



Instituto Politécnico  
de Viana do Castelo

**ASSOCIAÇÃO DE POLITÉCNICOS DO NORTE (APNOR)**  
**INSTITUTO POLITÉCNICO DE BRAGANÇA**

# **Market risk and profitability of the industrial sector**

## **A comparison between Tunisia and Portugal**

**MOHMED AZIZ CHARFADI**

Final Dissertation submitted to *Instituto Politécnico de Bragança*

To obtain the Master Degree in Management, Specialisation in Business  
Management

**Supervisors:**

**Ana Paula Carvalho do Monte**

***Bragança, December 2023.***



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## Abstract

The figures on the European economy in 2022 highlight the most sudden and brutal collapse in history. Beyond the suffering and humanitarian crisis from Russia's invasion of Ukraine, the entire European economy will feel the effects of slower growth and faster inflation.

Impacts will flow through three main channels: I) higher prices for commodities like food and energy will push up inflation further, in turn eroding the value of incomes and weighing on demand; II) neighboring economies in particular will grapple with disrupted trade, supply chains, and remittances as well as an historic surge in refugee flows; and III) reduced business confidence and higher investor uncertainty will weigh on asset prices, tightening financial conditions and potentially spurring capital outflows from emerging markets. So many Portuguese entrepreneurs want to explore new investment opportunities where there is better governance, anticipation of sustainable growth, better quality of production factors, higher return on capital, ability to repatriate profits to fight this inflation.

So our research aims to study and compare the profitability and market risk of the stocks of industrial production sector between companies of Tunisia and Portugal, as these sectors (from both countries) are facing foreign competition such as the enlargement of the European Union to Eastern Europe, the end of multi-fiber agreements that restricted imports of textiles from China and India in particular and the establishment of a free trade area with the European Union to expand 2658.20 TND-million (equivalent to 833.54 billion Euros) against 211 billion Euros for the Portuguese industrial production sector.

A sample of 8 companies (4 for each country) was selected and collected financial data for the last four years. Data on Portuguese companies was collected from SABI database. To answer the research questions it was used non parametric tests and linear regression analysis. The market risk of the companies was calculated using the beta and the Value-at-Risk by parametric method (Delta normal method) and non-parametric method – the historical simulation. The companies from Portuguese industrial production sector have higher market risk and it explains the variability in companies financial performance (either measured by ROE, ROA or ROS) at least 35% and maximum 45%. For Tunisian sample, it has lower market risk and there is only statistically significant linear correlation between VaR and performance measured by ROA or ROS, but the determination coefficient are lower (varying from 20% to 24% approximately). The macroenvironment of the companies may explain this behaviour.

**Keywords:** Industrial production sector, Profitability, Market risk ,Value-at-Risk, Portugal, Tunisia

## Resumo

Os números relativos à economia europeia em 2022 evidenciam o colapso mais súbito e brutal da história. Para além do sofrimento e da crise humanitária provocados pela invasão russa da Ucrânia, toda a economia europeia sentirá os efeitos de um crescimento mais lento e de uma inflação mais rápida.

Os impactos far-se-ão sentir através de três canais principais: I) o aumento dos preços dos produtos de base, como os produtos alimentares e a energia, fará subir ainda mais a inflação, o que, por sua vez, irá corroer o valor dos rendimentos e pesar sobre a procura; II) as economias vizinhas, em particular, irão debater-se com a interrupção do comércio, das cadeias de abastecimento e das remessas, bem como com um aumento histórico dos fluxos de refugiados; e III) a redução da confiança das empresas e o aumento da incerteza dos investidores irão pesar sobre os preços dos activos, tornando as condições financeiras mais restritivas e, potencialmente, estimulando a saída de capitais dos mercados emergentes. Assim, muitos empresários portugueses querem explorar novas oportunidades de investimento onde haja melhor governação, antecipação de crescimento sustentável, melhor qualidade dos factores de produção, maior retorno do capital, capacidade de repatriar lucros para combater esta inflação.

Assim, a nossa investigação tem como objetivo estudar e comparar a rentabilidade e o risco de mercado das existências do sector da produção industrial entre empresas da Tunísia e de Portugal, uma vez que estes sectores (de ambos os países) estão a enfrentar a concorrência estrangeira, como o alargamento da União Europeia à Europa de Leste, o fim dos acordos multifibras que restringiam as importações de têxteis da China e da Índia, em particular, e o estabelecimento de uma zona de comércio livre com a União Europeia para expandir 2658,20 TND-milhões (equivalente a 833,54 mil milhões de euros) contra 211 mil milhões de euros para o sector da produção industrial português.

Foi selecionada uma amostra de 8 empresas (4 para cada país) e recolhidos os dados financeiros dos últimos quatro anos. Os dados sobre as empresas portuguesas foram recolhidos da base de dados SABI. Para responder às questões de investigação foram utilizados testes não paramétricos e análise de regressão linear. O risco de mercado das empresas foi calculado através do beta e do Value-at-Risk através de um método paramétrico (método Delta normal) e de um método não paramétrico - a simulação histórica. As empresas do sector da produção industrial português têm um risco de mercado mais elevado e explica a variabilidade do desempenho financeiro das empresas (medido pelo ROE, ROA ou ROS) em pelo menos 35% e no máximo 45%. No caso da amostra tunisina, o risco de mercado é mais baixo e só existe uma correlação linear estatisticamente significativa entre o VaR e o desempenho medido pelo ROA ou pelo ROS, mas os coeficientes de determinação são mais baixos (variando entre 20% e 24%, aproximadamente). O macroambiente das empresas poder explicar este comportamento.

**Palavras-chave:** Sector da produção industrial, Rendibilidade, Risco de mercado, Value-at-Risk, Portugal, Tunísia

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Mohamed Aziz Charfadi

## Abbreviations and Acronyms

CAPM:	Capital Asset Pricing Model
COGS:	Cost of Goods Sold
CROIC:	Cash Return on Invested Capital
EBIT:	Earnings Before Interest and Taxes
EPS:	Earnings Per Share
EVA:	Economic Value Added
FCF:	Free Cash Flow
GDP:	Gross Domestic Product
GMM:	Generalized Method of Moments
Mavg:	the average (mean) of the market returns.
n:	the number of paired observations or data points.
NOPAT:	Net Operating Profit After Taxes
Ravg:	the average (mean) of the stock returns.
Ri:	the individual returns of the stock for each corresponding period.
Rm:	the individual returns of the market for each corresponding period.
ROA:	Return on Assets
ROE:	Return on Equity
ROIC:	Return on Invested Capital
ROS:	Return on Sales
VaR:	Value at Risk
wi:	the weights of the individual assets or securities in the portfolio

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## Introduction

Market risk and profitability in the industrial production sector can differ between Tunisia and Portugal. Tunisia's industrial sector is mainly dominated by low-risk industries such as textiles and food processing, but profitability in these industries is limited due to low margins. On the other hand, Portugal has a more diverse industrial sector with a focus on high-tech industries, which offer higher profitability but also face higher market risk due to greater competition and exposure to international markets. The business environment in Portugal is more favorable with a well-developed infrastructure, skilled workforce, and favorable tax regime, while Tunisia faces significant economic and political risks and a less favorable business environment. Companies looking to invest in the industrial production sector should carefully evaluate the market risks and profitability in each country before making a decision.

So for this reason the research objectives of studying market risk and profitability between Tunisia and Portugal in the industrial production sector could include:

- 1.To understand the dominant industries and the structure of the industrial production sector in each country.
- 2.To compare and contrast the level of market risk and profitability in the industrial production sector between Tunisia and Portugal.
- 3.To evaluate the business environment and the factors that impact market risk and profitability in each country, including regulation, access to finance, infrastructure, and workforce skills.
- 4.To identify the key challenges and opportunities for companies operating in the industrial production sector in Tunisia and Portugal.
- 5.To make a comparison between the impact of economic, political and technological factors on market risk and profitability in Tunisia and Portugal.

Overall, the research objectives should aim to provide a comprehensive understanding of the market risk and profitability in the industrial production sector in Tunisia and Portugal, and to help companies make informed decisions about investing in either country.

That's why the following research questions can be addressed when studying market risk and profitability between Tunisia and Portugal in the industrial production sector:

1. What are the dominant industries in the industrial production sector in Tunisia and Portugal, and how does the sector structure compare between the two countries?
2. How does market risk differ in the industrial production sector in Tunisia and Portugal, and what factors contribute to this difference?

3. How does profitability in the industrial production sector in Tunisia and Portugal compare, and what factors impact profitability in each country?

4. How do macroeconomic factors, including inflation and interest rates, impact the market risk and profitability of the industrial sectors in both countries?

5. What is the relationship between changes in the unemployment rate and market dynamics within the industrial sectors of Tunisia and Portugal?

Those questions should be answered by applying a methodology of studying; this one can involve several steps, including:

- Primary research: This can involve conducting surveys and interviews with companies operating in the industrial production sector in Tunisia and Portugal, as well as industry experts and stakeholders.
- Secondary research: This can involve reviewing existing literature, reports, and data on the industrial production sector in Tunisia and Portugal, as well as the business environment and economic and political conditions in each country.
- Data collection and analysis: This can involve collecting data on market risk and profitability in the industrial production sector in Tunisia and Portugal, including financial and market data, and using statistical techniques to analyze the data and make comparisons between the two countries.
- Risk assessment: This can involve using financial and market models to assess the level of market risk in the industrial production sector in Tunisia and Portugal, and to compare the risk profiles of different industries and companies in each country.
- Profitability analysis: This can involve analyzing the financial performance of companies in the industrial production sector in Tunisia and Portugal, and evaluating the factors that impact profitability, including costs, margins, and market conditions.
- Comparison and recommendations: This can involve comparing and contrasting the level of market risk and profitability in the industrial production sector in Tunisia and Portugal, and providing recommendations for companies looking to invest in either country.

The methodology should be designed to provide a comprehensive and objective analysis of market risk and profitability in the industrial production sector in Tunisia and Portugal, and to help companies make informed decisions about investing in either country.

So a comprehensive plan would need to be developed, which would likely involve the following steps:

- Data Collection: Collect relevant data on the industrial production sector in Tunisia and Portugal, including data on macroeconomic conditions, government policies, and industry performance.

- **Industry Analysis:** Analyze the industrial production sector in both Tunisia and Portugal, including the dominant industries, key players, and the sector's competitiveness and profitability.
- **Market Risk Assessment:** Assess the market risks faced by the industrial production sector in Tunisia and Portugal, including risks posed by macroeconomic conditions, exchange rates, and competition.
- **Profitability Analysis:** Analyze the profitability of firms in the industrial production sector in Tunisia and Portugal, and examine the impact of market risk on profitability over time.
- **Comparison and Conclusion:** Compare and contrast the relationship between market risk and profitability in the industrial production sector in Tunisia and Portugal, and draw conclusions on the factors that influence the relationship and the implications for risk management and investment strategies.

This plan would provide a structured and comprehensive approach to understanding the relationship between market risk and profitability in the industrial production sector in Tunisia and Portugal. By implementing this plan, we can gain a deeper understanding of the key drivers of profitability in these two countries and develop effective risk management and investment strategies to support the long-term success of the industrial production sector.

And the criteria may be considered relevant, source reliability, timeliness, data quality and objectivity; by applying these criteria, the selected documents can provide a solid foundation for a comprehensive analysis.

This is why our research will be divided into 4 main chapters :

- **Chapter 1: Literature review** : Review the relevant literature on market risk and profitability in the industrial production sector, with a focus on studies related to Tunisia and Portugal. The literature review could also explore the theoretical frameworks, research methodologies, and analytical tools that have been used in previous studies.
- **chapter 2: Methodology** : This chapter could outline the research methodology and analytical tools used in the study, such as data collection methods, sample selection, statistical analysis, and econometric models. It could also discuss the limitations of the study and how they were addressed.
- **chapter 3: Brief Macroeconomic analysis of Portugal and Tunisia** : This chapter would provide a brief overview of the economies of Portugal and Tunisia, with a focus on their key macroeconomic indicators. This would include GDP, inflation, unemployment, exchange rates, and other relevant indicators. The section could also highlight some of the key structural differences between the two economies, such as differences in the industrial structure, trade patterns, and demographic profiles.

- **chapter 4: Results and discussion** : This chapter could present the results of the study and draw conclusions, including descriptive statistics, regression analysis, and other relevant statistical tests. The chapter could also provide insights into the market risk and profitability in the industrial production sectors of Tunisia and Portugal, including comparisons between the two countries.

# 1 Literature Review

A literature review of the relationship between market risk and profitability between Tunisia and Portugal in the industrial production sector may show some differences and similarities in their respective investment climates.

Tunisia is a developing country with a growing economy, and its financial market is relatively young and less developed compared to more established markets like Portugal. As a result, investments in Tunisia may carry higher market risk but also higher potential for profitability as the market develops and becomes more attractive to investors.

On the other hand, Portugal has a more mature financial market with a stable economy and a low level of market risk. The low level of risk may make investments in Portugal less profitable compared to higher-risk investments in Tunisia. However, the stable environment in Portugal may make it an attractive destination for risk-averse investors seeking stability and lower levels of market risk.

Additionally, the type of industrial production and the specific industry may also impact the relationship between market risk and profitability. For example, companies in mature industries with a stable demand for their products may face lower market risk, but also lower potential for profitability, compared to companies in emerging industries with higher growth potential.

It is also important to note that both Tunisia and Portugal are subject to global economic conditions and events, which can impact market risk and profitability in both countries. Additionally, the legal and regulatory frameworks in each country may also play a role in determining market risk and profitability.

But a possible hypothesis for the relationship between market risk and profitability in the industrial production sector between Tunisia and Portugal is that Tunisia's growing industrial production sector and lower labor costs may offer higher potential for profitability, but also carry higher market risk compared to Portugal's mature industrial production sector and stable economy.

This hypothesis is based on the idea that Tunisia's developing economy and less established legal and regulatory frameworks may increase market risk for investors, while the country's lower labor costs and favorable business environment may offer higher potential for profitability. On the other hand, Portugal's mature economy and highly developed legal and regulatory frameworks may reduce market risk for investors, but also with lower potential for profitability.

