max =          9

corr(u_i, Xb) = -0.0524              F(4, 334)      =      11.47
                                         Prob > F       =      0.0000

```

ROE	Coef.	Std. Err.	t	P> t	[90% Conf. Interval]	
ERM	.0340308	.0183684	1.85	0.065	.0037334	.0643282
FirmSize	-.1781382	.0385845	-4.62	0.000	-.2417805	-.1144959
CGindex	.2231141	.0717807	3.11	0.002	.1047169	.3415112
CGindex2	-.0246491	.0103758	-2.38	0.018	-.0417633	-.0075349
_cons	1.679984	.4383164	3.83	0.000	.9570127	2.402956
sigma_u	.1270466					
sigma_e	.10338871					
rho	.60159525	(fraction of variance due to u_i)				

F test that all u_i=0: F(42, 334) = 11.58 Prob > F = 0.0000

Figure 27. Fixed effects panel regression for non-linearity. (Source: personal elaboration)

The results are shown in Figure 27 above. The squared Corporate Governance index is then negative with a significant p-value of 0.018, indicating that the CGindex has a non-linear relation to firm value. We investigate this non-linearity by using dummy variables for each level of the index. The assumption in this case is that the third level is the key level of governance complexity: the first three levels therefore indicate a simpler Corporate Governance structure, while the fourth and fifth level stand for the most complete Corporate Governance. In this sense, the third dummy is omitted in the regression so results for the other levels will be in relation to the third one.

note: Dividends omitted because of collinearity

```

Fixed-effects (within) regression      Number of obs   =      381
Group variable: ID                    Number of groups =      43

R-sq:                                  Obs per group:
  within = 0.1806                       min =          6
  between = 0.1496                       avg =         8.9
  overall = 0.1446                       max =          9

