

Financial and Economic Risk: Empirical Evidence from the Spanish Construction Sector from 2003 to 2013

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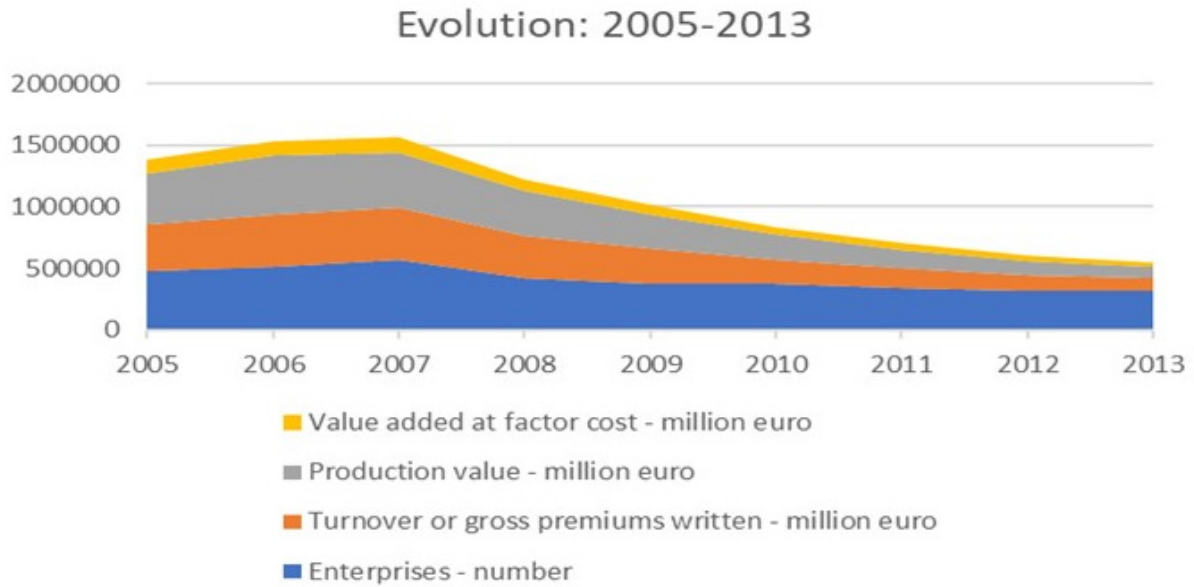
Abstract Risk is an important factor in the business environment. Decisions have a risk associated with them, and the importance of this risk depends on the environment. Investing in the construction sector is not the same as investing in the banking sector. The possibility of loss requires one to know the maximum risk of sector each type and the implications for this on making the investment. In accordance with this, the objective of this report is to apply the economic and financial risks, which are more important from the business point of view in the construction sector from 2003 to 2013, which allows us to assess whether the risks in the years of growth in this sector are excessive. The data used to carry out this study come from the Bank for the Accounts of Companies Harmonized (BACH) and the methodology will be the formulas for economic and financial risk. The main results of this report are that the risk could advance the future problems of the construction sector while the report also enables an improvement in the risk management in different sectors. Furthermore, this concept ensures that the companies or the sectors could advance measures to optimize the management risk of these areas, especially the economic and financial areas. However, this methodology should be applied in other sectors during the same crisis period in Spain, since this would increase the performance of future studies.

Keywords Financial Risk, Economic Risk, Construction Risk, Statistical Size, Construction Risk

1. Introduction

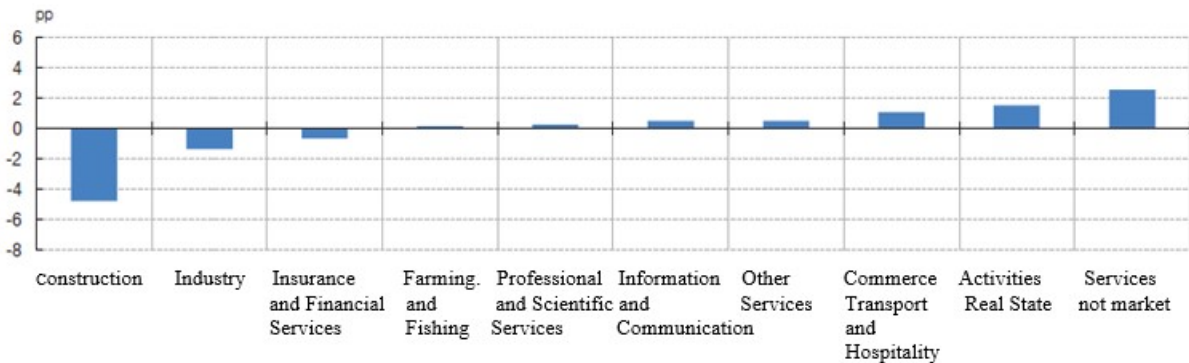
In 2007, the annual Spanish Central Bank mentioned [1] that the first signs of slowdown in the real construction sector appeared in the middle of 2006 and gradually consolidated over 2007. The increase in interest rates and the lower expectations of home depreciation derived from the very maturation of the cycle in this market (really the increase prices of the real estate had been declining since 2004) and the prospective outlook for moderate growth in the net income of families led to a slowdown in the intense demand for housing. Therefore, the real activity of residential construction began to lose vigour. In May 2009, the monthly report by the European Central Bank [2] emphasized that in the case of Spain, the percentage of homes owned was 83% and the debt for home purchase was 58% of GDP.

As can be seen in Figure 1, the decrease in activity in the construction sector is shown and thus the impact this had on the Spanish economy.



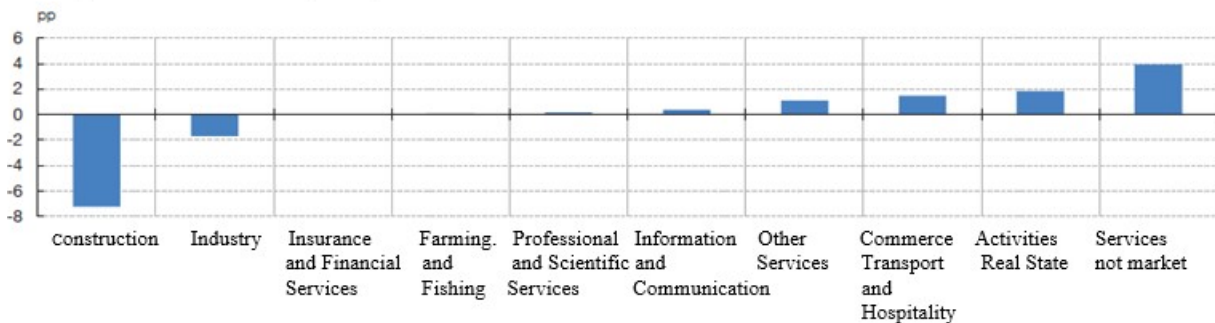
Source: Eurostat (2020).