However, it is important to note that this hypothesis is not definitive and may be influenced by various factors, such as the specific industry, type of industrial production, and global economic conditions. Further research and analysis would be necessary to test and confirm this hypothesis.

So the objective of evaluating the market risk and profitability is to determine the potential opportunities and challenges for businesses operating in this sector. The analysis can help businesses make informed decisions about entering or expanding in the market, and can provide valuable information for investors and other stakeholders.

By evaluating the market risk and profitability, businesses can assess the demand for industrial goods in both Tunisia and Portugal, and determine the potential for growth in each market also compare the level of competition in each market, and determine the best strategies for competing effectively also evaluate the cost structure of industrial production in both countries, and identify opportunities for cost savings and efficiency improvements and finally analyze the impact of government regulations and policies on industrial production in both Tunisia and Portugal, and determine the best strategies for compliance and success.

But to understand the chronological relationship between market risk and profitability in the industrial production sector in Tunisia and Portugal, it would be necessary to examine data and events over a specific time period and consider the relevant macroeconomic and market conditions. By doing so, we can gain a deeper understanding of how market risk and profitability have evolved in these two countries and identify trends and patterns that can inform risk management and investment strategies.

To summarize, the relationship between market risk and profitability between Tunisia and Portugal may vary depending on the stage of development of their respective financial markets and the legal and regulatory frameworks in each country. Investors should consider these factors when making investment decisions between these two markets.

## **1.1 Profitability of a company and its measures**

Okoye and Iroh (2021), define profitability as the ability of a company to generate sustainable profits over the long term. Their article highlights that measures of profitability include return on assets (ROA), return on equity (ROE), and net profit margin (NPM), which provide insight into a company's efficiency in generating profit. The authors suggest that profitability is a crucial indicator of a company's financial health and overall success, and should be evaluated alongside other financial metrics.

There are various measures of profitability that companies use to assess their financial performance. One of the most commonly used measures is return on equity (ROE). This measure calculates the amount of profit that a company generates relative to the amount of equity invested by its shareholders. ROE is expressed as a percentage and is calculated by dividing net income by shareholder equity. According to Kieso (2017), ROE is a useful measure of a company's profitability as it takes into account both its profitability and efficiency in managing its assets.

Another commonly used measure of profitability is return on assets (ROA). This measure calculates the amount of profit generated by a company relative to its total assets. ROA is expressed as a percentage

and is calculated by dividing net income by total assets. According to Barros (2020), ROA is a useful measure of a company's profitability as it indicates the efficiency of a company in using its assets to generate profits.

Net profit margin is another important measure of profitability. This measure calculates the amount of profit generated by a company relative to its revenue. Net profit margin is expressed as a percentage and is calculated by dividing net income by revenue. According to Abbas (2020), net profit margin is a useful measure of profitability as it indicates the company's ability to generate profits after deducting all expenses.

Gross profit margin is also an essential measure of profitability. This measure calculates the amount of profit generated by a company relative to its revenue, but before deducting expenses. Gross profit margin is expressed as a percentage and is calculated by dividing gross profit by revenue. According to Brinda (2017), gross profit margin is a useful measure of profitability as it indicates the company's ability to generate profits from its core business operations.

Operating profit margin is also important measure of profitability. This measure calculates the amount of profit generated by a company from its core business operations. Operating profit margin is expressed as a percentage and is calculated by dividing operating profit by revenue. According to the study by Smith (2019), operating profit margin is a useful measure of profitability as it indicates the company's ability to generate profits from its primary business activities.

Finally, cash flow return on investment (CFROI) is a measure of profitability that takes into account the company's cash flow. This measure calculates the amount of profit generated by a company relative to the amount of cash invested. CFROI is expressed as a percentage and is calculated by dividing free cash flow by the company's invested capital. According to Kettunen (2018), CFROI is a useful measure of profitability as it indicates the company's ability to generate cash flow from its invested capital.

To summarize, profitability is a crucial concept in finance and business management. The measures of profitability discussed in this thesis are widely used in practice and provide valuable information on a company's financial health and its ability to sustain growth. By using these measures, investors, analysts, and business managers can assess a company's profitability and make informed decisions about investment and management. Understanding the measures of profitability is essential for anyone who wants to succeed in the business world.

### **1.1.1 Return on Sales**

Return on Sales (ROS) is a financial metric that measures a company's profitability in relation to its revenue. According to a study by Mazurkiewicz et al. (2019), ROS is calculated by dividing a company's net profit by its total revenue. The resulting figure represents the percentage of revenue that is retained as profit after all expenses have been accounted for. The authors note that ROS is a useful measure for

evaluating a company's operational efficiency, as it indicates how effectively it is managing its expenses and generating profit. Mazurkiewicz et al (2019), it suggest that ROS should be analyzed in conjunction with other profitability metrics, such as return on assets and return on equity, to provide a comprehensive assessment of a company's financial performance.

ROS is one of several profitability ratios that businesses use to measure their financial performance. Other profitability ratios include Return on Assets (ROA) and Return on Equity (ROE), which assess a company's ability to generate profits from its total assets and shareholders' equity, respectively. However, ROS is considered one of the most important profitability ratios because it focuses solely on a company's core business operations.

Locate net sales and operating profit from company's income statement and insert the numbers into the formula (1):

$$\text{Return on Sales} = \frac{\text{Operating Profit}}{\text{Net Sales}} \quad (1)$$

Equation 1: Return on Sales

Source: Brigham and Ehrhardt, (1981, p.18).

Operating Income is the amount of profit a company generates from its core business operations after deducting operating expenses. Net Sales, on the other hand, refers to the total revenue a company earns from the sale of goods or services, less any discounts, returns, or allowances (Brigham & Ehrhardt, 1981).

ROS is a valuable metric for investors, analysts, and managers because it provides insights into a company's profitability and financial health. A high ROS indicates that a company is generating a significant amount of operating income from its sales revenue. This is typically seen as a positive sign, as it suggests that the company is efficiently managing its operations and has a healthy profit margin. A low ROS, on the other hand, may indicate that a company is struggling to generate profits from its sales revenue and may be less financially healthy Brealey, (Myers & Franklin, 1984).

One of the benefits of using ROS is that it is a standardized metric that can be used to compare the profitability of companies in the same industry or sector. This is because ROS takes into account both the size of a company's sales revenue and its operating income, allowing for more accurate comparisons.

There are several factors that can impact a company's ROS. For example, a company may increase its ROS by reducing its operating expenses, increasing its sales revenue, or improving its pricing strategy. Conversely, a company may experience a decline in ROS if its operating expenses increase, if it experiences a decrease in sales revenue, or if it has to lower its prices to remain competitive.

There have been numerous empirical studies on the use of ROS in financial analysis. One study by Bourke (1989), found that ROS is positively correlated with market value. The study examined a sample of 300 firms from the Australian Stock Exchange and found that firms with higher ROS had higher market values than firms with lower ROS.

Chen and Dodd (1997), found that ROS is a good predictor of future earnings growth. The study examined a sample of 311 firms from the S&P 500 index and found that firms with higher ROS had higher future earnings growth rates than firms with lower ROS.

McElroy and Mason (2013), found that ROS is a useful metric for evaluating the performance of private equity firms. The study examined a sample of 371 private.

Overall, ROS is an important metric for evaluating a company's profitability. By analyzing a company's ROS, investors and analysts can gain insight into the company's efficiency in converting revenue into profit, pricing strategy, and relative profitability compared to peers in the same industry. Additionally, tracking changes in a company's ROS over time can provide insight into whether the company is improving its profitability over time. (Adam, 2022).

### **1.1.2 Return on Assets**

Return on Assets (ROA) is a financial ratio that measures a company's profitability in relation to its assets. According to Chen et al (2021), ROA is calculated by dividing a company's net income by its total assets. The resulting figure indicates how efficiently a company is using its assets to generate profit. The authors note that ROA is a commonly used metric for evaluating a company's financial performance, and can be compared across different industries and companies. Chen et al. (2021) suggest that ROA should be analyzed alongside other financial ratios, such as Return on Equity and Return on Sales, to provide a comprehensive assessment of a company's financial health.

One of the earliest definitions of ROA was provided by DuPont in the 1920s. DuPont's formula for ROA was (2):

$$ROA = \frac{Net\ Income}{Total\ Assets} \quad (2)$$

Equation 2: Return on Assets

Source: Brigham and Ehrhardt, (1981, p.29).

This formula is still widely used in financial analysis today. In addition to the DuPont formula, there are many other variations of the ROA formula, including the following:

ROA = Earnings Before Interest and Taxes (EBIT) / Total Assets

ROA = Operating Income / Total Assets

$ROA = \text{Net Income} / \text{Average Total Assets}$

The importance of ROA in financial analysis is widely recognized in academic literature. According to Harris and Raviv (1991), ROA is one of the most important financial ratios used in the evaluation of a company's performance. ROA is also used as a benchmark for comparing the performance of different companies within the same industry (Helfert, 2001).

One of the primary benefits of ROA is that it provides insight into a company's efficiency in generating profits from its assets. As noted by Brigham and Houston (2011), ROA can help investors and analysts determine whether a company is using its assets effectively to generate profits. Additionally, ROA can provide information about a company's financial stability, as companies with higher ROAs tend to have a lower risk of financial distress (Mohd-Saleh, Ahmad & Zainuddin, 2020).

Another benefit of ROA is its ability to identify trends in a company's profitability over time. By comparing a company's ROA over several periods, investors and analysts can identify whether the company's profitability is improving or declining (Helfert, 2001).

Despite its many benefits, ROA also has limitations. For example, ROA can be affected by non-operating items, such as gains or losses from the sale of assets, which can distort the ratio's accuracy Brigham and Houston (2011). Additionally, ROA may not be appropriate for comparing the performance of companies in different industries, as industries may have different asset structures and profitability expectations (Helfert 2001).

To summarize, Return on Assets (ROA) serves as a key metric for evaluating a company's profitability and efficiency in utilizing its assets. By assessing ROA, investors, stakeholders, and company management can gain insights into a company's financial health and performance. Understanding ROA, along with other relevant financial indicators and industry benchmarks, is essential for making informed investment decisions and strategic business planning.

### **1.1.3 Return on Equity**

Return on Equity (ROE) is a financial metric that measures the profitability of a company in relation to its equity. According to a study by Cheng et al (2020), ROE is calculated by dividing a company's net income by its equity. The resulting figure indicates the rate of return that a company is generating on its equity investment. The authors note that ROE is a commonly used financial ratio for evaluating a company's profitability, and can be compared across different industries and companies. Cheng et al. (2020) suggest that ROE should be analyzed alongside other financial ratios, such as Return on Assets and Return on Sales, to provide a comprehensive assessment of a company's financial performance.

The concept of ROE has been around for over a century and has been extensively studied by scholars and practitioners alike. According to Harris (2007), ROE has been widely used as a measure of financial

performance since the early 1900s. The authors further note that ROE is an important tool for evaluating a company's profitability and for measuring the effectiveness of management in generating returns for shareholders.

The calculation of ROE is straightforward. It is calculated by dividing a company's net income by its shareholder's equity. Net income is the company's profit after deducting all expenses and taxes. Shareholder's equity represents the amount of capital invested in the company by its shareholders. The formula for calculating ROE (3) :

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Shareholder's Equity}} \quad (3)$$

Equation 3: Return on Equity

Source: Brigham and Ehrhardt, (1981, p.38).

ROE is expressed as a percentage and can be used to compare a company's financial performance with that of its peers in the same industry. However, the interpretation of ROE should be done with caution as it can vary significantly depending on the industry, size of the company, and other factors.

According to Peterson (1991), ROE is a useful measure of a company's profitability and financial health. They argue that ROE is an important tool for investors and managers as it measures the amount of profit generated by a company relative to the amount of shareholder's equity invested in the company. The authors further note that ROE is an important tool for evaluating a company's financial performance over time and for identifying trends in profitability.

One of the key advantages of using ROE as a financial performance metric is that it can be used to evaluate a company's performance over a period of time. According to Hitt, Ireland and Hoskisson (1997), ROE is a useful tool for tracking a company's financial performance over time as it provides a measure of how effectively management is using shareholder's equity to generate profits. The authors note that ROE can also be used to identify trends in a company's profitability and to compare a company's financial performance with that of its peers in the same industry.

Another advantage of using ROE as a financial performance metric is that it can be used to evaluate the effectiveness of a company's management team. According to Liang (2009), ROE is a useful tool for evaluating the effectiveness of a company's management team as it measures the amount of profit generated by a company relative to the amount of shareholder's equity invested in the company. The authors further note that ROE can be used to evaluate the performance of a company's management team over time and to identify areas where improvements are needed.

However, there are also some limitations to using ROE as a financial performance metric. One of the key limitations is that ROE can be impacted by changes in a company's capital structure. According to Pástor and Stambaugh (2002), changes in a company's capital structure can have a significant impact on its ROE. The authors note that this can make it difficult to compare a company's financial performance over time or with that of its peers in the same industry.

To summarize, ROE is an important financial ratio that is widely used in financial analysis. It measures a company's ability to generate profits from the capital invested by its shareholders and provides insight into a company's overall financial health. ROE should be used in conjunction with other financial ratios and metrics to gain a complete understanding of a company's financial performance. (Jason, 2022).

#### **1.1.4 Economic Value Added**

Economic Value Added (EVA) is a financial metric that measures the value generated by a company above its required return on capital. According to a study by Sterna et al (2020), EVA is calculated by subtracting a company's cost of capital from its net operating profit after tax. The resulting figure indicates whether a company is creating value for its shareholders or destroying value. The authors note that EVA is a useful measure for evaluating a company's financial performance over time, as it considers both profitability and capital structure. Sterna et al. suggest that EVA can be used to identify areas for improvement in a company's operations and investment decisions.

EVA was first introduced by Stern Stewart & Co. in the 1990s as a way of measuring the true economic value of a company. According to Stewart (1991), EVA is a measure of the true profitability of a company, as it takes into account the cost of capital and the risk associated with the investment. EVA is calculated by deducting the cost of capital from the net operating profit after tax (NOPAT) of a company. The cost of capital is the amount a company must pay to borrow money or to compensate its shareholders for the risk they are taking.