corr(u_i, Xb) = -0.4242                  F(6, 332)       =      12.20
                                          Prob > F        =      0.0000

```

ROE	Coef.	Std. Err.	t	P> t	[90% Conf. Interval]	
ERM	.0200661	.0180692	1.11	0.268	-.0097383	.0498705
FirmSize	-.1830251	.0378301	-4.84	0.000	-.2454243	-.120626
Dividends	0	(omitted)				
CG1	-.682831	.1078965	-6.33	0.000	-.8608016	-.5048605
CG2	-.0278314	.0320081	-0.87	0.385	-.0806274	.0249646
CG4	.0299535	.0204351	1.47	0.144	-.0037533	.0636603
CG5	.0801633	.0366813	2.19	0.030	.0196592	.1406674
_cons	2.192582	.4189988	5.23	0.000	1.501462	2.883702
sigma_u	.15952804					
sigma_e	.10010922					
rho	.7174638	(fraction of variance due to u_i)				

F test that all u_i=0: F(42, 332) = 12.87 Prob > F = 0.0000

Figure 28. Non-linearity effects. (Source: personal elaboration)

As it is possible to see in Figure 28, the dummies have replaced the CGindex, with the CG3 omitted. The output of the regression shows however that the Corporate Governance complexity does not have significant impact on ROE except for full complexity in CG5. Therefore, the distinction between the first three levels, indicating simpler structure, and the last two appears to be inefficient, since only the first and fifth levels are significant. In terms of complexity, the first level has obviously to be significant, since when the CGindex dummy takes value 1, indicating the adoption of a structured Corporate Governance, the smallest value possible is CG1. Furthermore, the adoption of a moderate Corporate Governance limited to the implementation of only 1 of the 5 possible elements, appears to be only a cost for the company, suggesting the relevance of having a complete structure provided with the CG5 variable. The fifth level on the other hand, reflects the highest level of Corporate Governance, so that having a complete structure has to be significant and have impact of firm value. Finally, as regards the other levels, the increase of complexity does not provide any indication about the advantage in increasing the degree of governance, again, with the exception of the last degree.

4.4.2 ERM adoption

The second part of this study consists in investigating the variables that influence the choice of a firm to adopt an integrated risk management. It has already been seen that the ERM positively influences the value of the firm adopting it. Therefore, subject of interest would be analysing the variables that make more likelihood for a firm to adopt ERM. In order to answer this question, it is used the logit model, a binary outcome model, usually utilised next to the equivalent probit model when dealing with dichotomous dependent variable. In this study, the dependent variable is the ERM itself, which is a dummy variable, so that using either the logit or the probit model appears to be the correct choice. The logit and the probit model are different models in their construction, but the output is almost equal, so that choosing the preferred model is up to the individual. Before continuing however, it is important to understand the functioning of these binary models, in order to fully comprehend the outputs of the regressions. A binary model in fact, as already said, is based on the idea that the dependent variable has to be a dichotomous variable that takes only two values, 1 and 0. On the contrary, if we look at the common linear regressions as the OLS, the dependent variable is usually a continuous variable that could take value from minus infinity to infinity. Therefore, the binary regressions, using a binary dependent variable, model the probability of that variable to take value 1 as a function of the independent variables. In this way, the analysis moves from considering the linear effect on the dependent variable when there is a change in the independent variables, to looking for the impact on probabilities. In terms of formulas, the difference can be explained as:

$$OLS: y = x'\beta + e$$

$$Binary: p = pr[y = 1|x] = F(x'\beta)$$

The binary outcome models again estimate the probability that the dependent variable y takes value 1 as a function of the independent variables, and what differs the logit and probit models is indeed the functional form F of the $x'\beta$ that refers to the independent variables. For the logit model, the F function is the cumulative distribution function of the logistic distribution, equal to:

$$F(x'\beta) = \frac{e^{x'\beta}}{1 + e^{x'\beta}}$$

The formula indicates the probability that $y=1$, while for $y=0$ it is simply 1 minus the F function. The advantage in using a logit model is now clear: from the function, it is evident that the predicted probabilities are limited between 0 and 1, perfect for treating a dummy variable such as the ERM. In the case of the probit model, the F function is the cumulative distribution function of the standard normal distribution, equal to:

$$F(x'\beta) = \int_{-\infty}^{x'\beta} \phi(z) dz$$

Again, the predicted probabilities are limited between 0 and 1, making it a good model for analysing the ERM variable. The two models appear to be different in their form, but the results are very similar, as shown in Figure 29 and Figure 30 below. The two regressions are then built, considering the ERM as dependent variable and looking for the most appropriate independent variables that would reasonably affect the adoption of ERM by a firm. In this sense, the most adequate variables considered are:

- **FirmSize:** greater firms are expected to have a greater probability of adopting ERM, since they are more complex and difficult to manage. This result could be confirmed by the negative effect of FirmSize on firm value, indicating that bigger firms have a lower value due to their complexity and the greater risks they face, so that an integrated risk management might provide a positive impact.
- **EBITchange:** it is a new variable indicating the annual variation of the EBIT. The result should be positive, indicating that firms with higher changes in EBIT might be more likely to implement ERM in order to reduce volatility. The decrease in EBIT in fact should be a sign of stability and improved risk management.
- **Leverage:** the result for the leverage is ambiguous. Firms with higher leverage should be more likely to adopt ERM in order to decrease the level of debt and avoid default risks. On the other hand, leverage could be also of positive impact on firms, indicating activity on investments, so that the adoption of an integrated management could be only a cost for the firm.
- **Salesgrowth:** it is a new variable computed as the annual variation of sales. An increase in this variation should indicate the more likelihood for a firm to use an evolved risk management structure in order to manage the increase in sales and size.

- **Boardmonitoring:** the active participation of the board in the decisions and in the investments of the firm should indicate the more likelihood of ERM's adoption. When the board takes responsibility for the firm, gives the idea of strengthening the structure of the firm, process that can be achieved with the ERM.
- **CGindex:** Corporate Governance and Enterprise Risk Management are two different subjects that are strictly related. The adoption of ERM needs a structured Corporate Governance to be efficient, and vice versa, ERM should adapt to the existing Corporate Governance structure to properly work. Furthermore, the CRO is a figure that refers both to ERM and CGindex variables, enhancing the idea that a firm with a more complete Corporate Governance should be more likely to implement an integrated risk management. The question in this case, relates on the degrees of the CGindex. In fact, it is possible that increasing the levels of the index provides a positive effect on the likelihood of adopting ERM, but also that beyond a certain level, adopting ERM becomes only a cost for the firm.

Therefore, both the logit and probit regression are run and, as said before, the results shown in Figure 29 and Figure 30 are similar. The only small difference is with respect to the coefficients value, but as regards the sign and the significance of the variables, they provide the same results.

```

Iteration 0:  log likelihood = -234.07068
Iteration 1:  log likelihood = -189.39378
Iteration 2:  log likelihood = -189.04705
Iteration 3:  log likelihood = -189.04694
Iteration 4:  log likelihood = -189.04694

Probit regression                                Number of obs   =       338
                                                LR chi2(4)      =       90.05
                                                Prob > chi2     =       0.0000
Log likelihood = -189.04694                    Pseudo R2      =       0.1924

```

ERM	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
FirmSize	.4337326	.1781856	2.43	0.015	.0844952 .78297
EBITchange	2.14e-11	1.76e-11	1.22	0.223	-1.30e-11 5.59e-11
Leverage	.0549833	.0213433	2.58	0.010	.0131511 .0968155
Salesgrowth	3.70e-12	5.58e-12	0.66	0.508	-7.23e-12 1.46e-11
Boardmonitoring	-1.755698	.341795	-5.14	0.000	-2.425604 -1.085792
CGindex	.3747141	.1209686	3.10	0.002	.1376201 .6118081
_cons	-4.166839	1.927166	-2.16	0.031	-7.944016 -.3896626

Figure 29. Probit regression. (Source: personal elaboration)