Figure 1. Adaptation of a company to business risk



Source: Spanish Central Bank (2014).

Figure 2. Change in the structure of gross value added between 2013 and 2007.



Source: Spanish Central Bank (2014).

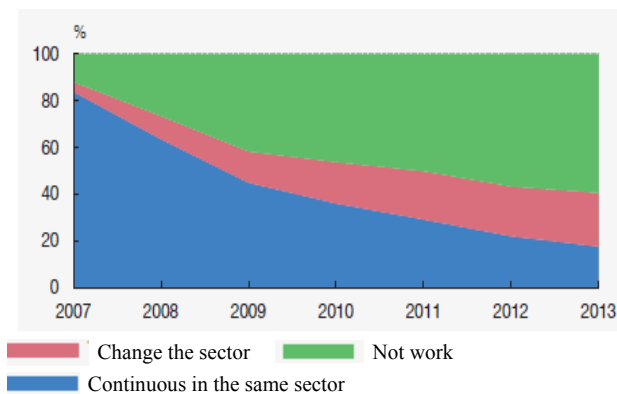
Figure 3. Change in the structure of employment between 2013 and 2007.

I have analysed the different literature about the relationship between construction and financial risk. Following this approach, [3] mentioned that there is a strong dependence between the construction sector and the banking sector, which could affect the profitability and liquidity of companies in a possible economic and

financial crisis. On the other hand, [4] study the relationship between bank profitability, related industry and determinants of macroeconomics determinants and the results show that, with the exception of liquidity, all specific determinants significantly affect bank profitability in the anticipated way.

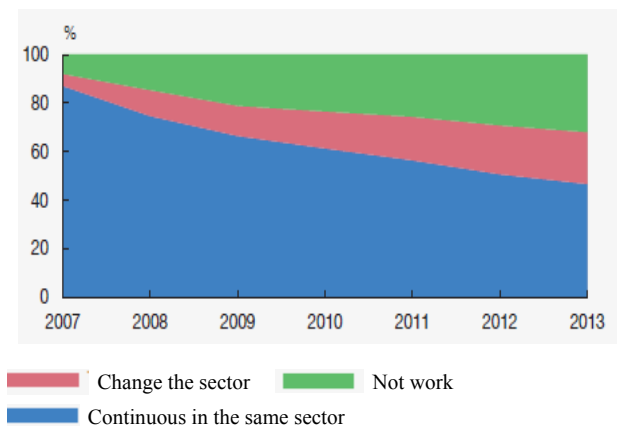
One of the most important impacts in the construction sector was the sectorial restructuring in the Spanish economy (Figures 2 and 3). The increase in the construction sector's GDP up to 2008 was reverted in the following year.

Consequence 2008 crisis. Employees in the construction sector changed employment since the Spanish economy needed to change the growth drive (Figures 4 and 5).



Source: Spanish Central Bank (2014).

Figure 4. Evolution of the labour situation between 2007 and 2013 in the construction sector in early 2007



Source: Spanish Central Bank (2014).

Figure 5. Evolution of the labour situation between 2007 and 2013 in other sectors in early 2007

A consequence of the 2008 crisis in Spain, especially in the construction sector, was that the composition of the drivers were changed and the financial institutions had to change the structure of the loans and invest in different sectors that had more value added in order to avoid their investment being largely concentrated in the construction sector.

2. Literature Review

2.1. Introduction

There are many ways to classify risk [5,6], including

strategic, operational, and financial ways. Risk classification can also include the risk factor to determine which risks are systematic and specific to the company, which can be evaluated efficiently and numerically, and which are more qualitative and may depend on the perception of the environment, as in the current case of climate change and the importance that it plays today.

Regarding classifications, I can cite [7], which publishes a report that assesses risk over the next 10 years, including estimates of probability and possible impacts. The Allianz Risk Barometer [8] determines risks by geographical area. The Risk Management Initiative [9] determines the risks that will affect companies in the next 12 months.

In finance [10], risks emanate from the definitions of financial risk and risk models (namely from models where all potential future events are both controlled and accounted for) and uncertainty (namely from events that are not accounted for and, generally, events and consequences that are not considered in risk models – namely, events that are neglected or unknown). In the first case, risk is defined in terms of potential financial losses (or risk exposure) and volatility. In the second case (uncertainty), risk arises from situations and states that are not accounted for by risk models. There are many financial risks, such as investors' risk of losses, bank risk, financial systems risk, and risks derived from sectors other than financial services.

Additionally, in [11] the authors demonstrate that value at risk (VaR) is one of the most important measures with which to evaluate the maximum loss of a company that could arise from market movements over a specific period. VaR is the distribution of the projected gains and losses over a holding period. If X is the variable that defines the changes in the amounts from the beginning of the period to the end, then 100(1-α) % VaR of a long (L) position is defined as:

$$VaR(L)=\inf (x: P(X\leq x)\geq\alpha) \tag{1}$$

The holder over an extended period has a loss when $X < 0$ and α is small, but the holder over a brief period has a loss when $X > 0$. 100(1-α) % VaR of a short (S) position is defined by:

$$VaR(S)=\inf (x: P(X\leq x)\leq\alpha) \tag{2}$$

When α is small, VaR(S) is positive and signifies that there is a loss for a short position.

2.2. Economic Risk

Economic risk appears [12] from circumstances to which the company is subjected, and it measures some of the risk factors affecting the company. Failures in productive process, changes in demand, and changes in the selling price or the cost factors are some of the circumstances that can cause the results to be not as expected. One of these circumstances may affect several

companies simultaneously in the same way, which could lead us to call it a systematic risk, but it is certainly a specific risk, as each company can control the factors.

Another term that can be used for economic risk is business risk [13], which is the exposure to loss in value caused by fluctuations in volumes, margins and costs that stem from decreased demand, competitive pressure, operational efficiency, changes in regulation, etc. These fluctuations can occur because of internal, industry-wide, or wider market factors. In one of its simplest forms, business risk is regarded as the risk that, because of changes in margins and volumes, earnings will fall below the fixed cost base.

On the other hand, economic risk is a direct consequence of investment decisions, so that the structure of the assets of the company is responsible for the level and the variability of the operating profit.

This is a type of specific risk (not a systematic risk) since it only affects the investments in the company. In other words, the exposure varies according to the investment or the company in which the investment is made, and this will influence the selection policy for the assets of each investor.