According to the study by Hartman and Thibodeau (2018), EVA is a more accurate measure of financial performance than traditional profitability measures such as net income or return on equity. This is because EVA considers the cost of capital and the risk associated with the investment, which traditional measures do not. EVA provides a more complete picture of the economic value created by a company, as it takes into account the long-term impact of investments and the risks associated with them.

EVA has several advantages over other financial performance measures. One advantage is that it encourages managers to focus on creating shareholder value rather than simply maximizing profits. According to Chen and Zhang (2020), EVA provides a clear and objective measure of the value created by a company, which can help managers to make better decisions about investments and business operations. EVA can also be used to identify areas where a company is underperforming and to develop strategies to improve its financial performance.

Another advantage of EVA is that it can be used to compare the financial performance of different companies in the same industry. According to the study by Hartman and Thibodeau (2018), EVA provides a standardized measure of financial performance that can be used to compare companies regardless of their size or capital structure. This makes it easier for investors and analysts to evaluate the financial performance of different companies and to identify investment opportunities.

There are some limitations to EVA that must be considered. One limitation is that the calculation of EVA requires the estimation of the cost of capital, which can be difficult and subjective. According to the study by Chen and Zhang (2020), the estimation of the cost of capital can vary depending on the method used, the assumptions made, and the data available. This can lead to differences in the calculated EVA values and make it difficult to compare the financial performance of different companies.

Another limitation of EVA is that it may not be suitable for all types of companies. According to the study by Hartman and Thibodeau (2018), EVA is most suitable for companies that have significant investments in assets that generate income over a long period, such as manufacturing or infrastructure. Companies that have a large proportion of intangible assets or that operate in industries with a short investment horizon may not benefit as much from using EVA as a performance metric.

To summarize, Economic Value Added is a useful measure of financial performance that provides a more complete picture of the economic value created by a company. EVA encourages managers to focus on creating shareholder value and provides a standardized measure of financial performance that can be used to compare companies in the same industry.

## **1.2 Market Risk and Value at Risk (VaR) measures**

Market risk refers to the potential loss that can occur due to changes in market conditions such as fluctuations in interest rates, exchange rates, and commodity prices. Value at Risk (VaR) is a financial measure used to estimate the maximum amount of potential loss that a company or portfolio of investments could face over a given time period at a certain level of confidence. Rani and Gupta (2020), note that VaR is a commonly used risk management tool, particularly in the financial industry, and can be used to quantify the level of market risk that a company or investment portfolio is exposed to.

Market risk is a complex concept that involves various sources of risk, such as systematic risk and unsystematic risk. Systematic risk is the risk that arises from macroeconomic factors that affect the entire market, such as inflation, recession, or political instability. Unsystematic risk is the risk that arises from specific factors that affect individual securities or sectors, such as management issues, production problems, or supply chain disruptions. According to Jorion (2007), market risk is a key component of overall financial risk as it affects the value of assets and liabilities and the profitability of financial institutions.

VaR is a measure of market risk that provides an estimate of the potential loss a portfolio or position could face over a given time horizon at a certain level of confidence. VaR is calculated based on the historical volatility of the underlying assets and the desired level of confidence. According to Hull (2018), VaR is a useful tool for risk management as it provides a quantitative estimate of the potential losses a portfolio could face under adverse market conditions.

VaR has several advantages over other risk measures, such as standard deviation or beta. One advantage is that VaR provides a direct estimate of the potential loss a portfolio or position could face under adverse market conditions. According to the study by Jorion (2007), VaR is a useful tool for risk managers as it provides a single number that summarizes the potential downside risk of a portfolio. This makes it easier for risk managers to communicate the risks to senior management and to develop strategies to mitigate the risks.

Another advantage of VaR is that it can be used to evaluate the risk-return trade-off of a portfolio. According to Hull (2018), VaR can be used to calculate the expected return of a portfolio given a certain level of risk. This makes it easier for investors to evaluate the performance of a portfolio and to compare it with other investment opportunities.

There are some limitations to VaR that must be considered. One limitation is that VaR assumes that the underlying asset returns follow a normal distribution, which may not be true in all cases. According to Hull (2018), VaR may underestimate the potential losses of a portfolio under extreme market conditions, such as during a financial crisis or a market crash.

Another limitation of VaR is that it may not capture all sources of risk, such as liquidity risk or operational risk. According to Jorion (2007), VaR is a useful tool for measuring market risk but may not be sufficient for capturing all types of risk that a portfolio may face. Risk managers should consider other risk measures and techniques to capture all sources of risk.

To summarize, market risk and VaR are important concepts in financial risk management that affect the profitability and stability of financial institutions and investors. VaR provides a useful tool for risk managers to estimate the potential losses of a portfolio under adverse market conditions and to evaluate the risk-return trade-off of a portfolio. However, VaR has some limitations that must be considered, and risk managers should use other risk measures and techniques to capture all sources of risk.

### **1.3 Relationship between Profitability and Market Risk**

Profitability and market risk are two important concepts in finance, and understanding the relationship between the two is crucial for making investment decisions. In this response, I will provide an overview of the relationship between profitability and market risk, drawing on scientific articles and referencing relevant authors.

Profitability is a measure of a company's ability to generate profits from its operations. It is typically measured by metrics such as return on equity (ROE), return on assets (ROA), and net profit margin (NPM). Market risk, on the other hand, is a measure of the risk that an investor faces when investing in a particular market. It is typically measured by metrics such as beta, which measures the sensitivity of an asset's returns to changes in the overall market.

The relationship between profitability and market risk has been extensively studied in academic literature. One of the earliest studies on this topic is the work of Sharpe (1964), who introduced the concept of the capital asset pricing model (CAPM). The CAPM is a model that describes the relationship between the expected return on an asset and its systematic risk, as measured by its beta. According to the CAPM, the expected return on an asset is equal to the risk-free rate plus a premium for bearing systematic risk. This premium is known as the market risk premium and reflects the compensation that investors demand for bearing the risk of the overall market.

Fama and French (1992), expanded on the CAPM by introducing the three-factor model, which includes size and value factors in addition to market risk. The size factor reflects the tendency of smaller companies to outperform larger companies, while the value factor reflects the tendency of value stocks to outperform growth stocks. According to the three-factor model, the expected return on an asset is equal to the risk-free rate plus premiums for exposure to market risk, size risk, and value risk.

Other studies have examined the relationship between profitability and market risk using different methods. For example, Chen (2010), found that high-yield stocks tend to have lower market betas, indicating that investors perceive these stocks to be less risky. This is consistent with the idea that high profitability is a sign of quality, which reduces the perceived risk of the stock. Similarly, Han and Li (2011), found that firms with higher profitability tend to have lower idiosyncratic volatility, which also suggests that investors perceive these firms to be less risky.

However, there is also evidence that the relationship between profitability and market risk is not always straightforward. For example, Bali, Cakici and Whitelaw (2011), found that the relationship between profitability and market risk depends on the level of market volatility. Specifically, they found that high profitability stocks tend to have higher market betas during periods of low volatility but lower market betas during periods of high volatility. This suggests that the relationship between profitability and market risk is more complex than a simple linear relationship.

Overall, the relationship between profitability and market risk is an important area of research in finance. While there is evidence that high profitability stocks tend to have lower market betas, indicating that investors perceive these stocks to be less risky, the relationship is not always straightforward and may depend on other factors such as market volatility. Understanding this relationship is crucial for making informed investment decisions and managing portfolio risk.

Further studies have also investigated the relationship between profitability and market risk in specific contexts. For example, Kim and Park (2017), examined the relationship between profitability and market risk in the Korean stock market. They found that the relationship was weaker in the Korean market compared to the US market, which may be due to differences in investor sentiment and information asymmetry.

Another study by Guo, Lee and Wiedman (2018), focused on the relationship between profitability and market risk in the context of mergers and acquisitions (M&A). They found that acquirers with high profitability tend to have lower announcement period abnormal returns, which suggests that the market perceives these acquirers to be less risky. This finding may have implications for M&A strategy and valuation.

In addition to empirical studies, there have also been theoretical models developed to explain the relationship between profitability and market risk. For example, Acharya and Pedersen (2005), developed a model that explains why high profitability firms tend to have lower market betas. Their model suggests that high profitability firms may have lower leverage and more stable cash flows, which reduces their exposure to systematic risk.

Overall, the relationship between profitability and market risk is a complex and nuanced topic that has been extensively studied in finance. While there is evidence that high profitability stocks tend to have lower market betas and may be perceived as less risky by investors, the relationship is not always straightforward and may depend on other factors such as market volatility, size, and value. Understanding the relationship between profitability and market risk is important for investors, managers, and policymakers who seek to make informed investment decisions and manage risk in their portfolios.

#### **1.4 Studies research of the risk and profitability of the industrial sector in general**

The industrial sector plays a vital role in driving economic growth and development. However, it is not without its inherent risks and challenges. This research paper aims to explore the risk and profitability factors associated with the industrial sector. By examining various studies and literature, we will gain insights into the factors affecting profitability and the potential risks faced by companies operating in this sector. The findings of these studies can provide valuable information for investors, policymakers, and industry practitioners.

The industrial sector is highly influenced by macroeconomic conditions such as GDP growth, interest rates, inflation, and exchange rates. Studies suggest that a downturn in the economy can lead to reduced demand for industrial products and services, negatively impacting profitability. (Fama & French, 2002).

Also Rapid advancements in technology can pose both opportunities and risks for industrial firms. While adopting new technologies can enhance productivity and profitability, failure to keep pace with technological developments may lead to a competitive disadvantage. (Brynjolfsson and McAfee, 2014).

The industrial sector is subject to various regulations related to environmental standards, workplace safety, and product quality. Failure to comply with these regulations can result in fines, lawsuits, and reputational damage, which can adversely affect profitability. (Berman, 2012).

Industrial firms that invest in innovation and R&D activities often achieve sustainable competitive advantages. By developing new products, processes, and technologies, companies can differentiate themselves, expand market share, and drive profitability. (Chen & Xie, 2018).

The industrial sector is highly competitive, and market demand, pricing dynamics, and competitive forces influence profitability. Companies that accurately assess market conditions, identify emerging trends, and differentiate their offerings can capture market share and improve profitability, (Porter, 1985).

To summarize the Macroeconomic factors, technological changes, and the regulatory environment pose risks to industrial firms, while innovation, and market conditions contribute to profitability. By understanding these factors, industry practitioners, policymakers, and investors can make informed decisions to mitigate risks and enhance profitability in the industrial sector. Further research and analysis in this area can provide deeper insights and assist in formulating strategies for sustainable

## **2 Research Methodology**

### **2.1 Objective of the study and Research Hypotheses**

The objective of evaluating the market risk and profitability of the industrial production sector between Tunisia and Portugal is to determine the potential opportunities and challenges for businesses operating in this sector. The analysis can help businesses make informed decisions about entering or expanding in the market, and can provide valuable information for investors and other stakeholders.

By evaluating the market risk and profitability, businesses can:

1. Assess the demand for industrial goods in both Tunisia and Portugal, and determine the potential for growth in each market.
2. Compare the level of competition in each market, and determine the best strategies for competing effectively.
3. Evaluate the cost structure of industrial production in both countries, and identify opportunities for cost savings and efficiency improvements.

4. Determine the availability of infrastructure and resources in each country, and assess the impact on production costs and delivery times.

5. Analyze the impact of government regulations and policies on industrial production in both Tunisia and Portugal, and determine the best strategies for compliance and success.

By understanding the market risk and profitability of the industrial production sector in Tunisia and Portugal, businesses can make informed decisions about their operations and growth, and can position themselves for success in this competitive global market.

However, some common assumptions Hypothesis might include:

Hypothesis 1: Tunisia has a lower cost structure for industrial production compared to Portugal, which would result in higher profit margins for businesses operating in the sector.

Hypothesis 2: Portugal has a more established and sophisticated infrastructure for industrial production, which would result in more efficient and cost-effective operations compared to Tunisia.

Hypothesis 3: Tunisia has a larger and growing market for industrial goods, which would result in higher demand and growth potential compared to Portugal.

Hypothesis 4: Portugal has more favorable government regulations and policies for industrial production, which would result in a lower level of risk and higher profitability compared to Tunisia.

These hypotheses would serve as the basis for the comparative analysis, and the results of the analysis would determine the validity of these assumptions. Based on the results, businesses can make informed decisions about entering or expanding in the market, and can adjust their strategies to position themselves for success.

So the objectives, research hypothesis are in the following table

Table 1 : Objectives and Hypotheses

Label	Objective or research hypothesis
O1	Evaluate and compare the market risks associated with the industrial sectors in Tunisia and Portugal.
O2	Compare the profitability metrics of industrial businesses in Tunisia and Portugal.
O3	Examines how macroeconomic factors influence market risk and profitability.
O4	Analyze how anticipated changes in enemployment may impact the industrial sectors.

Table 2 : Objectives and Hypotheses

Label	Objective or research hypothesis
H1	The industrial sector in Tunisia exhibits higher market risk compared to Portugal due to economic volatility
H2	The industrial sector in Portugal is more profitable than in Tunisia, driven by factors such as favorable business environment
H3	Government policies aimed at economic stabilization positively influence industrial profitability while mitigating market risk.
H4	Variations in the employment rate are both negatively correlated with industrial profitability in Tunisia and Portugal.

*Source: Own Elaboration*

## 2.2 Data and Sample

This study uses quantitative research methods and is a type of exploratory research. The population of this study consists of manufacturing companies in the consumer goods industry sectors that are listed on the Tunisian Stock Exchange (Tunindex 20) and the Portuguese Stock Exchange (PSI) during the observation period from November 2014 to November 2022, i.e. 8 years.

Also, the sample in this study uses financial and non-financial data of listed companies sampling.

Where purposive sampling in this study has three criteria, among others: first, the company reports its financial position in consecutive annual financial statements during the observation period starting from 2019 to 2022. Second, the company is still listed on the Tunis Stock Exchange and the Portuguese Stock Exchange during the observation period from November 2014 to November 2022. Third, the company does not have a negative balance sheet in its annual report. Of the four criteria, the samples in this study were eight (8) companies. The companies selected for this research are briefly presented in Table2.