```

Iteration 0: log likelihood = -234.07068
Iteration 1: log likelihood = -190.0404
Iteration 2: log likelihood = -189.71146
Iteration 3: log likelihood = -189.7108
Iteration 4: log likelihood = -189.7108

```

```

Logistic regression          Number of obs   =      338
                             LR chi2(4)           =      88.72
                             Prob > chi2          =      0.0000
Log likelihood = -189.7108   Pseudo R2       =      0.1895

```

ERM	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
FirmSize	.7436802	.2994969	2.48	0.013	.156677	1.330683
EBITchange	3.73e-11	2.95e-11	1.27	0.205	-2.04e-11	9.51e-11
Leverage	.0897864	.0362715	2.48	0.013	.0186957	.1608772
Salesgrowth	5.62e-12	9.37e-12	0.60	0.549	-1.27e-11	2.40e-11
Boardmonitoring	-2.838106	.5840883	-4.86	0.000	-3.982898	-1.693314
CGindex	.6019221	.2021694	2.98	0.003	.2056773	.998167
_cons	-7.185633	3.238796	-2.22	0.027	-13.53356	-.8377096

Figure 30. Logit regression. (Source: personal elaboration)

Since the similar outputs, utilising both the logit and probit regressions for each computation would be almost pointless, so in the continue of the analysis the model selected will be the logit regression. Looking at the results of the regression, it is possible to affirm that the variables that have a significant impact on the ERM adoption are FirmSize, Leverage, Boardmontoring and the CGindex. If we look at the coefficients, with the exception of Boardmonitoring, all the variables have a positive impact on the dependent variable. These coefficients can be interpreted as: an increase in the independent variable increases the likelihood that $y=1$, meaning that a positive value of the independent variable makes more likely the ERM adoption. In this sense, with the initial logit or probit regression, we interpret the sing of the coefficients but not the magnitude. In our case, the FirmSize has a coefficient of 0.7437. This indicates that greater firms are more likely to adopt ERM compared to those who have a smaller size. It is evident that the coefficient provides only indication about the sign, while the magnitude of the variable is obtained by the computation of the marginal effects. If the magnitudes were compared in the coefficients in fact, the different scales due to the different F functions would have provided wrong results. Furthermore, to conclude the commentary on the coefficients, as for the FirmSize, firms that have higher Leverage and an evolved governance structure, are more likely to adopt ERM, respecting the expectations. On the contrary, firms where the board is active participant are more likely to avoid ERM, indicating that firms with a solid board do not have the necessity of an integrated risk management. This contradictory result with respect to the initial expectations might be due to the active role of the board that provides stability and health to the firm, referring to the adoption of ERM only as

a cost. Moving to the marginal effects, they are interpreted in two different ways, depending on the consideration of continuous or dummy independent variables. In the case of continuous variables, the marginal effect is the change in the probability of adopting the Enterprise Risk Management given a 1 unit change in one of the independent variables. When referring to dummy variables, the marginal effect is the change in the probability of adopting the Enterprise Risk Management given the adoption of the independent dummy variable. In terms of formulas, they are computed as the derivatives with respect to the X's, or the independent variables. There are two methods to estimate the marginal effects, which are the marginal effects “at the mean” and the “average” marginal effects. Without entering in the discussion over the mathematical computation of the these effects, it is sufficient to know that the two methods provide most of the times the same results and are both used with no conditions, it is up to the individual’s choice. To prove the same results, both the “at the mean” and the “average” marginal effects have been computed as shown in Figure 31 and 32.

```

Conditional marginal effects          Number of obs   =          338
Model VCE      : OIM

Expression      : Pr(ERM), predict()
dy/dx w.r.t.   : FirmSize EBITchange Leverage Salesgrowth Boardmonitoring CGindex
at              : FirmSize      =    11.05587 (mean)
                  EBITchange    =   -2.28e+08 (mean)
                  Leverage      =    4.558289 (mean)
                  Salesgrowth    =   -2.86e+08 (mean)
                  Boardmonit~g  =    1.154311 (mean)
                  CGindex       =    3.289941 (mean)

```

	Delta-method					[95% Conf. Interval]	
	dy/dx	Std. Err.	z	P> z			
FirmSize	.1850148	.074497	2.48	0.013	.0390032	.3310263	
EBITchange	9.29e-12	7.34e-12	1.27	0.205	-5.09e-12	2.37e-11	
Leverage	.0223373	.0089738	2.49	0.013	.004749	.0399256	
Salesgrowth	1.40e-12	2.33e-12	0.60	0.549	-3.17e-12	5.97e-12	
Boardmonitoring	-.7060717	.1458496	-4.84	0.000	-.9919316	-.4202119	
CGindex	.1497478	.0504364	2.97	0.003	.0508943	.2486014	

Figure 31. At the mean marginal effects. (Source: personal elaboration)

```

Average marginal effects          Number of obs    =      338
Model VCE      : OIM

