Master Thesis

The impact of Hedging strategies and Equity Multiples on stock returns surrounding COVID-19

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Master Thesis Business Administration: Financial Management

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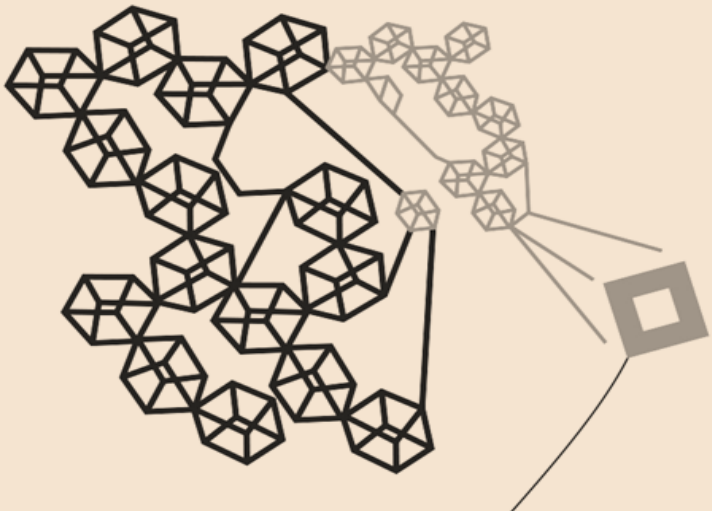

Master Thesis - Part 1

Hedging strategies and Stock Returns surrounding COVID-19: Evidence from EU publicly-listed companies in five Euronext EU locations

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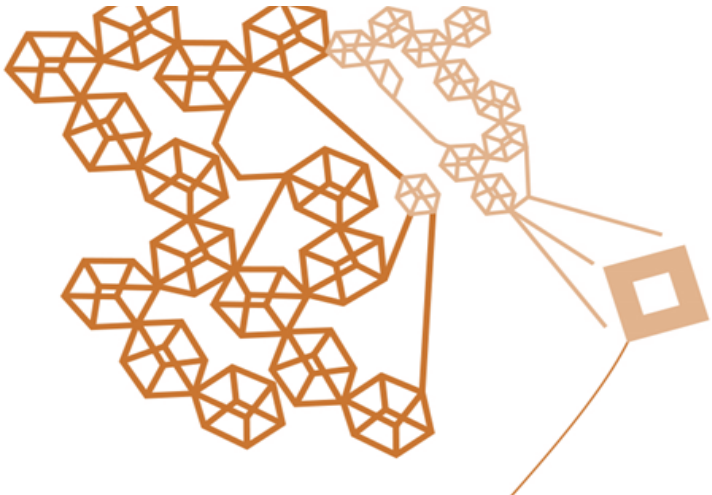

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Abstract

In an era of extreme uncertainty, the complex relationship between corporate hedging strategies and stock performance has received much academic attention, yet lacked in detailed research. This paper aimed to fill the research gap by investigating the dynamics of hedging practices and stock returns in the European Union (EU) environment, specifically during the disruptive times of the COVID-19 pandemic. The research, which ran from 2017 to 2021, looked into the impact of corporate hedging on stock returns among publicly listed companies on multiple Euronext exchanges, including Euronext Paris, Amsterdam, Dublin, Lisbon, and Brussels. Furthermore, it intended to investigate the influence of the COVID-19 pandemic peak years (2020 and 2021), firm operating sector, and firm size on the hedging – stock returns relationship.

Using the original dataset of 268 companies, we found that the vast majority of sampled companies used hedging. The intricacies inherent in the independent variable (hedging strategies) became more apparent as the study progressed. The topic's broadness introduced complexities, such as differences in reporting formats among organizations and difficulties categorizing and assessing hedging strategies. This made it difficult to determine the answer to whether a company uses hedging strategies or not - and even more difficult to assess the intensity/degree or types of hedging that a company employs. As a result, the connection between hedging strategies and stock returns could not be examined.

Rather than constraining the study, these complexities necessitated a shift in focus, revealing promising avenues for future research to further our understanding about how corporate strategies affect stock returns. The second part of the Thesis would continue to investigate the impact of another important yet quantifiable independent variable - market multiples on stock returns.

Introduction

The world of business and finance is packed with uncertainties. Uncertainty is an essential element in all parts of company operations, from the broad macroeconomic backdrop to the most specific activities (Fuller, 2023). The global COVID-19 pandemic, which starts in Wuhan, China, in December 2019 and spreads to Europe in January 2020, is a demonstration of uncertainty episodes (Szczygielski et al., 2022). The economic volatility caused by such an event emphasizes the importance of understanding the strategic tactics that businesses may use to navigate these uncertainties to maintain financial stability and facilitate growth.

Corporate hedging, a method used by businesses to control their exposure to various risks, has received an immense amount of attention in academic and professional circles over the years (Bodnar et al., 1995). Hedging serves as a stabilizing factor in an unpredictable environment by minimizing the potential variability in business value, with consequences for multiple financial outcomes, including stock returns. Firms' use of hedging methods to hedge against anticipated bad events has long sparked the interest of both academics and practitioners. This interest has been heightened by the growing momentum of financial globalization and the associated interconnection of markets, making the study of hedging techniques both a contemporary and long-lasting subject of study (Speranda, 2009).

The relationship between corporate hedging and stock returns is scarce and widely debated, and past research has yielded inconsistent findings. Some academics argue that engaging in hedging activities increases firm value, thereby positively impacting stock returns (Froot et al., 1993; Jin & Jorion, 2006). Others, however, argue that hedging may not always result in positive stock returns due to factors such as implementation costs and potential agency issues (Stulz, 1996; Tufano, 1996). When the moderating effect of uncertainty periods on the link between corporate hedging and stock returns is examined, the degree of complexity of this relationship becomes clearer. Because of fluctuating risk levels and market dynamics, the effectiveness of hedging strategies may increase during times of greater uncertainty (Bloom et al., 2007; Nguyen & Nguyen, 2020). Furthermore, the scope of a firm's operations, as well as the type or sector of its industry, can shape the impact of hedging strategies on stock returns (Allayannis & Ofek, 2001; Bartram et al., 2011). Previous research has also acknowledged the role of firm-specific variables such as company size (Guay & Kothari, 2003).

The European Union (EU), with its integrated and diverse economic landscape, offers a unique setting for investigating the dynamics between corporate hedging and stock returns. Since the beginning of the twenty-first century, the EU has faced several significant periods of increased uncertainty, including the European Sovereign Debt Crisis (2009), Brexit (2016), and, most noticeably, the COVID-19 pandemic (2020). These events have had far-reaching consequences for the EU's economic fabric, influencing both macroeconomic performance and microeconomic firm decisions.

While research on the effects of hedging on stock returns has been conducted, the majority of it has focused on US markets (Pastor & Veronesi, 2012; Adrian et al., 2015), leaving a gap in our understanding of these relationships in the context of European firms. This study will thus focus on firms listed on Euronext, providing a fresh look at these relationships in the European context. Furthermore, few studies have taken into account the role of uncertainty, particularly recent uncertainty events, as a moderator in this relationship (Adam et al., 2015). To capture the most recent developments in market reactions, this study employs the most recent 5-year time zone, from 2017 to 2021, and incorporates the COVID-19 pandemic period as the central moderator. Finally, the potential moderating role of firm-specific variables—operating sector and firm size—has gone mostly unnoticed. The current study seeks to fill these gaps by investigating the moderating effects of the firm's operating sector as well as its size on the relationship between hedging and stock returns.

The primary goal of this paper is to investigate the effects of corporate hedging practices on the stock returns of EU-listed companies surrounding the COVID-19 pandemic. This will be accomplished by examining: 1) the direct relationship between corporate hedging strategies and stock returns among EU-listed companies; 2) the moderating effect of the COVID-19 period on the relationship between corporate hedging strategies and stock returns; and 3) the variation in the effectiveness of corporate hedging strategies on stock returns based on firm operating sector and firm size. The following are the primary research questions that will guide this study:

1. How do corporate hedging strategies impact stock returns among EU-listed companies?
2. How did the COVID-19 pandemic moderate the relationship between corporate hedging strategies and stock returns?
3. How do the operating sector and firm size affect the impact of corporate hedging strategies and stock returns?

The findings of this study would add to the existing literature in a variety of ways. Theoretically, it broadens understanding of the impact of hedging practices on stock returns as well as how this relationship is moderated by periods of high uncertainty such as COVID 19, firm operating industry, and firm size. It offers empirical evidence in the context of the EU, a critical economic bloc that has faced significant uncertainty over the last five years (Baker et al., 2016; Roscoe et al., 2020). This study provides practical insights for investors, corporate executives, and policymakers. Investors can gain a better understanding of the risk and return implications of firms; hedging strategies in various uncertain environments. Policymakers can also gain insights into the effects of economic and political uncertainties on financial markets, thus informing economic policies during volatile times.

The remainder of this thesis is organized as follows: Section 2 examines the theoretical foundations as well as empirical evidence on stock returns, hedging strategies, and uncertainty periods. This will result in testable hypotheses that can be used to answer the research questions. Sections 3 and 4 report the methodology and results of the study. Sections 5 and 6 outline future research directions and conclude the study.

2. Theoretical Background and Hypotheses Development

2.1. Stock returns and Hedging strategies

2.1.1. Stock returns

Stock returns are important in corporate finance because they are often viewed as an indicator of a company's financial health and performance. Investors put money into the stock market in the hope of profiting. This income is referred to as stock returns, and it can take the form of profits from share trading or dividends received (Reddy & Narayan, 2016). The significance of stock returns extends beyond simply indicating investment profitability. They serve as indicators of a company's future prospects, operational efficiency, and strategic decisions, influencing the decisions of its stakeholders. Stock returns can help investors and analysts make informed decisions about where to invest their money (Baker et al., 2017).

Mathematically, stock returns provide a measure of the financial gain or loss made from an investment in a company's equity over a certain period, expressed as a percentage of the initial investment, and encompass both the change in the stock's price and any dividends received

during that period (Bodie, Kane, & Marcus, 2014). Positive stock returns over time typically indicate a successful and growing company, reflecting the market's optimism about the firm's future prospects.

$$\textit{Total Stock Return} = \frac{Pend - P\ start + Dividend}{Pstart}$$

where *Pend* is the stock price at the end of the time period, *Pstart* is the stock price at the start of the period, and *Dividend* is the dividend amount paid during the period. However, in this research, the risk-adjusted version of stock returns, represented by Sharpe ratio (Sharpe, 1966) is utilized as the dependent variable.

Stock return analysis is a popular topic in financial literature, with multiple models and theories created over time to explain the performance and volatility of these returns. Sharpe (1964), Lintner (1965), and Mossin (1966) developed one of the oldest and most influential studies, the Capital Asset Pricing Model (CAPM). According to the model, the expected return on a security is the sum of the risk-free rate and the product of the stock's beta (a measure of its market risk) and the market risk premium. The CAPM essentially implies that a stock's projected return is directly proportional to its beta, reaffirming the fundamental principle that higher risk demands higher returns. Fama and French (1992) enhanced the CAPM by including two new variables: the book-to-market ratio and the firm's size. These parameters were chosen because Fama and French discovered that small-cap companies and stocks with high book-to-market ratios are inclined to outperform the market, a behavior that the original CAPM could not explain. Their three-factor model also better explained the cross-sectional variation in average stock returns. Later, in 2015, Fama and French expanded their method to cover two more elements: profitability and investment (Fama & French, 2015). Fama and French (2015) argued that these two additional factors are essential in predicting future earnings and, therefore, future stock returns.

In the broader economic context, stock returns have been found to be sensitive to both institutional and macroeconomic conditions (Scully, 1988). The influence on stock market returns can be examined from two distinct angles: an institutional standpoint, which pertains to the economic progress of a nation, and a macroeconomic standpoint, which encompasses the overall economic instability at a national or aggregate level (Scully, 1988). A rich vein of research has sought to untangle the relationship between macroeconomic variables and stock returns. For instance, Chen, Roll, and Ross (1986) identified several macroeconomic variables that influence stock returns, including industrial production, changes in the risk premium, and a twist in the yield curve.

Later, Fama (1981) asserted that factors such as inflation, industrial production, and the spread between long- and short-term interest rates have predictive power over stock returns. Furthermore, Schwert (1990) provided evidence that stock volatility is influenced by future production growth rates, suggesting that macroeconomic instability can lead to fluctuations in stock returns. From an institutional perspective, the role of government policies and legal structures in shaping stock returns cannot be discounted. La Porta et al. (2002) empirically demonstrated that countries with more robust legal protections for investors tend to exhibit higher-valued equity markets measured by Tobin's Q, suggesting a positive correlation between investor protection and firm valuation, which affects stock returns.

An array of firm-specific factors has been empirically shown to shape stock returns, significantly enriching our understanding of this multifaceted phenomenon. Research indicates that the quality of a company's earnings, reflecting its income reliability and sustainability, can significantly influence stock returns (Francis et al., 2004). Specifically, firms with high-quality earnings are often associated with more stable and predictable stock returns, highlighting the importance of earnings quality in corporate finance and stock return predictability. Furthermore, the realm of corporate governance has emerged as a notable predictor of stock returns. According to Gompers et al. (2003), firms that have robust corporate governance structures (measured by the governance index) tend to achieve higher abnormal stock returns. This can be attributed to increased investor confidence in the company's management and operations, reinforcing the link between internal governance and market performance. Dividend policy is another critical factor that has been studied in relation to stock returns. In their seminal work, Grullon et al. (2002) argued that dividend payment changes could convey a firm's financial health to the market and affect the risk premium. They found that firms increasing their dividend payouts were often rewarded with higher stock returns, as the market perceives such signals as positive.

Aside from these variables, corporate events can cause major market reactions and influence stock returns. Earnings announcements (Ball & Brown, 1968), dividend announcements (Aharony & Swary, 1980), and merger announcements (Bradley, Desai, & Kim, 1983) have all been shown to cause fluctuations in stock prices. These occurrences bring new information to investors, causing stock prices to revalue and thereby impacting returns. M&A announcements, for example, frequently have a significant impact on stock returns, especially around the announcement date. This is because these actions are expected to result in synergistic benefits, greater market share,

or other favorable consequences (Rosen, 2006). However, the effects can be varied, with acquiring firms having different patterns of stock returns than target firms (Andrade et al., 2001).