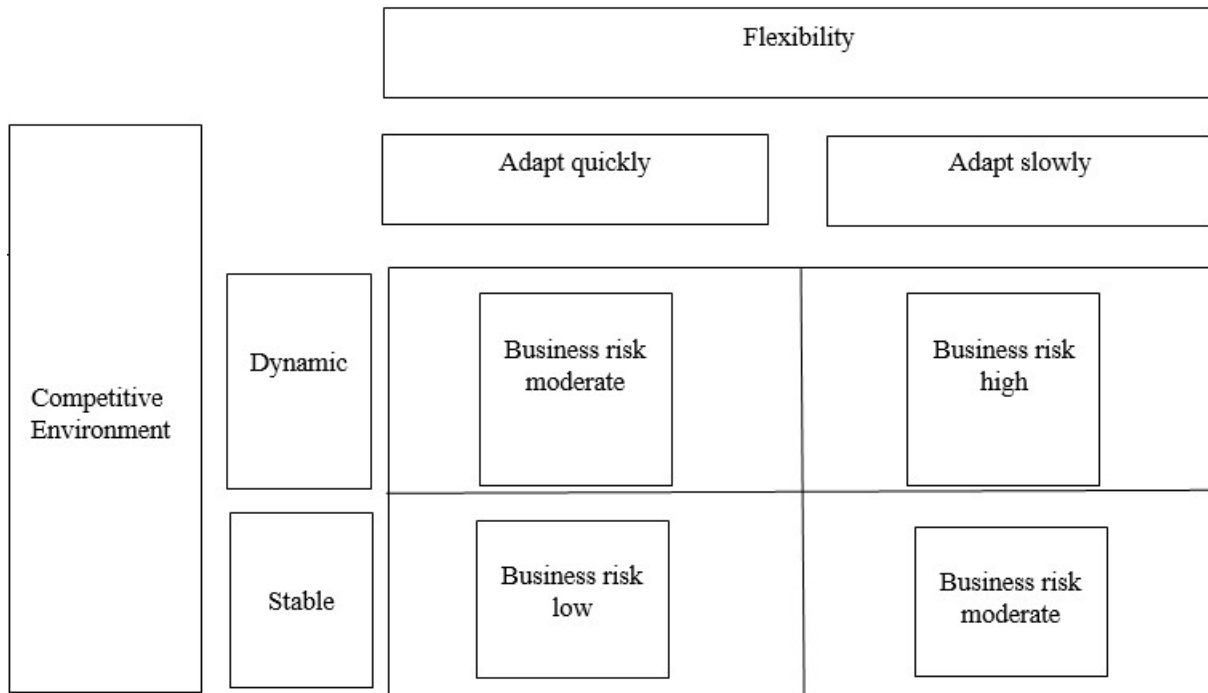
It should be considered that this type of risk can

produce big losses in the short term; for example, the appearance of new products or an economic crisis could lead to a significant decline in sales, causing a big loss to the company.

The following figure (Figure 6) summarizes how a company can adapt to business risk.

The basic calculation framework [13] is driven by the volatility in the Profit and loss (P&L) and the multiple of capital that determines how much capital should eventually help to produce a given level of confidence. In addition, one can adjust the level of (un)certainly with respect to volatility. For the calculation of volatility, a P&L time series can be used that needs to be cleansed of other risk events (markets, credit, etc.).

In this way, the benefit–cost ratio (BCR) method [14] tries to evaluate this risk for a project where the uncertainties are not explicitly considered. BCR is defined as the ratio of benefits to costs. The criteria examine whether the benefits of the project are high enough to justify the costs. Following this, we consider that the Earnings Before Interest and Taxes (EBIT) could be the way to evaluate part of the economic risk of the profit and loss account.



Source: Lelyveld (2006).

Figure 6. Adaptation of a company to business risk

In more detail, the most important figure representing the magnitude of the economic activities of a company is earnings before tax and interest and, therefore, this measures the changes in the factors such as we have noted. For this reason, the usual way of measuring the economic risk is to measure the variability of profit in relative terms, or the economic profit of the return on investment (ROI). Variability measured by standard deviation follows the equation below:

$$\sigma(ROI) = \frac{(1-t)\sigma(EBIT)}{E+L} \quad (3)$$

Where:

σ (ROI) is the standard deviation of economic profit, a measure of economic risk,

t is the rate of corporate income tax,

σ (EBIT) is the standard deviation of earnings before interest and tax,

E is the equity and

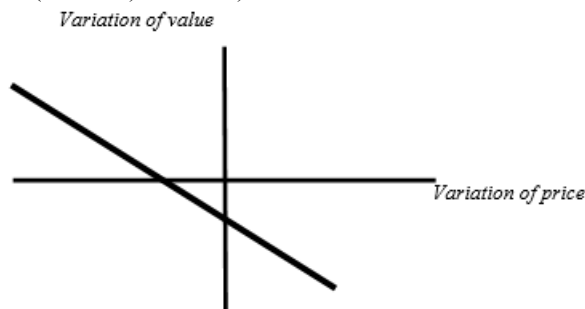
L is the liabilities.

2.3. Financial Risk

Financial risk is the major concern of a company today, because of the risk to the business or the market, since this factor can change the share price. In this sense Nueno and Pregel [15] when there is a financial risk the market quickly realizes this and adds it to the share price through the discount rate applied to future cash flows.

Measuring the risk of the financial position [16] is a complex process that relates to several features in the financial or insurance market. One hypothesis is to transfer the risk through the derivatives market (futures and options). The price of this product is part of the risk position, and the remaining part of the risk should be evaluated through a probability model and the preferences of the risk-taker. Therefore, measuring the risk relates to probabilistic modelling, with the price and preferences of the company and the shareholders.

To illustrate (Figure 7) the effect of changes in the financial price on the value of a company, we will introduce the concept of the risk profile of the company, specifically by measuring the variations suffered in the value of the company (V) to the extent that there are some variations (P) (for example, in Madrid Interbank Offered Rate (MIBOR) or wheat).



Source: Nueno and Pregel (1997).

Figure 7. Change in price against value.

A risk profile of this type means that future payments of the company depend on the price P; if this fluctuates upwards, it will undermine the value of company, and vice versa.

On the other hand, financial risk refers to the variability of profits expected by the shareholders. Financial risk will probably be higher than economic risk because of financial leverage. Financial leverage occurs when a company finances part of its assets using debt, which implies a fixed financial cost, but with the hope for shareholders of an increase in performance.

Financial risk is a direct result of financial decisions because the composition of the capital structure of the company, or the level of financial leverage, directly affects the value. On the other hand [17] financial risk measures are often interpreted as the amount of capital to be held in reserve for risk portfolio or investment, and therefore it is important when constructing a risk method or index to measure it accurately. The goal of financial risk techniques [18,19] is to maintain the appropriate level of cash and liquidity and to manage the uncertainty resulting from the outcomes, hence managing the total cost of risk.