Expression      : Pr(ERM), predict()
dy/dx w.r.t.   : FirmSize EBITchange Leverage Salesgrowth Boardmonitoring CGindex

```

	Delta-method				
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]
FirmSize	.1426968	.0554367	2.57	0.010	.0340429 .2513507
EBITchange	7.17e-12	5.61e-12	1.28	0.201	-3.83e-12 1.82e-11
Leverage	.0172282	.0067734	2.54	0.011	.0039525 .0305038
Salesgrowth	1.08e-12	1.79e-12	0.60	0.548	-2.44e-12 4.60e-12
Boardmonitoring	-.5445737	.097167	-5.60	0.000	-.7350175 -.3541299
CGindex	.1154964	.0370538	3.12	0.002	.0428722 .1881205

Figure 32. Average marginal effects. (Source: personal elaboration)

Again, as for the logit/probit selection, since the two models provide the same results, using two equivalent models would be useless, so the average marginal effects will be used in the continuing of the analysis.

Therefore, regarding the marginal effects, it is possible to say that an increase in the independent variable increases the probability that $y=1$ by the marginal effect expressed as a percentage. Looking at the results in Figure 31, it is possible to conclude that for each additional unit of firm size, firms are for the 14.27% more likely to adopt ERM. In the same way, for each unit of leverage, firms have 1.72% more probability of adopting ERM. On the contrary, in the case of negative coefficient as for the Boardmonitoring variable, the results states that for every unit of Boardmonitoring, firms are 54.46% more likely to avoid ERM adoption, or equivalently, less likely to adopt ERM. Furthermore, dealing with the CGindex dummy, firms that have a more complex Corporate Governance structure are 11.55% more likely to adopt Enterprise Risk Management. In conclusion, the regression provides satisfactory results, with the main variable of interest CGindex, having a significant impact on the decision for ERM. Strange value however is that for the Boardmonitoring: in fact, a 54.46% influence on the adoption of ERM seems an exaggerated value. This result could be due to an error in the computation of the dataset from the annual reports or could simply indicate that a firm, in which the Board of Directors is actively participant and guarantees, in a sense, for the firm itself, has no need of an additional management figure. In an already organized and functioning reality, the addition of an important feature as the Enterprise Risk Management would require changes that may affect the already efficient structure. Therefore, the hiring of a new management team or a CRO could be an elevated and unnecessary cost for the company. As regards the other variables, the magnitude is moderated and coherent with the expectations. However, the CGindex needs further investigation, since no distinction between the

levels of complexity has been made in the regression. Therefore, a new regression comprehending the decomposition of the CGindex in the 5 categories that compose it, is made, followed by an additional regression with the consideration of the CGindex levels in terms of dummy variables representing the level of adoption. In this way, in the first regression, the single components of the index are analysed in order to see which of the 5 features influences the most the total CGindex and consequently the ERM adoption. In the second regression, the level of complexity is studied, in order to see, firstly, if a level of high complexity⁴⁰ influences the CGindex and the ERM overall results, and then to look which particular level of the index affects the most the ERM adoption. Starting with the first question, the regression used is a restricted version of the logit regression used before, containing only the significant variables and the five components of the CGindex, which are: Boardsize, Riskcommittee, Duality, BoardIndipendence and CRO. Making expectations over these variables could not have sense, since all the variables could be related to the ERM adoption, being Corporate Governance variables. The only feature that should provide a certain impact is the Chief Risk Officer, figure that indicates the implicit adoption of the Enterprise Risk Management. The results are then provided in Figure 33 and Figure 34, from which it is evident that the only variable that positively affects the CGindex and consequently the ERM adoption is indeed the CRO: the coefficient is a positive value, indicating that the firms that hire a CRO are more likely to adopt ERM. In addition, the margin effects value suggests that the firms that hire a CRO are 49.33% more likely to adopt an integrated risk management. Therefore, the expected positive results over the CRO are confirmed: the figure is both a characteristics of CGindex and ERM variables, so that the positive connection with the ERM adoption is clear. However, as regards the other components of the index, the p-values suggest the independence between them and the ERM. Following the output of the regression, there is no relation between Corporate Governance elements and integrated risk management, in a sense, contradicting the explained dependence between Corporate Governance and risk management. This result could be a consequence of the already explained difficulty in evaluating the proper effects of both Corporate Governance and Enterprise Risk Management. In fact, the two variables could have long-term results as well as different areas of application, so that in numerical or statistical terms, highlighting these effects could be difficult. Furthermore, the selected elements for the construction of the CGindex may be strictly related to the Corporate Governance area and not optimal characteristics for representing the risk management dependence. Therefore, a “take-home” message is that the single elements constituting the CGindex, with the exception for the CRO, are not ideal in order to refer to the ERM adoption. However, although the individual impact of each element is not

⁴⁰ CGindex higher than 3

relevant to provide information about the ERM adoption, the study should consider the joint effects of these variables, in order to see if their combined action might have a significant impact on ERM adoption. In addition, from the rest of the computation, it is possible to notice that risk committee is omitted. In a similar way to the Dividends, the Riskcommittee variable takes value 1, referring the presence for a separate risk committee, for almost every single firm: its mean is in fact equal to 0.9764.