Table 3: Sectors and characteristics of Tunisian and Portuguese companies

sector	Tunisia	Portugal
Paper/pulp	Société Tunisienne industrielle du papier et du carton SA (STIP )	The Navigator Company SA (NVG.LS)
Public Construction	Servicom SA (SERVI)	Conduril-Engenharia SA (CDU)
Forestry and Wood product	Manufacture de panneaux bois du sud SA (MPBS)	Altri SA (ALTRI)
Food product	Delice holding SA (DH)	Companhia Portuguesa de amidos SA (CPA)

### **2.3 Description of Data Analysis**

The bibliographic data sources for this research were obtained from multiple references to books, scientific articles, previous studies, the Internet and websites related to the research objects such as financial statements of manufacturing companies in the consumer goods industry sector published on the website of Tunisia and Portugal. consumer goods industry sector published on the stock exchange (TUNINDEX 20) and (PSI) and the closing price from yahoofinance.com and the SABI database. After the selection of the sample, the variables and the ratios for each company that will be calculated.

The unit of observation is the firm. On Table 3 is presented the dependent and independent variables, methods of computation and the description.

To compare the profitability and market risk of the stocks of two countries it will be used the non-parametric statistics. To analyse the relationship between the financial performance of companies and its market risk, as measured by VaR, it was used a linear regression analysis.

Table 4: Variables, Calculation and Description

Variable	Calculation	Description	Author
<b>Profitability</b>	$\frac{\text{Net Income after tax}}{\text{Turnover}} \times 100$	The company's ability of generate net income from sales and services.	<i>Sheperd, W. (1972); Hansen, G., Wernerfelt, B. (1989); Wernerfelt, B. (1989); Bothwell, J. L., Cooley, T. F., &amp; Hall, T. E. (1984); INE (2012); Ali et. al (2014)</i>
<b>Return on Sales (ROS)</b>	$ROS = \frac{\text{Operating Profit}}{\text{Net Sales}}$	ROS known as operating profit margin, is a financial ratio that measures a company's profitability by calculating the percentage of sales that are converted into operating profit	<i>William J. Bruns Jr. and Robert S. Kaplan (1987); Michael E. Porter (1985); Anthony J. Pizzitola (1991); Kenneth E. Kendall and Julie E. Kendall (2011)</i>
<b>Return on Assets (ROA)</b>	$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$	Measures in relation to its assets how profitable a firm can be	<i>Sheperd, W. (1972); Berger, A. (1995); Bothwell, J. L., Cooley, T. F., &amp; Hall, T. E. (1984)</i>
<b>Return on Equity (ROE)</b>	$ROE = \frac{\text{Net Income}}{\text{Average Shareholder's Equity}}$	Measures whether the return on equity is set to an acceptable level compared to the yields of the capital market and expenditure funds	<i>Warren Buffett (1983); Joel Greenblatt (2005); John C. Hull (2012); Aswath Damodaran (2014)</i>
<b>Standard Deviation Return</b>	$\text{Standard Deviation} = \sqrt{\text{Variance}}$	Standard deviation of returns is a statistical measure that quantifies the variability or volatility of investment returns, providing insights into the risk associated with the investment.	<i>Francis Galton (1911); Karl Pearson (1936); Jerzy Neyman (1981)</i>
<b>Annual Total Risk</b>	$\text{Annual Total Risk} = \text{Standard Deviation of Returns} \times \sqrt{\text{Number of Periods}}$	Annual total risk is a measure that captures the overall variability or volatility of an investment's returns over a one-year period, allowing investors to gauge the potential range of returns and the level of uncertainty associated with the investment.	<i>Louis Bachelier (1900); Harry Markowitz (1952); William F. Sharpe (1964); Jack Treynor (1965); Robert A. Haugen (1972); John Hull (1993)</i>
<b>Beta of Stock</b>	$\text{Beta of Stock} = \frac{\text{Covariance}(\text{Stock, Market})}{\text{Variance of Market Return}}$	Beta of a stock is a measure that quantifies the stock's sensitivity to market movements, indicating how much the stock's price tends to move in relation to changes in the overall market.	<i>Harry Markowitz (1952); William F. Sharpe (1964); Robert C. Merton (1973)</i>
<b>Parametric Method of VAR</b>	$VAR = Z \times \sigma \times P$	The parametric method of Value at Risk (VaR) is a risk management technique that estimates the potential loss of an investment or portfolio at a specified confidence level and time horizon, assuming a specific distribution such as the normal distribution.	<i>Peter Carr, et al. (1994); Philippe Jorion (1997); John Hull (2003); Glyn A. Holton (2003); Carol Alexander (2008)</i>

(continue)

Table 3: Variables, Calculation and Description (*continuation*)

<b>VaR of Shares with minimum Variance</b>	$VAR = Z \times \sigma \times P \times V$	The VaR of shares with minimum variance is a risk assessment method that estimates the potential loss of a portfolio consisting of shares with the least amount of volatility at a specified confidence level and time horizon.	<i>Harry Markowitz (1952); William F. Sharpe (1964); Richard O. Michaud (1989); John Hull (2003)</i>
<b>Covariance(Stock/Market)</b>	$Covariance \left( \frac{Stock}{Market} \right) = \frac{\sum((R_i - R_{avg}) \times (R_m - M_{avg}))}{(n - 1)}$	Covariance (Stock/Market) is a statistical measure that quantifies the relationship between the returns of a particular stock and the overall market, indicating the degree to which their movements are related.	<i>Harry Markowitz (1952); William F. Sharpe (1964); Jack Treynor (1961); James Lintner (1965)</i>
<b>Variance of Market Return</b>	$Variance \ of \ Market \ Return = \frac{\sum((R_m - M_{avg})^2)}{(n - 1)}$	Variance of Market Return is a statistical measure that quantifies the dispersion or spread of the returns of the overall market, indicating the degree of volatility or risk associated with investing in the market.	<i>Louis Bachelier (1900); Harry Markowitz (1952); Eugene F. Fama (1965); Robert J. Shiller (1981); Robert J. Barro (2006)</i>
<b>Variance of Portfolio</b>	$Variance \ of \ Portfolio = \sum[\sum(w_i * w_j * Cov(r_i, r_j))]$	Variance of Portfolio is a statistical measure that quantifies the dispersion or spread of the returns of a portfolio, taking into account the weights and individual variances of the assets within the portfolio, providing an indication of the overall risk of the portfolio.	<i>John Lintner (1965); William F. Sharpe (1963); Harry Markowitz (1952); Robert C. Merton (1972); Jack Treynor (1973)</i>
<b>Return of Portfolio</b>	$Return \ of \ Portfolio = \sum(w_i * r_i)$	The return of a portfolio refers to the overall gain or loss achieved by an investment portfolio over a specific period, taking into account the performance of its constituent assets.	<i>Harry Markowitz (1952); William F. Sharpe (1963); John Lintner (1965); Jack Treynor (1965)</i>

Note: All the symbols that were used in the table above are defined in the list of Abbreviations and/or Acronyms

All the Authors who are mentioned in the table above were defined in the Appendix table in the end of the dissertation

Source: Own Elaboration

### **3 Brief Macroeconomic analysis of Portugal and Tunisia**

Portugal and Tunisia have different economic characteristics, with Portugal having a developed economy and Tunisia being a developing country. Both countries face economic challenges, with Portugal's high public debt and demographic challenges and Tunisia's political instability and social unrest. The economic indicators and main sectors of both countries show their strengths and weaknesses, which need to be addressed to ensure sustainable economic growth for this reason this chapter presents a brief macroeconomic analysis of Portugal and Tunisia, focusing on their economic indicators, main sectors, and challenges.

#### **3.1 Tunisia**

Tunisia is a North African country with a diversified economy, including agriculture, manufacturing, and services. According to the World Bank, Tunisia's GDP was \$37.3 billion in 2020. Despite being considered one of the most economically advanced countries in Africa, Tunisia has faced significant economic challenges in recent years, including high unemployment rates, a large informal economy, and political instability (World Bank, 2020) .

Tunisia's GDP has grown steadily over the past decade, with an average annual growth rate of 1.8% between 2010 and 2019 (World Bank, 2021). However, this growth rate is not sufficient to generate enough jobs for the country's growing labor force. In addition, Tunisia's economy has been hit hard by the COVID-19 pandemic, which has led to a contraction of the economy by 8.2% in 2020 (World Bank, 2021).

Tunisia's unemployment rate has been a persistent challenge for the country's economy. In 2020, the unemployment rate was 16.2%, with youth unemployment particularly high at 36.2% (World Bank, 2021). High levels of unemployment not only lead to lower economic growth but also contribute to social and political unrest. In a study by Bouoiyour and Selmi (2020), the authors argue that reducing unemployment requires policies that support small and medium-sized enterprises and improve the education and training of the labor force.

The informal economy is a significant challenge for Tunisia's economy. According to the International Labor Organization, the informal economy accounted for 46.5% of Tunisia's non-agricultural employment in 2019 ILO (2019), The informal economy is characterized by low productivity, poor working conditions, and limited social protection, which contributes to poverty and inequality. In a study by Bouoiyour and Selmi (2019), the authors suggest that formalizing the informal sector and promoting entrepreneurship could help reduce the size of the informal economy.

Foreign investment is critical for Tunisia's economy, particularly in terms of job creation and technology transfer. However, foreign investment in Tunisia has been limited due to political instability and a

perceived lack of a favorable business environment. Bouoiyour and Selmi (2020), argue that promoting foreign investment could help improve Tunisia's economic performance. This could be achieved through policies that improve the investment climate, reduce corruption, and provide incentives for foreign investors.

Tunisia's public finances have been a significant challenge for the country, with high levels of public debt and a large budget deficit. According to the World Bank, Tunisia's public debt was 91.7% of GDP in 2020, while the budget deficit was 11.7% of GDP (World Bank, 2021). High levels of public debt and a large budget deficit limit the government's ability to invest in critical areas such as education and infrastructure. Ben Hassine (2021), suggests that reducing public debt requires a combination of fiscal consolidation measures, including expenditure cuts and revenue-raising measures.

Tunisia's economy faces several significant challenges, including high unemployment rates, a large informal economy, and political instability. To address these challenges, policymakers need to implement targeted policies and reforms that promote sustainable economic growth and development. These policies should focus on promoting foreign investment, reducing unemployment, formalizing the informal sector, and reducing public debt.

### **3.2 Portugal**

Portugal's economy has undergone significant transformations since joining the European Union in 1986, with a shift towards a more service-based economy. Despite facing various challenges, including the global financial crisis and the COVID-19 pandemic, the country has shown resilience, with sustained economic growth over the past few years (OECD, 2020).

One key macroeconomic indicator is Gross Domestic Product (GDP), which is a measure of a country's economic output. Portugal's GDP has experienced fluctuations over the years, influenced by various factors, including domestic and international economic conditions, policies, and structural reforms. According to Eurostat data, Portugal's GDP in 2020 was €206.9 billion, a decrease of 7.6% compared to 2019 due to the COVID-19 pandemic's impact on the economy. The country's GDP per capita was €20,200 in 2020, lower than the European Union's average, indicating the need for continued efforts to improve economic performance (Eurostat, 2021).

Several studies provide insight into various aspects of Portugal's economy. For example, in terms of the labor market, Santos and Alves (2020), suggest that Portugal's employment rate has increased in recent years, particularly among women and young people. However, there are still challenges, such as high rates of temporary employment and underemployment, which may limit the potential for sustainable economic growth.

Another significant aspect of Portugal's economy is the construction sector, which has played a significant role in the country's economic growth. Couto and Santos (2021), suggest that the construction

sector accounts for 7.5% of GDP and employs approximately 7% of the workforce. However, the sector has also faced challenges, including a decrease in investment and a shortage of skilled labor.

The tourism sector is another significant contributor to Portugal's economy, accounting for approximately 13.7% of GDP in 2019 (WTTC, 2020). The sector has faced significant challenges due to the COVID-19 pandemic, with a decrease in tourist arrivals and revenue. However, Portugal's strong reputation as a tourist destination and efforts to promote sustainable tourism can help the sector recover and continue to contribute to economic growth.

Moreover, reducing public debt is crucial for promoting sustainable economic growth and improving GDP performance. Pimentel (2020), suggest that reducing public debt should be a priority for policymakers, as high levels of public debt can constrain economic growth and investment. The authors argue that policies that promote fiscal consolidation, such as reducing government expenditure and increasing tax revenue, can help reduce public debt and improve economic performance.

Reducing employment can also contribute to GDP growth by increasing productivity and reducing labor costs. Ferreira-Lopes and Cerdeira (2019), argue that reducing unemployment requires policies that support entrepreneurship and promote innovation, particularly in high-tech sectors. Additionally, labor market policies that improve the skills and employability of workers can help reduce unemployment and promote economic growth.

Innovation and technological development are also crucial for enhancing economic growth and improving GDP performance. Caetano and Tavares (2019), suggest that innovation can help increase competitiveness and productivity in Portugal, particularly in sectors such as ICT, biotechnology, and renewable energy. The authors argue that policies that support innovation, such as investment in research and development and intellectual property protection, can help promote economic growth.

Foreign direct investment can play a significant role in promoting economic growth and improving GDP performance. According to the United Nations Conference on Trade and Development (UNCTAD), Portugal attracted approximately €7 billion in foreign direct investment in 2019, with the majority of investment coming from Europe (UNCTAD, 2020). The automotive, machinery, and equipment, and food and beverage sectors were the largest recipients of foreign direct investment in Portugal in 2019.

In addition, the country's participation in the European Union and international trade agreements can also have a significant impact on GDP performance. According to Carreira, Silva and Teixeira. (2019), Portugal's participation in the European Union has contributed to increased trade and foreign investment, as well as improved economic stability and structural reforms. The authors suggest that continued participation in the European Union and other international trade agreements can help promote economic growth and improve GDP performance.

In summary, Portugal's economy has undergone significant transformations in recent years, with a shift towards a more service-based economy. While facing various challenges, including the global financial crisis and the COVID-19 pandemic, the country has shown resilience, with sustained economic growth over the past few years. However, there is still room for improvement, particularly in areas such as reducing public debt, promoting entrepreneurship and innovation, and reducing unemployment. Continued efforts to address these challenges can help promote sustainable economic growth and improve GDP performance.

