ASSOCIAÇÃO DE POLITÉCNICOS DO NORTE **(APNOR)**

INSTITUTO POLITÉCNICO DE BRAGANÇA

The impact of the COVID 19 pandemic on the stock market: The case of the Portuguese and Tunisian markets.

Borhen Eddine AYADI

Final Dissertation submitted to *Instituto Politécnico de Bragança.*

To obtain the master's degree in management, Specialization in Business Management

Supervisors:

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Abstract

The COVID-19 pandemic sent shockwaves through the global financial system, significantly impacting stock markets worldwide. This thesis investigates the specific effects of the pandemic on the performance of the Portuguese and Tunisian stock markets.

This study aims to conduct a comparative analysis of the risk and return characteristics of the Portuguese and Tunisian stock markets over a thirteen-year timeframe from 2010 to 2023, specifically focusing on the period before and during the COVID-19 pandemic. The research will involve I) Pre-COVID Period: Analysing the risk-return profiles of both markets for several years preceding the pandemic. This will establish a baseline for comparison: II) During COVID Period: Examining how the risk and return characteristics of both markets changed during the pandemic timeframe. This will involve measuring changes in volatility, average returns, and potential correlations between the two markets. III) Comparative Analysis: Comparing the pre- and during COVID performance. of 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 investing.com Website. To answer the research questions, it used parametric tests like paired simple Test was used to assess the impact of the COVID-19 pandemic on the average monthly returns of the Tunisian Stock Exchange (TUNINDEX) and the Portuguese Stock Exchange (PSI-20) from 2017 to 2022, comparing pre-pandemic (2017-2019) and during-pandemic (2020-2022) returns to identify any significant differences and Levene's test.

The results indicate that while the COVID-19 pandemic may have influenced market volatility, it did not lead to a statistically significant change in the average monthly returns of the Portuguese and Tunisian stock market indices. This result underscores the resilience of both markets in the face of the pandemic's economic disruptions, suggesting that while the pandemic introduced heightened uncertainty and fluctuations, it did not fundamentally alter the long-term average returns of these markets. However, the analysis of market risk using Levene's test revealed a significant increase in volatility for the Portuguese market during the pandemic, indicating a heightened level of risk and uncertainty for investors in this market compared to the Tunisian market.

This study's findings benefit various groups: Investors can use them to make informed choices about Portuguese and Tunisian markets based on their risk tolerance. Academics can leverage these results to understand how emerging markets respond to global crises. Furthermore, this research opens doors for future investigations into the reasons behind market performance differences and the long-term pandemic impact.

Key words: Tunisia, Portugal, Stock Market, Risk, Return, Volatility, Financial Performance.

Resumo

A pandemia da COVID-19 provocou ondas de choque no sistema financeiro global, impactando significativamente os mercados de ações em todo o mundo. Esta tese investiga os efeitos específicos da pandemia no desempenho dos mercados de ações português e tunisino.

Este estudo tem como objetivo realizar uma análise comparativa das características de risco e retorno dos mercados de ações português e tunisino ao longo de um período de treze anos, de 2010 a 2023, com foco específico no período antes e durante a pandemia da COVID-19. A pesquisa envolverá:

I) Período Pré-COVID: Análise dos perfis de risco e retorno de ambos os mercados por vários anos anteriores à pandemia. Isso estabelecerá uma base para comparação.

II) Período Durante a COVID: Exame de como as características de risco e retorno de ambos os mercados mudaram durante o período da pandemia. Isso envolverá a medição de mudanças na volatilidade, retornos médios e possíveis correlações entre os dois mercados.

III) Análise Comparativa: Comparação do desempenho pré e durante a COVID de uma amostra de 8 empresas (4 para cada país) selecionadas, com coleta de dados financeiros dos últimos quatro anos. Os dados sobre as empresas portuguesas foram coletados do site investing.com. Para responder às questões de pesquisa, foram utilizados testes paramétricos como o teste t de amostras emparelhadas para avaliar o impacto da pandemia da COVID-19 nos retornos médios mensais da Bolsa de Valores da Tunísia (TUNINDEX) e da Bolsa de Valores de Portugal (PSI-20) de 2017 a 2022, comparando os retornos pré-pandêmicos (2017-2019) e durante a pandemia (2020-2022) para identificar quaisquer diferenças significativas, e o teste de Levene.

Os resultados indicam que, embora a pandemia da COVID-19 possa ter influenciado a volatilidade do mercado, ela não levou a uma mudança estatisticamente significativa nos retornos médios mensais dos índices do mercado de ações português e tunisino. Este resultado destaca a resiliência de ambos os mercados diante das perturbações econômicas da pandemia, sugerindo que, embora a pandemia tenha introduzido incerteza e flutuações elevadas, ela não alterou fundamentalmente os retornos médios de longo prazo desses mercados. No entanto, a análise do risco de mercado utilizando o teste de Levene revelou um aumento significativo na volatilidade do mercado português durante a pandemia, indicando um nível elevado de risco e incerteza para os investidores neste mercado em comparação com o mercado tunisino.

Os resultados deste estudo beneficiam vários grupos: Investidores podem usá-los para tomar decisões informadas sobre os mercados português e tunisino com base em sua tolerância ao risco. Os formuladores de políticas ganham insights para desenvolver estratégias que mitiguem os riscos e promovam a estabilidade do mercado. Os acadêmicos podem aproveitar esses resultados para entender como os mercados emergentes respondem a crises globais. Além disso, esta pesquisa abre

portas para futuras investigações sobre as razões por trás das diferenças de desempenho do mercado e o impacto de longo prazo da pandemia.

Palavras-chave: Tunísia, Portugal, Mercado de Ações, Risco, Retorno, Volatilidade, Desempenho Financeiro.

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Abbreviations and Acronyms:

ROA: Return on Assets

ROE: Return on Equity

ROS: Return on Sales

VaR: Value at Risk

wi: the weights of the individual assets or securities in the portfolio

GDP: Gross Domestic Product

Mavg: the average (mean) of the market returns.

n: the number of paired observations or data points.

EMH: Efficient Market Hypothesis

EaR: Expected Average Loss

PSI-20: Portuguese Stock Index 20

TUNINDEX: Tunisian Stock Exchange Index

S: Standard deviation of returns

R: Return

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Introduction

The global outbreak of the COVID-19 pandemic in early 2020 sent shockwaves through the world economy, triggering unprecedented challenges and disruptions across various sectors. One of the most visibly affected areas was the stock market, where investors grappled with volatile conditions, uncertain economic prospects, and rapidly changing market dynamics. As nations endeavored to contain the spread of the virus, governments implemented stringent measures, including lockdowns and travel restrictions, with profound consequences for businesses and financial markets alike. This thesis explores the ramifications of the COVID-19 pandemic on two distinct yet interconnected stock markets—the Portuguese and Tunisian markets. By delving into the intricacies of how these markets responded to the unprecedented crisis, we aim to uncover valuable insights into the resilience and vulnerabilities in emerging and developed economies.

The impact of global crises on financial markets has been a subject of scholarly investigation for decades, with researchers seeking to understand the intricate relationships between external shocks and market behavior. Notably, the work of Reinhart and Rogoff (2009) sheds light on the historical patterns of financial crises, emphasizing the interconnectedness of economic and financial systems across borders. The COVID-19 pandemic, as a multifaceted crisis, has presented an unparalleled case study for analyzing how markets react to external shocks. Academic discourse on the subject has flourished, and scholars such as Baker et al. (2020) and Bekaert et al. (2020) have delved into the specifics of market volatility and investor sentiment during the pandemic. This thesis contributes to this growing body of literature by focusing on the distinctive features of the Portuguese and Tunisian markets and assessing the nuanced ways in which they navigated the challenges posed by the global health crisis.

The Portuguese and Tunisian markets, though divergent in their economic structures and developmental stages, share a commonality in confronting the economic fallout of the pandemic. Portugal, as a member of the Eurozone and the European Union, faced the challenges of navigating a highly integrated financial landscape. On the other hand, Tunisia, positioned in North Africa, experienced the pandemic within the context of its unique economic and geopolitical considerations. The divergent economic structures of these nations present an intriguing comparative lens through which to analyze the resilience of markets in the face of a shared global crisis. By considering the varying degrees of exposure to international trade, dependence on specific industries, and the effectiveness of government responses, this research aims to discern the factors that shaped the trajectory of the Portuguese and Tunisian stock markets during the COVID-19 pandemic.

Several theoretical frameworks will guide our analysis. The Efficient Market Hypothesis (EMH), as formulated by Fama (1970) posits that stock prices fully reflect all available information, implying that

unexpected events, such as the COVID-19 pandemic, should be swiftly incorporated into market prices. However, the Behavioral Finance perspective, championed by scholars like Shiller, (1981) and Kahneman and Tversky, (1979) challenges the notion of market efficiency, suggesting that investor behavior may be influenced by psychological factors, leading to deviations from rational decision-making. This study incorporates elements of both theories to construct a comprehensive understanding of the dynamics at play in the Portuguese and Tunisian markets during the pandemic.

In addition to theoretical frameworks, the empirical analysis will draw on a range of methodological approaches, including event studies and statistical models. Event studies, as pioneered Fama et al. (1969), provide a robust methodology for assessing the impact of specific events on financial markets. By applying event study techniques to key milestones in the progression of the COVID-19 pandemic, we aim to discern the immediate and cumulative effects on stock prices in both Portugal and Tunisia. Furthermore, statistical models, including regression analyses, will be employed to explore the relationships between various macroeconomic indicators, government interventions, and stock market performance.

As the world grapples with the ongoing effects of the COVID-19 pandemic, understanding how different economies and financial markets responded to this crisis becomes increasingly vital. This thesis seeks not only to contribute to the academic discourse surrounding the impact of the pandemic on financial markets but also to provide policymakers, investors, and market participants with valuable insights into the adaptive capacities of the Portuguese and Tunisian markets. By unraveling the complexities of market reactions in these two diverse contexts, we aim to contribute to the broader understanding of global financial resilience in the face of unprecedented challenge.

1 Literature review

The COVID-19 pandemic of 2020 was a global crisis that sent shockwaves through the world economy, affecting various sectors, with the stock market emerging as one of the most visibly impacted arenas. This literature review delves into existing research to explore the multifaceted impact of the pandemic on stock markets, emphasizing the unique case studies of Portugal and Tunisia.

The historical context of financial crises provides a foundation for understanding the repercussions of the COVID-19 pandemic on stock markets.

Reinhart and Rogoff's (2009) offer a comprehensive examination of financial crises spanning eight centuries, underscoring the interconnectedness of economic and financial systems across borders. Their work provides insights into the patterns of crises, laying the groundwork for understanding how the unprecedented nature of the COVID-19 pandemic may have distinct implications for global financial markets.

The Efficient Market Hypothesis (EMH), formulated by Fama (1970), is a key theoretical framework guiding the study of stock market behavior. EMH posits that stock prices fully reflect all available information, suggesting that market participants efficiently process and incorporate new information into stock prices. This theory is particularly relevant when examining how quickly and efficiently stock markets responded to the unforeseen challenges posed by the pandemic. While EMH provides a theoretical foundation, the behavioral Finance perspective challenges the notion of market efficiency by considering the impact of psychological factors on investor behavior. Scholars like Shiller (1981) and Kahneman and Tversky (1979) have explored how investor sentiment and decision-making may deviate from rationality. Given the unprecedented and emotionally charged nature of the pandemic, behavioral finance provides a lens through which to understand potential deviations from traditional market expectations.