The disclosure of hedging strategies, in particular, can trigger market reactions and, as a result, influence stock returns. These announcements are regarded as internal information because they indicate the company's risk profile and future cash flow prospects. These can include strategies to hedge against currency fluctuations, interest rate changes, commodity price volatility, and other market risks. Such disclosures can reflect a company's proactive attitude toward risk management, which can boost investor confidence and raise business value (Jin & Jorion, 2006).

Finally, in the realm of behavioral finance, academics have looked into psychological biases and their impact on stock performance. Those factors explain stock return anomalies that models like CAPM do not account for by concentrating on psychological biases and investor behavior. According to De Bondt and Thaler's (1985) overreaction hypothesis, investors tend to overreact to recent information, resulting in major market corrections in the long run. Barberis et al. (1998) further explained this by offering a model to explain why stocks may underreact to a sequence of positive or negative news events and then overreact afterwards.

2.1.2. Hedging

According to Hull (2018), hedging is a risk management strategy used by corporations to protect themselves from potential losses due to price fluctuations. Hedge instruments include stocks, exchange-traded funds, insurance, forward contracts, swaps, options, and futures (Morewedge, Tang, & Larrick, 2016). These methods involve the use of financial instruments known as derivatives to create a counterbalancing position in relation to a specific risk exposure. Derivatives are contracts between two parties to buy or sell an asset at a future date and price. Each of these derivative types serves a specific purpose and is used in a variety of situations. Futures and forwards contracts, for example, are commonly used to hedge against price risk, whereas options provide protection against unfavorable price fluctuations. Swaps, on the other hand, are frequently used to hedge interest rate or currency risk (Bodnar et al., 1995). Furthermore, hedging strategies may differ significantly depending on the industry and the specific risks that a company faces. Oil companies, for example, frequently hedge against fluctuations in oil prices (Jin & Jorion, 2006), which may not be the case for companies in other industries.

Hedging, a risk management strategy used by businesses, serves a variety of functions in corporate finance. Hedging is primarily used by businesses to manage and mitigate risks such as commodity price risk, interest rate risk, currency exchange risk, and even political risk (Smith & Stulz, 1985). Firms use these strategies to protect their financial performance from potential negative impacts, establishing operational and financial stability (Froot et al., 1993). Tax considerations also highlight the significance of hedging. Because corporate tax schedules are progressive, hedging stabilizes pre-tax income, which in turn can optimize a company's tax liabilities (Smith & Stulz, 1985). Hedging is an important tool for preventing financial distress in addition to managing external risks. Hedging acts as a protective measure in volatile markets and uncertain business environments, shielding firms from risks that could lead to financial distress or bankruptcy. As a result, it improves the firm's financial resilience and ensures its survival (Froot et al., 1993).

Hedging is also relevant in the context of agency theory. Smith and Stulz (1985) extended the MM theorem by incorporating agency theory to explain why businesses hedge. Conflicts of interest can arise between different stakeholders in a firm, such as shareholders and managers, according to agency theory. Managers, who are responsible for running the company on behalf of shareholders, may choose to hedge in order to reduce the risk of their human capital, even if it means sacrificing higher returns that shareholders might prefer. As a result, agency costs, which are a type of market imperfection, can motivate firms to engage in hedging activities.

Directly tied to risk reduction, hedging shields firms from market volatility and unforeseen events that could detrimentally affect financial performance. Firms can hedge against fluctuations in commodity prices, exchange rates, and interest rates by using financial derivatives, thereby stabilizing income and cash flows and ensuring predictability for stakeholders (Froot et al., 1993). Hedging indirectly influences strategic and operational decisions within a company. Hedging, for example, facilitates investment and strategic planning by reducing exposure to market uncertainties. This reduction in risk enables firms to plan future investments with greater certainty (Froot et al., 1993). This feature is especially useful for businesses that require long-term planning and large capital investments. Furthermore, hedging can increase a company's debt capacity. Hedging can help firms manage debt better by reducing income and cash flow volatility, giving them more financial flexibility and the ability to seize strategic opportunities as they arise (Smith & Stulz, 1985).

According to Anjos and Winegar (2022), hedging can effectively mitigate informational asymmetries in firms. Hedging can significantly benefit firms with higher output, particularly those seeking external capital from uninformed investors. They can use this risk management strategy to reduce the likelihood of financial distress, effectively communicate their high-output status, and reduce financing costs, thereby encouraging investment (Anjos & Winegar, 2022). The authors explain that hedging helps to overcome informational asymmetry because it would be costly for firms with lower output to imitate this strategy due to the basis risk associated with output discrepancy.

Hedging, on the other hand, is not without costs and potential drawbacks. For example, it can create a false sense of security, causing managers to ignore other necessary risk management practices. Furthermore, hedging strategies can be costly to implement, particularly for small businesses with limited resources (Stulz, 1996). Tufano's study (1996) supported this view by recognizing that hedging is costly. In fact, some businesses may choose not to hedge, especially if they have a high risk tolerance or believe that the potential returns from taking on risk outweigh the benefits of hedging (Smith & Stulz, 1985). As a result, the decision to hedge should be carefully considered, taking into account both the potential benefits and drawbacks.

2.1.3. Empirical evidence about hedging and stock return relationships

The empirical literature on the relationship between hedging and stock returns provides several perspectives that add depth to this study. Allayannis and Weston (2001) examined a large sample of non-financial firms in the United States between 1990 and 1995 and discovered that firms that used foreign currency derivatives had a higher firm value (as measured by Tobin's Q) than their non-hedging counterparts. Their findings suggest that hedging can increase firm value and, as a result, lead to positive stock returns. Bartram et al. (2011) investigated the effects of derivatives on firm risk and value in a broader context. They discovered that using derivatives reduces risk, implying that hedging can contribute to firm value and positively impact stock returns. Li et al. (2014) also examined the benefits of foreign currency derivatives usage in 134 non-financial firms and found no evidence supporting the notion that the use of foreign currency derivatives can enhance a firm's value.

Similarly, Jin and Jorion (2006) concentrated on the oil and gas industry and found a positive relationship between hedging and firm value. Their research emphasizes the importance of hedging in risky industries and highlights the potential for positive stock returns through effective

risk management practices. This study discovered that the systematic risk of the oil and gas industry (beta) is negatively correlated with hedged firms and that the market rewards hedged firms with higher market values.

Carter et al. (2006) provide additional empirical evidence pointing to a positive correlation between hedging and stock returns. In their study of U.S. airline companies, the researchers emphasized that firms could increase their value and, as a result, stock returns through effective hedging practices, particularly those involving fuel prices. Their findings suggested that airlines that strategically hedged against fuel costs had Tobin's Q ratios that were 5–10% higher on average than airlines that did not use such hedging practices. Surprisingly, the extent of the valuation premium was directly proportional to the volume of future fuel requirements hedged.

Finally, Tufano's (1996) research on risk management in the gold mining industry provides useful insights into industry hedging practices. His findings show that risk management practices in the gold mining industry appear to be related to firm and managerial characteristics. Firms with lower cash balances, for example, manage more risks, and firms with newer CFOs tend to take more risks. This study demonstrates the complexities of hedging decisions and their potential consequences for stock returns.

Guay and Kothari (2003), on the contrary, discovered that firms do not extensively use derivatives for hedging purposes. Their research suggests that other forms of risk management may be more common and that the relationship between hedging and stock returns may be complex and dependent on the type of risk being hedged.

2.2. The European Union and Covid 19 pandemic

2.2.1. The European Union (EU)

The EU's distinct economic, financial, and regulatory environment can have far-reaching implications for the interaction of uncertainty periods, corporate hedging, and stock returns. The European Union market is distinguished by a high degree of integration, a common currency among Eurozone members, and coordinated economic and financial policies (Baldwin & Wyplosz, 2015). These characteristics have the potential to both amplify and mitigate the effects of uncertainty on firms' financial strategies and stock market performance.

One notable aspect of the EU context is the implementation of the Economic and Monetary Union (EMU), which has led to increased conformity in the business cycles among member countries (Artis & Zhang, 1997). This could imply that periods of uncertainty, such as recessions or financial crises, are more likely to be regional in scope, affecting a large number of firms at the same time. Hedging may become more important for firms in this context as they seek to mitigate the risks associated with these widespread uncertainty periods (Bodnar et al., 2011).

Furthermore, the EU's unified regulatory framework has important implications for corporate hedging. The European Market Infrastructure Regulation (EMIR), which went into effect in August 2012, for example, requires certain risk mitigation techniques for over-the-counter derivative contracts, which are commonly used for hedging (European Parliament and Council of the European Union, 2012). EMIR has had a significant impact on EU companies' hedging strategies, as the regulation has increased the costs and complexity of using OTC derivatives, which are commonly used for hedging. As a result, EMIR is likely to have influenced firms' decisions about whether and how to hedge their risk exposure.

Several periods of pronounced uncertainty have occurred in EU member states, characterized by significant economic and political events that had significant implications for corporate decision-making, including hedging strategies and stock market performance. One notable example was the sovereign debt crisis, which began in the late 2000s and lasted for several years. This crisis, which primarily impacted Southern European economies, created significant uncertainty and had a significant impact on firms' financial performance and investment decisions across the EU (Acharya & Steffen, 2015). The 2016 Brexit referendum, which resulted in the United Kingdom's decision to leave the EU, triggered yet another wave of uncertainty throughout the region. Brexit's potential consequences, such as changes to trade relationships, regulatory frameworks, and economic stability, have caused widespread uncertainty (Bloom, 2014). Although not part of the 2017–2021 period under consideration in this study, the Brexit aftermath has continued to create waves of uncertainty that likely impacted firms' risk management strategies and stock market dynamics in the following years.

Recently, the global COVID-19 pandemic caused unprecedented levels of uncertainty throughout the world, particularly in the EU. The health crisis, combined with drastic containment measures and lockdowns, severely disrupted economic activity, causing significant volatility in financial markets and forcing firms to adjust their hedging strategies to manage the heightened risk (Baker et al., 2020). Given the pandemic's recent occurrence, research into its specific impact on hedging

and stock returns within the EU has yet to emerge. This study tries to fill that void by using the COVID-19 pandemic as the central uncertainty period.

2.2.2. COVID-19 pandemic

The COVID-19 pandemic outbreak in early 2020 had an unparalleled influence on global financial markets. The unexpected and severe market disruptions generated serious concerns about the efficacy of various risk management measures, including hedging, in minimizing the negative consequences of market volatility on corporate performance and stock returns. The pandemic spread over the European Union (EU), having serious consequences for the region's economy, politics, healthcare systems, and societal norms.

The European Union (EU) faced a sequence of notable occurrences in the aftermath of the global outbreak of the new coronavirus in December 2019. COVID-19 had reached several EU nations by early 2020, prompting immediate containment measures like travel restrictions and quarantines. The World Health Organization labeled the virus a global pandemic in March 2020, prompting EU member states to impose significant lockdowns, border closures, and social distancing measures. Subsequent waves of infection, including a significant second wave in the fall of 2020, put the EU's healthcare institutions to the test and highlighted the significance of cross-border collaboration. In the midst of these problems, immunization operations began in December 2020, with coordinated EU-wide initiatives to ensure vaccine supplies. As vaccination campaigns expanded through early 2021, ideas regarding post-pandemic recovery gained traction despite ongoing concerns about vaccine delivery. The introduction of new virus types delayed reopening efforts in the months that followed. Throughout 2022, the pandemic's impact was evident in a variety of industries, including travel, education, and trade (Mavragani, 2020; Goniewicz, 2020). The timeline of COVID-19's influence on the EU region emphasizes the pandemic's dynamic nature in the economy, healthcare, politics, and society. The EU's reaction to the crisis underlined the critical role of cross-border collaboration and coordination in dealing with a global health emergency. The lessons learned from the pandemic are likely to impact legislation, healthcare systems, and economic initiatives for years to come as Europe navigates the route to recovery.

Ramelli and Wagner (2020) chronicle the immediate stock market reactions to the COVID-19 outbreak, highlighting a pronounced decline in stock prices globally. For Euronext-listed companies, this market reaction was marked by significant heterogeneity, determined by the

industry, size, and leverage of the firms. The EU, in particular, faced a double whammy, grappling not only with the pandemic's health crisis but also its implications for the European Single Market, a pillar of economic integration in the region (Baldwin & Weder di Mauro, 2020).

In the face of these unprecedented challenges, firms in the EU reviewed and reevaluated their risk management strategies. Amid the pandemic, Corbet et al. (2022) noted a pivot towards conservative hedging, with companies attempting to insulate themselves from the volatilities of financial markets. This transition was particularly evident among Euronext-listed companies, where firms scrambled to hedge against currency and interest rate risks arising from uncertain macroeconomic policies.

The relationship between hedging strategies and stock returns in this period is intricate. Amidst the COVID-19-induced market volatility, companies with robust hedging strategies in place seemed better poised to mitigate downside risks. According to Gormsen and Koijen (2020), firms that actively hedged against pandemic-related risks observed relative outperformance in stock returns when compared to firms that remained unhedged. This finding emphasizes the pivotal role of risk management, particularly in the context of unforeseen macroeconomic shocks like the COVID-19 pandemic.

COVID-19 has undoubtedly emerged as a crucial moderator in the relationship between hedging strategies and stock returns among EU publicly-listed companies. The pandemic has revealed intricate dynamics wherein the effectiveness of hedging strategies varied across industries, with firms adapting to unique challenges and external influences introduced by the crisis. Understanding the moderating role of COVID-19 in this context offers valuable insights into the evolving landscape of risk management practices and their implications for stock returns during times of crisis.