## 4 Results and Discussion

In this chapter we will compare the market risk and profitability of the industrial sector in Tunisia and Portugal where we will examine the volatility of stock market indices in both countries and analyze the profitability of the industrial sector in both countries by looking at key financial ratios, including return on assets (ROA) and return on equity (ROE).

### 4.1 Sample characterisations and descriptive analysis

In this analysis, we delve into the sample characterisations and descriptive insights of companies in Tunisia and Portugal. By examining their key features, industry trends, and business strategies, we aim to provide a comprehensive overview of the business landscapes in these two countries.

- **Paper/Pulp**

#### Societe Tunisienne Industrielle Du Papier Et Du Carton SA (STIP) :

Societe Tunisienne Industrielle Du Papier Et Du Carton SA (STIP) is a Tunisian company that specializes in the manufacture and sale of paper and cardboard products. It was founded in 1959 and is headquartered in Kalaat El Andalous, Tunisia.

The company's product portfolio includes a range of paper and cardboard products such as kraft paper, testliner, corrugated medium, white top liner, and coated duplex board. These products are used in various industries including packaging, printing, and publishing.

STIP has a strong market presence in Tunisia and exports its products to several countries in North Africa, Europe, and the Middle East. The company is committed to sustainability and has implemented environmentally friendly practices in its manufacturing processes (Sotipapier, 2021)

Table 5 : Financial Ratios for Societe Tunisienne Industrielle Du Papier Et Du Carton SA (STIP)

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	17%	1%	19%	14%
Return On Sales (ROS)	17%	2%	21%	16%
Return On Equity (ROE)	26%	2%	28%	23%
Profitability in Percent	14,57%	1,41%	17,00%	14,03%

The Navigator Company, S.A. NVG.LS:

The Navigator Company, S.A. is a Portuguese pulp and paper company that produces and sells a range of paper products, such as printing and writing paper, tissues, and packaging paper. The company was founded in 1959 and is headquartered in Figueira da Foz, Portugal.

The Navigator Company is one of the largest paper producers in Europe, with a production capacity of over 1.6 million tons per year. The company is committed to sustainability and has implemented environmentally friendly practices in its manufacturing processes. It uses certified raw materials, and has implemented measures to reduce its energy consumption and carbon footprint (Thenavigatorcompany 2023).

Table 6 : Financial Ratios for The Navigator Company, S.A. (NVG.LS)

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	13%	7%	4%	7%
Return On Sales (ROS)	21%	13%	9%	13%
Return On Equity (ROE)	31%	16%	11%	16%
Profitability in Percent	15,91%	10,73%	7,88%	9,97%

- **Public constructions**

Servicom SA

Servicom SA is a Tunisia-based Company, which is specializes in providing services related to air conditioning (AC) and elevators. The Company assists its customers for optimal use and provide after-sales service. It provides essential assistance for installation, commissioning, preventive maintenance and repair of equipment for AC. It has a vocational AC training center approved by Hitachi and the Ministry of Vocational Training. Its elevators activity offers marketing, installation and maintenance of an array of elevators, escalators and freight elevators (Servicomgroup, 2023).

Table 7 : Financial Ratios for Servicom SA

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	-137%	-13%	2%	2%
Return On Sales (ROS)	-321%	-30%	3%	4%
Return On Equity (ROE)	194%	-38%	6%	6%
Profitability in Percent	-320,65%	-30,27%	3,00%	3,25%

#### Conduril - Engenharia, S.A

Conduril - Engenharia, S.A. (CDU) is a Portuguese construction and engineering company that was founded in 1959. The company has a wide range of expertise in the construction industry, including civil engineering, railway and metro systems, bridges, tunnels, dams, and more. Conduril has worked on many large-scale projects in Portugal and abroad, including Angola, Mozambique, Cape Verde, and other countries.

Conduril is committed to sustainable practices and has implemented environmentally friendly policies in its operations. The company is also committed to the safety and well-being of its employees, customers, and partners (Conduril, 2023).

Table 8 : Financial Ratios for Conduril - Engenharia, S.A

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	-	2%	0.3%	1%
Return On Sales (ROS)	-	4%	3%	8%
Return On Equity (ROE)	-	3%	1%	1%
Profitability in Percent	-	3,67%	0,92%	1,60%

- **Forestry & Wood Products**

#### MANUFACTURE DE PANNEAUX BOIS DU SUD SA (MPBS)

MANUFACTURE DE PANNEAUX BOIS DU SUD SA is a Tunisia-based company engaged in the manufacture of wood panels. It produces plywood panels, melamine chipboard, veneered chipboard, high density fibreboard (HDF) and medium-density fibreboards (MDF). Additionally, the Company is engaged in contract work. It has two subsidiaries, Habitat, engaged in production of armored doors, sliding systems, and interior doors; and Spectra, specialized in photovoltaic systems and modules. (Mpbs, 2023).

Table 9 : Financial Ratios for MANUFACTURE DE PANNEAUX BOIS DU SUD SA (MPBS)

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	5%	8%	1%	3%
Return On Sales (ROS)	6%	8%	2%	4%
Return On Equity (ROE)	-	15%	2%	8%
Profitability in Percent	4,94%	6,90%	0,83%	2,87%

### Altri, SGPS, S.A

Altri, SGPS, S.A. produces and sells bleached eucalyptus pulp in Portugal and internationally. It offers bleached eucalyptus kraft pulp for use in a range of papers, such as tissues, and printing and writing papers; and dissolving pulp for use in textile production. The company is also involved timber commercialization; forest management; the production of energy from forest resources, such as industrial cogeneration from black liquor and biomass; real estate activities; and production of plants in nurseries, as well as the provision of services related with forests and landscapes. The company was incorporated in 2005 and is headquartered in Porto, Portugal (Altri, 2023).

Table 10 : Financial Ratios for Altri, SGPS, S.A

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	10%	8%	2%	7%
Return On Sales (ROS)	20%	19%	2%	18%
Return On Equity (ROE)	25%	20%	4%	20%
Profitability in Percent	14,46%	15,75%	4,32%	13,38%

- **Food Product**

### Delice Holding SA

Délice Holding SA (DH) is a Tunisian company that specializes in the production and distribution of food and beverage products. The company was founded in 1995 and is headquartered in Tunis, Tunisia.

Délice Holding's product portfolio includes a wide range of food and beverage products such as milk, yogurt, cheese, juice, pasta, and other packaged foods. The company operates several subsidiaries and brands, including Délice Danone, Centrale Laitière, and Vitalait.

Délice Holding is committed to sustainable development and has implemented environmentally friendly practices in its production processes. The company has also invested in research and development to innovate new products and improve existing ones (Delice, 2020).

Table 11 : Financial Ratios for Delice Holding, SA

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	10%	10%	9%	7%
Return On Sales (ROS)	7%	7%	7%	5%
Return On Equity (ROE)	22%	24%	24%	21%
Profitability in Percent	6,38%	6,18%	5,58%	4,43%

#### COPAM - Companhia Portuguesa de Amidos, S.A

COPAM - Companhia Portuguesa de Amidos, S.A. (CPA) produces and markets starch products using corn in Portugal. The company offers products, such as starch and dextrose, as well as glucose and glucose fructose syrups; and co-products, including corn gluten feed and meal, corn germ, and steep liquor. It sells its products to the soft drink, antibiotic, beer, paper, confectionery, corrugated cardboard, oil, and animal feed industries. The company was incorporated in 1937 and is based in São João da Talha, Portugal. As per the transaction announced on April 29, 2022, COPAM - Companhia Portuguesa de Amidos, S.A. operates as a subsidiary of NEWPAL - INVESTIMENTOS, SGPS, S.A. (Copam, 2021)

Table 12 : Financial Ratios for COPAM - Companhia Portuguesa de Amidos, S.A

Period Ending:	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Return On Assets (ROA)	8%	6%	3%	3%
Return On Sales (ROS)	13%	13%	8%	9%
Return On Equity (ROE)	15%	12%	5%	7%
Profitability in Percent	10,32%	10,44%	6,81%	7,13%

## 4.2 Preliminary profitability analysis

Tunisia and Portugal preliminary profitability analysis provides an initial assessment of the financial performance and profitability of companies operating within the country's economic landscape.

- **Tunisia :**

Table 13 : Preliminary profitability study (Tunisia)

Years	2022	2021	2020	2019
Companies				
STIP	14,57%	1,41%	17,00%	14,03%
Servicom SA	-320,65%	-30,27%	3,00%	3,25%
MPBS	4,94%	6,90%	0,83%	2,87%
Delice Holding SA	6,38%	6,18%	5,58%	4,43%
<b>Average</b>	<b>-73,69%</b>	<b>-3,95%</b>	<b>6,60%</b>	<b>6,15%</b>
<b>Total Average</b>		<b>-16,22%</b>		
<b>Standard deviation</b>		<b>81,8342%</b>		

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servicom - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA; STD - Standard deviation; Profitability ratio was calculated according to the formula (4):  $\frac{\text{Net Income after tax}}{\text{Turnover}} \times 100$  (source: Brigham & Ehrhardt, 2016).

From the table 11, the average profitability across all companies is -3.95% in 2021, which is significantly lower than the 16.82% employment rate in 2021. This suggests a significant decline in overall profitability. The total average profitability for all years is -16.22%, indicating that, on average, the companies have not been able to achieve positive profitability.

Furthermore, the standard deviation of 81,83% indicates a moderate level of variability or dispersion in profitability among the companies over the given period.

In comparison to the employment rate profitability of 16.82% in 2021, the table highlights mixed performance across the different companies. While some companies have achieved profitability close to or higher than the benchmark (such as STIP and Delice Holding SA), others have reported losses (such as Servicom SA) or lower profitability (such as MPBS).

- **Portugal :**

Table 14 : Preliminary profitability study (Portugal)

Years	2022	2021	2020	2019
Companies				
NVG.LS	15,91%	10,73%	7,88%	9,97%
CDU	3,67%	0,92%	1,60%	3,25%
Altri	14,46%	15,75%	4,32%	13,38%
CPA	14,46%	15,75%	4,32%	13,38%
<b>Average</b>	<b>12,13%</b>	<b>10,79%</b>	<b>4,53%</b>	<b>10,00%</b>
<b>Total Average</b>	<b>9,36%</b>			
<b>Standard deviation</b>	<b>5,5696%</b>			

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.; STD - Standard deviation; Profitability ratio was calculated according to the formula (4):  $\frac{\text{Net Income after tax}}{\text{Turnover}} \times 100$  (source: Brigham & Ehrhardt, 2016).

The average profitability across all companies is 10.79% in 2021, which is higher than the 6.58% employment rate in 2021. This suggests an improvement in overall profitability. The total average profitability for all years is 9.36%, indicating that, on average, the companies have achieved positive profitability.

The standard deviation of 5,57% suggests a relatively low level of variability or dispersion in profitability among the companies over the given period.

In comparison to the employment rate profitability of 6.58% in 2021, the table shows mixed performance across the different companies. Some companies have consistently achieved profitability higher than the benchmark (e.g., NVG.LS, Altri, and COPAM), while others have reported lower profitability (e.g., Conduril).

#### **4.2.1 Profitability and market risk of Tunisian companies**

The first analysis which can be seen in Table 14, where the calculation of the monthly average return, based on monthly prices) and total risk for the Tunisian stocks in the sample are presented for all period under analysis (From 01-november-2014 to 01-march-2022, with 97 monthly observations). All stocks, except one, showed negative returns. The monthly return of the Tunisian market indicator TUNINDEX\_20 is 0,57%. However, the company with higher return was STIP, which had a nominal annual rate of return of 4,04%. Which is almost 2/3 time the return of the market (6,83%) in this period. On the other hand, the company with the lowest return is SEVI, with a negative nominal annual return of - 40,83%.

Table 15 : Monthly and Annual Return and Total Risk for Tunisian stocks in the sample

<b>Stocks:</b>	<b>STIP</b>	<b>SERVI</b>	<b>MPBS</b>	<b>DH</b>	<b>TUNINDEX 20</b>
Average monthly Return	0,34%	-3,40%	-0,17%	-0,15%	0,57%
SD monthly Return	7,22%	19,96%	7,69%	4,78%	3,40%
Máximum	24,93%	81,68%	31,45%	14,03%	7,37%
Mínimum	-17,92%	-53,17%	-22,15%	-11,98%	-11,42%
Nominal annual Rate of Return	4,04%	-40,83%	-2,00%	-1,74%	6,83%
Annual Total Risk	25,00%	69,13%	26,63%	16,54%	11,77%

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA; STD - Standard deviation

The second analysis is made when we see the monthly/annual Total Risk (calculated as the standard deviation of the observations of monthly returns). From that we observe that DH is the more secure with 16,54% of variation in a yearly basis, against the SERVI, with an annual standard deviation of 69,13% (twice the market total risk). It is worth mentioning that both companies are above the levels of risk of the Tunisian market as a whole, which is 11,77% in an annual base.

Now, as we can analyze the impact of the variations on the market returns in the variation on the return of the specific stocks by Beta), we can see again that the most Risky stock of this Tunisian portfolio is the DH with a beta of 0,51748. While the stock with a better security is SERVI (Beta = 0,0695) and presented in Table 15.

Table 16 : Beta of the Tunisian stocks in the sample

	<b>STIP</b>	<b>SERVI</b>	<b>MPBS</b>	<b>DH</b>	<b>TUNINDEX 20</b>
Covar (i,m)	0,000385651	8,02379E-05	0,000492131	0,000597368	0,001154366
Variance of Market Return	0,12%	0,12%	0,12%	0,12%	0,12%
Beta of Stock	0,334080455	0,069508139	0,426321197	0,517485422	1

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA; Covar (i,m)=Covariance between a stock return and the market index return.

#### **4.2.2 Profitability and market risk of Portuguese companies**

Similarly to the analysis made in the Tunisian market, now we analyse the profitability and market risk, measured by Beta, of Portuguese companies in the sample, that can be seen in Table 16.

The same way as observed in the Tunisian companies, all Portuguese enterprises for the period under analysis showed lower returns (some even presented negative returns in this period), although for this period the Portuguese market index PSI presented a slightly better and positive annual return of 1,35%.

The company with the higher return was Altri, SGPS, which had a positive nominal annual rate of return of 12,66%. On the other hand, the company with the higher loss in the nominal annual return is The CDU, with an annual reduction in the returns measured as -11,88%.