As the COVID-19 crisis unfolded, scholars turned their attention to the specific dynamics of market volatility and investor sentiment during this period. Baker, Bloom, Davis, and Terry (2020) conducted a comprehensive analysis of the impact of COVID-19 on global stock markets, emphasizing the rapid and substantial changes in market conditions. Their research highlights the challenges faced by investors as they grappled with heightened uncertainty and the evolving economic landscape. Additional Bekaert, Engstrom, and Xu (2020) explored the risk mismanagement crisis triggered by COVID-19, shedding light on the ways in which investors navigated the crisis and the implications for market stability. These studies contribute valuable insights into the broader discourse on market reactions during times of crisis, providing a backdrop for the more specific analysis of the Portuguese and Tunisian markets.

Turning attention to the unique case studies of Portugal and Tunisia, it is essential to consider the distinct economic structures and geopolitical contexts that shaped their responses to the pandemic. Portugal, as a member of the Eurozone and the European Union, faced the challenges of navigating a highly integrated financial landscape. The global economic slowdown, disruptions in international trade, and the effectiveness of European-level policy responses are critical factors influencing Portugal's market dynamics. The work of Moura and Silva (2021) investigates the economic impact of COVID-19 in Portugal, providing insights into how the pandemic influenced sectors and labor markets. Such studies are vital in understanding the broader economic implications that, in turn, affect stock market performance.

On the other hand, Tunisia, positioned in North Africa, experienced the pandemic within the context of its unique economic and geopolitical considerations. Tunisia's economic structure, dependence on specific industries, and its response to the crisis play a crucial role in understanding the trajectory of its stock market. Research by Ben-Cheikh,, A., Ben Abdallah, R., Ben Abdallah, N., & Ben Abdallah, & Y., (2021) examines the economic consequences of the pandemic in Tunisia, shedding light on the challenges faced by the country and its policy responses. By considering the varying degrees of exposure to international trade, sectoral dependencies, and government interventions, this research aims to discern the factors that shaped the trajectory of the Tunisian stock market during the COVID-19 pandemic.

The methodologies employed in studying market reactions to the pandemic are diverse, ranging from event studies to statistical models. Event studies, as pioneered by Fama et al. (1969), provide a robust methodology for assessing the impact of specific events on financial markets. By applying event study techniques to key milestones in the progression of the COVID-19 pandemic, researchers can discern the immediate and cumulative effects on stock prices in both Portugal and Tunisia. Additionally, statistical models, including regression analyses, offer a quantitative approach to exploring the relationships between various macroeconomic indicators, government interventions, and stock market performance. The application of such methodologies allows for a nuanced understanding of the factors influencing market dynamics in the face of the pandemic.

As the world continues to grapple with the ongoing effects of the COVID-19 pandemic, the study of how different economies and financial markets responded to this crisis becomes increasingly vital. The literature reviewed here contributes to the academic discourse surrounding the impact of the pandemic on financial markets, providing a foundation for the analysis of the Portuguese and Tunisian markets. By unraveling the complexities of market reactions in these two diverse contexts, this thesis aims to contribute to the broader understanding of global financial resilience in the face of unprecedented challenges.

1.1 Navigating the Turbulent Waters: Pandemics, Financial Crises, and the Unprecedented Shockwave of COVID-19

The COVID-19 pandemic, declared in March 2020, has had a profound impact on global health, economies, and societies. The virus's rapid spread led to unprecedented challenges for healthcare systems and governments worldwide, resulting in economic disruptions and social change. Historically, pandemics have shaped economies and societies, causing widespread mortality, disrupting trade and labor markets, and transforming social structures. COVID-19, while unprecedented in its global reach, follows this pattern, causing economic hardship and social disruption. The pandemic triggered a sharp global economic downturn, with lockdowns and restrictions leading to job losses and supply chain disruptions. Governments responded with stimulus packages and monetary easing, but the long-term economic consequences remain uncertain. Scientific research led to the rapid development of vaccines, but the pandemic also exposed existing inequalities, with marginalized communities disproportionately affected.

1.1.1 The pandemic crisis and its history

Pandemics are events in which people's psychological reactions to infection play a key role in both the spread and containment of disease and influence the extent of emotional distress and social unrest. When threatened by infection, people react in highly variable ways. The complexity of their reactions needs to be taken into account in order to understand the psychology of pandemics and how it can affect the economy of a country.

For pandemics in general, the causal elements are multiple and complex. The essential elements are an infectious agent (e.g. a virus or bacteria), a host (e.g. a person) and the environment (Lederberg, Shope, & Oakes, 1992)

The host's resistance to infection depends on a number of factors, including immunocompetence and psychological factors that influence how the host copes with or reacts to actual or potential infection. Environmental factors are numerous and multifaceted, including those that promote or hinder host resistance strategies (Lederberg, Shope, & Oakes, 1992)

The most famous pandemic was the bubonic plague (1346-1353), attributed to Yersinia pestis, which killed around 50 million people worldwide. Over the past century, numerous other pandemics have occurred, with varying degrees of contagiousness and lethality. Examples include HIV/AIDS (1981-present), Spanish flu (a strain of the influenza virus Hi Ni; 1918-1920), Russian flu (H2N2 or H3N8, 1889-1890), Asian flu (H2N2, 1957-1958), Hong Kong flu (H3N2, 1968-1969), a second Russian flu pandemic (H1Nl, 1977-1978), swine flu (H1Nl, 2009-2010) and the Zika virus pandemic (2015-2016) (Belshe, 2005;

Crosby, 2003; Doherty, 2013; Honigsbaum, 2014; Morens & Fauci, 2017; OMS, 2010b). Avian flu has spread in recent years but has not reached the pandemic stage.

The history of pandemics has had significant and far-reaching impacts on economies throughout the ages. These impacts are multifaceted, affecting various sectors, trade, labor, and economic structures. Here is an overview of how pandemics have influenced economics across different historical periods, as it is followed.

- Pre-Modern Times: Early pandemics often resulted in severe economic disruptions due to high mortality rates. Labor shortages caused by widespread death reduced agricultural output and slowed economic activity. Trade routes were affected as well, leading to interruptions in the flow of goods and services. The economic consequences of pandemics were compounded by limited medical knowledge and technology, exacerbating the challenges of disease control and mitigation (Jordà, Singh, & Taylor, 2020)
- Middle Ages and Renaissance: the Black Death, one of the most devastating pandemics in history, reshaped labor dynamics and led to the decline of the feudal system in Europe. With a significant reduction in the population, labor became scarcer, and wages increased for surviving workers. This shift gave rise to social and economic changes, including the rise of urban centers and the weakening of traditional power structures. The scarcity of labor also prompted innovations in agricultural practices (Jordà, Singh, & Taylor, 2020).
- Industrial Revolution and Modernization: The advancements in medical science during the 19th century, such as the development of germ theory, contributed to improved pandemic management. As countries modernized and established public health systems, the impact of pandemics on economies became somewhat mitigated. However, the global nature of trade and travel during this period still allowed for the spread of diseases, impacting trade routes and regional economies (Jordà, Singh, & Taylor, 2020).
- 20th Century: The Spanish Flu pandemic had economic consequences as well. The global nature of World War I and the pandemic disrupted economies already strained by the war effort. The pandemic affected industries and sectors that required physical presence, leading to reduced productivity. Additionally, healthcare systems were strained, diverting resources from other economic activities (Jordà, Singh, & Taylor, 2020).
- 21st Century: The economic impact of pandemics remains pronounced in the modern era due to increased globalization and interconnectedness. The SARS outbreak in 2002-2003 and the COVID-19 pandemic highlighted the vulnerabilities of global supply chains, as disruptions in one region could lead to cascading effects throughout the world. Lockdowns, quarantines, and travel restrictions implemented to control the spread of diseases resulted in severe economic contractions, job losses, and business closures (World Bank, 2020).

Pandemics throughout history had a profound impact on economies by disrupting trade, labor markets, supply chains, and economic structures. The scale of these impacts has been influenced by factors such as medical knowledge, technological advancements, globalization, and the interconnectedness of today's world. As societies continue to face new health challenges understanding the historical context of pandemics' economic effects can inform strategies for mitigating and adapting to these disruptions.

The financial crises associated with pandemics have been notable for their profound and often wide-ranging economic repercussions. These crises typically stem from the disruptions caused by the pandemic's impact on economic activities, investor confidence, financial markets, and government responses in all these cases, financial crises resulting from pandemics were characterized by similar patterns as follows (Ruhm, 2021)

- Economic Disruption: Pandemics disrupt economic activities through lockdowns, quarantines, and reduced consumer spending, leading to decreased business revenue and layoffs.
- Market Volatility: Financial markets often experience heightened volatility as investor sentiment shifts in response to uncertainty and economic disruption.
- Supply Chain Disruptions: Global supply chains are disrupted as production, shipping, and distribution are hampered, affecting various industries.
- Government Responses: Governments and central banks implement monetary and fiscal measures to counter the economic impact. Stimulus packages, interest rate cuts, and unconventional monetary policies are common responses.
- Long-Term Implications: Financial crises linked to pandemics can have lasting economic effects. Recovery may take time due to structural changes in industries, changes in consumer behavior, and the need to rebuild investor confidence.

Financial crises resulting from pandemics have historical precedents, with each crisis showcasing the interconnectedness of economies and financial markets. These crises reveal the importance of preparedness, effective government response, and global cooperation to mitigate their economic impact.

1.1.2 COVID-19's Impact: A Global Tapestry of Health, Economics, and Social Change

The COVID-19 pandemic, which originated in late 2019, has left an indelible mark on the global landscape. The virus, SARS-CoV-2, was first identified in Wuhan, China, and its rapid spread led to a swift declaration of a pandemic by the WHO in March 2020. Health systems around the world faced unprecedented challenges as hospitals grappled with surges in patients, shortages of medical supplies, and the need to adapt quickly to an evolving crisis. Governments implemented a range of measures, from strict lockdowns to social distancing guidelines, to slow the virus's transmission, resulting in profound economic disruptions and widespread job losses (World Health Organization, March 11, 2020).

Scientific research played a pivotal role in understanding the virus's characteristics, transmission dynamics, and clinical manifestations (Zhou, P. et al., 2020). The global scientific community collaborated in unprecedented ways to sequence the virus's genome, study its mutations, and develop diagnostic tests. This collective effort also led to the rapid development of vaccines, with multiple candidates authorized for emergency use within a remarkably short timeframe. Vaccination campaigns, starting in late 2020, aimed to curb the spread of the virus and protect vulnerable populations (Baden, et al., 2021).

However, the pandemic brought to light existing inequalities, as marginalized communities and disadvantaged individuals disproportionately bore the brunt of its impact. Socioeconomic disparities were exacerbated, and access to healthcare and vaccines revealed glaring gaps in global healthcare systems. New variants of the virus emerged, prompting concerns about vaccine effectiveness, and necessitating ongoing monitoring and adaptation of public health strategies programme (United Nations Development, 2020) As societies navigated phased reopening and sought a semblance of normalcy, the pandemic underscored the importance of global cooperation, effective communication, and evidence-based decision-making. Lessons from the crisis spurred discussions about pandemic preparedness, public health infrastructure, and equitable distribution of resources. The ongoing story of COVID-19 serves as a reminder of humanity's resilience, the power of scientific advancement, and the need for international solidarity in addressing complex global challenges.

The financial impacts of COVID-19 on the global economy have been profound and far-reaching. The pandemic triggered a complex interplay of factors that disrupted economic activities, financial markets, and trade on a global scale (International Monetary Fund, 2020) also triggered a severe global economic crisis. Widespread lockdowns, travel restrictions, and business closures implemented to control the virus's spread resulted in a sharp economic decline. Many sectors, particularly hospitality, tourism, and retail, experienced significant contractions, leading to the worst global economic downturn since the Great Depression. Millions of workers lost their jobs or faced reduced hours and furloughs, disproportionately impacting low-wage earners and exacerbating income inequality (World Bank, 2020).