2.3. Hypotheses Development

In this section, testable hypotheses are developed based on a review of theories and research gaps. Hypotheses will be made based on 2.3.1. the effect of hedging on stock returns; 2.3.2. the moderating effect of the COVID-19 period on the hedging and stock returns relationship; and 2.3.3. the moderating effects of firm operating sector and firm size on the hedging and stock returns relationship.

2.3.1. The effect of hedging on stock returns

Hedging practices have been extensively researched in the context of firm value and financial performance, with the trade-off theory (Kraus & Litzenberger, 1973) serving as the guiding theoretical framework. Market imperfections such as taxes, bankruptcy costs, agency costs, and information asymmetry exist in reality, giving rise to a so-called "trade-off theory". According to the theory, there is an optimal capital structure for every firm that balances the tax benefits of debt with the bankruptcy costs of debt. In the context of hedging, the trade-off theory suggests that firms can add value by lowering the risks that could lead to costly financial distress, thereby moving toward an optimal capital structure through risk management practices such as hedging.

Despite the fact that there is a body of empirical literature exploring the role of hedging in risk management and the correlation between firm value and stock returns, less attention has been paid specifically to the relationship between hedging and stock returns. Furthermore, while the potential benefits of hedging, such as reduced cash flow volatility and financial distress costs, are recognized, their direct translation into superior stock performance in a shorter time frame remains unexplored. This leaves a significant gap in our understanding of the mechanisms by which hedging may contribute to higher stock returns.

For these reasons, the first hypothesis for this research is:

H1: Firms engaging in hedging practices experience higher stock returns compared to those that do not engage in such practices.

The hypothesis is based on the theoretical understanding that hedging can help firms manage risk more effectively, potentially improving market valuation and, as a result, stock returns. Testing this hypothesis will assist in clarifying the relationship between hedging practices and stock returns as well as providing a more nuanced understanding of the mechanisms by which hedging may contribute to firm stock performance.

2.1.2. The moderating effect of COVID-19 on the hedging and stock return relationship

Several studies conducted during the COVID-19 era have explored the stock market's reaction to the pandemic. For instance, Al-Awadhi et al. (2020) identified a significant negative effect of COVID-19 on stock market returns globally, emphasizing the pandemic's profound influence on investor sentiments and financial decisions. Amid such market volatility, corporations worldwide

needed to reconsider their financial strategies, with hedging emerging as a crucial tool to manage risk (Ding et al., 2020). In the context of the pandemic, corporate hedging strategies were not merely seen as traditional financial tools but as adaptive mechanisms for a rapidly changing economic environment.

However, the breadth and depth of this relationship, specifically the differential effect of corporate hedging strategies on stock returns during the COVID-19 periods compared to other times, have not been comprehensively explored. While studies have acknowledged the consequences of COVID-19 and called for risk-management measures, there remains a gap regarding how the pandemic impacts the magnitude and nuances of this hedging-stock returns relationship. The specificity of the pandemic's impact, as compared to other financial crises or economic downturns, has not been distinctly outlined, which can imply that findings from previous crises may not be entirely applicable. The temporal dynamics of this relationship—whether the effect of hedging strategies on stock returns varied across different phases of the pandemic—have also not been extensively studied. We define COVID-19 periods as the years of 2020 and 2021. The other subgroup from the year 2017 to 2019 is regarded as pre-Covid-19.

Thus, the second hypothesis is proposed as:

H2: The positive relationship between corporate hedging strategies and stock returns is more pronounced during COVID-19 periods.

This hypothesis is built on the assumption that as hedging conveys companies' reactions to difficulties, the market may respond positively. Testing H2 will provide critical insights into the interaction of hedging practices, COVID-19, and stock returns.

2.3.3. The moderating effects of firm-specific variables on the hedging and stock return relationship

When the operational sectors of firms are included in the equation between hedging and stock returns, a deeper degree of complexity is added. The various characteristics of different industries frequently alter organizations' risk profiles, potentially affecting the value and consequences of their hedging tactics.

Froot et al. (1993) addressed how hedging can help firms reduce the costs of external funding, thereby increasing firm value, in an earlier study of the subject. The repercussions for enterprises

in capital-intensive industries such as manufacturing can be significant. Meanwhile, industries with variable cash flows, such as commodities, may rely on hedging to stabilize profits and limit the risk of financial instability. Stulz (1996) elaborated on the significance of corporate hedging, emphasizing its importance for enterprises exposed to foreign exchange risks. This is especially important in industries like technology and energy, where corporations frequently have significant worldwide operations, putting them exposed to currency changes.

This study acknowledges the need for deep dives into how these relationships manifest across specific sectors. This leads to the third hypothesis:

H3: The relationship between corporate hedging and stock returns varies depending on the different operational sectors of companies.

The empirical validation of this hypothesis would lead to strategic refinement. Businesses might take a more holistic approach to hedging, adjusting their strategies to sector-specific risks and rewards. Furthermore, armed with this knowledge, investors may adjust their portfolio plans, recognizing that the impact of hedging on stock returns varies by sector.

Another dimension that has been recognized but not thoroughly investigated in the context of hedging and its impact on stock returns is firm size. According to research, firm size has a significant impact on risk management decisions and market reactions (Froot et al., 1993; Graham & Rogers, 2002). Larger firms may have different risk management requirements and capacities than smaller firms due to their resources, scale, and market influence. This may have an impact on the relationship between their hedging practices and stock returns. However, the existing literature lacks a nuanced examination of how firm size may act as a moderator in this relationship, particularly in the context of EU-listed companies. This creates a research gap, which this study aims to fill.

This study divides companies into three market capitalization categories: small-cap (up to €2 billion), mid-cap (€2 billion to €5 billion), and large-cap (over €5 billion). This classification corresponds with common financial analysis practices and allows for a more in-depth examination of the role of firm size. As a result, we propose the following fourth hypothesis:

H4: The effectiveness of corporate hedging strategies in influencing stock returns is more pronounced in bigger firms.

Testing this hypothesis would help us better understand how firm size interacts with hedging strategies in the context of EU-listed companies. Furthermore, it may provide useful insights for corporate decision-makers as well as investors, guiding their risk management and investment strategies according to corporate features.

3. Data collection and data analysis plan

3.1. Data collection

The key information for this study was the hedging methods and stock returns of publicly traded EU companies during the COVID-19 timeframe. Given the plethora of hedging methods and financial instruments available, it was critical to gather detailed data that could provide a full picture.

In essence, the data can be divided into two categories: quantitative and qualitative. Stock returns, specific financial measures that might reveal a business's financial health and position, metrics determining corporate sizes, the volume of hedging performed, and the frequency of such financial methods were all part of the quantitative component.

A rich qualitative counterpart supplemented this quantitative feature. This took the form of insights into whether organizations utilize hedging, the types of hedging methods firms use, illuminating extracts from annual reports, notations on risk management practices, and sophisticated language patterns identified from diverse thesis presentations.

Sourcing such a diverse set of data required a multifaceted strategy for data collection. Stock returns for the five years were calculated using publicly available sources such as the Euronext website, Yahoo Finance, and Investing.com. Simultaneously, yearly reports and financial statements from various companies were analyzed in order to delve deeper into the qualitative details of hedging tactics.

In terms of time span, the study collected data from January 1st, 2017 to December 31st, 2021. This time period was chosen to offer a solid pre-pandemic baseline before tracking the evolution and consequences of hedging techniques as the COVID-19 crisis evolved.

The study was ambitious and expansive in terms of volume. Data from 268 Euronext publicly traded firms was reviewed, including a proportional amount of companies listed on Euronext Paris (XPAR), Euronext Amsterdam (XAMS), Euronext Brussels (XBRU), Euronext Lisbon (XLIS), and

Euronext Dublin (XDUB). The selection of 268 firms strives for a confidence level of 0.95 and a margin of error of 6%. For efficient testing of H4, this corpus comprises data from 134 large-cap corporations as well as 134 mid-cap and small-cap companies. Multiple Euronext exchange locations were chosen to provide a comprehensive view of the general European market. Figure 1 provides a graphical description of the sample distribution.

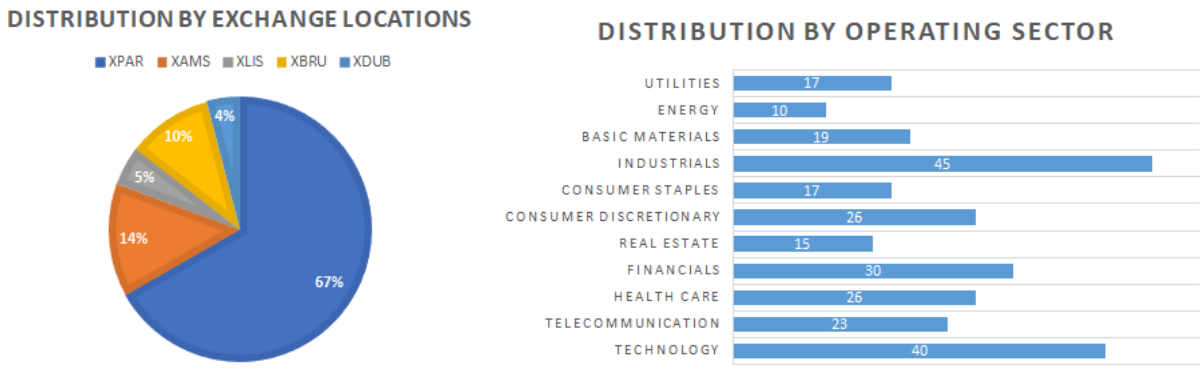

Figure 1: Sample distribution by exchange location and operating sector

3.2. Data analysis plan

To understand the intricacies underlying our proposed hypotheses, we primarily utilize quantitative but also qualitative methods. Firms will be divided into two cohorts, using the CAC All-Tradable Index as our benchmark: firms that outperformed the market index and firms that underperformed. This segmentation serves as the foundation for our analysis.

The reasons for choosing the CAC All-Tradable Index (CACT) as our benchmark are numerous. First and foremost, the CAC All-Tradable Index is broad, including a broad range of enterprises listed on the Euronext Paris, providing a complete perspective of market dynamics. Furthermore, because of its broad scope, the index not only reflects broad market movements but also the complex ebbs and flows of various industries. This ensures that our reference point's portrayal is neither skewed nor constrained.

Furthermore, since the majority of the companies in our sample (66.83%) are listed on Euronext Paris, using the CAC All Tradable Index assures geographic and economic context, enhancing the contextual relevance of our analysis. We effectively create a stratified spectrum by dividing firms based on their performance relative to this index, allowing for detailed understandings of firm-specific mechanisms that contribute to either outperformance or underperformance.

However, we should note that this index may not be as useful for companies listed in locations other than Euronext Paris.

Regarding the analysis plan, our study plans to utilize quantitative methods for all hypotheses. Regression analysis is used for all hypotheses.

To begin, a multiple regression model is drafted to capture the effect of all independent variables expected to influence stock returns:

$$StockReturns = \beta0 + \beta1*Hedging + \beta2*CovidDummy + \beta3*OperatingSector + \beta4*FirmSize + \varepsilon$$

Where:

- StockReturns: Individual firm stock returns (measured by Sharpe ratio).
- β0: The intercept.
- Hedging: A binary variable indicating if a firm engages in hedging.
- CovidDummy: A binary variable indicating if the stock returns is in Covid-19 years (2020 or 2021).
- OperatingSector: Categorical variable indicating the sector that a company operates.
- FirmSize: Continuous variable indicating market capitalization of a company.
- ε: error term

Besides the main model, each hypothesis is further investigated with another model.
Hypothesis 1 (H1): With a linear regression model, we examine the effect of hedging practices on stock returns:

$$StockReturns=\beta0+\beta1\times Hedging+ \varepsilon$$

Where:

- StockReturns: Individual firm stock returns.
- β0: The intercept
- Hedging: A binary variable indicating if a firm engages in hedging (1 for yes, 0 for no).
- ε: error term

Hypothesis 2 (H2): We employ a multiple regression model to scrutinize the interplay between the Covid-19 period, hedging, and stock returns.

$$StockReturns=\beta0+\beta1\times Hedging+\beta2\times CovidDummy+\beta3\times(Hedging\times CovidDummy)+ \varepsilon$$

Where:

- β0: The intercept.
- Hedging: A binary variable indicating if a firm engages in hedging (1 for yes, 0 for no).
- CovidDummy: A binary variable indicating if the stock returns is in Covid-19 years (1 for 2020 or 2021, 0 for other years).
- ε: error term

Analyzing this model lets us deduce the combined influence of hedging and the Covid-19 years on stock returns.

Hypothesis 3 (H3): To investigate the whether stock returns varies across different operating sectors, we will employ multiple regression analysis. Similar to other hypotheses, the dependent variable is Stock return (Sharpe ratio), while the newly introduced moderating variable is firm operating sector.

$$StockReturns = \beta0 + \beta1 * Hedging + \beta2 * OperatingSector + \beta3 * Hedging * OperatingSector + \varepsilon$$

Where:

- β0: The intercept.
- Hedging: A binary variable indicating if a firm engages in hedging (1 for yes, 0 for no).
- OperatingSector: Categorical variable indicating the sector that a company operates.
- ε: error term

The results of this model will help to identify whether differences in sector affects the relationship between hedging and stock returns.

Hypothesis 4 (H4): This hypothesis seeks to determine if the effects of corporate hedging strategies on stock returns are more pronounced in large-cap firms compared to mid and small-cap firms. The dependent variable is Stock return (Sharpe ratio), while the moderator is firm size.

Multiple regression is utilized to capture the interaction between company size and hedging on stock returns:

$$StockReturns = \beta0 + \beta1 * Hedging + \beta2 * FirmSize + \beta3 * Hedging * FirmSize + \varepsilon$$

Where:

- β0: The intercept.
- Hedging: A binary variable indicating if a firm engages in hedging (1 for yes, 0 for no).
- FirmSize: Continuous variable indicating market capitalization of a company

- ε: error term

The results of this model helps to identify the direction and strength of firm size (market capitalization) as a moderator for hedging – stock returns relationship.

4. Findings

The investigation into the intricacies of hedging strategies and their subsequent influence on stock returns, especially amid the COVID-19 climate, has proven to be both revealing and challenging. This explains the literature gap in the analysis of hedging as well as its influence on stock returns.