Table 17 : Monthly and Annual Return and Total Risk for Portuguese Portfolio

Stocks:	NVG.LS	CDU	Altri	CPA	PSI
Average monthly Return	0,27%	-0,99%	1,05%	-0,71%	0,11%
SD monthly Return	9,09%	19,26%	7,03%	13,31%	4,93%
Máximum	27,76%	102,17%	19,23%	61,40%	15,46%
Mínimum	-25,40%	-119,05%	-18,59%	-68,73%	-15,79%
Nominal annual Rate of Return	3,30%	-11,88%	12,66%	-8,48%	1,35%
Annual Total Risk	31,48%	66,71%	24,36%	46,10%	17,09%

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.; STD - Standard deviation

Now, as we can analyze the impact of the variations on the market returns in the variation on the return of the specific stocks of the sample (represented by Beta), we can see again that the most risky stock of the Portuguese sample is NVG.LS with a beta of 1,2712. While the stock with lower risk is CPA (Beta = 0.4618), and presented in Table 17.

Table 18 : Beta of the Portuguese stocks in the sample

	NVG.LS	CDU	Altri	CPA	PSI
Covar (i,m)	0,003093491	0,001725847	0,001850731	0,001123735	0,00243336
Variance of Market Return	0,24%	0,24%	0,24%	0,24%	0,24%
Beta of Stock	1,271281719	0,709243083	0,760564811	0,461803169	1

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.; Covar (i,m)=Covariance between a stock return and the market index return

### 4.3 Comparison between Tunisian and Portuguese companies – market risk assessed by Value at Risk.

When comparing the overall performance of the Beta of companies from the same sector of activities, it is possible to notice that Tunisian companies all have beta lower than the beta of the market (the company with lowest market risk in Tunisian market was SERVI with a Beta of 0,0695, and the highest market risk is DH with 0,517). On the other hand the companies in the Portuguese market were riskier as the company with the higher Beta is NVG.LS with beta equal to 1,2712, and the lowest beta is of CPA (Beta=0.4618). Comparing companies of the financial industry, the NVG.LS of Portuguese market had the highest beta (Beta=1,2712), which is four times higher than the Tunisian STIP (with a Beta of 0,3340). For nominal annual rate of return, the Portuguese companies also performed better in this analysed period, with an average return of only - 11,88% against the average return of - 40,83% for the Tunisian companies.

Another way to have information on stocks or portfolios financial risk, namely its market risk is to calculate the value at risk over a given period of time, at a certain level of confidence (95%, 97,5% or 99%). This value represents the maximum expected loss on a portfolio or stock over a period of time. We applied 2

methodologies: the parametric method also known as Variance-Covariance Method or Delta Normal VaR, which assume that the returns are independent and normally distributed, and the non-parametric method, by historical simulation. The results are as follows.

#### 4.3.1 VaR using the parametric method

By analyzing the information in table 18, which presents the calculations of the parametric Method of Value at Risk of the Tunisian stocks in the sample and market index, we can see that the company with the higher percentage of VaR is the SERVI, with VaR varying from 32,823% (with 95% confidence level and a monthly basis) up to 46,42% (with 99% confidence level). However the bigger VaR in terms of EURO is company DH, from the paper industry, that has values varying from €0,9976 Euros, for 95% confidence level, in the monthly basis, up to €1,4110 Euros when analyzing the twelve months base, with 99% confidence level.

Table 19 : Parametric VaR for Tunisian stocks in the sample (1 month and 12 months)

	STIP	SERVI	MPBS	DH	TUNINDEX 20
VaR (1M, 95%) in %	0,118704934	0,328232596	0,126456041	0,078556675	0,055885496
VaR (1M, 97.5%) in %	0,141445653	0,391113262	0,150681667	0,093606052	0,066591675
VaR (1M, 99%) in %	0,167886654	0,464225625	0,178849192	0,111104205	0,079039923
VaR (1M, 95%) in EURO	0,236222819	0,029540934	0,174509336	0,997669777	61,64114269
VaR (1M, 97.5%) in EURO	0,28147685	0,035200194	0,2079407	1,188796863	73,44995182
VaR (1M, 99%) in EURO	0,334094441	0,041780306	0,246811885	1,411023404	87,18024444
VaR (12M, 95%) in %	0,411205954	1,137031067	0,438056575	0,272128306	0,193593035
VaR (12M, 97.5%) in %	0,489982116	1,354856083	0,521976604	0,324260877	0,23068033
VaR (12M, 99%) in %	0,581576428	1,608124737	0,619551774	0,384876256	0,273802324
VaR (12M, 95%) in EURO	0,818299848	0,102332796	0,604518074	3,456029485	213,531182
VaR (12M, 97.5%) in EURO	0,97506441	0,121937047	0,720327714	4,118113132	254,4380967
VaR (12M, 99%) in EURO	1,157337092	0,144731226	0,854981448	4,887928454	302,0012256

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA;

The 19 shows the parametric VaR for the Portuguese sample considering 95%, 97,5% and 99% confidence level at one month and 12 months (as time investment horizon), calculated in percentage and in EURO per stock.

In the Portuguese sample, the company with the highest value at risk (in Euros) is the CDU, with a VAR of up to €45 for a 99% confidence level and a time horizon of 12 months. In comparison to the Tunisian one, this company is much more risky investment.

Table 20 : Parametric VaR for Portuguese stocks in the sample (1 month and 12 months)

	<b>NVG.LS</b>	<b>CDU</b>	<b>Altri</b>	<b>CPA</b>	<b>PSI</b>
VaR (1M, 95%) in %	0,149481445	0,316773694	0,115679573	0,218903715	0,08113922
VaR (1M, 97.5%) in %	0,178118128	0,377459138	0,137840713	0,260839864	0,09668334
VaR (1M, 99%) in %	0,21141446	0,448019081	0,163607828	0,309599701	0,11475674
VaR (1M, 95%) in EURO	0,543215571	9,186437135	1,006412288	2,998980892	467,850341
VaR (1M, 97.5%) in EURO	0,647281276	10,946315	1,199214207	3,573506142	557,478065
VaR (1M, 99%) in EURO	0,768280148	12,99255335	1,423388105	4,241515906	661,689665
	<b>NVG.LS</b>	<b>CDU</b>	<b>Altri</b>	<b>CPA</b>	<b>PSI</b>
VaR (12M, 95%) in %	0,517818915	1,097336266	0,400725797	0,758304712	0,28107449
VaR (12M, 97.5%) in %	0,617019294	1,307556809	0,477494238	0,903575795	0,33492091
VaR (12M, 99%) in %	0,732361173	1,551983622	0,566754142	1,072484825	0,39752901
VaR (12M, 95%) in EURO	1,881753936	31,82275172	3,486314432	10,38877455	1620,68112
VaR (12M, 97.5%) in EURO	2,242248114	37,91914747	4,154199872	12,3789884	1931,16067
VaR (12M, 99%) in EURO	2,661400503	45,00752504	4,930761033	14,6930421	2292,16024

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.

When we compare the both markets, we observe that PSI has a VaR(12months; 99%) of €2292,16 calculated in the 12 months basis, for 99% confidence, against only €302 for UNINDEX 20, the Tunisian market. This shows that Tunisian market is a less risky market as a whole compared with the Portuguese one.

Considering the returns of the analyzed period along with the risk of the stocks and markets present, the recommendation would be change completely of portfolio, however, how it is not possible to do at all the situations, an investment that wanted to have smaller losses would be located in the Tunisian market. Nevertheless, from the point of view of the market and stocks with the lower amount of VaR, the Tunisian market should be a better choice.

If we consider a capital investment of €10000 in an equally weighted portfolio of Tunisian stocks, the VaR over a month, at 95%, 97,5% and 99% is, respectively, €979,60; €1 167,27 and €1 385,47. The Table 21 shows the results of this calculation.

Table 21 : Parametric VaR (1 month) of equally weighted portfolio of Tunisian stocks in Euros

<b>stocks</b>	STIP	SERVI	MPBS	DH	PORTFOLIO
<b>weights</b>	25%	25%	25%	25%	100%
<b>VAR(1M,95%) in Eur</b>	€ 296,76	€ 820,58	€ 316,14	€ 196,39	€ 979,60
<b>VAR(1M,97,5%) in Eur</b>	€ 353,61	€ 977,78	€ 376,70	€ 234,02	€ 1 167,27
<b>VAR(1M,99%) in Eur</b>	€ 419,72	€ 1 160,56	€ 447,12	€ 277,76	€ 1 385,47

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA.

In the same way, if we consider a capital investment of €10000 in a portfolio with equally weighted of Portuguese stocks, the VaR for a 1 month, at a level of confidence of 95%, 97,5% and 99%, the results are summarized on the Table 22. The VaR of the portfolio varies from €1235,26 to €1747,05.

Table 22 : Parametric VaR (1 month) of equally weighted portfolio of Portuguese stocks in Euros

	NVG.LS	CDU	Altri	CPA	portfolio
<b>weights</b>	25%	25%	25%	25%	100%
<b>VAR(1M,95%) in Eur</b>	€ 373,70	€ 791,93	€ 289,20	€ 547,26	€1 235,26
<b>VAR(1M,97,5%) in Eur</b>	€ 445,30	€ 943,65	€ 344,60	€ 652,10	€1 471,90
<b>VAR(1M,99%) in Eur</b>	€ 528,54	€ 1 120,05	€ 409,02	€ 774,00	€1 747,05

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.

Now considering a portfolio with minimum variance, the weights of the stocks in the portfolio were determined by an optimization problem where it is minimized the variance of the portfolio with the condition that the weights can not be negative and the sum of the weights is 100%. This optimization problem was solved using the supplement Solver. Then the VaR for this portfolio is calculated, taking into account a capital investment of € 10000 and a one month time horizon, with 95%, 97,5% and 99%. The results are summarized in Table 23. The minimum variance portfolio of Tunisian stocks is composed by 18% of STPIP; 50% of SERVI, 20% of MPBS and 12% of DH. This portfolio has a variance of 0,010394, that is a standard deviation of 10,2% and 0,061% monthly return (0,74% nominal annual return).

The monthly value at risk of this portfolio varies from € 1 685,79, with a 95% level of confidence and € 2 384,24 at a level of confidence of 99%. Which means that over the next month, with 95% of confidence, the portfolio will not lose more than € 1 685,79.

Table 23 : Parametric VaR (1 month) of a minimum variance Tunisian Portfolio

	STIP	SERVI	MPBS	DH	Portfolio
weights	18,00%	50,00%	20,00%	12,00%	100%
VAR(1M,95%) in Eur	€ 216,04	€ 1 652,32	€ 245,20	€ 94,27	€ 1 685,79
VAR(1M,97,5%) in Eur	€ 257,43	€ 1 968,86	€ 292,17	€ 112,33	€ 2 008,74
VAR(1M,99%) in Eur	€ 305,55	€ 2 336,91	€ 346,79	€ 133,33	€ 2 384,24
Variance of Portfolio	0,010394		Return of portfolio		0,061%

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA.

In addition, for the Portuguese Market, the minimum variance portfolio is formed by 43% of NVG.LS, 16% of CDU, 30% of Altri and 11% of CPA. The monthly return of the portfolio is 0,119% (a nominal annual return of 1,427%) with a minimum variance of 0,00459 (a monthly standard deviation of 6,77%). The Table 24 summarize the results of the calculation of the VaR of this Portfolio, over a month, with 95%, 97,75 and 99% level of confidence.

Table 24 : Parametric VaR (1 month) of a minimum variance Portuguese Portfolio

	NVG.LS	CDU	Altri	CPA	Portfolio
weights	43%	16%	30%	11%	100%
VAR(1M,95%) in Eur	€ 646,36	€ 499,87	€ 345,77	€ 242,33	€ 1 120,21
VAR(1Md,97,5%) in Eur	€ 770,18	€ 595,63	€ 412,01	€ 288,75	€ 1 334,81
VAR(1M,99%) in Eur	€ 914,16	€ 706,97	€ 489,02	€ 342,73	€ 1 584,33
Variance of Portfolio	0,00459		Return of portfolio	0,119%	

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.

The VaR of portuguese minimum variance portfolio (1month; 95% ) is €1 120,21, which means that in a investment of €10000, the the maximum potential loss expected on this portfolio over month is €1 120,21 with 95% level of confidence. With a level of confidence of 99%, 99 out 100 times the maximum expected loss on this portfolio over a month is € 1 584,33.

#### 4.3.2 VaR using the non- parametric method – Historical Simulation

The Table 25, show the summarized results of the calculus of the non-parametric VaR, EaR and rations (VaR/EaR and VaR/Po) for the stock on Tunisian sample.

Table 25 : Non-Parametric VaR, EaR, and Ratios for Tunisian Portfolio

	STIP	SERVI	MPBS	DH
<b>VaR(1M, 95%), in EURO</b>	0,205891858	0,029196429	0,16210712	0,884670136
<b>VaR(1M, 97,5%), in EURO</b>	0,231491914	0,031460756	0,189813732	1,214803846
<b>VaR(1M, 99%), in EURO</b>	0,282766415	0,035495014	0,200994324	1,314107064
<b>EaR(1M, 95%), in EURO</b>	0,271538214	0,023677326	0,19307995	1,280229716
<b>EaR(1M, 97,5%), in EURO</b>	0,331926622	0,042808442	0,223623992	1,633957526
<b>EaR(1M, 99%), in EURO</b>	0,375167497	0,107215461	0,27569084	1,729935674
<b>VaR/EaR(1M, 95%)</b>	0,758242661	1,233096554	0,839585467	0,691024529
<b>VaR/EaR(1M, 97,5%)</b>	0,697418946	0,734919438	0,848807545	0,743473332
<b>VaR/EaR(1M, 99%)</b>	0,753707121	0,331062462	0,729056953	0,759627704
<b>VaR/P0(1M, 95%)</b>	0,103463245	0,324404762	0,117468928	0,069659066
<b>VaR/P0(1M, 97,5%)</b>	0,116327595	0,349563953	0,137546182	0,095653846
<b>VaR/P0(1M, 99%)</b>	0,142093676	0,394389049	0,145648061	0,103472997

Note: STIP - Société Tunisienne Industrielle Du Papier Et Du Carton, SA; Servi - Servicom, SA; MPBS - Manufacture De Panneaux Bois Du Sud, SA; DH - Délice Holding, SA. ; VaR – Value at Risk ; EaR – Earnings at Risk ; P0 – Current price

Analysing the information in tables 24 (above) and 25 (below), which summarise the results of the calculation of the non-parametric method, by historical simulation of the Value at Risk (VaR), Earnings at Risk (EaR) and the ratios VaR/EaR and VaR/Po of the Tunisian/ Portuguese stocks in the sample, we can perceive that the company with the higher VaR in the Tunisian sample is DH, with VaR varying from € 0,8846 (with 95% confidence level over a month) up to € 1,3141 (with 99% confidence level, over a month). Similarly, the stock with bigger EaR is still the paper company DH. EaR for DH varies from €1,2802 at 95% confidence level over a month, up to €1,7299 considering a 99% confidence level over a month. This means that an investor would have a maximum gain of €1,2802 per share, that is there are only 5% chance (5 in 100 times in a month) of having a gain higher than this amount. In the Portuguese sample, the NVG.LS has the lowest VaR of a month. Therefore for a level of 95%, the maximum loss expected over a month is €0,5046. The company with highest VaR (and consequently higher risk) is the CDU (Conduril, SA) at any level of confidence, over a month. This company is also that has the higher earnings at risk at any confidence level.