Central banks implemented monetary policies with interest rate reductions and quantitative easing to inject liquidity and support economic recovery. Businesses adapted to the new environment, accelerating trends towards digitalization and remote work models, while those reliant on physical presence faced challenges. The tourism and travel industry, a significant economic contributor for many countries, suffered severe setbacks due to travel restrictions and decreased consumer confidence, causing substantial revenue losses for airlines, hotels, and related businesses. National debt levels increased as governments increased spending to combat the crisis, raising concerns about long-term fiscal sustainability and potential impacts on future generations. The pandemic also prompted long-term structural changes, with consumers shifting towards increased e-commerce and digital services,

potentially leading to permanent changes in certain industries. Companies reevaluated their business models and supply chain strategies. As vaccination efforts progressed and restrictions eased, economies began to recover at varying paces by region, with some countries facing setbacks due to new variants or uneven vaccine distribution.

1.1.3 Global fight against COVID-19

During Pandemic Crises, many countries implemented various non-pharmaceutical interventions (NPIs) like lockdowns, mask mandates, and travel restrictions. While NPIs can be effective in controlling transmission, they can also have significant social and economic consequences. Striking a balance between public health measures and economic well-being has been a key challenge for policymakers throughout the pandemic (Owen, 2021). Finally, the pandemic has had a devastating impact on the global economy, with lockdowns and travel restrictions disrupting supply chains, shuttering businesses, and leading to widespread job losses (Baldwin & Weder, 2020). Tracking economic indicators and monitoring recovery rates are essential to understand the pandemic's long-term economic consequences.

1.2. The financial impact of the Pandemic crisis of COVID 19 on the global stock market

The pre-pandemic era witnessed a glorious run for global stock markets. Investor confidence soared amidst a seemingly endless bull market, with major indices like the S&P 500 and FTSE 100 experiencing impressive average annualized returns (Zhang, Hu, & Ji, 2020). This prosperity stemmed from a perfect storm of favorable factors: robust economic growth, accommodative monetary policies with low interest rates Fama (1970), and a positive correlation between GDP and stock market performance. However, this era of financial triumph was not without its tremors. Geopolitical tensions, trade wars, and regional conflicts triggered short-term market volatility, while sectors like energy and traditional retail faced headwinds Fama (1970). Despite these challenges, the 2010s remain etched in investor memory as a decade of exceptional growth and significant trends, forever shaping the landscape of global stock markets (Gramer, 2024).

The COVID-19 pandemic triggered a shift in investor behavior, fundamentally altering a financial world previously basking in the glow of a seemingly endless bull run. Pre-pandemic optimism, fueled by robust economic performance and low-interest rates (Barberis, Greenwood, & Shleifer, 2016; Baker, Bloom, Davis, & Terry, 2020) COVID-induced economic uncertainty, evaporated with the emergence of the virus in late 2019. Investor confidence plummeted, replaced by a wave of panic selling and a dramatic decline in stock prices (Liu, Manzoor, Wang, Zhang, & Manzoor, 2020). Faced with unprecedented uncertainty,

investors adopted a risk-averse approach, seeking the comfort of safe-haven assets like bonds and gold (Akhtaruzzaman, Boubaker, & Sensoy, 2020).

As the pandemic unfolded, investor behavior became more heterogeneous. Some, enticed by the potential for quick returns, embraced short-term trading strategies (Yu et al., 2020). Others, wary of the volatile market, adopted a wait-and-see approach. Sectoral preferences also shifted dramatically. Industries perceived as resilient during lockdowns, such as technology and e-commerce, witnessed a surge in investor interest (Gharghori, 2020). Conversely, sectors reliant on in-person interaction, like travel and hospitality, faced significant investor flight (Nicola, Alsafi, & Sohrabi, 2020).

A glimmer of hope emerged as economies gradually reopened and vaccination efforts progressed. Investor confidence began to recover, with stock markets exhibiting signs of a rebound (Baker et al., 2021). However, the long-term economic and social impacts of the pandemic remain shrouded in uncertainty. The pandemic exposed vulnerabilities in global supply chains, potentially leading to long-term disruptions that could influence future investment decisions (Baldwin & Weder di Mauro, 2020). The effectiveness of government interventions and the pace of economic recovery will also significantly shape investor behavior (Flaxman, 2020). Notably, the pandemic accelerated the use of online brokerage platforms and digital investment tools, potentially paving the way for a more tech-savvy investor base in the coming years (Saha, A., & Ray, 2020). As the pandemic continues to evolve, continuous monitoring of investor behavior and the ability to adapt investment strategies will be crucial for navigating the complex financial landscape in the years to come

Another observed impact of the COVID-19 was in the risk preferences and economic pessimism (Lo et al, 2022), observed that individuals directly impacted by the pandemic exhibited a significantly decreased willingness to take on risky investments. This newfound risk aversion likely stemmed from a confluence of factors. Job losses, a hallmark of the pandemic's economic fallout, undoubtedly played a role. Witnessing colleagues or loved ones experience unemployment could instill a sense of financial vulnerability, pushing investors towards more conservative strategies. Additionally, the broader economic downturn likely fueled pessimism. Stock market volatility and declining GDP growth could lead investors to believe that risky ventures were less likely to yield positive returns. Finally, the fear of contagion itself may have contributed to risk aversion. The uncertainty surrounding the pandemic's trajectory and potential health risks could have instilled a general sense of caution, prompting investors to prioritize asset safety over potentially high-reward investments. As a result, many investors turned to less risky assets like bonds or cash, seeking to weather the economic storm with their wealth intact. This shift in investor behavior highlights the interconnectedness between public health crises and financial markets. The pandemic's ripple effects not only impacted individual health but also fundamentally altered investment decisions and risk tolerance across a broad spectrum of people.

A study by Baker et al. (2021) examined the trading patterns of retail investors during the initial outbreak of COVID-19 and found that they significantly increased their trading activity. This surge in retail investor participation was evident in several key metrics, including the following:

- Increased trading frequency: Retail investors traded more frequently, establishing more new positions, and engaging in more frequent buying and selling activities.
- Increased order size: The average order size for retail investors increased, indicating a greater willingness to commit larger sums of capital to their trades.
- Increased use of electronic trading platforms: The adoption of electronic trading platforms by retail investors accelerated during the pandemic, allowing them to participate in the market more efficiently and conveniently.

This heightened retail investor participation, driven by factors such as increased access to online trading platforms, government stimulus packages, and a desire to capitalize on potential opportunities during market volatility, contributed to the overall increase in trading volume and volatility observed during the pandemic (World Health Organization, March 11, 2020).

Policymakers also play a crucial role in shaping the investment landscape and mitigating the negative impacts of crises on investor behavior. Timely and effective government interventions, such as fiscal stimulus packages and monetary policy adjustments, can help to stabilize markets, foster investor confidence, and promote economic recovery.

The COVID-19 pandemic has presented a unique set of challenges for investors and policymakers alike. Understanding the intricacies of investor behavior during such crises is crucial for navigating the dynamic market environment and making informed decisions that support financial stability and economic growth.

As we mentioned before, the COVID-19 pandemic, an unprecedented global crisis with far-reaching consequences, has had a profound impact on the global financial landscape, with stock markets around the world experiencing unparalleled volatility and significant declines Baker et al. (2021). The sudden and severe disruption to the global economy, caused by the implementation of containment measures and the resulting economic downturn, led to heightened uncertainty and fear among investors, driving a rapid sell-off in stock markets worldwide (Lo, 2022).

Financial markets experienced extreme volatility (Uddin, Alam, & Gow, 2021), with rapid stock market declines followed by periods of recovery influenced by government interventions and stimulus measures to stabilize economies. Global supply chains were disrupted due to factory closures, transport restrictions, and reduced production capacities, leading to shortages of essential goods and components in industries reliant on just-in-time manufacturing. Governments enacted massive fiscal stimulus packages featuring direct cash payments, unemployment benefits, business grants, and healthcare

system support to counteract the downturn, although concerns mounted about long-term fiscal sustainability.

1.2.1 Sectoral Divergence: Resilience in the Face of Disruption

The impact of the COVID-19 pandemic on different sectors within the stock market was uneven (Xu et al, 2023). Sectors such as technology, healthcare, and consumer staples, perceived as more resilient to the pandemic's economic fallout, outperformed sectors like energy, transportation, and hospitality (Huang et al., 2021). Technology companies, with their ability to operate remotely and their reliance on digital platforms, were less affected by the pandemic's disruptions. This resilience, coupled with the increased demand for technology products and services during the lockdown period, led to strong gains for technology stocks (Brown, Rocha, & Thomaz, 2021).

Healthcare companies, benefiting from increased demand for medical services and the development of COVID-19-related products, also witnessed notable growth during the pandemic. Consumer staples companies, providing essential goods like food, household products, and personal care items, were also relatively resilient, as demand for these products remained stable even during the economic downturn (Tafadzwa, 2021).

In contrast, sectors such as energy, transportation, and hospitality faced significant challenges due to the pandemic's impact on travel and tourism. Energy prices plummeted as demand for oil and gas declined, while airlines, hotels, and restaurants experienced severe revenue losses due to travel restrictions and social distancing measures (Troli, 2024).

The COVID-19 pandemic led to a significant shift in investor behavior, with increased risk aversion and heightened trading activity becoming prevalent (Baker et al., 2021). Investors, faced with heightened uncertainty about the future of the economy, became more cautious in their investment decisions, favoring safer assets such as bonds and low-volatility stocks (Lo et al., 2022).

This increased risk aversion led to a preference for safer assets, such as bonds and low-volatility stocks, while investments in riskier assets, such as emerging market stocks or stocks with high exposure to the pandemic's impact, experienced declines (Xu et al., 2023). Retail investors, particularly those new to the market, played a more prominent role during this period. The rise of online trading platforms and the ease of accessing financial information through digital channels facilitated the entry of new investors into the market. While some retail investors made successful trades, others suffered losses due to inexperience and volatile market conditions (Huang et al., 2021).

1.2.2 Policy Responses: Fiscal and Monetary Support

The COVID-19 pandemic triggered a severe economic downturn, threatening to plunge the global stock market into a tailspin. However, government policies and central bank actions played a critical role in mitigating the negative impacts and fostering a more stable environment for investors (Brown et al., 2021).

One key strategy employed by governments was the implementation of fiscal stimulus packages (Brown et al., 2021). These packages involved injecting significant amounts of capital directly into the economy through measures like grants, tax relief, and unemployment benefits. By providing direct financial assistance to businesses and individuals, these programs helped to maintain economic activity during a period of widespread disruption. This prevented a more severe economic contraction, which could have had a devastating cascading effect on the stock market (Brown et al., 2021).

Central banks also took decisive action to bolster financial stability Brown et al., (2021). Monetary policy easing aimed to make borrowing more affordable and stimulate investment. This was achieved through a combination of tools, including interest rate cuts and quantitative easing programs. Lowering interest rates directly reduces the cost of borrowing for businesses and consumers, encouraging them to invest and spend, which in turn fuels economic growth. Quantitative easing involves central banks purchasing government bonds and other securities, injecting additional liquidity into the financial system. This increased liquidity makes it easier for businesses to access credit and can also lead to a rise in asset prices, including stocks.

The combination of these proactive fiscal and monetary measures helped to stabilize investor confidence during a period of unprecedented uncertainty. By alleviating the immediate economic pain and creating a more supportive financial environment, these policies prevented a further collapse of the stock market. The buffer provided by government stimulus packages and central bank interventions laid the foundation for the subsequent market recovery. While the long-term economic effects of the pandemic remain to be fully understood, the swift and decisive actions taken by policymakers undoubtedly played a crucial role in preventing a more catastrophic financial crisis (International Monetary Fund, 2020).