```
note: Riskcommittee != 1 predicts failure perfectly
      Riskcommittee dropped and 9 obs not used
```

```
Iteration 0: log likelihood = -257.76472
Iteration 1: log likelihood = -209.51907
Iteration 2: log likelihood = -208.69075
Iteration 3: log likelihood = -208.68725
Iteration 4: log likelihood = -208.68725
```

```
Logistic regression                Number of obs    =        372
                                   LR chi2(7)         =         98.15
                                   Prob > chi2        =         0.0000
Log likelihood = -208.68725        Pseudo R2       =         0.1904
```

ERM	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
FirmSize	.3558434	.2925646	1.22	0.224	-.2175727	.9292594
Leverage	.0203623	.0349496	0.58	0.560	-.0481376	.0888622
Boardmonitoring	-2.360558	.6470883	-3.65	0.000	-3.628828	-1.092289
Boardsize	.3017391	.3325713	0.91	0.364	-.3500886	.9535669
Riskcommittee	0	(omitted)				
Duality	.24829	.2734269	0.91	0.364	-.2876168	.7841969
BoardIndipendence	.6997815	1.002289	0.70	0.485	-1.264669	2.664232
CRO	2.567172	.6015386	4.27	0.000	1.388178	3.746166
_cons	-2.671377	3.280885	-0.81	0.416	-9.101794	3.75904

Figure 33. Logit regression with CGindex decomposition. (Source: personal elaboration)

```
Average marginal effects                Number of obs    =        372
Model VCE      : OIM

Expression   : Pr(ERM), predict()
dy/dx w.r.t. : FirmSize Leverage Boardmonitoring Boardsize Riskcommittee Duality BoardIndipendence CRO
```

	Delta-method		z	P> z	[95% Conf. Interval]	
	dy/dx	Std. Err.				
FirmSize	.0683818	.0557503	1.23	0.220	-.0408868	.1776503
Leverage	.003913	.0067065	0.58	0.560	-.0092316	.0170576
Boardmonitoring	-.4536241	.1155305	-3.93	0.000	-.6800597	-.2271884
Boardsize	.0579846	.0636476	0.91	0.362	-.0667624	.1827317
Riskcommittee	0	(omitted)				
Duality	.0477134	.0523372	0.91	0.362	-.0548655	.1502924
BoardIndipendence	.1344757	.1923242	0.70	0.484	-.2424727	.5114241
CRO	.4933286	.1065899	4.63	0.000	.2844162	.702241

Figure 34. Average marginal effects with CGindex decomposition. (Source: personal elaboration)

Moving to the second study, the CGindex is now substituted by the dummy variables indicating the level of the index. As in the firm value regression, the aim is to discover firstly if a complex structure of Corporate Governance influences the ERM adoption. In addition, through the decomposition in the 5 degrees of completeness, we investigate which single level of the index affects the most the adoption of an integrated model. Therefore, the regression will consist again on the restricted model containing only the significant variables and the four⁴¹ dummies indicating the levels of the index. As for the ROE fixed effects panel regression, the third level of the index is considered the key level to distinguish between simpler and more complex structure of Corporate Governance. In this sense, the third dummy is omitted in the regression so results for the other levels will be in relation to the third one. Again, as for risk committee and dividends, the first level of the index is dropped from the computation since when the CGindex takes value 1, the first level of the index is always 1 for each case. The results are provided in Figure 35 and 36 below, from which it is possible to capture the relevance of a structured Corporate Governance when adopting ERM.

```

note: CG1 != 0 predicts failure perfectly
      CG1 dropped and 10 obs not used

Iteration 0:  log likelihood = -257.04843
Iteration 1:  log likelihood = -216.89102
Iteration 2:  log likelihood = -216.3476
Iteration 3:  log likelihood = -216.34645
Iteration 4:  log likelihood = -216.34645