Our study, which relied heavily on data from annual reports, ran into a number of issues due to the various reporting formats used by firms. These difficulties were especially apparent when comparing corporations from different Euronext markets. To begin, while annual reports could be thorough in some situations, they sometimes lacked consistency in vocabulary and presentation, making it difficult to identify the exact sorts of hedging tactics used. For example, one corporation may allude to its usage of "forward contracts" in a straightforward manner, while another may discuss "risk management instruments" without specifying the specific tools used. Such ambiguities not only made classification difficult but also raised concerns regarding data comparability among organizations.

Furthermore, even when the type of hedging was clear, determining the amount to which a corporation used these tactics proved difficult. While some reports gave precise quantitative breakdowns, others only provided qualitative descriptions or broad percentages, making determining the depth of their hedging commitments challenging. This variation in disclosure exacerbated the difficulties of conducting a consistent analysis.

Furthermore, organizations across different Euronext locations occasionally followed different accounting and reporting norms. Even if just slightly different, these rules introduced complexities in how hedging operations were recorded and declared. Such discrepancies in core data could have a major impact on the accuracy of the findings in a study trying to draw conclusions across a unified market sector.

Hedging was frequently used by large and mid-cap enterprises. The prevalence of hedging in these firms caused methodological hurdles. Due to the vast majority of companies using hedging tactics, introducing a binary variable indicating whether a corporation was hedging or not proved

impossible. While considering a transition to assess the degree or efficacy of hedging appeared to be a viable answer, inconsistencies in annual reports muddled the process even further. Concerns were expressed concerning the trustworthiness and availability of comparable data due to different reporting techniques between countries. Identifying consistent financial line items across all reports, for example, proved difficult, raising questions about the quality and consistency of the generated insights.

Small enterprises faced a completely new set of issues. A major portion of these businesses only provided reports in local languages, such as French, potentially introducing translation problems. In addition, many tiny businesses produced very rudimentary, brief annual reports. This brevity frequently resulted in gaps, with important information frequently removed.

From 2017 to 2021, another problem arose in the area of classifying corporations based on their market valuation. We were forced to utilize 2023 data to determine market capitalization across all companies due to data availability limitations. This created the possibility of errors, as there could be considerable differences in a company's capitalization in 2023 compared to the analyzed prior years. Some companies need to be omitted because they have not gone public since January 2017.

In order to improve our research, we attempted to segment companies based on their performance against market indices. Surprisingly, a significant number of businesses underperformed the market. The prolonged economic uncertainties and market volatility associated with the COVID-19 pandemic, together with the different hurdles given by varying regulatory regimes throughout the Euronext destinations, could be one cause for this tendency.

The sample selection procedure created its own set of challenges. With so many criteria to consider—from the number of enterprises that use hedging to their distinct sizes and sectoral differences—creating a representative sample that matched all of our criteria proved more difficult. The challenges underlying sample selection raised the specter of potential selection bias. The study risked accidentally favoring certain types of organizations by stressing certain variables over others, such as the incidence of hedging, company size, or specific sectors. This may result in findings that are not entirely representative of the overall market landscape.

Furthermore, because we had to deal with data limits and make certain adjustments, there's a chance that the resulting sample would mistakenly ignore relevant items or overemphasize

others. Even if unintentional, such biases could skew the results and interpretations, limiting the generalizability of our findings to the larger population of publicly traded enterprises in the EU. The problem was not only to find the correct companies but also to ensure that the selection procedure did not introduce biases into the analysis.

Given these constraints, it was unable to conduct a subsequent quantitative investigation of the relationship between hedging techniques and stock returns. However, the study was successful in computing the dependent variable, which is stock returns from 2017 through 2021, measured with Sharpe ratio.

5. Future research directions

The investigation into the relationship between hedging techniques and stock returns, particularly in the context of the COVID-19 epidemic, has shed insight on both the complexities and potential difficulties of doing such an analysis. However, with difficulty comes opportunity. Based on the study's findings and problems, we offer the following avenues for future research:

The variety in reporting techniques is a significant challenge in the field of contemporary financial research, particularly when contrasting firms from the various tapestries of markets exemplified by the Euronext locations. The development of a comprehensive, uniform framework is a significant possibility for future research. A methodology like this, designed for dissecting and categorizing details from yearly reports, would be very useful for clarifying hedging tactics. The potential for consistent analysis across enterprises and worldwide justifies the need for this standardization.

Nonetheless, the complexities of hedging remain numerous, not least because of the complexities connected with the plethora of instruments at enterprises' disposal. An in-depth examination of individual techniques, such as currency swaps or interest rate hedges, may provide scholars with the specificity lacking in wider categories. A more narrative approach can be justified by complementing this quantitative rigor with qualitative flexibility. Given the descriptive nature of many annual reports, structured talks with financial company representatives could provide a more nuanced picture of the motivations and strategies underpinning corporations' hedging actions.

Furthermore, temporal dimensions urge closer examination. Our dependence on data from 2023 to compute market capitalization highlights the dynamic inherent in financial markets. A longitudinal lens that tracks the ebb and flow of hedging tactics over time may provide more than just snapshots; it may illustrate the evolution of these financial maneuvers. A collaborative mentality could be beneficial in bolstering the strength of such inquiries. Researchers could combine localized characteristics into coherent, consistent findings by bridging expertise across Euronext locations.

However, as the underperformance of many enterprises in comparison to the market index becomes clear, the desire for a more comprehensive framework becomes apparent. Beyond the limitations of hedging, scholarly attention is drawn to the enormous expanse of global market dynamics, pandemic-induced statecraft, and sectoral distinctions. The power of modern data analytics is ready to help researchers navigate these enormous fields. There are a plethora of tools ready to deepen our grasp of hedging's relationship with stock returns, ranging from machine learning paradigms to the sophistication of natural language processing.

6. Conclusion

This thesis sought to craft a complex comprehension informed by the context of EU publicly traded companies across prominent Euronext locales in order to better understand the intricate relationships between hedging strategies and stock returns, particularly in light of the COVID-19 pandemic. The study emphasized the importance of stock returns and hedging techniques while also shedding light on how they interact in the chaotic environment of a global health crisis.

This study's theoretical framework revealed the complex nature of stock returns and the strategic features of hedging, establishing a solid platform for the subsequent empirical investigations. The combination of previous empirical data and the specific setting of the COVID-19 pandemic provided depth to our hypothesis. The notion that hedging, while usually regarded as a risk-mitigation tool, might take on multifaceted implications when interwoven with the threads of a disruptive global event was central to these arguments.

The study emphasized the importance of regional specificity by drawing on the rich tapestry of the EU's history and response to the pandemic. The EU, with its distinct mix of interconnected

economies and its collective handling of the Covid-19 crisis, provides a fertile environment for witnessing the convergence of financial tactics and market consequences.

As we delved deeper into our research, the intricacies of the study became evident. The richness of the topic introduced complexities, such as discrepancies in data reporting among organizations and the challenges in classifying and assessing hedging strategies. Instead of constraining our study, these complexities broadened its parameters, suggesting promising avenues for future research to enrich our comprehension. The designated paths for future exploration are numerous. They range from reporting standardized details to the promise of collaborative, cross-border activities, indicating the vast potential of this research sector.

In summary, this thesis has discovered a plethora of observations and questions while negotiating the subtle connections between hedging techniques, stock returns, and the impact of the COVID-19 pandemic. It exemplifies the changing character of financial research, confirming both its challenges and its limitless potential for inquiry. The voyage, with all of its discoveries and oversights, emphasizes the virtue of constant research and the significance of context, especially while investigating financial strategies in the midst of uncertainty.

7. Transition to second part: Equity Multiples and Stock Returns in Large-Cap and Mid-Cap Companies listed in Euronext Paris

After a thorough assessment of hedging strategies and stock returns in years surrounding Covid-19 pandemic, we figure that data-related constraints relating to the independent variable - hedging are the main hindrance to a comprehensive analysis within the initially intended framework. Recognizing the difficulties and desiring to continue the exploration, this thesis will shift its analytical focus to another factor that plays a crucial role in every company valuation - equity multiples. The next part in this thesis will focus our academic research on the relationship between equity multiples and stock returns. Our empirical examination will also be narrowed to large-cap and mid-cap companies listed on Euronext Paris. Covid 19 remains as our main moderator, which divides the timeline into two periods - before Covid 19 pandemic (2017-2019), and periods of Covid 19 pandemic (2020-2021).

While prompted by previously identified issues, this shift in direction appears as a relevant continuation of our financial exploration. Euronext Paris, with its dynamic trading environment and

broad listing portfolio, provides an ideal setting for analyzing the relationship between market multiples—integral indicators of firm valuation and investor sentiment—and stock returns. By focusing on only Euronext Paris instead of many Euronext locations, the variability introduced by differing national regulatory and economic environments is reduced, thus offering a more homogenous sample.

Findings from the first part of the thesis will be used to refine our investigative strategy in the next section, encouraging precise methodology and assuring sharp analytical depth. As we embark on this new academic journey, it is our hope that this investigation will both improve the existing literature and provide useful insights for practitioners and scholars in the field of financial markets.

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Master Thesis - Part 2

Equity Multiples and Stock Returns surrounding COVID-19: Evidence from publicly-listed companies in Euronext Paris

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Abstract

The relationship between equity multiples, Price-to-Earnings (P/E), Price-to-Cash Flow (P/CF), Price-to-Book (P/B) ratios, and risk-adjusted stock returns (as analyzed by the Sharpe ratio) is investigated in this study. The study uses 106 EURONEXT Paris public-listed companies from 2017 to 2021, spanning both before and during the COVID-19 pandemic. Using regression models, the study discovers a statistically significant positive link between P/CF and P/B ratios and stock returns, while the P/E ratio has no significant influence.

With regression analysis, this study identifies a notable association of the P/CF ratio with stock returns, emphasizing the enduring significance of cash flows in stock valuation and performance. The research further reveals a significant positive correlation between the P/B ratio and risk-adjusted returns, suggesting companies with higher P/B ratios typically exhibit superior returns when adjusted for risk. On the other hand, the widely acknowledged P/E ratio did not display a significant relationship within our regression model. This observation resonates with prior findings by Fama and French (1992). The study also investigates the moderating effects of pandemic peak years (2020 and 2021), operating sectoral variations, and company size on these relationships. Both the impact of COVID-19 peak years and company size recorded some noticeable impacts on equity multiple-stock return correlations. Meanwhile, the impact of the operating sectors remains minor.

Despite providing insightful findings, the study acknowledges limitations related to data accuracy, Sharpe ratio adjustments, and potential biases in the sources used. Regardless of these limitations, the research makes an important contribution to the financial literature in different aspects by combining theoretical frameworks with empirical findings and providing both practical and theoretical implications for the broader finance community.

1. Introduction

The year 2020, which marks the peak of the COVID-19 epidemic, is going to be a historic year in the financial history, characterized by unexpected turmoil and market instability. The global financial landscape suffered a major chaos as the pandemic's ripples expanded, beginning in late 2019 and intensifying in 2020, highlighting the necessity for robust academic and empirical investigations (Baker et al., 2020). Among the numerous consequences of the pandemic, the equity market, with its intricate interaction of variables impacting stock returns, became a focal point of attention for researchers, investors, and politicians. COVID-19's worldwide repercussions, while reminiscent of earlier financial shocks such as the 2008 crisis, have a unique trait: a widespread health crisis worsened by synchronized global lockdowns. This unusual combination emphasizes the importance of scrutinizing equity multiples and understanding their changing link with stock returns (Baker et al., 2020).

Equity multiples have long been seen as vital tools for the investors. Price-to-Earnings (P/E), Price-to-Cash Flow (P/CF), and Price-to-Book (P/B) ratios operate as financial compasses, guiding investors across the complicated terrains of corporate valuations (Damodaran, 2012). Beyond their quantitative nature, these measurements can also contain qualitative insights that represent market perceptions about a firm's growth trajectory, risk profile, and profitability potential. Understanding these indicators becomes even more important in the case of economic adversities, such as the one caused by COVID-19, because they transform into metrics of current market behavior and investor expectations.

Euronext Paris, a European financial powerhouse, stands out as a rich site for such inquiry. This exchange, known for its strong financial history, is home to a diverse range of Europe's leading firms. Its wide portfolio, which includes companies from a variety of industries and sizes, provides a unique stance to investigate the relationship between equity multiples and stock returns, particularly against the volatile backdrop of the COVID-19 pandemic. Formerly known as the Paris Bourse, Euronext Paris has long been a pillar of European financial architecture. Its popularity extends beyond France's main exchange to its overall effect across the Eurozone. In the aftermath of COVID-19, which had a disproportionate impact on European economies, examining its implications for this critical financial nexus assumes increased importance (Pagano & Schwartz, 2003).

However, the reason for focusing on Euronext Paris goes beyond its size. France's economic mosaic, which includes sectors ranging from customer discretionary to energy, reflects the larger European market milieu (Mazier et al., 2020). Analyzing market maneuvers and strategies during the COVID-19 may provide a framework, allowing for a more comprehensive understanding of the European financial landscape.

In previously developed financial research, equity multiples has long been a popular topic, guiding stock valuations and reflecting market sentiments. While extensive studies have elucidated the role of these multiples across different economic landscapes (Fama & French, 1992), the unique challenges posed by the COVID-19 pandemic demanded fresher, up-to-date perspectives. Unlike prior financial crises rooted in economic frailties, such as the 2008 meltdown (Reinhart & Rogoff, 2009), the COVID-19 crisis stemmed from external health factors, challenging many financial conventions.

Much of the current research has homed in on dominant exchanges like the NYSE or NASDAQ (Al-Awadhi et al., 2020), leaving Euronext Paris, a hub reflecting Europe's distinct financial dynamics, comparatively understudied. Additionally, the varied macroeconomic responses, including differences in the strategies of the European Central Bank and the U.S. Federal Reserve (Tooze, 2020), further underscore the necessity of examining Euronext Paris in its own right. In essence, a nuanced understanding of Euronext Paris's interplay between equity multiples and stock returns during the pandemic remains a crucial gap in current financial research, demanding focused attention for a holistic comprehension of the post-pandemic financial landscape.