From a practical point of view [12], risk can be defined to depend on derived performance variability in the proportion of borrowed funds used, and it appears in productive investment as a function of the profit split between external and equity funding. Also, risk appears in financial investment based on the proportion of equity used to support existing financial obligations.

The calculation of financial risk is obtained from the standard deviation of financial performance (RF), following this equation:

$$RF = \frac{E(EBIT)(1-t) - I(1-t)}{E} \quad (4)$$

where E is the equity of the company. In other words, if average economic performance measures the profit from all providers' funds, financial performance measures the profit of an investor, the shareholder.

The standard deviation of financial performance from the equation above is:

$$\sigma(RF) = \frac{\sigma(EBIT)(1-t)}{E} \quad (5)$$

Substituting the equation, we found for economic risk, we get:

$$\begin{aligned} \sigma(RF) &= \frac{\sigma(ROI)(E+L)}{E} \\ &= \sigma(ROI) * \frac{L}{(1+E)} \end{aligned} \quad (6)$$

Where:

σ (ROI) is the standard deviation of an economic measure of economic risk.

E is the equity, and

L is the liabilities.

Another element to be considered within risk is the relationship of risk and the indebtedness structure and, as a derivation thereof, the financial leverage [20–22]

$$r = \frac{(\text{EBIT}) * (1 - t)}{E + L} \quad (7)$$

where:

r is profitability

t is the tax rate; and

EBIT is earnings before interest and tax

If the EBIT is a random variable (E) and the indebtedness cost remains as a constant in relation to the indebtedness level, we can determine this in the following way (applying the average operator):

$$E(r) = \frac{E((\text{EBIT}) * (1 - t))}{E + L} \quad (8)$$

The associated risk is determined as follows:

$$\sigma(r) = \frac{\sigma((\text{EBIT}) * (1 - t))}{E + L} \quad (9)$$

If the equity = total liabilities plus equity (there are no liabilities) and the economic structure remains stable:

$$E(r^*) = \frac{E((\text{EBIT}) * (1 - t))}{E} \quad (10)$$

The associated risk will be determined as follows:

$$\sigma(r^*) = \frac{\sigma((\text{EBIT}) * (1 - t))}{E} \quad (11)$$

Therefore $\sigma(r) > \sigma(r^*)$.

Consequently, the shareholder's risk increases with the level of indebtedness.

Finally, the variability in profitability for shareholders depends on the economic structure (types of investment made by the company, evolution in price, costs, etc.) and on the way in which the investments are financed (the debt ratio).

3. Data

3.1. Data

The unit analysis is the firms of the construction sector and the variables (Variables I) defined in accordance with our analysis. The data used to carry out this study come from the Bank for the Accounts of Companies Harmonized [23]. The BACH is a database that provides comparable aggregated data (both economic and financial) based on the annual accounts of non-financial corporations of the following European countries: Austria, Belgium, the Czech Republic, France, Germany, Italy, Poland, Portugal and Spain.

Since it contains [23] data from annual balance sheets and income statements, the BACH database is an adequate data source for analysing the financial situation of non-financial corporations (NFCs). Currently, the data cover the period from 2000 onwards, and provide a sufficient level of detail by the business sector (17 NACE [Nomenclature of Economic Activities] sections and about 80 NACE divisions) and size (based on net turnover, allowing users to select small, medium, or large firms) for each country. Furthermore, two samples of annual data are available: a variable sample and a sliding sample. The variable sample (for each year) includes all corporations with known data for the selected year, while the sliding sample (containing two years) includes all corporations for which the data are available in two consecutive years. To sum up, the BACH database offers a variety of outputs for each combination of fiscal year, size of corporation, business sector and sample (variable or sliding).

The values of balance sheet ratios, income statement ratios and items from the notes expressed as weighted means should be determined once the absolute values for total assets and net turnover have been obtained.

The database used to conduct this research contained information for the construction sector in Spain from 2003 to 2013 for small, medium and large firms. We show in Table 1 the different items for the periods of coverage of this study.

Table 1. Items Covered for the Construction Sector from 2003 to 2013

Variable	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
C1	21.70	22.05	23.57	22.54	22.05	22.36	28.85	30.66	30.66	28.69	29.94
C2	31.73	32.33	34.67	34.59	34.35	40.58	49.61	51.16	55.49	54.24	55.63
AS	100,062,579	114,353,866	147,316,103	192,649,516	222,123,109	167,749,065	192,117,717	211,076,000	194,205,697	162,565,373	132,855,231
TU	63,291,813	73,240,867	88,003,065	105,207,049	114,360,363	99,686,033	96,169,879	84,366,568	70,199,940	55,439,661	45,595,886
GV	18,863,834	22,387,142	26,453,939	31,502,595	32,909,496	27,621,303	28,026,113	23,504,847	20,279,835	16,949,184	13,995,905
FI	45,337	51,298	60,632	64,403	67,180	64,256	77,916	80,149	75,882	69,367	66,376

Source: BACH database (2016).

However, in the interests of following a rigorous methodology we also show (Table 2) the split by size of turnover (i.e., net total sales) (> 10 M turnover; from 10 to .50 turnover; < 50 M turnover).

Variables I: Definition

- C1: coverage firms of total
- C2: coverage employees of total
- AS: total assets
- TU: turnover
- GV: gross value added
- FI: firms

Table 2. Items Covered by Size of Company in the Construction Sector from 2003 to 2013