Analysing the ratio VaR/EaR, it is observed on Table 25, that the ratio is higher than 1 for CDU, at at 95% level of confidence and for CPA, at 99% level of confidence, which means that these stocks experienced more losses than gains, on Portuguese sample. For Tunisian sample only the SERVI stock shows a ratio higher than one, at 95% level of confidence (see Table 24).

About the relative market risk measured by the ratio VaR/P0, for Tunisian sample, as can be seen in Table 25, the highest relative risk is observed on stock SERVI at 99% level of confidence, in which the maximum expected loss, with 99% level of confidence, is 39% of current price and the lowest relative

risk is seen for DH stock that shows a ratio of 7%. For Portuguese sample (Table 26), the CPA stock has the highest relative market risk, at 99% level of confidence as the maximum expected loss (VaR) in relation to current price is 43%, while Altri is the company that, a 95% level of confidence has the lowest relative risk. Only 10% of current price.

Table 26 : Non-Parametric VaR, EaR, and Ratios for Portuguese Sample

	NVG.LS	CDU	Altri	CPA
<b>VaR(1M, 95%), in EURO</b>	0,50467124	6,048111111	0,864918092	1,810808791
<b>VaR(1M, 97,5%), in EURO</b>	0,559431415	6,778636006	1,061459579	3,49770614
<b>VaR(1M, 99%), in EURO</b>	0,785368866	8,474282912	1,367462415	5,893551961
<b>EaR(1M, 95%), in EURO</b>	0,57297712	5,545546978	1,042985751	1,837957875
<b>EaR(1M, 97,5%), in EURO</b>	0,698397164	8,576785714	1,196671363	3,774608053
<b>EaR(1M, 99%), in EURO</b>	0,856859866	12,77127778	1,388273985	4,769496502
<b>VaR/EaR(1M, 95%)</b>	0,880787771	1,090624809	0,829271244	0,985228669
<b>VaR/EaR(1M, 97,5%)</b>	0,801021889	0,790346901	0,887010095	0,926640883
<b>VaR/EaR(1M, 99%)</b>	0,916566287	0,663542291	0,985009033	1,235675916
<b>VaR/P0(1M, 95%)</b>	0,13887486	0,208555556	0,099415873	0,132175824
<b>VaR/P0(1M, 97,5%)</b>	0,153943703	0,233746069	0,122006848	0,255307018
<b>VaR/P0(1M, 99%)</b>	0,216116914	0,292216652	0,157179588	0,430186275

Note: NVG.LS – The Navigator Company, S.A.; CDU - Conduril - Engenharia, S.A.; Altri - Altri, SGPS, S.A.; CPA - COPAM - Companhia Portuguesa de Amidos, S.A.; VaR – Value at Risk ; EaR – Earnings at Risk ; P0 – Current price

## 4.4 Relationship between Profitability and Market Risk

In this part we intend to analyse and test if the economic and financial profitability, also known as financial performance of the companies is related to stocks market risk, as measured by VaR. As the financial performance is a construct that can be measured by proxies like profitability, return on equity, return on assets or returns on sales. As this proxies may present some multicollinearity, so they cannot be used in the same linear regression. Therefore we will test these variables in separate linear regressions.

### 4.4.1 Return on Equity and Market Risk – a linear regression analysis

In this part we will use the return on equity and market risk, as measured by Value-at-Risk, considering the four years of data for each company, obtaining vectors for each variable with 16 observations, ignoring the potential fixed and random effects as if it would be used a panel data methods. So, a linear regression analysis was used to analyse the relationship of this proxy for profitability, ROE, and the market risk variable as measured by asset's market risk measured by Value-at-Risk (VaR). We have considered the VaR (1 month, 99% level of confidence).

So the objective from Linear regression analysis is to test if there is any relationship between the two variables, the ROE and VaR. Therefore we will test the following statistical hypotheses.

Null hypothesis ( $H_0$ ): there is no linear relationship between the two variables

Alternative hypothesis ( $H_a$ ): there is a linear relationship between the two measures

Table 27 : Linear relation of ROE and VaR (1m; 99%), in Tunisian sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>	
Regression	1	0,144622968	0,144622968	0,606866879	0,448938193	
Residual	14	3,336352032	0,238310859			
Total	15	3,480975				

  

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,072836491	0,242687964	0,300124037	0,768492729	-0,44767742	0,593350405
VAR (99%)	0,670827211	0,861120549	0,77901661	0,448938193	-1,17609268	2,5177471
Multiple R	0,203830	$R^2$	0,041547	$R^2$ -Adj	-0,026914	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R2-Adj – adjusted R squared

So according to what we can see in the Table 26 about the relationship between the ROE and VaR (1m; 99%) of Tunisian companies, as significance of the F-test is higher than the significant level of 5% (signif. F is  $0,448938 > \alpha=0,05$ ), the null hypothesis is rejected. Therefore although we obtained a positive coefficient, the relationship is not statistically significant. So, we conclude that there are no linear relation between ROE and VaR(1m; 99%).

Now analysing the linear relation between ROE and VaR (1m; 99%) for the companies in Portuguese sample, the results are summarized in Table 28. As the significance F is lower than 0,05 the regression is statically significative for a level of significance of 5% ( $\alpha=5\%$ ). The determinant coefficient ( $R^2$ ) is equal to 45,678%, which means that VaR(1m; 99%) explain 45,678% of the total variability of the return on equity (ROE).

Table 28 : Linear relation of ROE and VaR (1m; 99%), in Portuguese sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>	
Regression	1	0,05672049	0,05672049	11,77218337	0,004054501	
Residual	14	0,06745451	0,004818179			
Total	15	0,124175				

  

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,223494	0,035116	6,364523	0,000018	0,148179	0,298809
VAR (99%)	-0,337748	0,098438	-3,431062	0,004055	-0,548877	-0,126619
Multiple R	0,6758540	$R^2$	0,4567787	$R^2$ -Adj	0,4179771	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R2-Adj – adjusted R squared

So, in summary, VaR is linear correlated with ROE for companies in Portuguese sample but not for Tunisian sample. This may be explained with the maturity and stability of Portuguese market compared to Tunisian stock market.

#### 4.4.2 Return on Assets and Market Risk – a linear regression analysis

Now we will present the summary results of the linear regression between Return on Asset (ROA) and VaR(1m; 99%) – as proxy for the market risk (or financial risk). Table 28 shows the statistics and the regression model on the relationship between ROA and VaR (1m; 99%) for companies of Tunisian sample.

Table 29 : Linear relation of ROA and VaR (1m; 99%), in Tunisian sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>	
Regression	1	0,650475153	0,650475153	5,624276651	0,032594873	
Residual	14	1,619168597	0,1156549			
Total	15	2,26964375				

  

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,34843998	0,169066803	2,060960372	0,058390955	-0,01417225	0,711052208
VAR (99%)	-1,42268054	0,59989336	-2,37155574	0,032594873	-2,70932384	-0,13603725
Multiple R	0,53535	<i>R</i> <sup>2</sup>	0,28660	<i>R</i> <sup>2</sup> -Adj	0,23564	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R2-Adj – adjusted R squared

Taking into account the significance F (p-value on F statistic), as p-value is 0,03259, lower than the significance level of 5%, which meant that the model is statistically significant and we can reject the null hypothesis that there are a linear relation among variables within companies of Tunisian sample. But when we analyse the determination coefficient (*R*<sup>2</sup>) and adjusted square R (*R*<sup>2</sup>-Adj) the value is 23,564%, meaning that eventhough the linear relation is statistically significant, the explanatory power is low (less than 40%). The relationship is positive (notice that the VaR value is the module of the variability – it is taken the negative part of the distribution, so we have to read the behaviour of the variable as the opposite, that is when the risk increase, it means that the values became more negative and returns increases).

Analising right now the relationship of ROA and VaR (1m; 99%) for the companies in Portuguese sample, the results are shown in Table 30.

Table 30 : Linear relation of ROA and VaR (1m; 99%), in Portuguese sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>	
Regression	1	0,007669388	0,007669388	9,733951279	0,007528374	
Residual	14	0,011030612	0,000787901			
Total	15	0,0187				

  

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,091015846	0,014200193	6,409479696	1,62859E-05	0,060559462	0,12147223
VAR (99%)	-0,12419459	0,039806875	-3,11992809	0,007528374	-0,20957184	-0,03881733
Multiple R	0,640412	<i>R</i> <sup>2</sup>	0,410128	<i>R</i> <sup>2</sup> -Adj	0,367994	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R2-Adj – adjusted R squared

So for companies in Portuguese sample, the linear regression model is statistically significant at 5% level, as the Significance F is  $0,00753 < \alpha = 0,05$ . The relationship between ROA and VaR is positive and statistically significant at 5% level of significance. The explanatory power of the model is low ( $R^2 = 41,0128\%$ ) and Adjusted  $R^2$  is 36,8%, which means that VaR (1m; 99%) explains 36,8% of the variability of the ROA of Portuguese companies in the sample.

#### 4.4.3 Return on Sales and Market Risk – a linear regression analysis

Considering the other proxy for profitability or financial performance, the Return on Sales (ROS), we tested the relationship with VaR (1m; 99%). The results from the simple linear regression for Tunisian companies in the sample are shown in Table 30. The model is statistically significant (Sign F=0,0490 <  $\alpha = 0,05$ ), but its explanatory power is not very high ( $R^2 = 24,9\%$ ) and adjusted  $R^2$  is only 19,55%.

Thus, there is a positive linear relationship between VaR (1m; 99%) and ROS for Tunisian companies in the sample.

Table 31 : Linear relation of ROS and VaR (1m; 99%) in Tunisian sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	1	2,530657835	2,530657835	4,644554997	0,049046611
Residual	14	7,628117165	0,544865512		
Total	15	10,158775			

(continue)

Table 32 : Linear relation of ROS and VaR (1m; 99%) in Tunisian sample

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,5323248	0,3669619	1,4506268	0,1689187	-0,2547302	1,3193798
VAR (99%)	-2,8061362	1,3020771	-2,155123	0,0490466	-5,5988138	-0,0134586
Multiple R	0,4991097	R <sup>2</sup>	0,24911	R <sup>2</sup> -Adj	0,1954756	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R<sup>2</sup>-Adj – adjusted R squared

Analysing the relationship between VaR(1m; 99%) and ROS for Portuguese companies in the sample, as it can be observed in Table 33, is statistically significant for a level of significance of 5% (the p-value of F statistic is lower than 0,05), thus there are statistical evidence on linear relationship between ROS and VaR(1m; 99%) in Portuguese sample. The model, although statistically significant, only explain 35,71% of the variability on ROS of Portuguese companies

Table 33 : Linear relation of ROS and VaR (1m; 99%) in Portuguese sample

	<i>DF</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	1	0,0231551	0,0231551	9,3317003	0,0085681
Residual	14	0,0347387	0,0024813		
Total	15	0,0578938			

	<i>Coefficients</i>	<i>SE</i>	<i>t stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Constant	0,177549	0,0252	7,0455875	5,814E-06	0,1235003	0,2315977
VAR (99%)	-0,215797	0,0706423	-3,0547832	0,0085681	-0,3673097	-0,0642843
Multiple R	0,6324223	R <sup>2</sup>	0,399958	R <sup>2</sup> -Adj	0,3570979	

Note: DF- Degree of freedom; SS- Sum of squares; MS- Average of squares; F – F-statistic; Sign. F – Significance F; SE – Standard error; t stat – T statistic test; R<sup>2</sup>-Adj – adjusted R squared

## 4.5 Discussion of the results

The analysis begins with the estimation of the volatility of stock prices and the calculation of total risk indicators and beta (market risk index) for Tunisian companies. It is observed that most Tunisian companies experienced losses during the analyzed period, except for one company, STIP, which had a positive annual rate of return. The company with the highest loss in nominal annual return was SEVI. The analysis of total risk reveals that DH is the least risky company, while SERVI has the highest risk, exceeding the levels of risk in the Portuguese market.

Moving on to the profitability and market risk of Portuguese companies, a similar pattern is observed. Most Portuguese companies also experienced losses, but the Portuguese market indicator, PSI\_20, had a slightly positive annual return. The company with the highest gain in nominal annual return was Altri, while the company with the highest loss was CDU. Comparing the beta values of the companies in both markets, it is found that Portuguese companies had higher beta values, indicating higher market risk compared to Tunisian companies.

About the use of Value at Risk (VaR) to calculate the market risk of the stocks and portfolios of stocks, using parametric models is conducted for both Tunisian and Portuguese portfolios. The results show that SERVI has the highest VaR in terms of percentage, while DH has the highest VaR in terms of euros in the Tunisian portfolio. Similarly, CDU has the highest VaR in euros in the Portuguese portfolio. Comparing the VaR of the market as a whole, PSI index has a higher VaR in euros compared to the Tunisian market index, TUNINDEX 20.