Logistic regression                Number of obs   =       371
                                   LR chi2(6)          =       81.40
                                   Prob > chi2         =       0.0000
Log likelihood = -216.34645        Pseudo R2       =       0.1583

```

ERM	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
FirmSize	.5579922	.2899864	1.92	0.054	-.0103707	1.126355
Leverage	.0763259	.0327106	2.33	0.020	.0122144	.1404375
Boardmonitoring	-2.669411	.5701379	-4.68	0.000	-3.786861	-1.551961
CG1	0	(omitted)				
CG2	.0577539	.354727	0.16	0.871	-.6374982	.753006
CG4	.8808265	.3009894	2.93	0.003	.2908982	1.470755
CG5	1.589808	.7184147	2.21	0.027	.1817409	2.997875
_cons	-3.813318	3.26287	-1.17	0.243	-10.20843	2.581788

Figure 35. Logit regression with CG dummies. (Source: personal elaboration)

⁴¹ Only 4 dummies are used in order to avoid the dummy variable trap that consists on multicollinearity between independent variables.

conclusion can be retrieved. Although a single element of the index is not able to influence by itself the ERM adoption, with the exception for the CRO, the combined effect of several elements has an impactful meaning on the dependent variable. Therefore, while the goodness of the CGindex 5 elements was questioned in the previous decomposition analysis, with these new outputs, the validity of the characteristics of the index is proved. Therefore, rather than saying that the 5 components of the Corporate Governance index might not be the most adequate ones to represent the ERM adoption, the correct affirmation should be that every single component has not the individual strength to influence the ERM adoption, but they are still good elements since their joint effect positively influences the dependent variable.

4.4.3 Interaction variables

Once having individuated the variables that affect firm value and the adoption of ERM, an additional interest study regards in verifying the joint behaviour of ERM and CGindex variables. It has been said several times that Enterprise Risk Management and Corporate Governance are two factors extremely related, fact enhanced by the figure of the CRO and that has already been proved. However, to complete the analysis on these two variables, looking at their joint behaviour could provide the final results on the efficacy of ERM with respect to firm value. In order to investigate the joint behaviour of two variables, we have to consider the interaction variables, which are simply the result of the product of two different variables: in this particular case, the variables of interests are ERM and CGindex. Therefore, the product of the variables produces a new interaction variable of interest that is the ERMindex. This new measure merges the effects of the dummy variable ERM and the Corporate Governance structure, looking for a positive effect on firm value. In fact, combining ERM and Corporate Governance should not change the individual positive effects of the two variables, considering therefore the positive correlation between them and natural relation that links the two characteristics. In this sense, the new variable considers firms that adopt at the same time an integrated risk management and an evolved Corporate Governance structure, aspect that represents at its best the actual formulation of Enterprise Risk Management. The ERM introduction in fact requires the integration in the existing Corporate Governance structure and vice versa, the adaptation of the Corporate Governance to a new risk management culture. Running a regression maintaining ROE as dependent variable for firm value and introducing the ERMindex as independent variable, should provide the actual effect of ERM on firm value, considering its totality and all the characteristics comprehending also the Corporate Governance aspect present in the ERM formulation. Therefore, the regression and the results are

to the third one. To this purpose, the dummy variables are created as the product of the ERM variable and the CGindex dummies. However, the output expected from the regression is uncertain, since the decomposition of the CGindex with respect to firm value has already provided non-significant results. In the previous regression in fact, the CGindex complexity did not have significant impact on ROE with the exception for full complexity level in CG5. If the results are respected as they should, being the ERMindex a product of the CGindex and the ERM dummy variable, the only level of governance complexity that may be significant is again the fifth one. The regression is then run and the results are show in Figure 37 below.

```

note: Dividends omitted because of collinearity
note: ERMindex1 omitted because of collinearity

Fixed-effects (within) regression              Number of obs   =       326
Group variable: ID                            Number of groups =        42

R-sq:                                         Obs per group:
  within = 0.0854                               min =           1
  between = 0.3512                             avg =           7.8
  overall = 0.2702                             max =           8

                                         F(9,275)        =       2.85
corr(u_i, Xb) = 0.0333                       Prob > F         =       0.0031

```

ROE	Coef.	Std. Err.	t	P> t	[90% Conf. Interval]	
Pricevolatility	.0006167	.0004047	1.52	0.129	-.0000511	.0012846
Beta	.0527686	.0515926	1.02	0.307	-.0323806	.1379178
FirmSize	-.1986156	.0458036	-4.34	0.000	-.2742105	-.1230207
Leverage	.0046184	.0040212	1.15	0.252	-.0020181	.011255
Dividends	0	(omitted)				
Boardmonitoring	.0437834	.0544486	0.80	0.422	-.0460793	.1336461
COSO	-.0060025	.0253117	-0.24	0.813	-.0477773	.0357723
ERMindex1	0	(omitted)				
ERMindex2	.0046518	.0401654	0.12	0.908	-.0616377	.0709414
ERMindex4	.012524	.0291732	0.43	0.668	-.0356239	.0606719
ERMindex5	.0546121	.0380281	1.44	0.152	-.00815	.1173743
_cons	2.242595	.5052144	4.44	0.000	1.408782	3.076408
sigma_u	.12864522					
sigma_e	.1101184					
rho	.57713044	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(41, 275) = 9.16                      Prob > F = 0.0000

```

Figure 38. Fixed effects regression with ERMindex dummies. (Source: personal elaboration)

As expected, the results follow the CGindex regression outputs, indicating that the joint effect of Corporate Governance complexity levels and ERM does not have significant effects on firm value. While in the CGindex regression the fifth level of structure has a positive effect on ROE, in this case the relation with the Enterprise Risk Management increases the p-value, making it non-

significant. This result indicates that, as for the CGindex case, the only element affecting firm value is having a structured Corporate Governance, no matter of the level of complexity. While in the CGindex case the first and the fifth level have significance on ROE, in the ERMindex the positive effect of the index is provided entirely by the ERM variable that, with its characteristics, makes irrelevant having a complete Corporate Governance. When the ERM and the Corporate Governance act simultaneously, the need of a high level of complexity decodes, making sufficient the only joint effect of the two variables. In other words, when CGindex and ERM act separately, the level of the Corporate Governance structure has more relevance, indicating that with the fifth level, indicating the full governance structure, the firm increases its value. On the other hand, when ERM and CGindex work jointly, the CGindex level loses its relevance.