Size	Variable	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
< 10 M	C1	35,494,291	41,089,647	51,759,479	57,144,838	67,209,903	51,178,755	74,720,824	78,472,734	70,906,192	61,746,072	57,094,388
< 10 M	C2	28,916,079	31,884,475	38,476,499	42,306,126	44,341,220	38,807,367	38,346,711	34,333,450	28,684,308	22,719,233	20,009,224
< 10 M	AS	10,431,883	11,394,480	13,685,401	15,173,544	16,022,968	14,144,245	14,397,033	12,346,690	10,403,362	8,193,195	7,519,959
< 10 M	TU	44,776	50,563	59,774	63,354	66,079	63,460	77,050	79,374	75,194	68,827	65,968
< 10 M	GV	370,777	391,871	456,275	484,296	482,414	441,416	446,899	388,841	341,96	276,059	250,524
>10M-50 M	C1	12,789,280	19,892,788	23,054,086	29,935,466	34,741,676	20,220,880	20,346,669	23,670,927	25,938,992	15,966,412	11,255,271
>10M-50 M	C2	7,554,584	10,442,572	11,771,697	14,644,831	14,254,711	9,864,318	10,522,206	8,899,223	7,942,929	5,654,337	4,650,470
>10M-50 M	AS	2,044,324	2,836,951	3,205,805	3,894,108	4,020,614	2,684,339	2,967,756	2,505,828	2,107,062	1,574,227	1,474,263
>10M-50 M	TU	468	630	717	874	904	612	671	580	524	379	300
>10M-50M	GV	31,111	40,463	46,321	55,379	50,612	43,540	51,702	47,782	43,244	35,100	30,981
> 50 M	C1	51,779,007	53,371,430	72,502,536	105,569,211	120,171,530	96,349,429	97,050,224	108,932,338	97,360,517	84,852,929	64,505,607
> 50 M	C2	26,821,149	30,913,819	37,754,868	48,256,091	55,764,431	51,014,347	47,300,961	41,133,894	33,572,702	27,066,090	20,936,190
> 50 M	AS	6,387,743	8,155,947	9,565,523	12,434,941	12,865,912	10,792,717	10,661,323	8,652,328	7,769,410	7,181,761	5,001,683
> 50 M	TU	93	105	141	175	197	184	195	195	164	161	108
> 50 M	GV	83,659	97,380	110,733	120,310	144,405	134,970	139,521	125,048	108,928	98,656	80,038

Source: BACH database (2016).

The BACH project also has details by percentage of financial statement entries (Balance Sheet and Profit and Loss). Following these criteria, the variables that are used are as follows:

Table 3. Database Concepts

Code	Definition	Contents
I1	Net turnover	Includes sales of goods and services, net of returns, deductions, and rebates. Sales are net of VAT and excise taxes.
I2	Variation in stocks of finished goods and work in progress	Includes change in inventories of production recognized in the income statement.
I3	Capitalized production	Includes costs capitalized by the entity recognized as income in the period.
I4	Other income	Includes other income not identified in previous items (I1, I2 and I3).
I5	Cost of goods sold materials and consumables	Includes cost of materials and consumables used and the cost of goods sold in the period.
I6	External supplies and services	Includes expenses for external supplies and services in the period.
I7	Staff costs	Includes expenses for staff recognized in the period.
I8	Other expenses	Includes other expenses not identified in previous items (I5, I6 and I7).
I9	Depreciation and amortization of intangible and tangible fixed assets	Includes depreciation and amortization of assets.
E	Equity	Total equity.
L12	Bonds and similar obligations (non-current)	Includes bonds and securities issued by the entity.
L22	Amounts owed to credit institutions (non-current)	Includes debt of the entity to finance companies and credit institutions (including leasing).
L321	Other financial creditors (non-current)	Includes the remaining funding of the entity.
A	Assets	Total assets.

Table 4. Figures for Analysis of Company Size < 10M (2003–2013)

Variables	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Employees	370,777	391,870	456,275	484,296	482,414	441,416	446,899	388,841	341,960	276,059	250,524
Assets	35,494,291	41,089,647	51,759,479	57,144,838	67,209,903	51,178,755	74,720,824	78,472,734	70,906,192	61,746,072	57,094,388
Net Turnover	28,916,079	31,884,475	38,476,499	42,306,126	44,341,220	38,807,367	38,346,711	34,333,450	28,684,308	22,719,233	20,009,224
Equity	11,695,369	13,838,993	16,754,543	17,846,333	20,861,954	17,231,887	26,421,283	30,055,057	29,773,510	28,100,637	27,496,657
EBIT	2,145,573	2,416,843	2,901,128	3,316,800	3,409,840	1,664,836	1,303,788	645,469	-68,842	-322,613	-64,030
Tax rate	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
EBIT net	1,394,622	1,570,948	1,885,733	2,155,920	2,216,396	1,082,143	847,462	419,555	-44,748	-209,699	-41,619
L12	0	0	0	0	0	0	0	0	0	0	0
L22	5,966,590	7,034,590	9,948,172	12,051,846	15,787,606	10,977,943	18,956,673	18,731,442	15,081,747	11,552,690	9,323,514
L32	8,767,092	1,010,805	1,635,805	1,114,324	1,774,341	2,379,812	3,848,122	4,637,739	4,339,459	4,087,590	9,323,514
Economic Risk 2008%						0.00866					0.00573
						0.86697					0.57343
Financial Risk 2008%						0.01539					0.00853
						1.53903					0.85265
Profitability	0.03929	0.03823	0.03643	0.00377	0.03927	0.02114	0.01134	0.00534	-0.00063	-0.00339	-0.00072
%	3.92915	3.82322	3.64326	3.77227	3.29772	2.11444	1.13417	0.53465	0.06311	-0.33961	-0.07290

Source: Authors (L12, L22 and L32 calculated from % of total assets, EBIT calculated from % total net turnover).

4. Empirical Statistics

4.1. Construction Sector, With Company Size < 10 M

4.1.1. Figures

This section shows empirical findings for companies with size < 10 M. We analyse the random variables for economic risk, financial risk and profitability up to 2008 (period 2003–2008) and up to 2013 (period 2009–2013).

Table 4 shows the figures obtained from the BACH database for the construction sector for companies of size less than 10 M euros.

4.1.2. Statistical results

Additionally, we have calculated the statistical parameters to determine the correlation of profitability:

$$\text{Profitability} = \beta_1 \text{ EBIT} + \beta_2 \text{ Assets} + \beta_3 \text{ Debt} + \beta_4 \text{ Net Turnover} + \beta_5 \text{ Equity} (\beta_N: \text{Constant})$$

This model tries to determine whether profitability is correlated with the other variables.

Table 5. Correlation Model

R	R2	Correct R2	Error tip of the estimation	Statistical changes R2 Changes	Statistical changes in F
0.876	0.767	0.534	0.122448	0.767	3.296

Source: Authors.

Table 6. Descriptive Statistics for Selected Variables

Variable	Mean	Standard deviation	N
Profitability	0.017279	0.0179469	11
Assets	58,801,556.64	13,552,005.117	11
Net Turnover	33,529,517.45	7,856,388.303	11
Equity	21,825,111.18	6,724,530.284	11
EBIT	1,577,162.91	1,383,059.925	11
EBIT net	1,025,155.73	898,989.007	11
Debt	15,733,911.09	4,693,791.636	11

Source: Authors.

4.1.3. Analysis

The figures show that economic and financial risk were higher in 2008 than 2013. Profitability followed the same direction: from 2003 to 2008 the percentage was higher than from 2009 to 2013. It therefore seems that having more risk may indicate greater profitability, although it may be that the risk is simply a warning that the company could have problems in the future. In addition, we can see that the reduction in risk is derived from the reduction in profitability, implying the need for balance to recover an adequate structure for financial leverage.