2. Impact of COVID-19 in Portuguese and Tunisian Stock Market: a comparison

The global COVID-19 pandemic has ushered in an era of unparalleled economic volatility, testing the resilience of financial markets around the world. Stock markets, often regarded as barometers of a nation's economic health, have been profoundly affected by the crisis. The financial implications of the pandemic, as well as the responses of different countries to mitigate its impact, have led to diverse outcomes in stock markets worldwide. This thesis embarks on a comparative journey, analyzing the impact of the COVID-19 pandemic on the stock markets of two geographically distinct yet interrelated nations: Portugal and Tunisia.

Portugal, nestled in Southern Europe, has been no stranger to economic challenges, having endured the European sovereign debt crisis. On the other hand, Tunisia, situated in North Africa, faces its own set of economic complexities due to historical political transitions and regional factors. Both countries have unique economic landscapes, and this thesis aims to unravel the extent to which the pandemic has influenced their respective stock markets.

The primary objective of this study is to analyze the effects of the COVID-19 pandemic on stock market performance in Portugal and Tunisia. To achieve this, we will assess the market behavior before and during the critical phases of the pandemic. We will analyze the key indicators, such as the prices movements of stock indices and evaluate the market's reaction to the pandemic's evolving dynamics.

The core objective of this study is to conduct a univariate analysis of key financial indicators, including profitability metrics such as return on assets, return on equity, and net profit margins, as well as market risk metrics like volatility and beta. This approach allows us to gauge how individual companies in Portugal and Tunisia responded to the pandemic's financial challenges. In this study we're zooming in on four companies from each market to see how they've performed. With all the uncertainty and ups and downs in the markets, it's crucial to understand how these companies have handled. By looking at things like how profitable they've been and how much risk they've faced, we aim to get a clear picture of their performance. This research isn't just about numbers; it's about understanding how businesses in different parts of the world have adapted to the challenges brought by the pandemic. Ultimately, we hope to offer valuable insights for investors, policymakers, and anyone interested in the changing landscape of global finance during these extraordinary times.

Furthermore, In the Inferential Analysis will compare the returns of the Tunisian Stock Exchange (TUNINDEX) and the Portuguese Stock Exchange (PSI-20) before and after the pandemic. By employing a paired sample t-test, we seek to determine if there are statistically significant differences in the returns of these two indexes during these distinct periods.

The motivation for this analysis lies in understanding how an emerging market like Tunisia and a developed market like Portugal respond differently to global shocks. This comparison provides valuable insights into market resilience, investor behavior. The results will inform investors on diversification strategies and risk management, while also guiding policymakers in developing measures to stabilize markets during crises. By focusing on the periods before and after COVID-19.

The research contributes to the broader understanding of financial market dynamics in the face of unprecedented global disruptions. Intended to contribute to the broader understanding of how businesses respond to external shocks and uncertainties. It serves as a valuable resource for economists, financial analysts, and policymakers interested in the financial repercussions of the COVID-19 pandemic, and more specifically, its impact on the financial health of companies in Tunisia and Portugal.

2.1. Methodology and research

In conducting a comprehensive analysis of the impact of the COVID-19 pandemic on the stock markets of Portugal and Tunisia, the methodology employed in this thesis integrates quantitative approaches. The research design encompasses a quantitative investigation into historical stock market data, focusing on key financial indicators such as stock prices within a specified timeframe that recaps the onset and outcome of the pandemic.

The chosen methodology is underpinned by a theoretical framework that guides the investigation, and the study's limitations, such as data availability and external market influences, will be transparently acknowledged. Through this comprehensive and integrated approach, the thesis aims to contribute valuable insights into the nuanced effects of the COVID-19 pandemic on the Portuguese and Tunisian stock markets.

We used the Paired Sample t-test of Tunisian and Portuguese Stock Market return of Indices (Pre- and During COVID-19) because it analyzes differences within the same entities (indices) across timeframes. The paired sample t-test is highly relevant for comparing the returns of the Tunisian Stock Exchange (TUNINDEX) and the Portuguese Stock Exchange (PSI-20) before and during the COVID-19 pandemic. This test is ideal because it compares related groups, controlling for time-specific effects by pairing returns from the same dates. It accounts for the non-independence of financial time series data and

assesses mean differences, crucial for evaluating the pandemic's impact on returns. By determining the statistical significance of these differences, we will also calculate the Volatility for both periods. F-tests will be used to compare the variances (volatilities) of the indices between the pre-pandemic and pandemic periods. These tests provide valuable insights into the relative performance and resilience of the markets, aiding investors and policymakers in understanding market behavior during crises.

2.1.1. Objectives and hypothesis

The objectives encompass examining the pandemic's impact on the performance of both markets, comparing their resilience to external shocks, examine whether the COVID-19 pandemic caused a noticeable change in the overall performance of the Portuguese and Tunisian stock markets, as reflected in the average returns investors could have expected and investigate whether the COVID-19 pandemic led to a change in the level of risk and uncertainty associated with investing in both stock markets, and also to compare the financial performance and market risk of selected companies from the Portuguese and Tunisian stock markets before and during the COVID-19 pandemic. It uses profitability metrics like ROE and ROA and risk metrics such as beta coefficients. Also, an Independent Samples t-test and Levene's Test were used to assess whether there were any statistically significant differences in the performance between the simple of four Tunisian and Portuguese companies, both before and during the pandemic. A paired sample t-test and Levene's Test as well were used to determine if there are significant differences of return and market risk between the Portuguese and Tunisian indexes before and during the pandemic. The study seeks to identify how these diverse markets have adapted to the pandemic Therefore, the specific objectives are as follows:

i) To assess how the COVID-19 pandemic has influenced the performance of a sample of companies in Portugal and Tunisia.
ii) Investigating Return Disparities between Portuguese and Tunisian Stock Markets Indexes Pre and Post-COVID-19 Using Paired Sample t-tests
iii) Analysing Market Risk Disparities between Portuguese and Tunisian Stock Markets Pre- and Post-COVID-19 Using F Test.

The research hypothesis (RH) to be tested is as follow:

RH1: There is significant difference in the performance (return and risk) of the selected sample of companies in Portugal and Tunisia before and during the COVID-19 pandemic.

This hypothesis suggests that the COVID-19 pandemic may have had a noticeable impact on the performance of companies in Portugal and Tunisia, both in terms of profitability and the stability of their financial metrics, as indicated by changes in standard deviation and variance. Analyzing these

differences can provide valuable insights into how businesses in both countries responded to and were affected by the pandemic, contributing to a deeper understanding of its economic implications.

This hypothesis is inspired by the work of Eisenbart & Gajdzik, (2021), who examined the impact of the pandemic on financial performance across various industries, and Oblój & Rut, (2021), who analyzed changes in financial performance metrics of manufacturing companies before and during the pandemic.

RH2: There is a significant difference in the mean returns of the Portuguese and Tunisian stock market indices before and during the COVID-19 pandemic.

This hypothesis suggests that the COVID-19 pandemic may had an influence on the average returns of the stock market indices in Portugal and Tunisia. It implies that the pandemic could have potentially impacted on the financial performance of these indices, leading to changes in their average returns over the specified time periods. Examining these variations offers valuable insights into how the respective stock markets reacted to and were shaped by the pandemic, thereby enhancing our comprehension of its impact on financial markets. This hypothesis builds upon the research of Zhang, Dong, and Lin (2020), who investigated the pandemic's effects on global financial markets, including stock market returns.

RH3: There is a significant difference in the variances (volatility) of the Portuguese and Tunisian stock market indices before and during the COVID-19 pandemic.

This hypothesis suggests that the COVID-19 pandemic may have influenced the volatility of the stock market indices in Portugal and Tunisia. Analyzing these differences in variances can provide insights into how the level of risk in the financial markets of both countries changed during the pandemic, contributing to a better understanding of its impact on market stability and investor behavior. This hypothesis draws inspiration from Al-Awadhi, Al-Saifi,, Al-Awadhi, and Alhammadi (2020) who studied the impact of contagious infectious diseases on stock market returns and volatility.

2.1.2. Data and Sample

In this study, we employed a comprehensive dataset consisting of four companies from each of Portugal and Tunisia, covering the extensive period from 2010 to 2023 all the data was extracted from the website investing.com The selection of companies for this study aimed to establish a parallel comparison between the Tunisian and Portuguese economies. Both countries have significant banking sectors, represented by their largest banks, Amen Bank (AB) in Tunisia and Banco Comercial Português (BCP) in Portugal. The inclusion of these banks allows for a direct assessment of the pandemic's impact on the financial stability and performance of each country's leading financial institution.

Furthermore, both samples included a major player in the food industry, reflecting the importance of this sector in both economies. In Tunisia, Délice Holding (DH) was selected, while in Portugal, Jerónimo Martins (JMT) was chosen. This allows for a comparative analysis of how the pandemic affected consumer behavior, supply chains, and the overall resilience of the food sector in both countries.

To further diversify the sample and capture the impact on different industries, the study included companies from the industrial and telecommunications sectors. In Tunisia, Servicom (SERVI) represents the industrial services sector, while Société Tunisienne de l'Electricité et du Gaz (SOTE) represents the utilities sector, including telecommunications. In Portugal, Altri (ALSS) represents the pulp and paper manufacturing industry, while NOS is a major player in the telecommunications and entertainment sector.

While the specific companies chosen may not be direct equivalents in terms of market capitalization or specific sub-sectors, the selection ensures a balanced representation of key economic sectors in both countries. This approach allows for a nuanced understanding of how the pandemic affected different industries and the overall economic landscape in both Tunisia and Portugal.

To achieve the study's objectives and rigorously test the research hypotheses, we meticulously gathered financial data focusing on profitability measures. Specifically, we extracted data from the balance sheets of the selected companies, spanning the period from 2019 to 2022 (before 2019 and during COVID-19 2022).

Additionally, to evaluate the returns and market risk associated with the stock market indices of both Portugal and Tunisia, we diligently collected monthly closing prices. This meticulous data collection process enabled us to construct comprehensive time series datasets covering periods both before and during the COVID-19 pandemic, ranging from 2017 to 2022.

By capturing data over this extensive timeframe, we aimed to provide a thorough analysis of the impact of the pandemic on the financial performance and market dynamics of both countries.

2.1.3. Model and variable description:

The research should provide a clear and detailed description of the econometric model that will be used to analyze the impact of the COVID-19 pandemic on the Portuguese and Tunisian stock markets.

Also, we use various financial metrics and risk assessment techniques used to evaluate the performance and risk profile of investments, particularly stocks and portfolios. Each variable is accompanied by its calculation and a brief description to enhance understanding. On Table 1 it is summarized the variables used in this analysis, its description and how it is calculated

Table 1 : Variables, calculation and description

Variable	Calculation	Description
Net Profit Margin	$NPM = (NI / R) * 100$	It's a profitability ratio that shows how much net income or profit is generated as a percentage of revenue (James, Gerard, & Ross, 2004)
Return on Sales (ROS)	$ROS = OP / NS$	ROS, is a financial metric that measures the profitability of a company by expressing its net income as a percentage of its total revenue (Petrakis, 2003; Xuan, 2012) Operating Profit: OP Net Sales: NS
Return on Assets (ROA)	$ROA = NI / ATA$	Measures in relation to its assets how profitable a firm can be (Berger, 1995; Shepherd, W. G., 1972) ROA: Return on Assets Net Income: NI Average Total Assets: ATA
Annual Total Risk	$ATR = \sigma * \sqrt{T}$	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. (Bachelier, L., 1900; Markowitz, 1952)
Beta of Stock	$\beta = Cov(Ri, Rm) / Var(Rm)$	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.
Parametric Method of VAR	$VAR = Z * P$	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 (Alexander, 2008)
Returns of closing prices	$R = (Pt - Pt-1) / Pt-1$	where Rt represents the return at time t1, and Pt and Pt−1 represent the closing prices at time t and t−1, respectively. (Robert, 2009; Engle, 2009)
Standard deviation of returns	$A = \sqrt{1n-1\sum ni=1(xi-\bar{x})2}$	s = Sample standard deviation symbol = Arithmetic means of the observations and n = total number of observations. (Markowitz, 1991)
F-Test	$F = MSB / MSW.$	The F-test is a statistical method used to compare the variances of two or more groups. It calculates a test statistic called the F-value, which is a ratio of two variances (Wang et al. 2011; Schwert,(1989) MSB: Mean Square Between groups, which measures the variation between the means of different groups. MSW: Mean Square Within groups, which measures the variation within each group.