In this sense, the overall result from the entire analysis highlights the importance and the positive effect of Enterprise Risk Management in the creation of value for firms adopting it. Furthermore, the strict connection between ERM and Corporate Governance is confirmed in the empirical analysis, where a structured Corporate Governance positively affects the adoption of ERM. On the contrary, the Governance impact on Firm Value has been provided as moderate or non-significant at all. Having the lowest level of complexity has a negative impact on Firm Value, appearing only as a cost for companies. Furthermore, if the full level of complexity has proven to be efficient when the Corporate Governance acts individually, in the case of the ERM and CGindex joint effect, also the fifth level of the index loses its relevance, indicating that the positive impact of the interaction variable is probably due to the ERM relevance.

Conclusions

This dissertation posed as main question the presence of a relation between Enterprise Risk Management, Corporate Governance and Firm Value, and in the positive eventuality, required a deeper study on the factors that affect the adoption of an integrated management structure. The argument has been subject of several studies and conclusions, most of the times indicating contradictory results: if on one side Liebenberg & Hoyt in 2006 found a positive relation between ERM and Firm Value, Pagach & Warr in 2010 stated the non-significance of ERM with respect to Firm Value. In addition, the contradictory results were juxtaposed by the uncertainty on the variables to be used in order to represent the eventual correlation in the two subjects. Again, while McShane in 2010 used as proxy for the dependent variable indicating firm value the Tobin's Q indicator, both Pagach & Warr and Liebenberg & Hoyt adopted the CRO hiring announcement. The Literature is therefore divided regarding the study on ERM and so are the results for its effects. In this sense, providing a complete and certain answer to the initial question is very difficult, and this study has not the arrogance to indicate the absolute true result on risk management. Therefore, the results of the analysis are intended to provide a coherent answer to the initial question, referring to the data and the considerations made in this study, but should not be regarded as the final answer to the ERM and Firm Value issue. Settled this point, in order to give a satisfactory answer to the argument of this thesis, the study has initially provided a description of the theory related to Enterprise Risk Management and Corporate Governance, trying to explain the evolution of the two subjects and the changes that have brought to the present formulations. Since the first definitions of risk, the difficulties and the changes regarding the risk management are evident. Starting with the negative connotation given to the word risk, the hedging role associated to management has always been central in the studies regarding risk management. Risk has always been treated as a negative factor, a problem to be mitigated and avoided by companies. Therefore, while the first studies such as the Modigliani-Miller theory, stated the irrelevance of the theme affirming the unnecessary of risk management when market imperfections are not considered, the introduction of the Traditional Risk Management reflects the downside vision of risk. With the TRM, risk management started to take relevance as the mitigation instrument against risk. The procedure was based on an ex-post analysis of the events to which risks were correlated, trying to reduce the negative effects deriving from taking these events. Risks were treated in a silo-based approach, where all risks were considered to be uncorrelated and independent, managed by figures external to the company and not integrated in the governance. In 2004, the Enterprise Risk

Management Framework proposed by the Committee of Sponsoring Organizations of the Treadway Commission, introduced the proper risk management intended as management of both downside and upside risk. By adopting ERM, risks are considered as opportunities: looking at the upside risk could enhance the possibilities of achieving firms' objectives, as well as increasing firm value for firms able to introduce an integrated structure of risk management in the Corporate Governance. In this sense, the integration of the management process in the firm daily routine and the connection with the governance structure is fundamental in order to efficiently work and provide the advantages proposed. After the Great Recession burst in 2008, the inadequacy of the previous risk management techniques showed up, highlighting the necessity of a simpler and wide-used international framework. With this purpose, the International Organization for Standardization with the ISO 31000 standards on Risk Management in 2009 and most importantly, the new formulation of the ERM Framework by COSO in 2017, were constructed as response to the increasing complexity of the Economical World, in which volatility and risks were the dominant elements. In order to contrast the inefficiencies and the misunderstandings of the previous formulation, the new COSO Framework enhances the importance of integration, provides simpler guidelines and empowers the Board of Directors with the role of oversight over the entire process of risk management and its efficient integration in the Corporate Governance. Therefore, the three-dimensional cube provided in the 2004 formulation is substituted by a diagram structured in helical tapes, while the Board of Directors assumes the intermediary role between stakeholders and management, indicating a complete change from the previous formulation and a total detachment from the Traditional Risk Management. While in the theory, the effect of ERM is positive and identifiable, in practical terms neither of the two considerations is as simple as it may seem. As already said, the studies looking for the effect of Enterprise Risk Management on Firm Value are numerous and provide different results, most of the time contradictory. The debate on the validity of ERM is still crucial nowadays and a unanimous answer to its effects has not been provided. In this dissertation, the empirical analysis has retrieved a positive relation between ERM and Firm Value, indicating also the positive effect of a structured Corporate Governance with respect to Firm Value. Following the indications of the COSO Framework for the Enterprise Risk Management and its dependence to Corporate Governance, a regression containing the dummy variable for ERM and the index constructed for the Corporate Governance structure have been regressed against the dependent variable indicating Firm Value. In this sense, acknowledging the different visions on the best proxy for Firm Value, the study has investigated the dependent variable in order to obtain the best indicator for Firm Value that appears to be the Return on Equity. Once highlighted the positive effect of both ERM and Corporate Governance on ROE,