Given this context, the purpose of this thesis is to fill the gap in contemporary scholarly discourse. It aims to investigate the relationship between equity multiples and stock returns of companies publicly traded on Euronext Paris during the unpredictable COVID-19 pandemic. Understanding Euronext Paris' behavior can shed light on unexplored broader regional market dynamics, as it serves as a representative microcosm of the broader European market, distinguished by its distinct set of firms operating across various sectors (Mazier et al., 2020). Furthermore, by delving into these specific market dynamics, this study intends to provide detailed insights that go beyond broad global patterns to stakeholders ranging from institutional investors to politicians. The ultimate goal is to provide a comprehensive understanding that can potentially drive investment strategies and assist decision-making. In essence, this thesis serves as both an intellectual contribution and a strategic compass, with the goal of providing clarity in an era surrounded by unprecedented obstacles.

In short, this paper aims to investigate the effects of equity multiples, namely P/E, P/CF, P/B on the stock returns of Euronext Paris listed companies, from 2017 to 2021. Company operating sector and size would also be integrated into the model to improve its power. These will be accomplished by examining: 1) the relationship between equity multiples and stock returns among Euronext Paris companies; 2) the moderating effect of the COVID-19 peak years (2020 and 2021) on the relationship between corporate hedging strategies and stock returns; 3) the effect of operating sectors on the equity multiples - stock returns relationship, and 4) the moderating effect of firm size on the equity multiples - stock returns relationship. The following are the primary research questions:

1. How do companies with higher Price-to-Earnings (P/E) ratios correlate with their risk-adjusted stock returns as measured by the Sharpe ratio?
2. How do companies with higher Price-to-Cash Flow (P/CF) ratios correlate with their risk-adjusted stock returns as measured by the Sharpe ratio?
3. How do companies with higher Price-to-Book (P/B) ratios correlate with their risk-adjusted stock returns as measured by the Sharpe ratio?
4. How did the years marked by the COVID-19 pandemic (2020 and 2021) moderate the relationship between equity multiples and stock returns?
5. How does the relationship between equity multiples and stock returns vary across different operating sectors?
6. Does the size of the company moderate the relationship between equity multiples and stock returns, and if so, how?

The remainder of this thesis is organized as follows: Section 2 examines the theoretical foundations as well as empirical evidence on multiples, stock returns, and COVID-19. This will result in testable hypotheses that can be used to answer the research questions. Sections 3 and 4 report the methodology and results of the study. Sections 5 and 6 are further discussions and conclusions of the study.

2. Theoretical Background and Hypotheses Development

2.1. Equity Multiples and Their Implications for Stock Returns

2.1.1. Price-to-Earnings (P/E) Ratio

The Price-to-Earnings (P/E) ratio has long been recognized as one of the most important and widely used metrics in financial analysis and investment decisions. The P/E ratio, in essence, provides a snapshot of how much investors are willing to pay for each dollar of earnings, indicating a company's perceived value relative to its profitability (Ritter & Warr, 2002).

The P/E ratio can be interpreted in a variety of ways depending on the context and the benchmarks used for comparison. On the surface, a high P/E ratio may indicate that the stock is overpriced or that investors anticipate rapid future earnings growth (Damodaran, 2012). A low P/E ratio, on the other hand, may indicate undervaluation or the market's recognition of underlying challenges or limited growth prospects. However, it is critical to proceed with caution. P/E ratios must be compared to peers in the industry, the broader market, or historical averages for the same company. A high P/E ratio in a high-growth industry, such as technology or biotechnology, may be considered normative, whereas it may be considered an outlier in more established sectors (Penman, 2013).

The P/E ratio's importance in stock valuation is underscored by its widespread use among both novice and experienced investors. Several factors contribute to its dominance. The P/E ratio is an evidence to the rich tapestry of stock valuation, having emerged as a ubiquitous tool in the toolkit of investors around the world. Its popularity stems from more than just convention, but also from the tangible benefits it provides. The P/E ratio's allure stems from its simplicity and accessibility. In essence, the ratio represents the relationship between a stock's current market price and its earnings per share (EPS). Even for an inexperienced investor, obtaining these figures can be relatively simple. Stock prices are publicly quoted and constantly updated during trading hours, as they are the lifeblood of financial markets. The EPS, on the other hand, serves as an indicator for a company's profitability and is a standard fixture in a company's financial statements, providing insights into its performance over a specified period (Ball, 1978).

Beyond its simplicity, the P/E ratio's importance grows when one considers its predictive nature. While traditional P/E ratios are based on past or current earnings, there is a variant, known as the forward P/E, that is based on expected future earnings. This forward P/E ratio, which is based on projections, serves as a window into the market's collective conscience. It encapsulates investor sentiment, revealing expectations about a company's future growth and profitability. By providing this predictive perspective, the P/E ratio evolves from a reflection of the present to a compass pointing to future possibilities (Easton et al., 2002).

Furthermore, when used in benchmarking and relative valuation exercises, the P/E ratio reveals its true versatility. The investing landscape is vast, with countless stocks vying for investor attention. The P/E ratio emerges as a comparative tool in this complex arena, allowing investors to compare the valuation of one stock to another. Such comparisons could be intra-industry, revealing how a company compares to its peers, or inter-industry, revealing disparities in valuation metrics across industries. Aside from that, the P/E ratio acts as a time machine, allowing investors to compare a company's current valuation to its historical P/E benchmarks. Such a comparative analysis, rooted in the P/E ratio, enables investors to discern patterns, identify outliers, and make informed decisions in their investment journey (Bhojraj & Lee, 2002).

The relationship between P/E ratios and stock returns has long been the focus of extensive academic research. Fama and French (1992) discovered that stocks with low P/E ratios (value stocks) outperformed those with high P/E ratios (growth stocks) over long periods of time. This phenomenon, known as the value premium, suggests that value stocks may offer higher returns due to their inherent risk. However, the causal relationship between P/E ratios and future stock returns is still being debated. Some academics contend that P/E ratios reflect investor sentiment and over-optimism, particularly during market bubbles (Lakonishok et al., 1994). Others, on the other hand, believe that P/E dynamics are based on rational assessments of future growth opportunities (Dechow et al., 2000). A greater price/earnings ratio shows that investors are paying more for the same amount of earnings (DeBondt & Thaler, 1985). At the same time, investors are at ease since a higher price/earnings ratio indicates that the company is on a growth trajectory with attractive opportunities, and its earnings are less risky and more secured. Empirical research including Lakonishok et al. (1994), White (2000), Damodaran (2006), and Funda (2010) confirmed the positive impacts of the price/earnings ratio on stock returns.

In the context of Euronext Paris, and more broadly, European markets, factors such as market maturity, investor behavior, and industry composition may influence the relationship. There is an

inherent need to recognize that historical patterns may not always predict future performance, particularly in unprecedented times such as the COVID-19 pandemic.

2.1.2. Price-to-Cash Flow (P/CF) Ratio

The Price-to-Cash Flow (P/CF) ratio, a lesser-known but highly helpful metric, provides unique insights into a company's financial health. By focusing on a company's operational cash flows, it reduces distortions caused by accounting accruals and non-cash items (Lang & Lundholm, 1996).

The Price-to-Cash Flow (P/CF) ratio is a valuation metric that compares the market price of a company to its cash flow per share. Whereas some metrics, such as the Price-to-Earnings (P/E) ratio, emphasize profit, the P/CF ratio emphasizes cash flow, providing an alternative lens through which to view a company's financial health and performance. This ratio essentially determines how much investors are willing to pay for each unit of cash flow generated by the company. A lower P/CF ratio may indicate that the stock is undervalued, whereas a higher ratio may indicate that the stock is overvalued. However, it is important to note that “appropriate” P/CF values can vary significantly across industries, making cross-industry comparisons more difficult (Woolridge & Ghosh, 1986).

The P/CF ratio has carved out its significance in stock valuation in the intricate tapestry of financial metrics for a variety of reasons. Cash flows, unlike earnings, are more difficult to manipulate using accounting techniques, making them a more reliable reflection of a company's financial position (Dechow, 1994). Furthermore, cash flow demonstrates a company's ability to create shareholder value, primarily through dividends and capital growth. The P/CF ratio is also particularly useful in evaluating companies in capital-intensive industries or those with high depreciation costs. Such industries frequently have disparities between reported earnings and actual cash flows, causing traditional P/E ratios to provide potentially misleading valuations. In such cases, the P/CF ratio can be a more reliable indicator of a company's intrinsic value (O'Shaughnessy, 1996).

Historically, the relationship between the P/CF ratio and stock returns has been extensively researched. According to traditional finance literature, stocks with lower P/CF ratios, similar to low P/E or P/B ratios, tend to provide higher subsequent returns (Lakonishok et al., 1994). This viewpoint is consistent with the value investing paradigm, which holds that stocks that are undervalued based on their cash flows represent appealing investment opportunities with the potential for higher returns. This relationship, however, is complex. Higher P/CF than could mean

that the market have confidence in the performance of the stock and believe in its future growth potential outside of operating cash flow (Amuzu, 2010). A low price/cash-flow ratio shows that the company is earning a lot of cash that is not being absorbed by the present stock price, and vice versa (Akhtar, 2021).

To summarize, the P/CF ratio provides an alternative, cash flow-centric viewpoint on company valuation. Its significance, particularly in certain industries and economic environments, highlights the need for investors to take a multifaceted approach to stock valuation, incorporating both traditional metrics and contemporary insights.

2.1.3. Price-to-Book (P/B) Ratio

While not as well-known as the P/E ratio, the Price-to-Book (P/B) ratio has its own unique significance in the evaluation of company stocks. This ratio provides investors with a lens through which to determine the market's valuation of a company in relation to its book value (Chen & Shimerda, 1981).

A P/B ratio can reveal a variety of information. A P/B value less than one, for example, may indicate that the market believes the company's assets are overvalued or that the company is in distress. A value greater than one, on the other hand, typically indicates the opposite—that the market sees potential in the company or values its intangible assets, such as intellectual property or brand equity (Frankel & Lee, 1998). Yet, it is important to remember that P/B values, like all financial ratios, are most illuminative when placed in context. A sector with higher asset intensity might naturally exhibit a different P/B profile compared to a sector reliant on intangible assets.

The importance of the P/B ratio in stock valuation is supported by its intrinsic characteristics. To begin with, the P/B ratio emphasizes tangible assets. In contrast to other metrics that may include intangibles or forecast future projections, the P/B ratio is built on a firm foundation of a company's tangible assets. This foundation distinguishes it as a more conservative valuation measure (Ohlson, 1995). Second, the relevance of the ratio extends significantly to distressed scenarios. The P/B ratio is extremely useful in situations where bankruptcy is a possibility. It specifically reflects the potential value that investors could obtain if the company is liquidated. As Altman (1968) explains, this perspective is critical in determining the tangible returns an investor might expect in such adverse conditions. Finally, the P/B ratio serves as a guide in identifying value stocks. According to Fama and French (1998), a low P/B ratio can reveal companies that the

market may be undervaluing. This distinguishes them as appealing prospects for value investors, providing a lens through which to identify potential investment opportunities that align with a value investing philosophy.

The relationship between the P/B ratio and subsequent stock returns has long piqued the interest of academics and investors. Fama and French (1992) proposed that, along with market capitalization, the P/B ratio was a key determinant in predicting stock returns. Their findings suggested a systematic pattern in which stocks with low P/B ratios (value stocks) consistently outperformed their counterparts with high P/B ratios (growth stocks) over a long period of time. This organization, however, is not without controversy. Some argue that the inverse P/B-return relationship is caused by the inherent risks of value stocks (Petkova & Zhang, 2005). Others argue, resonating behavioral finance theories, that this relationship is a result of market mispricing and investor irrationality (Lakonishok et al., 1994). Penman (1997) conducted a seminal study that indicated that a higher P/B multiple is closely associated to an optimistic projection of a company's future equity value. Aras and Yilmaz (2008) demonstrated that businesses with a greater market-to-book multiple witnessed higher stock returns in 12 countries from 1997 to 2003. Furthermore, Fairfield's (1994) model revealed a favorable relationship between high P/B values and future stock returns for the businesses analyzed. Foster (1970) shared this opinion, pointing out that changes in the P/B multiple across equities might cause comparable shifts in stock returns.

For markets including Euronext Paris, the predictive power of the P/B ratio for stock returns may be regulated by factors such as market maturity, prevalent investor behavior, and the exchange's dominant industries. Furthermore, global events such as the COVID-19 pandemic can introduce anomalies in previously observed patterns.

2.1.4. Research Gaps Identification

While the literature on equity multiples and stock returns is rich and diverse, a common thread emerges. Equity multiples, such as P/E, P/CF, and P/B, have a strong predictive power over stock returns. However, the detail of these relationships, which is influenced by external factors as well as the definitions of the ratios themselves, invites further scholarly investigation and debate.

Past research helps us to identify several gaps that require further investigation. While mature markets in the United States are extensively studied, emerging and particularly European

markets, such as Euronext Paris, with its unique dynamism, are underrepresented (Chan et al., 1991). This disparity highlights the need for more regional research. Sectoral particulars complicate matters even more. Intangibles and innovation, for example, drive the technology sector, potentially diverging from traditional models that focus on tangible assets (Loughran & Ritter, 2000). Such variations highlight the importance of conducting more sector-specific analyses.

Furthermore, the irregular inclusion of macroeconomic events, such as the devastating effects of the COVID-19 pandemic, in equity multiple studies suggests a potential oversight (Baker et al., 2020). These large-scale events have the potential to significantly alter established market patterns, necessitating their inclusion in thorough analyses. The literature also shows a tendency to look at equity multiples in isolation. A comprehensive examination of metrics such as P/E, P/B, and P/CF may reveal nuanced interrelationships that individual studies miss.

Finally, rapid advances in financial econometrics point to a critical opportunity: re-evaluating previous findings using modern methodologies. This recalibration could provide previously unnoticed insights, enriching our understanding of equity multiples and their implications.