2.2. Brief Macroeconomic analysis of Tunisia and Portugal

Portugal, a developed economy, and Tunisia, a developing nation, present a unique case study in economic disparities. Despite their contrasting classifications, both countries face hurdles to sustainable growth. Portugal struggles with a high public debt (João & Ricardo, 2021) and aging population (Ramos, Elisabete & Helena, 2019) while Tunisia grapples with political instability (Monica, 2020) and social unrest (Sarah, 2018). To ensure long-term economic prosperity, this chapter will dissect the economic indicators, key sectors, and specific challenges faced by each nation. Through this analysis, we aim to identify potential solutions and pave the way for a more stable and prosperous future for both Portugal and Tunisia.

2.2.1. Tunisia

Tunisia is a small, upper-middle-income country located in North Africa. The economy is primarily driven by agriculture, tourism, and manufacturing. The country has experienced significant economic challenges in recent years, including political instability (Mohamed-Safouane & Mohamed-Sami, 2022) high unemployment (World Bank, 2023) and a large informal sector (Sami & Mohamed-Safouane, 2020)

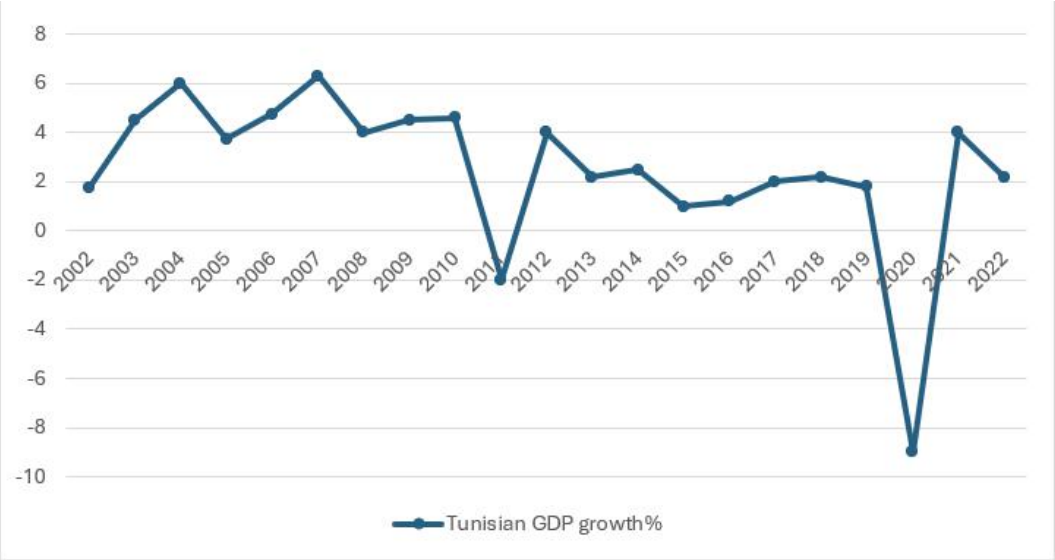

Figure 1- Tunisian GDP growth (annual %)

Source: https://www.worldbank.org

Figure 1 unveils the narrative of Tunisia's economic growth trajectory over a two-decade span, from 2001 to 2022. The data, represented by annual growth rates, paints a picture of a dynamic and sometimes volatile economy. The early years (2001-2007) witnessed a period of impressive economic expansion, with the GDP growth rate soaring to a peak of over 8% in 2007. This suggests a thriving economy fuelled

by factors that require further exploration. Perhaps tourism, a vital sector for Tunisia, was flourishing, or maybe foreign investments were driving significant growth in key industries.

However, the Figure 1 reveals a sharp downturn following the 2008 global financial crisis. This external shock likely impacted Tunisia's economy, causing a significant slowdown in growth. The year 2011 further highlights the volatility, with the GDP growth rate plummeting into negative territory. This dramatic decline can potentially be attributed to the Arab Spring, a period of social and political unrest that undoubtedly affected economic activity.The post-2011 era seems to be characterized by a process of cautious recovery. While the growth rate has shown some positive fluctuations, exceeding 3% in certain years, it also displays periods of stagnation or even slight contraction. This suggests a path of modest and somewhat uneven economic improvement. It would be beneficial to delve deeper and investigate the policies implemented by the Tunisian government during this timeframe. Overall, the GDP growth rate in Tunisia has averaged around 2.2% over the past four years. This data, while not entirely negative, points towards a relatively slow and potentially fragile recovery process. Further research into the specific factors influencing the economic landscape, both domestically and internationally, would provide a more holistic understanding of the forces shaping Tunisia's GDP trajectory.

2.2.2. Portugal

Portugal is a small, developed country (The Organisation for Economic Co-operation and Development (OECD), 2023) located in southern Europe. The economy is primarily driven by services, followed by manufacturing and agriculture (Bank of Portugal, 2022). Portugal is a member of the European Union and the eurozone.

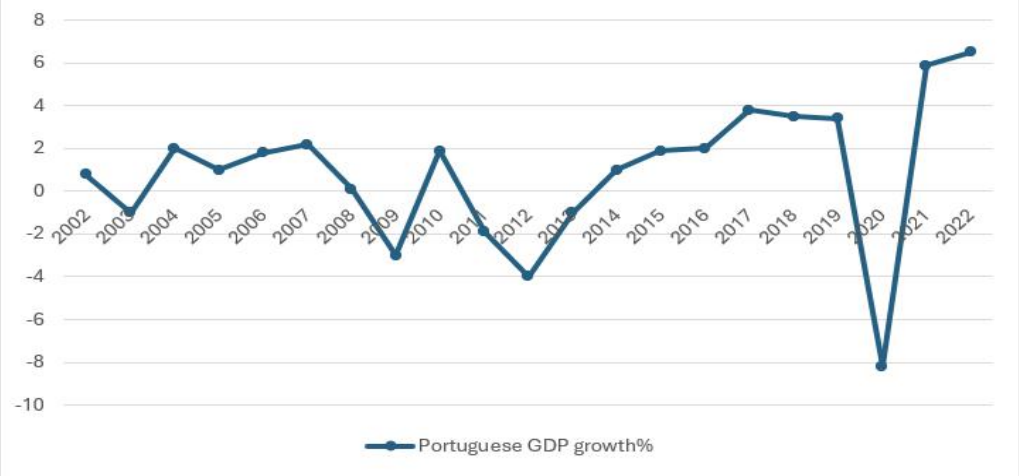

Figure 2- Portuguese GDP growth (annual %)

Source: https://www.worldbank.org

Figure 2 unveils the description of Portugal's economic growth, as measured by annual GDP growth rate, over two decades (2001-2022). The data shows a illustration of an economy that experienced periods of both boom and bust, followed by a path of cautious recovery.

The early years (2001-2007) were marked by a period of impressive economic expansion. The annual growth rate soared to nearly 8% in 2007, suggesting a thriving economy fueled by factors that warrant further investigation.

However, the graph reveals a dramatic shift following the 2008 global financial crisis. This external shock undoubtedly impacted Portugal's economy, triggering a significant slowdown in growth. The negative growth rates displayed in several years, culminating in a sharp decline in 2011, further emphasize this economic hardship. This period likely coincided with the European sovereign debt crisis, which significantly impacted Portugal's financial stability Friedrich-Ebert-Stiftung (2011).

The post-2011 era seems to be characterized by a process of gradual economic recovery. While the growth rate has shown some positive fluctuations, exceeding 3% in certain years, it also displays periods of stagnation or even slight contraction. This suggests a path of slow and uneven improvement. It would be beneficial to explore the policies implemented by the Portuguese government during this timeframe.

Overall, the GDP growth rate in Portugal has averaged around 0.5% over the past four years. While not entirely negative, this data indicates a relatively slow and potentially fragile recovery process. Further research into the domestic and international factors influencing the economic landscape could provide a more comprehensive understanding of the forces shaping Portugal's GDP trajectory.

2.3. Sample characterization and descriptive analysis.

This chapter dives into a head-to-head comparison of the Tunisian and Portuguese companies. We will explore two key aspects: market risk and profitability. First, we'll assess the financial health of the Portuguese and Tunisian companies by examining key ratios like Return on Assets (ROA) and Return on Equity (ROE) and the stability of their financial metrics. This will reveal the profitability of sectors in both Tunisia and Portugal.

The sample of companies selected for this study represents a diverse cross-section of the Tunisian and Portuguese economies. In the banking sector, Amen Bank and Banco Comercial Português (BCP), the largest banks in their respective countries, provide insights into the overall health of the financial sector. Délice Holding SA and Jerónimo Martins SGPS, S.A. offer contrasting perspectives on the food industry, encompassing both production and retail. Société Tunisienne d'Entreprises de Télécommunications S.A (SOTE) and NOS, S.G.P.S., S.A (NOS), the leading telecommunication providers, shed light on the digital landscape. Finally, Servicom SA (SERVI) and Altri, SGPS, S.A (ALSS) broaden the analysis by representing the industrial services and manufacturing sectors respectively. This deliberate selection

across key sectors ensures a comprehensive assessment of the COVID-19 pandemic's economic impact on these two nations.

By thoroughly characterizing our sample and establishing a baseline for the pre-pandemic economic conditions in Portugal and Tunisia, this chapter sets the stage for a rigorous analysis of the pandemic's impact on these economies. The subsequent chapters will delve into the specific changes observed in financial performance, stock market returns, and volatility following the onset of the COVID-19 crisis.

2.3.1 Tunisia

This analysis delves into the economic repercussions of the COVID-19 pandemic on Tunisia and Portugal by examining the financial performance and market risk of key companies in both countries. In Tunisia, the focus is on Amen Bank, a leading financial institution; Délice Holding, a major player in the food industry; Servicom, a prominent industrial services provider; and SOTE, the dominant telecommunications company. These firms were strategically chosen due to their size, market leadership, and influence on the national economy. Their experiences during the pandemic offer valuable insights into the resilience and vulnerabilities of various sectors, ultimately contributing to a comprehensive understanding of the pandemic's economic impact on Tunisia.

Amen Bank (AB) provides banking products and services to individuals and businesses in Tunisia. The company offers savings and current accounts; short-term and medium-term credits; remote banking products; payment products; bank cards; bancassurance products; investment products; cash products; and exchange products, as well as vaults and digital banking solutions. Amen Bank Société anonyme was founded in 1967 and is headquartered in Tunis, Tunisia.

Délice Holding SA (DH) engages in the food business in Tunisia. The company produces and sells carbonated drinks and juice beverages; dairy products, such as milk, flavored milk, milkshake, fermented milk, fresh cream, butter, and yoghurt; and melted triangle, squared, grated, and fresh cheese, as well as packaged drinking water. It offers its products under the DELICE and DANONE brands. Délice Holding SA was founded in 1978 and is headquartered in Tunis, Tunisia

Servicom SA (SERVI) 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.