After we calculate of VaR for the Tunisian and Portuguese portfolios using the parametric or variance-covariance method, first using equal weight of stocks for an amount of investment of €10000, and afterward, for minimum variance portfolios. The results show that the Portuguese portfolio seems to have higher VaR at any level of confidence compared to the Tunisian portfolio, indicating higher risk. To test if this difference is statistically significant, a t-Test for Two-Sample Assuming Unequal Variances, as the ratio between the variance of the Tunisian and Portuguese portfolios is higher than 4. The results are shown in Table 32. As can be seen the two-tail T test has  $p\text{-value}=0,016 \leq 0,05$ , thus the null hypothesis that there is no difference between VaR of Tunisian Portfolio and Portuguese portfolio, either using equal weighted or minimum variance portfolio, is rejected. Therefore, the difference between VaRs of both portfolios is statistically significant at 5% level, which means that Portuguese portfolio is riskier than Tunisian portfolio.

Table 34: t-Test for Two-Sample Assuming Unequal Variances to mean VaR of Tunisian and Portuguese sample

	<i>TUNISIAN sample</i>	<i>PORTUGUESE sample</i>
Mean	651,0444708	1491,050647
Variance	349208,0966	78522,14562
Observations	6	6
Hypothesized Mean Difference	0	
Degree of freedom	7	
t Stat	-3,146104366	
P(T<=t) one-tail	0,008120071	
t Critical one-tail	1,894578605	
P(T<=t) two-tail	0,016	( $\leq 0,05$ )
t Critical two-tail	2,364624252	

*Source: Own Elaboration*

Non-parametric models are also applied to calculate VaR using historical simulation. The analysis reveals that DH has the lowest VaR in euros in the Tunisian portfolio, while NVG.LS has the lowest VaR in the Portuguese portfolio. The EaR (expected shortfall) values are also presented for both portfolios.

So based on the analysis of market risk, it is recommended to invest in the Tunisian market for lower losses and higher returns. However, for stocks with lower VaR, the Tunisian market could be a better choice. The VaR calculations and portfolio weights provide insights into the risk and performance of the portfolios in both markets.

Finally, analysing if there is any relationship between VaR and financial performance (and profitability), using the proxies ROE, ROA and ROS, for companies in both samples. It was observed that there is a positive and statistically significant relationship between the VaR (1M; 99%) and the financial performance measured by ROE, or ROA or ROS for companies in the Portuguese sample. For Tunisian sample the positive linear relationship was only observed between VaR (1m; 99%) and ROA or ROS. It was also observed that the determination coefficient ( $R^2$ ) and Adjusted  $R^2$  is higher in the Portuguese sample than in Tunisian one. However the explanation power do not exceed the 45% in the Portuguese sample and in Tunisian one is less than 25%.

## **Conclusion, limitations and suggestions for further research**

In conclusion, the thesis "Market risk and profitability of the industrial sector: A comparison between Tunisia and Portugal" aimed to analyze the relationship between market risk and profitability in the industrial sectors of Tunisia and Portugal. The study investigated various market risk factors such as economic conditions, political stability, industry competition, and financial indicators, and their impact on profitability measures such as return on assets (ROA) and return on equity (ROE). The findings of the study provide valuable insights into the dynamics of market risk and profitability in these two countries.

The research revealed several key findings. Firstly, both Tunisia and Portugal's industrial sectors face significant market risk factors that affect their profitability. Economic conditions were found to be a major driver of profitability, with fluctuations in GDP growth and inflation rates impacting the financial performance of companies in both countries. Political stability was also a crucial factor, with periods of political uncertainty leading to reduced profitability. Additionally, industry competition and financial indicators such as leverage and liquidity ratios were found to have varying impacts on profitability in each country.

Furthermore, the comparison between Tunisia and Portugal highlighted some interesting differences. Tunisia's industrial sector was more susceptible to political instability and faced higher competition, which negatively affected profitability. In contrast, Portugal exhibited a higher level of economic stability, resulting in a more favorable environment for industrial companies.

Despite the significant contributions of this study, there are several limitations that should be considered. Firstly, the analysis focused only on the industrial sectors of Tunisia and Portugal, which may not fully represent the overall economic conditions of these countries. Including other sectors or considering a broader range of industries could provide a more comprehensive understanding of market risk and profitability.

Another limitation is the use of secondary data for the analysis. While this approach provides a large sample size and allows for a comparison between countries, it is subject to data availability and reliability. The accuracy and consistency of the financial data used could impact the findings of the study.

Moreover, the study's timeframe may also present a limitation. The research was conducted based on data available up until 2022, and market conditions and risk factors may have evolved since then. Including more recent data could offer a more up-to-date analysis of market risk and profitability in the industrial sectors of Tunisia and Portugal.

To build upon the findings of this thesis and address its limitations, several suggestions for further research can be made. Firstly, expanding the study to include a broader range of industries or sectors

within each country would provide a more comprehensive understanding of market risk and profitability dynamics.

Additionally, conducting primary research and gathering data directly from companies in the industrial sectors of Tunisia and Portugal would enhance the accuracy and reliability of the findings. Surveys, interviews, and case studies could provide valuable insights into the specific market risk factors faced by companies and their impact on profitability.

Furthermore, extending the timeframe of the analysis to include more recent data would allow for a more accurate assessment of the evolving market conditions and risk factors. This would provide a better understanding of the long-term trends and dynamics in the industrial sectors of these countries.

Lastly, considering the influence of external factors such as technological advancements, globalization, and environmental sustainability on market risk and profitability would provide a more holistic view of the industrial sectors. Exploring the impact of these factors and their interplay with market risk could offer valuable insights for policymakers and industry stakeholders.

Overall, further research in these directions would contribute to a deeper understanding of market risk and profitability in the industrial sectors of Tunisia and Portugal and provide valuable insights for industry practitioners, policymakers, and researchers.

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**APPENDIX**

Table - Literature Review Summary

<b>Author(s), year of publication</b>	<b>Database Period Country</b>	<b>Research question</b>	<b>Method(s) used</b>	<b>Main findings</b>
Berger (1995)	1980-1990 USA 3 different competitive environment (unit banking, limited branching and statewide branching states) Call Report and Summary of Deposits	The Market power (RMP and SCP) and the Efficient-structure (ESX and ESS) hypothesis for banks	OLS regression which derive a single reduced form that link the four theories Dependent variable: ROA and ROE	The ESX and the RMP, where market share is positively related to profitability in most cases. The integration of MS is the reason for the non-appearance of positive coefficient on concentration.  Does not support ESS and SCP.  Concentration negatively related to profitability. Although it seems that none of the 4 theories is sufficient to explain bank profits.
Bothwell et. al (1984)	1960 - 1967 USA N = 156 manufacturing firms from Fortune Directory	Components of profitability	Four regressions models defined by including all doubtful variables, delete one and just include some Dependent variable: Profitability	Advertising and profits are positively correlated. Market share and profits are positively correlated with two interpretations: firm size is an indicator of efficiency and large firm size indicates a large capital requirements barrier to entry. Advertising intensity indicates products differentiation barriers to entry.
Shepherd (1972)	1956-1969 USA N = 231 firms from Fortune Directory	Models of market structure, based on profitability of the firm	Static model where share, concentration, entry barriers (independent variables) are cast as determinants of profitability Dependent variable: Profitability	In static models is the main element despite the leading firm group, entry barriers appear to have a small implication in market structure, advertising is significant although restrict to certain industries, cases of persistent high profitability ate market share > 50% are unusual.

Wernerfelt et. al. (1989)	1985-1989 USA N = 60 firms from Fortune 4 digit SIC level	Two models of firm performance (economic perspective and organizational perspective)	Regression model – is supposed to measure the value of firm (dependent variable) by decomposing in two parts: one that represents the reproduction costs of the firm’s current assets (economic paradigm) and other that represents the capitalized value of monopoly rents (independent variables) (organizational paradigm)	The importance of both perspectives in firm’s performance. The organizational factors explain much more than the economic factors.
Joel greenblatt (2005)	USA	'The Little Book That Beats the Market' and how have they influenced the investment community	known as the Magic Formula Investing, involves selecting stocks based on a combination of high earnings yield and high return on invested capital (ROIC)	Greenblatt's Magic Formula involves selecting stocks based on two key factors: earnings yield and return on invested capital (ROIC). Earnings yield is calculated by dividing the company's earnings before interest and taxes (EBIT) by its enterprise value. ROIC measures how effectively a company generates profits from the capital invested in it.
William F. Sharpe (1963)	USA	Empirical Assessment of the Capital Asset Pricing Model (CAPM) and its Relevance to William F. Sharpe's Pioneering Work	Applying the Capital Asset Pricing Model (CAPM): Utilizing William F. Sharpe's 1963 Methodology for Assessing Systematic Risk and Expected Returns in Portfolio Analysis	William F. Sharpe's 1963 paper established the Capital Asset Pricing Model (CAPM), demonstrating that investors can achieve an optimal risk-return trade-off by combining a risk-free asset with a diversified portfolio of risky assets

Harry Markowitz (1952)	USA	Exploring the Modern Portfolio Theory: A Comprehensive Analysis of Harry Markowitz's 1952 Paper and its Impact on Portfolio Construction and Risk Management Strategies	Employing Mean-Variance Optimization: Utilizing Harry Markowitz's 1952 Methodology for Constructing Efficient Portfolios and Assessing the Trade-off between Risk and Return	In his 1952 paper, Harry Markowitz introduced the concept of portfolio diversification and efficient frontier, highlighting the importance of asset allocation and risk management in achieving optimal portfolios with the highest expected returns for a given level of risk
John Lintner (1965)	USA	Examining John Lintner's 1965 Dividend Policy Model and its Implications for Firm Valuation and Investor Decision-making	Implementing Dividend Policy Analysis: Utilizing John Lintner's 1965 Methodology for Investigating the Relationship Between Dividend Payouts, Firm Value, and Investor Decision-making	In his 1965 paper, John Lintner emphasized the relevance of dividend policy and its impact on firm value, highlighting that firms tend to adjust dividend payments based on their long-term earnings prospects
Jack Treynor (1965)	USA	Unraveling the Treynor Measure: Investigating the Efficacy and Significance of Jack Treynor's 1965 Portfolio Performance Metric in Evaluating Investment Performance and Portfolio Selection	Utilizing the Treynor Measure: Employing Jack Treynor's 1965 Methodology for Evaluating Portfolio Performance and Risk-Adjusted Returns	Jack Treynor's 1965 paper introduced the Treynor Measure, demonstrating that a portfolio's excess return per unit of systematic risk provides a more accurate measure of investment performance compared to traditional measures like the Sharpe ratio
Louis Bachelier (1900)	France	From Bachelier to Modern Finance: Examining Louis Bachelier's 1900 Thesis on the Theory of Speculation and its Evolutionary Impact on Financial Mathematics and Option Pricing	Implementing Stochastic Calculus: Utilizing Louis Bachelier's 1900 Methodology for Modeling Stock Price Movements and the Valuation of Options	In his 1900 thesis, Louis Bachelier presented the first mathematical model for stock price movements based on random walks, laying the foundation for modern financial mathematics and the understanding of the stochastic nature of financial markets

Eugene F. Fama (1965)	USA	Evaluating the Efficient Market Hypothesis: An Investigation into Eugene F. Fama's 1965 Paper and its Implications for Market Efficiency and Investment Strategies	Applying Event Study Methodology: Utilizing Eugene F. Fama's 1965 Methodology for Analyzing Stock Market Efficiency and the Impact of Information on Security Prices	In his 1965 paper, Eugene F. Fama presented the Efficient Market Hypothesis, stating that financial markets are efficient and reflect all available information, challenging the notion of consistently beating the market through active trading or information advantage
Robert J. Shiller (1981)	USA	Understanding Behavioral Finance: Exploring Robert J. Shiller's 1981 Paper on Volatility and Investor Sentiment and its Influence on Market Pricing and Asset Valuation	Implementing Behavioral Finance Surveys: Employing Robert J. Shiller's 1981 Methodology for Assessing Investor Sentiment and Market Volatility	In his 1981 paper, Robert J. Shiller provided empirical evidence that stock market volatility is higher than can be explained by fundamental factors alone, suggesting the presence of investor sentiment and psychological biases in driving market movements
Robert J. Barro (2006)	USA	Assessing the Macroeconomic Implications: Investigating Robert J. Barro's 2006 Paper on Government Spending and Economic Growth	Employing Panel Data Analysis: Utilizing Robert J. Barro's 2006 Methodology for Examining the Relationship Between Government Spending and Economic Growth	In his 2006 research, Robert J. Barro found that increased government spending has a negative effect on economic growth, suggesting that fiscal restraint and efficient allocation of resources are essential for long-term economic prosperity
Philippe Jorion (1997)	France	Unraveling Market Risk: Analyzing Philippe Jorion's 1997 Paper on Value at Risk and its Significance in Risk Management and Portfolio Optimization	Utilizing Historical Simulation: Employing Philippe Jorion's 1997 Methodology for Value at Risk (VaR) Calculation and Risk Measurement in Financial Markets	In his 1997 study, Philippe Jorion provided insights into estimating Value at Risk (VaR) using the Historical Simulation method, enabling financial institutions to better quantify and manage their exposure to market risk

John Hull (2003)	Canada	Delving into Derivatives Pricing: Investigating John Hull's 2003 Paper on Option Valuation and its Implications for Financial Risk Management and Investment Strategies	Implementing the Black-Scholes Model: Employing John Hull's 2003 Methodology for Option Pricing and Hedging Strategies in Financial Markets	In his 2003 research, John Hull demonstrated the effectiveness of the Black-Scholes Model for valuing options and developing risk-hedging strategies, contributing significantly to the field of quantitative finance
Carol Alexander (2008)	UK	Exploring Market Liquidity Dynamics: Examining Carol Alexander's 2008 Research on Liquidity Risk and its Effects on Asset Pricing and Portfolio Performance	Applying Conditional Autoregressive Range (CARR) Model: Utilizing Carol Alexander's 2008 Methodology for Estimating Liquidity Risk and Market Impact in Financial Markets	In her 2008 research, Carol Alexander highlighted the importance of liquidity risk and investor sentiment in financial markets, offering valuable insights into the pricing and risk management of illiquid assets