2.2. Euronext Paris and the COVID-19 Pandemic

2.2.1. Euronext Paris

The origins of Euronext Paris can be traced back to the Paris Bourse, a pivotal institution in Europe's financial history. According to Verdier (1997), the Paris Bourse was founded in the early nineteenth century, initially as a trading hub for governmental bonds before making its mark in equity trading. The Paris Bourse's evolution reflects broader socio-economic shifts in France, and its history is inextricably linked to European financial developments (Cassis, 2006).

The year 2000 marked a watershed moment in its history. Cassis (2006) emphasizes the unification of regional exchanges that paved the way for Euronext, which connects Amsterdam, Brussels, Dublin, Lisbon, the United Kingdom, and Paris. This development, which aims to increase liquidity and international appeal, has raised Euronext Paris's standing in the European financial landscape. Today, its prominence isn't merely symbolic of France's economic strength but also a testament to its resilience and adaptability in an ever-evolving financial world (Michie, 2001).

Euronext Paris is distinguished by distinct financial characteristics. Its significant market capitalization, which is consistently among the highest in Europe, exemplifies the depth and vitality of both the French economy and the wider European financial environment (Gallais-Hamonno & Hautcoeur, 2007). The availability of liquidity, which is critical for traders, is enhanced by a dynamic mix of domestic and international market participants, which is maintained through advanced electronic trading systems (Rutterford et al., 2017).

While equities are the dominant asset class, Gallais-Hamonno and Hautcoeur (2007) recognize the exchange's diversification into other financial instruments such as derivatives and commodities. This adaptability has not only catered to different investor segments, but it has also highlighted Euronext Paris' commitment to staying abreast of global financial developments. Furthermore, its regulatory environment, which is governed by EU directives and French regulatory frameworks, promotes integrity and trust, fostering a conducive investment climate (Verdier, 1997).

The sectors represented at Euronext Paris are representative of the French economy as a whole. La Porta et al. (2002) provide insights into the diverse sectors represented by Euronext Paris, including manufacturing, technology, and biotech. This diverse representation emphasizes the complexities of France's economic landscape.

Indexes such as the CAC Large 60 and CAC Mid 60 are extremely important. The CAC Large 60 index, as analyzed on the index website, captures a snapshot of France's corporate giants with many operating on a global scale, providing a glimpse into France's global economic standing. The CAC Mid 60, which represents the mid-cap segment, presents a more nuanced picture, highlighting sectors and industries on the verge of larger growth trajectories and exemplifying the vibrancy and potential inherent in France's corporate sector.

To summarize, the journey of Euronext Paris, as documented by scholars such as Verdier (1997) and Michie (2001), encapsulates the rich tapestry of European financial evolution. Its centuries-long narrative provides profound insights not only into the world of finance, but also into the socioeconomic fabric of a continent.

2.2.2. COVID-19 Pandemic

The emergence of the COVID-19 pandemic, first reported in late 2019 in the Chinese city of Wuhan, quickly transformed from a localized health concern into a global catastrophe, with

ramifications reverberating throughout human history. Among the many areas affected, financial markets saw unprecedented volatility, reflecting a mix of uncertainty, fear, and adaptation to a rapidly changing global landscape.

The speed and severity with which the pandemic hit global markets was reminiscent of the 2007-2008 financial crisis. While the financial crisis was caused by banking vulnerabilities and complex financial products, the pandemic's disruption was caused by a potent combination of supply chain disruptions, plummeting consumer demand, and wide-ranging lockdown measures put in place to stop the virus's spread (Baker et al., 2020).

Worldwide stock markets witnessed dramatic declines. In the U.S., for instance, the Dow Jones Industrial Average observed its most considerable point plunge in history in March 2020. Simultaneously, markets in Asia, which were the first to face the pandemic's wrath, suffered significant losses, with benchmarks like Japan's Nikkei and Hong Kong's Hang Seng reflecting investor anxiety. The cascading effect of these downturns rippled across global markets, with emerging markets grappling with capital flight, currency devaluations, and foreign debt concerns (Hale et al., 2020).

The pandemic also engendered an oil price war, most notably between Russia and Saudi Arabia, culminating in one of the most substantial oil price drops since the Gulf War. This, coupled with diminished demand due to global lockdowns, further exacerbated market distress (Yergin, 2020). Additionally, there was a rush towards safer assets, resulting in surging gold prices and declining bond yields, underscoring the pervasive sense of uncertainty that investors felt (Arezki & Nguyen, 2020).

The European financial landscape, already treading cautiously due to pre-existing uncertainties like Brexit, was substantially upended by the pandemic. Markets across the continent, one after another, reported escalating infection rates and death tolls. The European Central Bank (ECB), recognizing the magnitude of the economic disruption, embarked on a series of measures, including bond-buying programs, to inject liquidity and stabilize the markets (Lane, 2020).

The profound implications of the pandemic were especially pronounced in countries like Italy and Spain, which became early epicenters of the virus in Europe. However, even stalwarts like Germany's DAX and France's CAC 40 were not immune to the downturn. The CAC 40, representing the crux of the French economy on Euronext Paris, saw significant declines,

reflecting the broader sentiment of the French financial sector. Notably, industries like tourism, aerospace, and luxury goods, which are central to the French economy, faced considerable setbacks due to global travel restrictions and reduced consumer expenditure (Gopinath, 2020).

Yet, amidst the gloom, there were also glimpses of resilience and adaptability. The healthcare and technology sectors, for instance, demonstrated buoyancy, with firms accelerating efforts in vaccine development and digital solutions, respectively. Companies listed on Euronext Paris, such as Sanofi, took center stage in the global quest for a COVID-19 vaccine (Gaviria, 2020).

The French government, in tandem with other European nations, also rolled out comprehensive fiscal packages to bolster businesses, preserve employment, and fortify the healthcare infrastructure. These efforts, albeit adding to public debt, were critical in providing a safety net against the pandemic's economic aftershocks (Mauro & Zhou, 2020).

In conclusion, the COVID-19 pandemic, in its unprecedented sweep across the globe, has indelibly left its mark on financial markets. The entwined narratives of panic-driven downturns, strategic policy responses, and sectors discovering avenues of growth amidst adversity, encapsulate the year 2020. For Europe, and particularly France, the pandemic has been both a test of resilience and a testament to the enduring spirit of adaptability and innovation in the face of unparalleled challenges.

2.3. Hypotheses Development

The empirical journey of equity multiples, woven intricately through finance literature, provides a backdrop against which we frame our hypotheses. By exploring the associations between specific equity multiples and risk-adjusted stock returns, especially within the landscape of Euronext Paris, we seek to contribute fresh insights to the ongoing academic discourse.

2.3.1. The relationship between Equity Multiples and Stock Returns

Historically, the P/E ratio has been a focal point of financial research, owing to its perceived ability to foreshadow stock returns. While Basu (1977) demonstrated that low P/E ratios often correlate with superior future returns, this isn't an overarching principle shorter periods of time. Particularly in growth sectors, high P/E ratios can sometimes be seen as reflective of future growth potential

rather than overvaluation (Fama & French, 1992). Given the evolving perspectives on the P/E ratio's implications and results from multiple recent empirical research, we hypothesize:

H1: Companies with higher P/E ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.

The P/CF ratio, emphasizing the cash-centric nature of firms, is considered by many scholars to be a tangible and robust metric. Bowen et al. (1986) underscored the strong relationship between P/CF ratios and future stock returns, suggesting that it might serve as a reliable predictor. Thus, we posit:

H2: Companies with higher P/CF ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.

Scholars have also paid close attention to the P/B ratio, another popular equity multiple. While firms with lower market valuations relative to book values have historically outperformed, it is possible that in certain contexts or market conditions, high P/B ratios may be indicative of inherent value or future growth potential that the market has recognized. The short time period of our study is also an aspect to take into consideration. Thus, the understanding of the P/B ratio necessitates a more sophisticated viewpoint, prompting us to propose:

H3: Companies with higher P/B ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.

2.3.2. The Moderating Effect of the COVID-19 Pandemic

The unprecedented economic fallout during the COVID-19 pandemic years (2020 and 2021) has led to numerous anomalies and disruptions in stock market behaviors worldwide. Baker et al. (2020) detailed the pandemic's profound impacts on global financial markets. Consequently, we speculate that in COVID-19 pandemic’s peak years, the relationship between equity multiples and stock returns is more pronounced. We further break into two hypotheses to test the impact of each COVID-19 year:

H4a: The year 2020 emphasizes the relationship between equity multiples and stock returns.

H4b: The year 2021 emphasizes the relationship between equity multiples and stock returns.

2.3.3. The intensity of Equity multiples - Stock returns across different operating sectors

Equity multiples might not have a uniform relationship across all sectors. For instance, the tech sectors, laden with intangibles, may not reflect patterns observed in tangible asset-driven sectors (Loughran & Ritter, 2000). Hence, we theorize that differences in company operating sectors can significantly influence the relationship between market multiples and stock returns:

H5: The operating sectors of companies have significant impact on the relationship intensity and direction between equity multiples and stock returns.

2.3.4. The intensity of Equity multiples - Stock returns across different company size

Company size, often represented by market capitalization, is an influential factor in stock valuation and returns. Smaller firms might have different risk-return profiles compared to their larger counterparts, potentially influencing the relationship between equity multiples and stock returns. With this context, we propose:

H6: Bigger company size emphasize the positive relationship between equity multiples and stock returns.

By articulating these hypotheses, we hope to delve deeply into the dynamics of equity multiples and their correlations with risk-adjusted stock returns, contextualizing them within the Euronext Paris context. The empirical analysis that follows attempts to validate or refute these proposed relationships.

3. Methodology

3.1. Research design and data acquisition

Any empirical research's architecture should be robust, providing findings based on validity and reliability. This study was built around a quantitative research approach because of its compatibility with the research objectives and the nature of the hypotheses under consideration. The quantitative approach, as described by Kliestik et al. (2021), is distinguished by its emphasis on numerical data and statistical approaches. Unlike qualitative methods, which delve deeply into

subjective interpretations, quantitative research seeks breadth by providing objectivity and the ability to discover overarching patterns from massive amounts of data.

Our focus on the relationship between equity multiples and stock returns necessitated an approach that could be used across the financial ecosystem. According to Cottrell (2016), quantitative research stresses impartiality, allowing studies to untangle from biases and base conclusions on empirical facts. Furthermore, this methodology assures a large sample size, making the findings applicable to a broader range. This technique, which is essential in the academic world, also embeds replicability, providing future scholars with a framework for future investigations, either to re-validate findings in developing circumstances or to pioneer new routes. In essence, we chose quantitative design in order to make solid and important contributions to financial research.

The precision and reliability of data are essential cornerstones of empirical research, especially when exploring financial dynamics. For this study, data were garnered from a set of widely used and accessible online platforms known for their comprehensive financial repositories. Primarily, the study relied heavily on the EURONEXT PARIS website. EURONEXT, being one of Europe's most prominent stock exchanges, offers an extensive database of financial metrics and information about companies listed under its banner (Pagano & Schwartz, 2003). Its reputation for providing accurate and timely financial data makes it a logical choice for academic endeavors.

Complementing EURONEXT were platforms like Morningstar, Yahoo Finance, and Investing.com. Morningstar has long been recognized as a trustworthy source of in-depth financial analysis, earning worldwide praise for its precise company-specific insights. Yahoo Finance and Investing.com, on the other hand, are popular for their comprehensive worldwide financial data and real-time market updates. These web portals were selected because they have historical data that is relevant to the purposes of this study.

Our selection criteria were precisely specified in quest of solid and complete data. Our research covers the years 2017 through 2021, encompassing both pre-pandemic and pandemic-affected financial market trends. Our attention was drawn in particular to all 120 companies listed on the CAC Large 60 and CAC Mid 60, which represent a diverse range of industries. We carefully excluded any firm with incomplete datasets or confusing financial statements, emphasizing data quality. Such strict standards demonstrated that our research was founded on credible and comprehensive data.

3.2. Sample

Our dataset contains a large number of observations spanning the years 2017 to 2021. The study specifically uses data from companies listed on the CAC Large 60 and CAC Mid 60 indices. This large sample size was critical in improving the robustness of our following analyses and assuring the findings' generalizability to a broader market setting for large and mid cap companies. Differences can be seen if we go back to the period of 2017-2021 because the division is based on market capitalization in 2023. Although this indicates that we cannot be confident whether a firm was also classified as large, mid, or small cap back in 2017-2021, it does allow for a more diverse collection of company sizes.

When we go deeper into the structure of our sample, it is clear that the companies represented provide a rich variety of attributes. These companies, which represent a wide range of sectors, vary from emerging to old companies, capturing the whole range of market dynamism. Geographically, while the concentration is on businesses listed in the CAC Large 60 and CAC Mid 60, the impact of global market dynamics cannot be underestimated given their different operational areas. The vast diversity of our sample in terms of firm size, industry representation, and geographical footprint assures that our sample is not only representative of the financial markets throughout the specified period, but also of the intricate web of relationships and interdependencies that characterizes them.

Reflected in the names of the two indexes, the total sample size of this research is 120 companies, including 60 large-cap and 60 mid-cap (as of 2023). However, after removing companies based on dataset completeness and financial statement clarity, only 106 remained in the final sample. The majority of firms were removed since they went public later than January 1, 2017, resulting in missing data for both multiples and stock prices. Companies that are listed in Euronext locales other than Euronext Paris were also removed to ensure consistency. Table 1 describes the distribution of finalized companies based on their operating sectors.

Table 1: Sample distribution by operating sector

Sector name	Number of companies	% of total sample
Technology	9	8%
Telecommunication	2	2%
Health Care	10	9%
Financials	11	10%
Real Estate	9	8%
Consumer Discretionary	26	25%
Consumer Staples	6	6%
Industrials	24	23%
Basic Materials	4	4%
Energy	4	4%
Utilities	1	1%

3.3. Variables and their measurements

The efficacy and interpretability of empirical research rest on a clear delineation of the variables under study and the precision with which they're measured. This research hinges on a collection of dependent and independent variables, with control variables to adjust for potential confounders.