Société Tunisienne d'Entreprises de Télécommunications S.A. (SOTE) provides telecommunications services in Tunisia and internationally. Its services portfolio comprises architecture, design and

engineering, audit, consulting, project management, training, implementation and integration, and support and maintenance. The company is also involved in deployment of networks, and fiber optic backbone PDH-SDH and WDM; copper networks and related environmental solutions; implementation of FTTx high speed broadband telecommunications framework; and energy, air conditioning and security systems, installation, testing, and measurement activities. In addition, it offers communications and information solutions; develops security policy framework; intrusion prevention and advanced detection functions; cloud computing security solutions; and consulting services for analysis, implementation, and management of content; unified communications and collaboration work tools comprising fixed-line and mobile telephony over IP, video telephony, audio/video conferencing, contact centers and IVRs, and office automation tools, as well as unified and instant messaging, calendars, word processing, presentation software, presence and telepresence, web conferencing, and document sharing and management systems; multimedia contact screens; surveillance systems; and various television and interactive services. Further, the company assists in renovating lighting installations; and provides smart transportation, waste-collection management, smart irrigation, and smart metering solutions, as well as managed security services, network management platforms and systems, and performance management solutions. Société Tunisienne d'Entreprises de Télécommunications S.A. was founded in 1981 and is headquartered in Tunis, Tunisia

2.3.2 Portugal

In Portugal, our analysis centers on four key companies strategically chosen for their size, market dominance, and representation of diverse sectors within the Portuguese economy: Banco Comercial Português (BCP), a leading financial institution; Jerónimo Martins, a major player in the food retail industry; NOS, a prominent telecommunications provider; and Altri, a significant contributor to the pulp and paper manufacturing sector. Examining the experiences of these companies during the COVID-19 pandemic provides a multifaceted lens through which to assess the pandemic's impact on Portugal's economy.

Banco Comercial Português, S.A. (BCP) a private sector bank, engages in the provision of various banking and financial products and services in Portugal and internationally. It operates through Retail Banking; Companies, Corporate & Investment Banking; Private Banking; Foreign Business; and other segments. It offers a range of financial products and services, including current accounts, payment systems, savings and investment products, private banking, asset management, and investment banking services, such as mortgage loans, personal loans, commercial banking, leasing, factoring and insurance, and others. The company is also involved in the provision of investment fund and real estate management, e-commerce, web portal, real estate investment fund, trade finance, trust, consulting, brokerage, marketing, and real estate services, as well as internet, telephone, and mobile banking services. Banco Comercial Português, S.A. was incorporated in 1985 and is based in Porto, Portugal.

Jerónimo Martins, SGPS, S.A. (JMT) operates in the food distribution and specialized retail sectors in Portugal, Poland, and Colombia. The company operates through Portugal Retail; Portugal Cash & Carry; Poland Retail; Colombia Retail; and Others, Eliminations and Adjustments segments. It operates food stores under the Biedronka name; and a chain of health and beauty stores under the Hebe banner in Poland, as well as food stores under the Ara name in Colombia. The company also operates supermarkets under the Pingo Doce banner; and cash and carry stores under the Recheio name in Portugal. In addition, it operates restaurants under the Pingo Doce name; Bem-Estar pharmacies; petrol stations; and clothing under Code brand. Further, the company operates kiosks and coffee shops under the Jeronymo name; and chocolates and confectionary retail stores under Hussel name. Additionally, the company engages in human resources top management, real estate management and administration, training, and saline brackish waters aquaculture; wholesale of fruit and vegetables; retail management, consultancy, and logistics activities; the purchase and sale of real estate; growing of crops and farming of animals; retail sale of health and beauty products; manufacture of milk and dairy products; and provision of economic and accounting, business portfolio management, financial, and sea passenger water transport services. It is also involved in the trading and distribution of consumer goods; retail and wholesale of non-food products; other business support service activities; and provision of services in the area of wholesale and retail distribution. The company was founded in 1792 and is headquartered in Lisbon, Portugal. Jerónimo Martins, SGPS, S.A. operates as a subsidiary of Sociedade Francisco Manuel dos Santos, SGPS, S.E.

Altri, SGPS, S.A. (ALSS) produces and sells cellulosic fibers and energy in Portugal and internationally. The company produces pulp products for various applications including production of paper, tissue, and printing and writing papers; and dissolving pulp for use of textile production. It is also involved timber commercialization; forest management; production of forest-based renewable energy, 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.

NOS, S.G.P.S., S.A. (NOS) engages in the telecommunications, and media and entertainment business worldwide. It operates in Telco and Audiovisual segments. The company offers cable and satellite television, voice and internet access, mobile communication, IP voice, mobile virtual network, and related consulting services, as well as electronic communications services, including data and multimedia communications. It is also involved in the negotiation, acquisition, and distribution of content rights and other multimedia products, and Pay TV and video-on-demand rights; producing films and series channels; managing the advertising space on Pay TV channels; video production and sale; and cinema exhibition and distribution. In addition, the company provides data center management and consulting services in IT; invests in and supports the development of companies that aim to commercialize technologies and products; manages investments; commercializes public events; manages social

participations in other companies; and offers accounting, logistics, administrative, financial, tax, human resources, and licensing and engineering services. Further, it engages in the design, construction, management, and exploitation of electronic communications networks, and equipment and infrastructure; management of technological assets and renders related services; achievement and promotion of scientific, and research and development activities; import, distribution, editing, commercialization, and production of audiovisual products; and provides demonstration, dissemination, technology transfer, and formation services in the field of services and information systems. Additionally, the company purchases, sells, rents, and operates property and commercial establishments; and manages real estate and financing activities. The company was founded in 1999 and is headquartered in Lisbon, Portugal. NOS, S.G.P.S., S.A. is a subsidiary of ZOPT, SGPS, S.A.

2.3.3. Analysis of Profitability and market risk of companies

The performance of any company hinges on its ability to generate profits while managing its exposure to risk. This study aims to delve into the profitability and market risk of four companies, four from Tunisia and four from Portugal. This comparative analysis will provide valuable insights into the financial landscape of these two countries and potentially identify any underlying trends or differences.

Table 2 summarize the behavior of profitability of each Tunisian company over the period 2019-2022.

Table 2: Profitability analysis of Tunisian company

Companies	Years			
	2022	2021	2020	2019
AB	19.32%	19.79%	14.26%	20.28%
Delice	6.38%	6.18%	5.58%	4.43%
SERVI	-320.65%	-30.27%	3.00%	3.25%
SOTE	2.40%	-0.65%	12.12%	-7.12%
Average, Per Year	-73.14%	-1.24%	8.74%	5.21%
Standard Deviation Per Year	165%	21%	5%	11%
Total Average (Standard Deviation)	-15.11% (203%)			

Analyzing the Table 2, we can observe that the average net profit margin for all companies combined was negative in 2021 and 2022, primarily due to SERVI's substantial losses. The high standard deviation across all years reflects the wide disparities in performance among the companies.

The COVID-19 pandemic appears to have had a mixed impact on these companies. AB and Delice seemed to have weathered the storm relatively well, maintaining or even improving their profitability. However, SERVI was severely affected, incurring substantial losses in 2021, likely due to disruptions in

operations and reduced demand for its services. Despite this, the company managed a significant rebound in 2022, although it did not fully recover to pre-pandemic levels. SOTE also experienced a decline in profitability in 2021, suggesting a negative impact from the pandemic, though less severe than SERVI.

This sharp decline in average profitability after 2019 strongly suggests a negative impact of the COVID-19 pandemic on the financial performance of these companies. The pandemic likely disrupted operations, reduced demand, and increased costs, leading to lower profits and, in some cases, substantial losses also the increase in standard deviation of net profit margins after 2019, particularly in 2021 and 2022, can be related to the COVID-19 pandemic.

Now analyzing the behavior of profitability of Portuguese companies in the sample as shown in Table 3.

Table 3: Profitability analysis of Portuguese company.

Companies	Years			
	2022	2021	2020	2019
BCP	4.86%	-2.29%	10.65%	19.48%
JMT	2.39%	2.32%	1.67%	2.26%
ALSS	4.06%	8.99%	13.71%	17.08%
NOS	14.76%	10.06%	6.23%	9.77%
Average Per Year	6.52%	4.77%	8.06%	12.15%
Standard Deviation Per Year	6%	6%	5%	8%
Total Average (Standard Deviation)	8% (24%)			

Upon analyzing Table 3, the average net profit margin for all companies combined experienced a downward trend the average net profit margin for all companies decreased from 2019 to 2022, reflecting the broader economic impact of the pandemic. However, the relatively low standard deviation indicates that these companies demonstrated greater stability compared to a previous sample of Tunisian companies. The pandemic affected each company differently, with BCP and ALSS experiencing declines, while JMT and NOS remained resilient.

This decline in average profitability following 2019 suggests a negative impact of the COVID-19 pandemic on the financial performance of these Portuguese companies. So, for Portuguese sample we can accept the hypothesis RH1.

Table 4 analyzes the behavior of the return on closed prices of the stocks of the companies.

Table 4: Monthly returns, annual total risk, and market risk of Tunisian and Portuguese companies´ stocks, for the period 2010 to 2023.

	Tunisian				Portuguese			
Stocks:	AB	Delice	SERVI	SOTE	BCP	JMT	ALSS	NOS
Average monthly returns	0.15%	-1.59%	0.90%	-0.55%	-1.46%	0.67%	0.79%	0.05%
Stand. Dev. monthly returns	4.64%	17.42%	5.43%	11.66%	15.79%	7.20%	10.93%	7.47%
Maximum	15.86%	86.30%	23.34%	78.22%	43.01%	23.37%	31.63%	18.23%
Minimum	-10.77%	-82.82%	-20.61%	-23.29%	-68.62%	-21.12%	-55.70%	-28.09%
Nominal Annual Rate of Return	1.81%	-19.12%	10.83%	-6.60%	-17.51%	8.09%	9.51%	0.63%
Annual Total Risk	16.06%	60.35%	18.80%	40.38%	54.69%	24.93%	37.85%	25.89%
Beta of Stock	0.4962	0.519569	1.140695	0.679337	1.816524	0.561297	1.3152985	0.8474047

The Table 4 provides a 13-year (2010-2023) overview of the risk and return profile of selected Tunisian and Portuguese stocks. Tunisian stock SERVI stood out with the highest average monthly returns (0.90%) and a corresponding annualized return of 10.83%, but also carried a higher risk (18.80%) and greater market sensitivity (beta of 1.14). On the other hand, AB demonstrated moderate performance with positive returns and lower risk, while Delice emerged as the most volatile with negative returns and the highest risk among all stocks. In the Portuguese market, JMT offered a balanced risk-return profile with positive returns (0.67% monthly, 8.09% annualized) and moderate risk (24.93%). ALSS presented another option with positive returns (0.79% monthly, 9.51% annualized), though with slightly higher risk. BCP, however, exhibited negative returns and the highest risk among Portuguese stocks, coupled with high market sensitivity (beta of 1.82). Overall, the analysis underscores the trade-off between risk and return, emphasizing the importance of aligning investment choices with individual risk tolerance and financial goals. Diversification across both markets could be a viable strategy to manage risk while potentially enhancing returns.

The Table 5 analysis compares the average returns of Tunisian and Portuguese companies before and after the COVID-19 pandemic.

Table 5: The four Tunisian and Portuguese companies Profitability before and during COVID-19.

Group Statistics					
	Period	N	Mean	Std. Deviation	Std. Error Mean
Tunisain_companies_Average_Return	Before COVID-19	114	-.0045528	.21161209	.01981929
	After COVID-19	36	-.0509514	.30176742	.05029457
Portuguese_companies_Average_Return	Before COVID-19	114	-.0038420	.28357802	.02655952
	After COVID-19	36	-.0002308	.38695870	.06449312

Before the pandemic, the four Tunisian companies had a slightly negative average return (-0.0045), while Portuguese companies had a slightly positive average return (0.0038). Both groups experienced considerable variability in returns.