Examining the results in Table 8 for the statistical parameters shows that indebtedness leads to worse profitability, which implies excessive financial leverage (negative), which implies that the company is growing in an uncontrolled manner. This can be verified by looking at the total assets, whose value also damages this controlled growth. The result confirms that the leverage risk was excessive in 2008 and could have been an indicator that a certain prudence should have been used. On the other hand, R allows us to determine an adequate value for the correlation of profitability, assets, EBIT, debt, and equity.

Table 7. Pearson Correlation

	Profitability	Net turnover	Assets	EBIT net	Equity	Debt	EBIT
Profitability	1.000	.435	-.583	.740	-.804	-.418	.740
Assets	-.583	.153	1.000	-.379	.862	.845	-.379
Net Turnover	.435	1.000	.153	.798	-.357	.099	.798
Equity	-.804	-.357	.862	-.768	1.000	.705	-.768
EBIT	.740	.798	-.379	1.000	-.768	-.384	1.000
EBIT net	.740	.798	-.379	1.000	-.768	-.384	1.000
Debt	-.418	.099	.845	-.384	.705	1.000	-.384

Source: Authors.

4.2. Construction Sector, with Company Size 10 M to 50 M

4.2.1. Figures

The table below shows the empirical findings for companies with size from 10 M to 50 M.

Table 8. Figures for Analysis for Companies with Size 10 M–50 M (2003–2013)

Variables	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Employees	31,111	40,463	46,321	55,379	50,612	43,540	51,702	47,782	43,244	35,100	30,981
Assets	12,789,280	19,892,788	23,054,086	29,935,466	34,741,676	20,220,880	20,346,669	23,670,927	25,938,992	15,966,412	11,255,271
Net Turnover	7,554,584	10,442,572	11,771,697	14,644,831	14,254,711	9,864,318	10,522,206	8,899,223	7,942,929	5,654,337	4,650,470
Equity	3,944,214	5,408,849	6,409,036	8,432,821	9,758,937	6,175,457	6,671,673	6,552,113	5,613,198	4,053,872	3,238,141
EBIT	1,005,515	1,499,553	1,611,545	2,064,921	2,069,784	766,458	935,424	172,645	-356,638	-821,575	-282,749
Tax rate	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
EBIT net	653,585	974,710	1,047,504	1,342,199	1,345,360	498,197	608,026	112,219	-231,814	-534,024	-183,787
L12	0	0	0	20,955	0	36,398	22,381	21,304	5,188	0	1,126
L22	2,378,806	4,105,871	5,447,681	6,777,390	9,022,413	3,977,447	3,646,123	4,265,501	4,497,821	3,356,140	1,669,157
L32	425,883	843,454	749,258	1,116,593	1,278,494	746,150	921,704	2,305,548	3,229,405	1,486,473	1,206,565
Economic Risk 2008 %						0.06107 6.10726					0.04285 4.28593
Financial Risk 2008 %						0.10815 10.8146					0.08094 8.09366
Profitability %	0.05110 5.11041	0.04900 4.89981	0.04544 4.54368	0.04484 4.48364	0.03872 3.87247	0.02464 2.46378	0.02988 2.98833	0.00474 0.47408	-0.00894 -0.89369	-0.03345 -3.34467	-0.01633 -1.63289

Source: Authors (L12, L22 and L32 calculated from % of total assets, EBIT calculated from % total net turnover).

4.2.2. Statistical results

Additionally, we have calculated the statistical parameters to determine the correlation, as in section 4.1.2:

Table 9. Correlation Model

R	R2	Correct R2	Error of the estimation	Statistical changes R2 Changes	Statistical changes Changes in F
0.975	0.951	0.903	0.091989	0.951	19.589

Source: Authors.

Table 10. Descriptive Statistics for Selected Variables

Variable	Mean	Standard deviation	N
Profitability	.020400	.0295150	11
Assets	21,619,313.36	7,001,259.865	11
Net Turnover	9,654,716.18	3,176,744.375	11
Equity	6,023,482.82	1,927,092.089	11
EBIT	787,716.64	997,679.022	11
EBIT net	512,015.91	648,491.484	11
Debt	5,778,293.55	2,257,159.762	11

Source: Authors.

4.2.3. Analysis

In this section we analyse companies with size from 10 M to 50 M and follow the same structure as for companies with a size less than 10 M. The economic risk and financial risk were higher in 2008 than in 2013, and the same is true for profitability. As for the findings in the correlation model, the R shows a good result for determining the key points for profitability. However, in this case the correlation shows a positive sign for all the variables, which is different from companies with a size less than 10 M, and therefore the increase in profitability is a consequence not only of Net Turnover and EBIT but also of Debt, Assets and Equity, although the values here are low. This could indicate that profitability grows if the correlation is positive, but also, as can be seen from the beginning of the crisis in 2009, if this growth is not adequately balanced in the structure, any drastic change does not create a reaction in the short term, and strategies that last several years are needed to correct the excesses of indebtedness.

An interesting result emerges when we evaluate the impact of Net Turnover on profitability, since the correlation is higher than it is for companies of a size less than 10 M. This means that the profit is derived from the turnover, not from the optimization of the profit and loss statements.

Table 11. Pearson Correlation

	Profitability	Net Turnover	Assets	EBIT net	Equity	Debt	EBIT
Profitability	1.000	.729	.326	.924	.477	.162	.924
Assets	.326	.837	1.000	.563	.944	.973	.563
Net Turnover	.729	1.000	.837	.898	.925	.711	.898
Equity	.477	.925	.944	.712	1.000	.863	.712
EBIT	.924	.898	.563	1.000	.712	.415	1.000
EBIT net	.924	.898	.563	1.000	.712	.415	1.000
Debt	.162	.711	.973	.415	.863	1.000	.415

Source: Authors.

4.3. Construction Sector for Companies with Size > 50 M

4.3.1. Figures

The table below shows the empirical findings for companies with size greater than 50 M.