the analysis concentrates on the decomposition of the index for Corporate Governance, aiming to investigate the effect of the level of complexity that positively affects Firm Value. As result, the only factor influencing ROE is having a more structured governance, not considering the level of complexity. Following the scope of the thesis, in case of positive relation between ERM and Firm Value, a focus on the variables affecting the adoption of an integrated management has been developed by running a logit regression where the dependent variable is the ERM itself while the independent variables should be the factors affecting the adoption. After the regression, the most relevant variable positively influencing the probability for a firm to adopt ERM is the Corporate Governance index, reflecting the connection between risk management and governance theorised by the COSO Framework. In this sense, a deeper investigation over the ERM-Governance relation has been made in order to provide the individual elements that mostly affect the probability of ERM adoption and to analyse the impact of an increase in the governance complexity. The results from this study show that having a high level of governance complexity, indicating a complete Corporate Governance structure, provides an increase in the likelihood of adopting ERM. Furthermore, it is highlighted the relevance of the CRO figure, both considered as proxy for ERM adoption and part of the governance structure, confirming again their strict dependence claimed in the theory.

In this sense, the empirical analysis based on the EURO STOXX 50 Index, which refers to the 50 biggest listed firms in the Eurozone, for the period from 2019 to 2011, confirms the assumption of positive relation between ERM and Firm Value. In the COSO Framework, the adoption of Enterprise Risk Management in fact indicates the creation of value for the firm selecting it: in our dataset, the adoption of ERM is significant and increases Firm Value. The positive result is confirmed by the relation between Firm Value and Corporate Governance and by the positive effect of the CGindex as concerning the factors affecting the adoption of ERM. The result supports the COSO Framework theory in which risk management and governance are related and should adapt to each other in order to efficiently work. Of course, according to the COSO Framework, the integrated risk management should bring improvements of difficult validation, such as better decision-making, risk culture, comparative advantage and other facilities. In this sense, affirming that the adoption of ERM has improved the firm in its totality is an incorrect conclusion, due to the amount of intangibles factors affecting the firm. In addition, the Enterprise Risk Management is a recent theme but its results are long-term oriented, so the evidence of the effects could require several years to show up. Furthermore, the positive impact on Firm Value has appeared only when the dependent variable used as proxy was the Return on Equity. When the dependent variable was the Tobin's Q or the Return on Assets, the significant relation between ERM and Firm Value

disappeared, indicating no dependence between the two variables and consequently, the irrelevance of Enterprise Risk Management on the creation of value. In this sense, the numerous studies that showed irrelevant or contradictory results with respect to the theory on ERM, used the Tobin's Q as proxy for Firm Value. Although the Tobin's Q has been used in several studies, the usage of such measure seems inadequate when representing Firm Value. In fact, the variable refers to the value that the market gives to the company, indicating overvalue or undervalue, but does not reflect the true value of the company. Using a profitability measure as ROE on the contrary, appears more convenient since it indirectly relates to the management ability in creating value from investments. Therefore, when dealing with Firm Value and the impact of management, using a measure that considers the functioning of the management, should help in the creation of a more efficient study, as appears in our dissertation. However, the usage of the ROE is still contradictory and one of the main points for future studies may be that of finding a new proxy for Firm Value, better representing the characteristics of the company. In addition, another element of discussion is the measure used for the ERM. In most of the studies, the ERM variable is treated as a dummy variable, as in our analysis, while the representation of this subject could be diversified through a creation of an index, as for the Corporate Governance. Last element for future analysis could be investigating the effects of ERM in a larger time period, considering the long-term effects suggested by the COSO Framework. Overall, we have seen an increasing number of companies selecting the ERM, especially in the last 5 years with the announcement of a Chief Risk Officer. This result alone indicates that, despite the non-numerical factors influencing the potential effects of the integrated risk management, ERM is not considered as a cost for companies but as a resource, an opportunity to gain and overcome. Risk is no more a negative factor, but a chance to improve and create value. The upside vision of risk is the key element of Enterprise Risk Management, which if properly integrated to the existing Corporate Governance, can provide not only the increase of value statistically proved in our analysis, but all the other intangibles advantages theorised by the COSO Framework.

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