After the pandemic, both groups saw a decline in average returns. Tunisian companies experienced a more significant decrease, dropping to -0.051, while Portuguese companies saw a slight decline to -0.0002. The volatility of returns also increased for both groups, with the standard deviation rising substantially.

These results suggest that the COVID-19 pandemic negatively impacted the average returns of both Tunisian and Portuguese companies, with a more pronounced effect on Tunisian firms.

The Table 6 analysis compares the average returns of four Tunisian and four Portuguese companies to determine if there's a statistically significant difference.

Table 6: Comparative analysis of profitability using independent sample test: Tunisian vs. Portuguese companies.

		Levene's Test							95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Tunisian companies Average Return	Equal variances assumed	1.684	.196	1.028	148	.306	.04639864	.04513025	-.04278426	.13558155
	Equal variances not assumed			.858	46.368	.395	.04639864	.05405875	-.06239269	.15518997
Portuguese companies Average Return	Equal variances assumed	.987	.322	-.061	148	.952	-.00361123	.05948422	-.12115934	.11393687
	Equal variances not assumed			-.052	47.456	.959	-.00361123	.06974790	-.14389037	.13666790

Table 6: presents the results of an independent samples t-test comparing the average returns of Tunisian and Portuguese companies. The goal is to determine if there's a statistically significant difference in profitability between the two groups.

Levene's Test for Equality of Variances assesses whether the variances of two groups are significantly different. In this case, the results (p-values of 0.196 and 0.322) indicate no significant difference, allowing the assumption of equal variances for the t-test. The Independent Samples t-Test examines whether the means of the two groups are significantly different. The results (p-values of 0.306 and 0.952) show no significant difference in average returns between Tunisian and Portuguese companies, regardless of assuming equal variances or not. The mean difference represents the average difference in returns, and the 95% confidence interval provides a range where the true difference likely falls. Since both confidence intervals include zero, it further supports the conclusion of no significant difference in average returns.

Based on this analysis, there is no statistically significant difference in the average returns (profitability) of Tunisian and Portuguese companies. This suggests that, on average, both groups of companies performed similarly in terms of profitability. However, it's important to note that this analysis is based on a limited sample and does not specifically account for the impact of the COVID-19 pandemic, which could have influenced the results.

To compare between Tunisian and Portuguese companies-market risk assessed by Value at Risk We present Value at Risk (VaR) for four companies at two confidence levels (95% and 99%) over two timeframes (1-month and 12-month). Using both levels provides a comprehensive risk assessment: 95% VaR captures typical market risks, while 99% VaR accounts for extreme events in this case the COVID-19 Pandemic event (Jorion, 2006). This allows comparison of risk sensitivity and caters to investors with different risk tolerances (Kuester, K., Mittnik, S., & Paolella, M. S., 2006).

Table 7 provides VaR figures for Tunisian companies' stocks returns, which estimate potential losses for various investments over different timeframes and confidence levels.

Table 7: VaR of Tunisian companies´ stocks returns, by parametric method.

Parametric Method of VAR (Month, alfa)	AB	Delice	SERVI	SOTE
VaR (1M, 95%) in %	7.63%	28.66%	8.93%	19.17%
VaR (1M, 99%) in %	10.78%	40.53%	12.62%	27.12%
VaR (1M, 95%) in EURO	0.8646755	0.0170579	0.3320435	0.2236835
VaR (1M, 99%) in EURO	1.2229271	0.0241253	0.4696155	0.3163599

Parametric Method of VAR (Year, alfa)	AB	Delice	SERVI	SOTE
VaR (12M, 95%) in %	26.42%	99.27%	30.92%	66.42%
VaR (12M, 99%) in %	37.36%	140.40%	43.73%	93.93%
VaR (12M, 95%) in EURO	2.995323961	0.059090272	1.150232578	0.774862421
VaR (12M, 99%) in EURO	4.236343839	0.083572499	1.626795885	1.095902709

Analyzing the Table 7, it can observe that the VaR of Tunisian companies´ stock returns (AB, Delice, SERVI, and SOTE), using the parametric method, reveals significant insights into their risk profiles both monthly and annually. For a one-month period at a 95% confidence level, Delice shows the highest risk with a VaR of 28.66%, followed by SOTE at 19.17%, SERVI at 8.93%, and AB at 7.63%. At a 99% confidence level, the risks increase, with Delice again leading at 40.53%. In monetary terms, the potential losses for a 95% confidence level range from €0.0171 for Delice to €0.8647 for AB. Annually, the risks are substantially higher, with Delice exhibiting an extremely high VaR of 99.27% at the 95% confidence level, indicating considerable volatility. The 99% confidence level shows even more dramatic potential losses. The monetary VaR for a year at 95% confidence ranges from €0.0591 for Delice to €2.9953 for AB. This data highlights that while Delice shows the highest risk percentages, the monetary losses, though relatively smaller, indicate significant exposure, especially when considering annualized figures. This analysis provides a comprehensive understanding of the financial risks faced by these Tunisian companies.

Table 8: VaR of Portuguese companies´ stocks returns, by Parametric Method.

Parametric Method of VAR (Month, alfa)	BCP	JMT	ALSS	NOS
VaR (1M, 95%) in %	25.97%	11.84%	17.97%	12.29%
VaR (1M, 99%) in %	36.72%	16.74%	25.42%	17.39%
VaR (1M, 95%) in EURO	0.066422378	2.34165163	0.756590147	0.414336803
VaR (1M, 99%) in EURO	0.093942437	3.311842587	1.070059883	0.586004447

Parametric Method of VAR (Year, alfa)	BCP	JMT	ALSS	NOS
VaR (12M, 95%) in %	0.899506912	0.410097027	0.622542791	0.425906465
VaR (12M, 99%) in %	1.272189791	0.580008051	0.880474149	0.602367642
VaR (12M, 95%) in EURO	0.230093868	8.111719193	2.620905149	1.435304788
VaR (12M, 99%) in EURO	0.325426149	11.47255925	3.706796168	2.029978952

The table 8 shows the VaR for Portuguese companies (BCP, JMT, ALSS, and NOS) using the parametric method, which demonstrates varying levels of financial risk on both a monthly and annual basis. For a one-month period at a 95% confidence level, BCP shows the highest risk with a VaR of 25.97%, followed by ALSS at 17.97%, NOS at 12.29%, and JMT at 11.84%. At a 99% confidence level, these values increase, with BCP reaching 36.72%. In monetary terms, JMT shows the highest potential loss with €2.3417 at the 95% confidence level and €3.3118 at the 99% confidence level, indicating significant exposure. On an annual basis, the risks are comparatively lower, with the highest VaR percentage being 0.90% for BCP at the 95% confidence level, highlighting more stability over a longer term. In monetary terms, JMT exhibits the highest potential annual loss with €8.1117 at the 95% confidence level and €11.4726 at the 99% confidence level, suggesting a significant financial impact. Overall, while the monthly risk percentages are considerable, the annual figures, especially in monetary terms, underscore substantial potential losses, reflecting the broader financial exposure and stability of these Portuguese companies.

2.4.1 Comparison between Tunisian and Portuguese companies

The comparative analysis of VaR for Tunisian and Portuguese companies provides critical insights into the impact of COVID-19 on these stock markets. Evaluating data from 2010 to 2023 using the parametric method at 95% and 99% confidence levels highlights the increased volatility and financial risks during this period. Tunisian companies exhibit higher VaR percentages both monthly and annually, indicating greater sensitivity to market fluctuations induced by the pandemic. For instance, Delice shows a high monthly VaR of 28.66% at 95% confidence and an annual VaR of 99.27%, reflecting significant volatility.

Conversely, Portuguese companies like BCP have lower monthly VaR percentages, with the highest at 25.97% at 95% confidence, suggesting more stability. However, in monetary terms, Portuguese companies face higher potential losses, with JMT's monthly VaR at €2.34 and JMT annual VaR at €8.11 at 95% confidence. This indicates that despite lower percentage risks, the larger financial exposures of Portuguese companies could result in substantial absolute losses.

The choice of the parametric method for VaR calculation at 95% and 99% confidence levels allows for a robust assessment of potential losses under normal and extreme market conditions, respectively. This approach is particularly suited to capture the impact of unprecedented events like the COVID-19 pandemic, providing a comprehensive understanding of the risks faced by the Tunisian and Portuguese stock markets during this volatile period. This analysis underscores the varying degrees of impact and resilience across different markets, offering valuable insights for financial risk management and policymaking.

Table 9: Tunisian stocks portfolio with maximum profitability and minimum risk

Amount to invest	€ 10,000.00			
Portfolio	AB	Delice	SERVI	SOTE
%of investment	18.20%	50.34%	19.39%	12.07%
Amount of investment	€ 1,820.00	€ 5,034.00	€ 1,939.00	€ 1,207.00

The table 9 shows a Tunisian stocks' portfolio with maximum profitability and minimum risk, along with the amount of investment for each stock if you have €10,000 to invest. This means that if you have €10,000 to invest, you should invest €1,820 in AB, €5,034 in Delice, €1,939 in SERVI, and €1,200 in SOTE. The portfolio is well-diversified, with no single stock accounting for more than 50% of the portfolio weight. This diversification helps to reduce the overall risk of the portfolio. The portfolio is also weighted towards stocks with higher expected returns and lower variances. This helps to maximize the portfolio's expected return and minimize its risk. Overall, the portfolio is a well-constructed portfolio with a good risk-return profile.

The table 10 shows a Portuguese stocks' portfolio with maximum profitability and minimum risk, along with the amount of investment for each stock if you have €10,000 to invest.

Table 10: Portuguese stock portfolio with maximum profitability and minimum risk

Amount to invest	€ 10,000.00			
Portfolio	BCP	JMT	ALSS	NOS
% of investment	43.24%	15.78%	29.89%	11.09%
Amount of investment	€ 4,324.00	€ 1,578.00	€ 2,989.00	€ 1,109.00

To compose this portfolio, investing €10,000 in total, you allocate 43.24% in BCP shares, 15,78% in JMT, 29.89% in ALSS and 11.09% in NOS.This means that if you have to invest, you should invest €4,324 in BCP, €1,578 in JMT, €2,989 in ALSS, and €1,109 in NOS (see Table 10). The portfolio is well-diversified, with no single stock accounting for more than 50% of the portfolio weight. This diversification helps to reduce the overall risk of the portfolio. The portfolio is also weighted towards stocks with higher expected returns and lower variances. This helps to maximize the portfolio's expected return and minimize its risk. Globally, the portfolio is a well-constructed portfolio with a good risk-return profile.

The portfolios analysis for Tunisian and Portuguese companies, based on data from 2010 to 2023, offers crucial insights into the impact of COVID-19 on these stock markets. The portfolios are constructed to maximize profitability and minimize risk, with Tunisian stocks allocated as AB (18.20%), Delice (50.34%), SERVI (19.39%), and SOTE (12.07%), and Portuguese stocks as BCP (43.24%), JMT (15.78%), ALSS (29.89%), and NOS (11.09%). This diversification reduces overall risk, essential during the heightened uncertainty of the COVID-19 pandemic. The portfolios emphasize stocks with higher expected returns and lower variances, reflecting an effort to optimize the risk-return balance amidst market volatility.

The parametric VaR method, employed at 95% and 99% confidence levels, quantifies potential losses under normal and extreme conditions, crucial for understanding the stability of these markets before and during the pandemic. Tunisian companies showed higher volatility, while Portuguese companies had larger financial exposures. This analysis underscores how adaptive investment strategies and risk management are critical during crises, illustrating market behavior and resilience during one of the most challenging financial periods in recent history.