Table 12. Figures for Analysis for Companies with Size >50 M (2003–2013)

Variables	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Employees	83,659	97,380	110,733	120,310	144,405	134,970	139,521	125,048	108,928	98,656	80,038
Assets	51,779,007	53,371,430	72,502,536	105,569,211	120,171,530	96,349,429	97,050,224	108,932,338	97,360,517	84,852,929	64,505,607
Net Turnover	26,821,149	30,913,819	37,754,868	48,256,091	55,764,431	51,014,347	47,300,961	41,133,894	33,572,702	27,066,090	20,936,190
Equity	18,909,693	12,136,663	15,994,059	22,422,900	22,556,196	13,835,778	13,926,707	15,370,353	10,670,713	5,863,337	1,870,663
EBIT	2,888,638	3,864,227	5,081,805	7,479,694	6,217,734	-3,040,455	1,740,675	115,175	-275,296	-6,317,225	-2,711,237
Tax rate	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
EBIT net	1,877,615	2,511,748	3,303,173	4,861,801	4,041,527	-1,976,296	1,131,439	74,864	-178,943	-4,106,197	-1,762,304
L12	176,049	122,754	79,753	126,683	805,149	616,636	601,711	1,111,110	1,109,910	1,238,853	51,604
L22	5,623,200	7,760,206	13,753,731	20,554,325	27,302,972	13,055,348	12,383,609	18,169,914	19,647,352	14,781,380	10,869,195
L32	1,025,224	1,328,949	1,848,815	3,082,621	2,860,082	3,507,119	3,027,967	5,130,713	9,103,208	6,660,955	5,224,954
Economic Risk 2008 %						0.06877					0.07972
Financial Risk 2008 %						6.87799					7.97202
Profitability %	0.03626	0.04706	0.04556	0.04605	0.03363	-0.02051	0.01166	0.00069	-0.00184	-0.04839	-0.02372
	3.62621	4.70617	4.5559	4.60532	3.36313	-2.50511	1.16583	0.06872	-0.18379	-4.83919	-2.73202

4.3.2. Statistical results

Additionally, the statistical parameters are shown, following the correlation in section 4.1.2:

Table 13. Correlation Model

R	R2	Correct R2	Error of the estimation	Statistical changes R2 Changes	Statistical changes Changes in F
0.990	0.981	0.961	0.0064854	0.981	50.677

Source: Authors.

Table 14. Descriptive Statistics for Selected Variables

Variable	Mean	Standard deviation	N
Profitability	.011495	.0329664	11
Assets	86,585,887.09	23,048,317.431	11
Net Turnover	38,230,412.91	11,364,182.957	11
Equity	13,959,732.91	6,340,423.809	11
EBIT	1,367,612.27	4,274,982.698	11
EBIT net	888,947.91	2,778,738.917	11
Debt	19,340,186.45	7,751,677.688	11

Source: Authors.

Table 15. Pearson Correlation

	Profitability	Net Turnover	Assets	EBIT net	Equity	Debt	EBIT
Profitability	1.000	.287	-.123	.959	.743	-.234	.959
Assets	-.123	.787	1.000	.111	.400	.858	.111
Net Turnover	.287	1.000	.787	.445	.706	.446	.445
Equity	.743	.706	.400	.810	1.000	.144	.810
EBIT	.959	.445	.111	1.000	.810	-.007	1.000
EBIT net	.959	.445	.111	1.000	.810	-.007	1.000
Debt	-.234	.446	.858	-.007	.144	1.000	-.007

Source: Authors.

4.3.3. Analysis

It can be seen in this section that the economic risk is stable during the whole period of study, since from 2003 to 2008 the figure was 6.877% and from 2009 to 2013 it was 7.977%. However, the financial risk showed a different behaviour, since it went from 15.41% in 2008 to 76.78% in 2013, so that in this case the growth was a consequence of excessive financial leverage. On the other hand, the profitability has a negative correlation with the assets and debt; for this reason, it is necessary to achieve optimal debt as the company grows.

With regard to the model correlation, the R is as good as with the companies of size 10 M to 50 M, but the key finding is that the growth of profitability is a consequence of the EBIT and not of the Net Turnover. The companies therefore decided to establish a growth strategy focused not only on Net Turnover but also on the optimization of the profit and loss statement.

Finally, the standard deviation is too big; this may imply unequal growth from 2003 to 2013 because the sector is closely related to public administrations in Spain and other countries and we should point out that large companies run with more risks due to the volume of investments not only in Spain but also in other countries, such as in South America, large companies run with more risks due to the volume of investments they make, and therefore the 2008 crisis had a greater impact and so the standard deviation is higher than other companies with lower dimensions.