The dependent variable pivotal to this investigation is the risk-adjusted return of companies. This is often gauged using the Sharpe ratio, a metric conceptualized by William Sharpe in 1966 (Sharpe, 1966). The Sharpe ratio offers an insightful lens into the risk-adjusted performance of an investment by comparing the excess return over the risk-free rate to the investment's volatility. It is mathematically represented as the difference between the expected return of an investment and the risk-free rate, divided by the investment's standard deviation. Employing the Sharpe ratio aligns with the research's objective to discern the interplay between various equity multiples and the quality of returns companies present to their investors once adjusted for risk.

$$Sharpe\ Ratio = \frac{Expected\ return\ of\ the\ investment - Risk-free\ rate}{Standard\ deviation\ of\ the\ investment's\ return}$$

Turning to independent variables, the study harnesses three fundamental equity multiples to furnish insights into company valuations. First, the Price-to-Earnings (P/E) Ratio is an invaluable financial metric indicating the sum investors are inclined to pay for a single unit of company earnings. This ratio is derived by taking market capitalization divided by net income, or by the company's current market price per share and dividing it by its earnings per share. In this research we utilized the first method, with market capitalization, to make it easier for the annualization process. In the realm of financial literature, a heightened P/E ratio often insinuates anticipations of soaring future growth in earnings.

$$P/E\ Ratio = \frac{Market\ Capitalization}{Net\ income}$$

Secondly, the Price-to-Cash Flow (P/CF) Ratio emerges as a pivotal metric for this study, presenting a view into how a company is valued compared to its cash flow generating prowess. By dividing the annual market capitalization by operating cash flow, this ratio often proves crucial in sectors where cash flows are a more faithful representation of company health and performance than mere earnings.

$$P/CF\ Ratio = \frac{Market\ Capitalization}{Operating\ Cash\ flow}$$

Lastly, the Price-to-Book (P/B) Ratio encapsulates a company's market valuation in relation to its net assets or book value. It is computed by dividing the market capitalization by the common equity amount, and this ratio serves as a testament to the valuation placed on a company's inherent assets.

$$P/B\ Ratio = \frac{Market\ Capitalization}{Common\ equity}$$

Meanwhile, due to the broad context of financial markets, it is necessary to account for a plethora of external and internal forces that might shape stock returns. Thus, the inclusion of control variables in this study guarantees that potential confounders are minimized. The study incorporates company size, as assessed by market capitalization, to recognize its impact on a firm's risk and return dynamics. Larger firms may have risk profiles that differ from their smaller counterparts, and recognizing this diversity strengthens the analysis's robustness.

Furthermore, a company's operating sector, with its distinct risk-return patterns, is critical in our analysis. It is an established fact in financial research that sectors have their own unique valuation

standards and dynamics, which influence multiple benchmarks. The research avoids potential confounders by taking these sector-specific characteristics into consideration. The sector division is based upon 11 sectors of Global Industry Classification Standard (GICS). The Global Industry Classification Standard (GICS) is a widely recognized framework for classifying companies into distinct sectors and industries. Co-developed by MSCI Inc. and Standard & Poor's (S&P) in 1999, GICS provides a consistent and comprehensive taxonomy for investment research and asset management. The classification system breaks down the economic landscape into 11 sectors, which are the top level of its hierarchical structure (MSCI Inc., n.d.).

Finally, given the study's temporal scope, which includes both pre-COVID and COVID-impacted years, temporal effects also appear as a key control variable. Tectonic developments in the financial markets occurred throughout this time period, with far-reaching economic consequences. By accounting for historical differences, the research ensures that the acquired insights are both relevant and grounded in the current economic context. The summary of variables and its calculation is revealed in Table 2.

Table 2: Overview of variables

Variables	Definition	Calculation
P/E ratio	The price-to-earnings ratio, relates a company's share price to its earnings per share	$\frac{Market\ Capitalization}{Net\ income}$
P/CF ratio	The price-to-cash flow ratio, compares a company's market value to its operating cash flow or its stock price per share to operating cash flow per share	$\frac{Market\ Capitalization}{Operating\ Cash\ flow}$
P/B ratio	The price-to-book ratio measures the market's valuation of a company relative to its book value of equity	$\frac{Market\ Capitalization}{Common\ equity}$
Sharpe Ratio	Risk-adjusted stock returns, reflecting the stock's return relative to its risk	$\frac{Expected\ return\ of\ the\ investment - Riskfree\ rate}{Standard\ deviation\ of\ the\ investment's\ return}$
Year	Binary variable to capture the years 2020 and 2021	
Sector	Categorical variable representing the operating sector of companies, based on GICS 11 sectors	
Market capitalization 2021	The value of company's shares that is traded on the stock market in 2021	$log\ (Total\ number\ of\ shares\ end\ 2021 * Share\ price\ end\ 2021)$

3.5. Data cleaning and restructuring

Empirical research, especially one that seeks to derive insights from a combination of multiple datasets, necessitates meticulous data cleaning and restructuring. Data structural integrity and cleanliness are critical in ensuring the validity and reliability of any subsequent analysis.

To begin, the data harmonization process was approached methodically. Given that the data was gathered from a variety of online platforms, including EURONEXT PARIS, Morning Star, Yahoo Finance, and Investing.com, it was critical to ensure consistency and continuity across datasets. The first step was to thoroughly review all datasets to identify any inconsistencies in data format, units of measurement, or missing values. Following that, variable names were standardized across datasets to ensure consistent nomenclature and seamless merging. During the merging process, special care was taken to ensure that data from various sources was correctly aligned based on company identifiers and time periods. This meticulous alignment was critical in avoiding duplications or unintentional omission of critical data points.

Following the harmonization process, the data was transformed to ensure it was suitable for the subsequent analytical procedures. Log-transformation is one such transformation that is commonly used in financial research. Log-transformations were used in this study to address any concerns about non-linearity in relationships and to reduce the impact of extreme values or outliers. Such transformations not only help to normalize variable distributions but also improve the interpretability of regression coefficients, especially when predicting multiplicative changes (Osborne, 2002). In our study, we apply log-transformation to the market capitalization of companies at the end of 2021.

Furthermore, while performing advanced financial calculations such as the Sharpe ratio, a unique challenge associated with the risk-free rate emerged. Risk-free rates were negative during certain time periods within the scope of our study. Given the conceptual difficulty of interpreting negative risk-free rates in the context of the Sharpe ratio, these rates were adjusted to be positive. This decision was motivated by the desire to ensure the statistical and conceptual validity of the derived performance metrics.

3.6. Statistical Analysis

This study's analytical foundation is based on its methodological rigor, which transforms raw data into interpretable insights. An exhaustive descriptive analysis provided an initial insight into the dataset's complexities. Correlation matrices revealed early signs of relationships between variables, highlighting any potential multicollinearity issues or significant correlations. In addition, key summary statistics like mean, median, standard deviation, and range provided a comprehensive overview of the data's central tendencies and variability. These statistics were supplemented by visual tools such as histograms and scatter plots, which painted a picture of data distributions and possible variable interrelationships, laying the groundwork for more advanced analytical procedures (see Appendix for Visual illustrations of the dataset).

Following the foundational descriptive analysis, the research focused on its core: regression modeling. Regression was the preferred technique because it was compatible with both the characteristics of the data and the research objectives. Linear regression was appropriate given the goal of defining linear relationships between equity multiples (predictors) and stock returns (response variable). This technique not only traces the linear dependencies between variables, but also provides insights through metrics such as R-squared values, which elucidate the percentage of variation in stock returns due to changes in equity multiples. The residuals from the linear regression model aided in diagnostic checks, ensuring the accuracy of the model's predictions. Linear regression's efficacy in financial research is well established, making it an appropriate and established choice for this investigation (Wooldridge, 2015). After conducting the analysis for the main models and answering the first three research questions, subsequent analysis was conducted to test the moderating effect of COVID 19 years, operating sectors, and market capitalization of 2021.

In essence, the dual-phased statistical methodology, encompassing both descriptive and inferential analyses, was meticulously curated to imbue the research outcomes with robustness and analytical depth.

3.7. Robustness test

Robustness tests in empirical research provide validation to the findings of primary regression models, ensuring that results are not sensitive to variations in the model's specification or potential issues that might undermine the integrity of the findings. In this study, a series of robustness tests

were carried out to ensure the reliability and validity of our results concerning equity multiples' impact on stock returns on the Euronext Paris. The subsequent sections detail the methodologies adopted in these tests.

3.7.1. Alternative Model Specification

A frequent concern in empirical financial research is ensuring that results aren’t artifacts of a specific model specification. To address this, we use three methods: quadratic terms, exclusion of Sector in our model, and exclusion of Market Capitalization 2021 in our model.

Including quadratic terms for the equity multiples allows for the possibility of a nonlinear relationship between these ratios and stock returns. The inclusion of squared terms for variables like P/E, P/B, and P/CF can help identify whether there are diminishing or increasing returns to scale concerning these multiples.

It is plausible that the sector in which a company operates might introduce a bias, particularly if certain sectors are overrepresented in the data or have a dominant influence on stock returns. By excluding the 'Sector_code' from our regressions, we can ensure that our results are not merely an artifact of sector-specific characteristics.

Company size, proxied by the log of market capitalization, might have its intrinsic effects on stock returns. Removing this variable ensures that the observed relationships between equity multiples and returns are not unduly influenced by company size.

3.7.2. Outlier Analysis

Outliers, or extreme values in the dataset, can significantly skew results, particularly in regression analyses. Therefore, an integral part of our robustness checks involved outlier analysis.

Diagnostic tests were performed to identify potential leverage points and influential observations. Using standardized residuals and leverage values, observations that could disproportionately affect our model were identified. Upon identifying potential outliers, sensitivity analyses were conducted. These analyses involve running the regression models both with and without the identified outliers, comparing results to gauge the influence of these extreme values. Lastly, the rationale behind the presence of outliers was investigated. In certain instances, outliers can be indicative of genuine financial phenomena and shouldn't be excluded without proper justification.

3.7.3. Autocorrelation and Heteroskedasticity

The presence of autocorrelation and heteroskedasticity can compromise the efficiency of ordinary least squares (OLS) estimators, leading to unreliable standard errors and misleading test statistics. We conduct three tests to examine autocorrelation and heteroskedasticity of our study.

Given the possibility of heteroskedasticity in our residuals, robust standard errors were computed. These adjust the standard errors of the regression coefficients, ensuring that they remain valid under heteroskedasticity (White, 1980).

Autocorrelation implies that residuals from the regression model are correlated across observations, violating the OLS assumption that residuals should be independent. The Durbin-Watson statistic, among others, was employed to detect the presence of first-order autocorrelation (Durbin & Watson, 1951).

Heteroskedasticity exists when the variance of the residuals from a regression model isn't constant across observations. Tests like the Breusch-Pagan and White tests were used to diagnose the potential presence of heteroskedasticity (Breusch & Pagan, 1979; White, 1980).

In conclusion, robustness tests serve as a bulwark against spurious findings and offer researchers and readers greater confidence in the results. By addressing alternative model specifications, potential outliers, and common violations of OLS assumptions, we ensure that our findings on equity multiples and stock returns are well-grounded and resistant to various potential criticisms.

4. Results

4.1. Descriptive statistics

The final sample of our research comprises of 106 firms, offering insight into their financial performance and valuation measures from 2017 to 2021. This section provides a thorough knowledge of the major financial metrics, breaking down their relevance and effects.

In our dataset, stock returns, a key dependent variable measured by Sharpe ratio, revealed a wide variation. The minimum return was a surprising -0.901, implying huge losses for organizations, while the maximum return was 0.408. A closer look at the quartile distribution reveals that a big number of the companies (25%) had returns less than -0.008, while another

25% had returns greater than 0.009. Interestingly, both the median and the mean total returns converged around 0.000, suggesting a relatively balanced distribution of positive and negative returns across the 106 sampled firms.

Breaking down returns year by year provides a dynamic perspective on the annual performance of the companies:

The 2017 statistics revealed significant variation in results. Some firms suffered significant losses, as demonstrated by the lowest return of -1.173, while the best-performing enterprises earned a return of 4.874. The median return was 1.211, which was slightly lower than the mean of 1.167. This suggests a positively skewed distribution in which the majority of companies had moderate returns while a few outliers had extraordinarily high returns.

In comparison to 2017, 2018 appears to have been a difficult year for a lot of companies. This pattern is shown in the negative mean return of -0.488, which is exacerbated by the fact that the median return was also negative (-0.644). The year witnessed extremes, with some firms facing significant losses (minimum return of -1.909) and others enjoying gains, though the maximum return (1.725) was lower than the previous year.

In 2019, companies rebounded, with the mean return (1.125) closely matching the median (1.106). The distribution appears to be reasonably symmetrical, indicating that most enterprises had a stable year. The positive first quartile figure (0.420) indicates that 75% of companies had positive returns this year, which is a significant improvement over 2018.

The year 2020 presented both opportunities and challenges. While the worst-performing firms returned -0.896, the best performers returned 3.781. The median and mean for 2020 were 0.022 and 0.160, respectively, indicating a positive skew with many outliers.

Following in the footsteps of 2020, 2021 saw a positive skew in returns. The year certainly had several organizations with extraordinary performance, driving up the average to 0.991, slightly higher than the median of 0.779. Returns for 2021 also had a wider range than 2021, with Sharpe ratio ranging from the minimum of -1.398 to the maximum of 4.102.

Market capitalization in 2021 (logged) provides information about the size and scale of companies. The log-transformed numbers provide an adjusted perspective, accounting for the wide range of company sizes. With the smallest company at a log market cap of 19.810 and the

largest at 26.630, there's a substantial size difference within our sample. The median (22.740) and mean (22.880) being closely matched indicate a fairly balanced distribution of company sizes. The 1st and 3rd quartiles further demonstrate the central clustering of market caps around the median.