2.5. Inferential Analysis: Return and Risk Tests on Tunisian and Portuguese stock market Indexes.

The study scrutinized the impact of the COVID-19 pandemic on the Tunisian Stock Exchange (TUNINDEX) and the Portuguese Stock Exchange (PSI-20) by analyzing their monthly returns from 2017 to 2022. A paired sample t-test was employed to rigorously assess whether the pandemic induced statistically significant differences in the average monthly returns of these indices. This involved comparing the pre-pandemic period (2017-2019) with the pandemic period (2020-2022). By pairing returns from the same months across these distinct timeframes, the analysis effectively controlled for time-specific effects, isolating the pandemic's impact. The results of the t-test revealed that while the pandemic may have influenced market volatility, it did not lead to a statistically significant change in the average monthly returns of either the TUNINDEX or the PSI-20. This suggests that despite the economic disruptions caused by the pandemic, the long-term average returns of these markets remained relatively stable. However, it's important to note that this analysis focused solely on average returns and did not

delve into other aspects of market performance, such as volatility or risk, which could have been affected by the pandemic.

2.5.1 Tunisian Stock Market Index Returns: Pre- and During COVID-19 Periods (2017-2022)

This analysis examines the monthly returns of the Tunisian stock market indices, focusing on the period from 2017 to 2019, preceding the COVID-19 pandemic. The primary objective is to assess whether there were significant differences in the performance of this market Pre and During timeframe. This is achieved by examining the descriptive statistics, correlation, and conducting a paired samples t-test to compare the average monthly returns of these indices.

Table 11 presents descriptive statistics for the monthly returns of the Tunisian stock market index before and during the COVID-19 pandemic.

Table 11: Paired samples statistics of Tunisian market index before and during COVID-19

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Monthly Return of Tunisian Index Before the COVID-19	.006909270778	36	.0284843054537	.0047473842423
	Monthly Return of Tunisian Index During the COVID-19	.003948395417	36	.0350394884816	.0058399147469

It shows a slight decrease in the mean monthly returns from 0.69% before the pandemic to 0.39% during the pandemic. Additionally, the standard deviation, a measure of volatility, increased from 2.85% before the pandemic to 3.50% during the pandemic. While the Table 11 indicates an increase in volatility during the pandemic, it does not provide conclusive evidence to support the hypothesis of a significant difference in market risk. To determine statistical significance, an F-test for comparing variances would be needed. It also suggests a potential increase in volatility during the pandemic, but further statistical testing is required to confirm if this difference is significant and supports the hypothesis of a significant difference in market risk.

The Table 12 displays the correlation between the monthly returns of the Tunisian stock market index before and during the COVID-19 pandemic.

Table 12: Paired samples correlations of monthly return of Tunisian index before and during the COVID-19

	N	Correlation	p-value
Monthly Return of Tunisian Index Before & During the COVID-19	36	.123	.475

The correlation coefficient of 0.123 (see Table 12) suggests a weak positive relationship between the two periods. However, with a significance level (p-value) of 0.475, this correlation is not statistically

significant, indicating that there is not enough evidence to conclude that the returns before and during the pandemic are meaningfully related.

A paired samples t-test, as presented in table 13, was conducted to investigate potential differences in the mean monthly returns of the Tunisian stock market index before and during the COVID-19 pandemic.

Table 13: Paired samples t-Test of Tunisian stock market index before and during COVID-19

	Paired Differences							
		Std.	Std. Error	95% Confidence Interval of the Difference				Sig.
	Mean	Deviation	Mean	Lower	Upper	t	df	(2-tailed)
Monthly Return of Tunisian Index Before & During COVID-19	.00296088	.04235128	.00705855	.01136874	.017290488	.419	35	.677

Table 13 revealed a t-statistic of 0.419 with 35 degrees of freedom, corresponding to a p-value of 0.677. This p-value, exceeding the conventional significance threshold of 0.05, indicates that the observed mean difference of 0.296% is not statistically significant. The 95% confidence interval for the mean difference, ranging from -1.137% to 1.729%, further reinforces the conclusion of no statistically significant change. These results suggest that, despite a marginal decrease in average monthly returns during the pandemic, the impact was not substantial enough to be distinguished from normal market fluctuations. Therefore, the evidence does not support the research hypothesis RH2 of a significant change in the mean monthly returns of the Tunisian stock market index due to the COVID-19 pandemic.

2.5.2 Portuguese Stock Market Index Returns: Pre- and During COVID-19 Periods (2017-2022)

This analysis examines the performance of the Portuguese stock market indices Pre- and During during the COVID-19 pandemic, focusing on the period from 2017 to 2022. By analyzing descriptive statistics, correlations, and conducting a paired samples t-test, we aim to assess if there were statistically significant differences in their mean monthly returns during this turbulent time.

Table 14 illustrates the monthly returns of the Portuguese stock market index before and during the COVID-19 pandemic.

Table 14: Paired samples statistics of Portuguese market index before and during COVID-19

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Monthly Return of Portuguese Index before the COVID-19	.003874163389	36	.0334278923135	.0055713153856
	Monthly Return of Portuguese Index during the COVID-19	.003051536500	36	.0766048210684	.0127674701781

Prior to the pandemic, the index averaged a monthly return of 0.39% with a standard deviation of 3.34%, indicating moderate volatility (see Table 14). However, during the pandemic, while the average monthly return slightly decreased to 0.31%, the standard deviation surged to 7.66%, signifying a substantial increase in market volatility and risk. This suggests that the pandemic significantly impacted the Portuguese stock market, leading to greater fluctuations and uncertainty in monthly returns.

Table 15 presents the correlation between the monthly returns of the Portuguese stock market index before and during the COVID-19 pandemic.

Table 15: Paired samples correlations of monthly return of Portuguese index before & during the COVID-19

	N	Correlation	p-value
Monthly Return of Portuguese Index before & during the COVID-19	36	.002	.989

The correlation coefficient of 0.002 indicates a negligible and virtually non-existent linear relationship between the two periods (see Table 15) Furthermore, the significance level (p-value) of 0.989 confirms that this correlation is not statistically significant. This implies that the monthly returns before the pandemic do not offer any predictive power for the returns during the pandemic, suggesting a fundamental shift in market dynamics due to the COVID-19 crisis.

Table 16: Paired samples t-Test of Portuguese stock market index before and during COVID-19

	Paired Difference							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Monthly Return of Portuguese Index Before & During COVID-19	.00082263	.08351004	.01391834	.02743311	.02907836	.059	35	.953

The paired samples t-test, as presented in table 16, examined the hypothesis of a significant difference in mean monthly returns of the Portuguese stock market index before and during the COVID-19 pandemic. The analysis revealed a t-statistic of 0.059 with 35 degrees of freedom, corresponding to a p-value of 0.953. This high p-value, well above the conventional significance level of 0.05, indicates a failure to reject the null hypothesis of no difference in mean returns. Therefore, despite a marginal decrease of 0.082% in average monthly returns observed during the pandemic, this change lacks statistical significance, suggesting that it could be attributed to random fluctuations rather than a direct impact of the pandemic. The 95% confidence interval (-0.0274 to 0.0291) further supports this

conclusion, as it includes zero, indicating that the true difference in mean returns could reasonably be zero.

These findings suggest that while the COVID-19 pandemic may have influenced market volatility, as indicated by other analyses, it did not lead to a statistically significant change in the average monthly returns of the Portuguese stock market index. This result underscores the resilience of the Portuguese market in the face of the pandemic's economic disruptions.

2.5.3 Assessing Market Risk (Volatility) Changes During the COVID-19 Pandemic

To assess the impact of the COVID-19 pandemic on market risk, we examined the variances of monthly returns for the Portuguese and Tunisian stock market indices before and during the pandemic. Levene's test for equality of variances, a statistical tool that compares variances between two groups of 36, was employed to determine if significant changes in volatility occurred.

Table 17: Impact of COVID-19 on market risk (volatility)

Stock Market Index	Levene's Test (F-value)	p-value	Significant Change in Volatility?
Portuguese PSI-20	14.19	0.001	Yes
Tunisian TUNINDEX	1.4	0.243	No

For the Portuguese market, Levene's test revealed a statistically significant difference in variances ($F = 14.19$, $p = .001$), indicating a substantial alteration in market risk during the pandemic. This result supports the hypothesis that the Portuguese stock market experienced a significant shift in volatility due to the COVID-19 pandemic, reflecting heightened uncertainty and heightened risk perceptions among investors.

In contrast, Levene's test for the Tunisian market did not identify a statistically significant change in variances ($F = 1.40$, $p = .243$). This suggests that the Tunisian stock market, while likely experiencing some fluctuations, did not undergo a fundamental change in volatility comparable to that observed in the Portuguese market. This divergence in market responses underscores the importance of considering country-specific factors and economic structures when analyzing the impact of global events like the COVID-19 pandemic. These findings offer valuable insights into the diverse ways in which financial markets respond to exogenous shocks. The heightened volatility observed in the Portuguese market highlights the potential for increased investment risk during periods of crisis, while the relative stability of the Tunisian market suggests a greater degree of resilience. Further research is warranted to investigate the underlying factors contributing to these disparate outcomes, such as differences in economic policies, industry composition, and investor behaviour.

The varying impact of the pandemic on market risk in Portugal and Tunisia also emphasizes the need for tailored risk management strategies in different economic contexts. Investors and policymakers should consider the unique characteristics of each market when developing policies and investment portfolios to mitigate potential losses and capitalize on emerging opportunities.

Conclusion, limitations, and suggestions for further research

The COVID-19 pandemic's impact on the Portuguese and Tunisian stock markets has been a subject of intense scrutiny and analysis. This thesis aimed to shed light on the specific effects of this unprecedented global crisis on these two distinct yet interconnected markets. Through a comprehensive examination of financial data, market indicators, and risk assessment techniques, we have gained valuable insights into the resilience and vulnerabilities of both markets in the face of the pandemic's economic disruptions.

Our findings reveal a nuanced picture of the pandemic's impact. In Tunisia, the stock market experienced heightened volatility and increased risk, particularly for companies like Delice, which faced substantial fluctuations in their financial performance. However, the overall market demonstrated a degree of resilience, with some companies managing to maintain or even improve their profitability during the crisis.

In Portugal, the stock market also witnessed increased volatility, but the impact on average returns was less pronounced. While some companies experienced declines in profitability, others demonstrated resilience, highlighting the diverse ways in which different sectors and companies responded to the pandemic's challenges.

The comparative analysis of Value at Risk (VaR) further emphasized the varying degrees of risk exposure in both markets. Tunisian companies generally exhibited higher VaR percentages, indicating greater sensitivity to market fluctuations, while Portuguese companies, despite lower percentage risks, faced larger potential losses due to their greater financial exposures.

The paired sample t-tests conducted on the stock market indices of both countries revealed no statistically significant differences in mean returns before and during the pandemic. However, the analysis of market risk using Levene's test indicated a significant increase in volatility for the Portuguese market, suggesting a heightened level of risk during the pandemic.

This research contributes to the growing body of literature on the financial implications of the COVID-19 pandemic. It provides valuable insights for investors, policymakers, and market participants seeking to understand the dynamics of emerging and developed markets during times of crisis. The findings underscore the importance of diversification, risk management, and adaptive strategies in navigating the complexities of the post-pandemic financial landscape.

While this thesis has provided a comprehensive analysis of the pandemic's impact on the Portuguese and Tunisian stock markets, it is important to acknowledge its limitations. The study focused on a specific timeframe and a limited sample of companies, which may not fully capture the long-term effects of the pandemic. Additionally, the analysis primarily relied on quantitative data, potentially overlooking qualitative factors that could influence market behaviour.

Future research could expand on these findings by incorporating a broader range of companies and sectors, extending the analysis timeframe, and exploring qualitative aspects such as investor sentiment and government policies. Such research would further enrich our understanding of the pandemic's lasting impact on financial markets and inform strategies for building resilience in the face of future global crises.

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