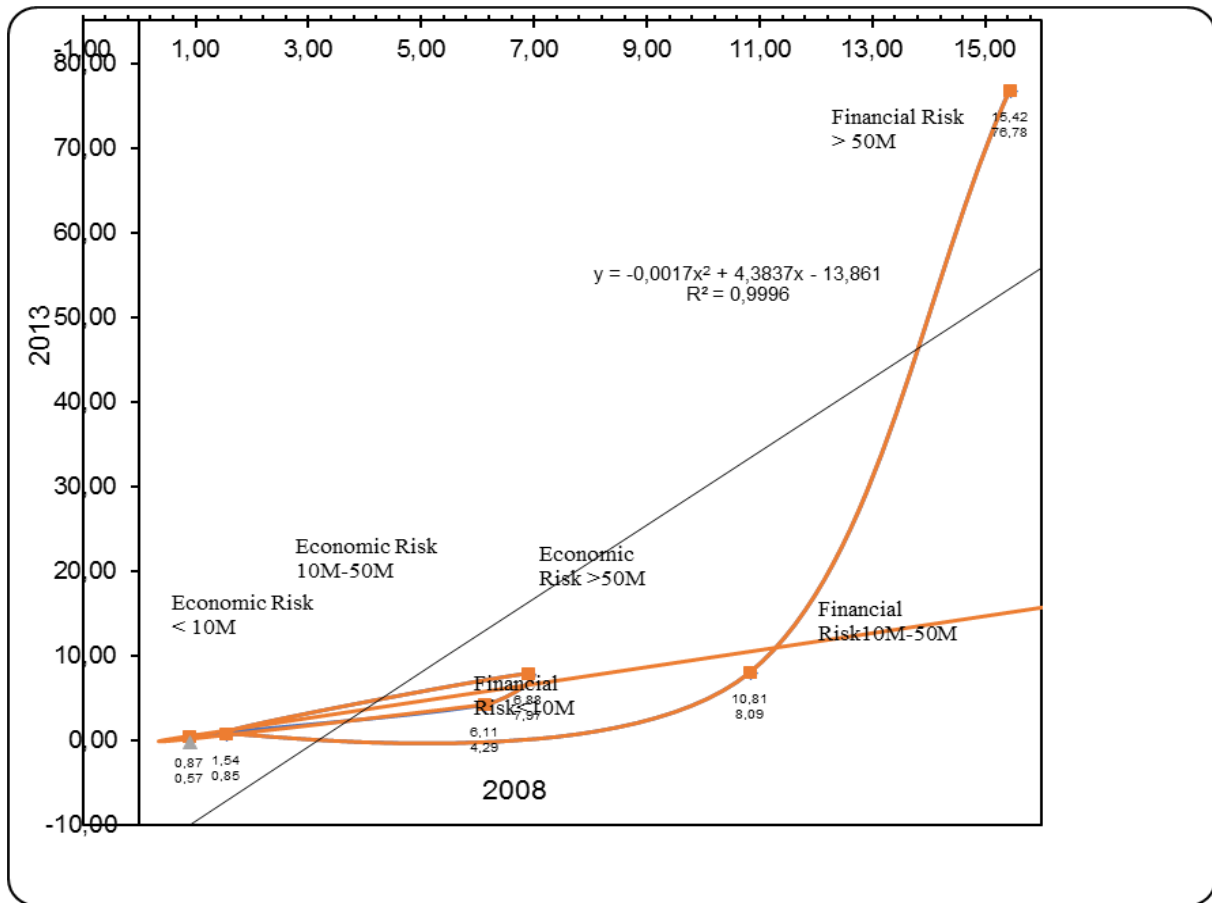
5. Concluding Remarks

This paper adds to the literature dealing with the determinants of economic and financial risk for companies, especially in the construction sector. The main conclusion emerging from my empirical results, which show the application of the concept of risk in business, allows potential problems for companies in the future to be avoided. The conclusions of the study (Figure 8) are that small and medium-sized construction companies showed more prudent behaviour in terms of economic and, especially, financial risk, but the large companies did not.

It can be seen from the proportions in terms of employment that the small companies played a key role, but in terms of value added, the large companies had a significant impact on the economy. When the economic crisis seriously affected the construction sector, the risk of the important companies therefore produced a proportional decrease in results and employment.

Furthermore, we recommend that a mechanism be introduced to control financial risk, so that companies do not reach excessive indebtedness in correlation with economic growth.

In general terms, the growth in the construction sector in Spain was favoured by an extraordinary economic growth and an increase in employment, with a high rate of unemployment being absorbed and immigration with great employment prospects being promoted, but this also contributed to perpetuating the main structural weakness of the Spanish economy, with a majority of low-skilled labour, to the detriment of other more efficient sectors, and to widening the gap in industrial productivity that already existed between the Spanish economy and the economies of the rest of Europe.



Source: Authors.

Figure 8. Correlation of economic and financial risk 2008 vs 2013.

REFERENCES

- [1] Banco de España. Informe Anual 2007. 1st ed. Madrid 2008 pp. 1-45
- [2] European Central Bank (2009). May Monthly Report. 1st ed. Frankfurt pp. 56-61
- [3] Kahle, K, M.m Stulz R.M. (2013). "Access to capital, investment, and the financial crisis". Journal of Financial Economics, 110(2), 280-299. DOI 10.1016/j.fineco.2013.02.014
- [4] Athanoglou, P.P., Delis, M.D, Staikouras, C.K. (2006). "Determinants of bank profitability in the south eastern region". Journal of Financial Decision Making, 2, 1-17. ResearchGate, net/publication/264861379
- [5] Ernest & Young (2010). The Ernest & Young Risk Report 2010: The Top 10 Risks for Business. 1st ed 2010. EYGM Limited. pp 3-8
- [6] Deloitte (2013). Exploring Strategic Risk. 1st ed. 2013 Deloitte Touche Tohmatsu Limited. pp 5-9
- [7] World Economic Forum (2017). Informe de Riesgos Mundiales 2017.12th ed. Geneva 2017 pp-1 -20
- [8] Allianz Global Corporate (2019). Allianz Risk Barometer: Top Business Risks 2019. Allianz Global Corporate (2019). 1st ed. Munich pp 8-10
- [9] Protiviti (2019). Executive Perspectives Money and Foreign Exchange Markets. John Wiley & Sons, England. 1st ed 2019. North Carolina pp 1-30
- [10] Tapiero, Charles S. (2013). Engineering Risk and Finance. Springer US, Boston 2013 1st ed. DOI:10.1007/978-1-4614-6234-7 pp 33-37
- [11] Lai, Tze Leung and Xing, Haipeng (2008). Statistical Models and Methods for Financial Markets. Springer Science, 1st ed. 2008 New York. DOI: 10.1007/978-0387-77827-3 pp- 305-311
- [12] Diez de Castro, Luis T. and López Pascual, Joaquín (2001). Dirección Financiera. Planificación, Gestión y Control. Prentice Hall, 2001 Madrid. 1st ed. pp 35-50
- [13] Lelyveld, Iman van (2006). Economic Capital Modelling: Concepts, Measurement and Implementation. Risk Books, 2006 London. 1st ed. pp 1-50
- [14] Spackova, Olga and Straub, Daniel (2015). "Cost-benefit analysis for optimization of risk protection under budget constraints". Risk Analysis, 35, 941-959. DOI.10.111/risa.1 2310
- [15] Nueno, Pedro and Pregel, Gert (1997). "Instrumentos

- financieros al servicio de la empresa”. Editorial Deusto, 1997 Bilbao. 1st ed. pp. 70-90
- [16] [16] Rüschenhof, Ludger (2013). *Mathematical Risk Analysis: Dependence, Risks Bound, Optimal Allocations and Portfolios*. Springer Alemania, 2013 Berlin. 1st ed. pp 141-165
- [17] MacKenzie, Cameron A. (2014). “Summarizing risk using risk measures and risk indices”. *Risk Analysis*, 34, 2143-2162. DOI:10.1111/risa.12220
- [18] Borghesi, Antonio and Gaudenzi, Barbara (2013). *Risk Management: How to Assess, Transfer and Communicate Critical Risk*. Springer Italia, 2013 Milan. 1st ed. pp 43-52
- [19] Ogilo Fredrick, Omwoyo Jeremiah and Zipporah Onsomu (2018), “The relationship between liquidity risk and failure of commercial banks in Kenya”. *Universal Journal of Accounting and Finance*, 6(1), pp 7-13, DOI: 10.13189/ujaf.2018.060102
- [20] Durban Oliva, Salvador (1994). *Introducción a las Finanzas Empresariales*. Universidad de Sevilla, 1994 Sevilla. 4th ed. pp 42-45
- [21] Torrents Arevalo, Juan Antonio (2008). “El Valor Añadido como Medida de la Eficacia Empresarial”. *Doctoral Thesis*. Universidad Politécnica de Catalunya Barcelona .1st.ed.http/hdl.handle.net/10803/6778 p.p 174-182
- [22] Alan T. Wang, Wen-Chung Hsu, Wen-Cheng Ho (2019), “Loan loss provisioning of the U.S. commercial banks after the financial crisis”. *Universal Journal of Accounting and Finance*, 7 (2), pp. 29–42, 2019. DOI: 10.13189/ujaf.2019.070201
- [23] BACH Project (2015) *Data Base Construction Sector*. European Committee of Central Balance Sheet Data Offices. October <http://www.bach.banque-france.fr/?lang=en>