In our sample, the P/E ratio, a critical statistic for valuation, showed the broadest spectrum. While the negative minimum figure of -272.200 may raise eyebrows, negative earnings are not uncommon for businesses, particularly those in growth periods or experiencing temporary difficulties. The maximum value of 851.900 indicates significant overvaluation or strong growth forecasts for some companies. The large discrepancy between the mean (28.060) and the median (19.390) indicates a positively skewed distribution, with a few companies having unusually high P/E ratios.

Another valuation metric was P/CF, which varied from -78.800 to 151.020. Negative cash flows, while concerning, are not unheard of, particularly for companies operating in capital-intensive industries or expanding. The fact that the mean (13.355) is greater than the median (9.930) indicates positive skewness.

In our dataset, P/B ratios ranged from a trembling -10.600 to an extraordinarily high 37.290. Companies having a negative P/B ratio may have suffered significant challenges or impairments during the period. The mean P/B was 3.305, somewhat higher than the median of 1.960, indicating a positive skew due to high outliers.

In conclusion, the financial landscape across the analyzed period was complex, as evidenced by the wide-ranging performances observed in total returns and the varied degrees of skewness across several indicators. This wide range highlights the inherent difficulties of financial measurements and the myriad of factors that influence them. Table 3 provides the descriptive statistics included in our study.

Table 3: Summary statistics for variables

Variable	Min	1st quartile	Median	Mean	3rd quartile	Max
Company						
Length	106					
Statistics						
Total_Returns	-0.901	-0.008	0.000	0.000	0.009	0.408
Returns_2017	-1.173	0.239	1.211	1.167	1.924	4.874
Returns_2018	-1.909	-1.107	-0.644	-0.488	0.137	1.725
Returns_2019	-1.123	0.420	1.106	1.125	1.760	3.610
Returns_2020	-0.896	-0.273	0.022	0.160	0.451	3.781
Returns_2021	-1.398	0.195	0.779	0.991	1.919	4.102
Log_MCap_2021	19.810	21.840	22.740	22.880	23.850	26.630
P/E	-272.200	10.450	19.390	28.060	32.560	851.900
P/CF	-78.800	5.207	9.930	13.355	17.407	151.020
P/B	-10.600	1.140	1.960	3.305	3.877	37.290

4.2. Correlation Matrix

Table 4 depicts a deep dive into the interrelationships between five critical financial indicators and metrics for 2021: the Price-to-Earnings ratio (P/E), the Price-to-Cash Flow ratio (P/CF), the Price-to-Book value ratio (P/B), the Sector Code, and the Market Capitalization. Understanding correlations, particularly in financial data, is critical because it reveals how distinct variables move in relation to one another.

A coefficient of 0.136 implies a weak beneficial relationship between the P/E ratio and the P/CF ratio. This shows a slight inclination: while the P/E ratio rises, the P/CF ratio often rises as well, but not as significantly. Similarly, the P/B ratio has a slight positive association with the P/E ratio, as indicated by a coefficient of 0.143. When we compare the P/E ratio to the Sector Code, we get a very slight negative connection, implying that the P/E ratios may vary very slightly among sectors. The association between the P/E ratio and the Market Cap of 2021 is likewise marginally

positive, implying that companies with greater market capitalizations in 2021 may have somewhat higher P/E ratios.

We find intriguing associations when we look at the Price-to-Cash Flow ratio (P/CF), a metric that provides insights into a company's price in relation to its cash flows. Quite similar to the P/E ratio, P/CF ratio also has a fairly favorable association with the P/B ratio. This link, denoted by a coefficient of 0.320, indicates that greater P/CF ratios frequently correspond with larger P/B values. The association between the Sector Code and the P/CF ratio is slightly negative, meaning that some sectors may have somewhat lower P/CF ratios. Furthermore, when the P/CF ratio is compared to the 2021 Market Cap, there is a discernible mild positive association, implying that larger companies may have marginally higher P/CF ratios.

In the correlation matrix, the Price-to-Book value ratio (P/B), which compares a company's stock price to its book value, presents a different story. Aside from its interactions with P/E and P/CF, its relationship with the Sector Code is just somewhat negative. This suggests that the P/B ratio varies only slightly among industries. Its association with Market Cap 2021, on the other hand, is moderately positive. This suggests that, in 2021, larger companies may have slightly higher P/B ratios.

The Sector Code, presumably a categorical variable representing multiple market sectors, has fairly small associations with the other metrics. It is worth noting that the P/E, P/CF, and P/B ratios vary just slightly between sectors, showing that the nature of the sector has little influence on these ratios. Furthermore, the relationship between the Sector Code and Market Cap 2021 is minimal, implying that factors other than the sector are more influential in establishing a company's market capitalization.

To summarize, the correlation matrix illustrates the complex links between the five financial variables. The moderate link between P/CF and P/B is the most noticeable association observed. The underlying theme, however, is that most connections are weak, showing that each of these indicators brings unique information to the table. This distinctiveness is critical in financial research since it ensures that each comparison provides a new and diversified perspective on organizations' financial health.

Table 4: Correlation matrix for variables

Variable	P/E	P/CF	P/B	Sector_code	MCap_2021
P/E	1				
P/CF	0.136	1			
P/B	0.143	0.320	1		
Sector_code	-0.026	-0.141	-0.041	1	
MCap_2021	0.061	0.158	0.260	0.020	1

4.3. The relationship between Equity Multiples and Stock returns

The regression analysis was conducted with the intent of examining the influence of specific financial indicators on company returns. In this regression model, the dependent variable is "Return," while the independent variables are the Price-to-Book value ratio (P/B), the Price-to-Cash Flow ratio (P/CF), the Price-to-Earnings ratio (P/E), and the Sector_Code.

The primary model is described as:

$$Return=\beta 0+\beta 1(P/B)+\beta 2(P/CF)+\beta 3(P/E)+\beta 4(Year)+\beta 5(Sector\_code)+\epsilon$$

Where:

- $B0$ is the intercept.
- $B1, \beta 2, \beta 3, \beta 4, \beta 5$ are the coefficients for each of the respective variables.
- ϵ is the error term.

Starting with the intercept, the model shows that when all the independent variables are held constant at zero (which may not be practically feasible for all variables but is a standard interpretation), the expected return is estimated to be 1.004. This intercept is highly statistically significant with a t-value of 15.565 and a p-value less than 0.01, indicating that it's not due to random chance.

The coefficient for P/B is 0.0381. It suggests that for a one-unit increase in the P/B ratio, holding all other variables constant, the return is expected to increase by approximately 0.0381 units. This relationship is highly significant, with a t-value of 8.470 and a p-value less than 0.01.

The P/CF ratio exhibits a coefficient of 0.009, which implies that for each one-unit increase in the P/CF ratio, the return is projected to rise by around 0.009 units, assuming other variables are held constant. Like the P/B, the relationship of the P/CF ratio with the return is also highly significant, with a t-value of 7.062 and a p-value less than 0.01.

In contrast, the P/E ratio has a coefficient of -0.00007293, suggesting a very minute decrease in returns for every one-unit increase in the P/E ratio, keeping all other factors constant. However, the relationship between the P/E ratio and returns is not statistically significant, given its t-value of -0.274 and a p-value of 0.7845. This indicates that the P/E ratio might not be a reliable predictor for returns in this particular model.

The Sector_Code has a coefficient of -0.0139. It intimates that for a one-unit increment in the sector code (assuming it's a numerical representation of sectors), the return decreases by approximately 0.0139 units. However, this relationship is on the border of significance with a p-value of 0.0698, outside the conventional 0.05 cutoff for significance. Residual analysis reveals that the spread of the residuals ranges from -3.0244 to 4.0089, which provides insight into the variance of the model's prediction from actual values. From the model summary, we can also gather the overall fit of the model. The multiple R-squared value is 0.3558, suggesting that approximately 35.58% of the variability in returns is explained by the model. The adjusted R-squared, which accounts for the number of predictors in the model, is slightly lower at 0.3539 but is in close agreement with the R-squared value. A highly significant F-statistic of 182.4 and a p-value less than 0.01 indicates that the model is a good fit for the data when compared to a model with no predictors.

In summary, this regression analysis provides significant insights into the relationships between company returns and a suite of financial indicators and categorical variables. The P/B and P/CF ratios stand out as statistically significant predictors, while the P/E ratio does not appear to hold predictive power in this context. The yearly data underscores some fascinating temporal dynamics, and while sectoral influence is borderline significant, it prompts further exploration. This model serves as a foundational piece, enabling a deeper understanding of the factors influencing company returns. Table 5 gives the summary of the regression results.

Table 5: Regression Table: The impact of equity multiples on stock returns

Variable	Sharpe Ratio
P/B	0.038***
	(0.004)
P/CF	0.009***
	(0.001)
P/E	-0.0001
	(0.0003)
Sector_code	-0.014*
	(0.008)
Constant	1.004***
	(0.064)

Observations	2,650
R2	0.356
Adjusted R2	0.354
Residual Std. Error	0.942 (df = 2641)
F Statistic	182.360*** (df = 8; 2641)
==========	==========
Note:	*p<0.1; **p<0.05; ***p<0.01

4.4. The interaction effect of COVID-19 years on the relationship between equity multiples and stock returns

This section tests whether the impact of COVID-19 year (2020 and 2021) is significant in moderation of the relationship between equity multiples and stock returns.

2020

The analysis of the interaction effects between different financial metrics and the year 2020 provided several insights. In the context of research question four (RQ4), the study sought to examine how the year 2020 modulated the relationship between the financial metrics (P/B, P/CF, and P/E) and the dependent variable Return (measured by Sharpe ratio).

Firstly, the model assessing the interaction effect of P/B for the year 2020 was considered. The regression formula utilized for this was Return ~ P/B + year_2020 + P/B:year_2020 + P/CF + P/E + Sector_code. The results indicated a significant relationship between the P/B variable and Return, with an estimated coefficient of 0.0394 ($t = 6.131$, $p < 0.01$). However, the interaction term, P/B:year_2020, was not significant ($t = -0.383$, $p = 0.702$), suggesting that the year 2020 did not substantially modify the relationship between P/B and Return. The model also highlighted a significant relationship between P/CF and Return ($t=5.767$, $p<0.0000$). The model's goodness of fit was moderate, with an adjusted R-squared value of 0.04391.

Next, the interaction effect of P/CF for the year 2020 was explored using the regression formula: Return ~ P/CF + year_2020 + P/CF:year_2020 + P/B + P/E + Sector_code. Again, the P/CF variable exhibited a significant relationship with Return, with an estimated coefficient of 0.0085 ($t=4.901$, $p<0.0000$). However, similar to the previous model, the interaction term, P/CF:year_2020, was not found to be significant ($t=0.542$, $p = 0.588$). This indicates that the year 2020 did not have a modulating effect on the relationship between P/CF and Return. The P/B variable also maintained its significance in this model ($t=6.967$, $p < 0.0000$). The adjusted R-squared value for this model was 0.044, comparable to the previous model.

Lastly, the interaction effect of P/E for the year 2020 was examined. The regression formula employed for this analysis was Return ~ P/E + year_2020 + P/E:year_2020 + P/B + P/CF + Sector_code. The P/E variable did not exhibit a significant relationship with Return ($t=0.098$, $p = 0.922$), and similarly, the interaction term, P/E:year_2020, was also not significant ($t=-0.533$, $p=0.594$). This suggests that neither the P/E metric nor the year 2020 had a substantial effect on the relationship between P/E and Return in the context of this model. The variables P/B ($t = 6.977$, $p<0.0000$) and P/CF ($t=5.777$, $p<0.0000$) remained significant in this model as well. The adjusted R-squared value was 0.04396, maintaining consistency with the previous models.

Across all three models, the sector code variable, represented as Sector_code, was not found to have a significant relationship with Return. This suggests that, in the context of these models, the sector of operation might not play a critical role in determining returns.

In summary, while individual financial metrics, particularly P/B and P/CF, demonstrated significant relationships with Return, the interaction with the year 2020 did not modulate these relationships. The lack of significant interaction effects might suggest that, despite the tumultuous events of 2020, the relationships between these financial metrics and returns remained stable. This stability hints at the resilience of these metrics as predictors of return, even in challenging times. Future research might consider expanding the temporal scope or incorporating additional external factors to understand the nuances of these relationships better.

2021

Similar methods is applied to test the interaction effect of year 2021. For the interaction effect with the P/B ratio for the year 2021, the model starts at a baseline return of 0.4341, assuming all other predictors are zero. This baseline is statistically significant. An increase in the P/B ratio by one unit leads to an increase in return by about 0.0374 units when not considering the year 2021. This relationship is statistically significant. However, when examining the year 2021 specifically, we find that the average return does not significantly differ from other years when the P/B is zero. Additionally, the interaction between the P/B ratio and the year 2021 suggests that the effect of P/B on return does not change significantly in 2021 compared to other years.

Regarding the interaction effect with the P/CF ratio for 2021, an increase in the P/CF ratio by one unit is associated with an increase in return by 0.0081 units in years other than 2021. This effect is statistically significant. However, the return in the year 2021 does not seem to be significantly different from other years when the P/CF is zero. When examining the interaction between the P/CF ratio and the year 2021, the effect of P/CF on return does not seem to differ significantly in 2021 compared to other years.

Lastly, when analyzing the interaction effect with the P/E ratio for 2021, an increase in the P/E ratio by one unit leads to a decrease in return by 0.0003 units in years other than 2021. However, this relationship is not statistically significant. Furthermore, the return in the year 2021 does not show any significant difference from other years when the P/E is zero. Interestingly, the interaction

between the P/E ratio and the year 2021 is statistically significant. This indicates that the effect of the P/E ratio on return does change in the year 2021 compared to other years.

In summary, when we examined the influence of two pandemic years on the link between equity multiples and stock returns, we discovered that the P/B and P/CF ratios were consistently significant in forecasting returns, regardless of the year. The unstable events of 2020 (tested in H4a), in particular, had little effect on the correlations between all equity multiples (P/B, P/CF, and P/E) and stock returns. Meanwhile, 2021 (H4b) maintained the consistency of the P/B and P/CF correlations while emphasizing a particular interaction between the P/E ratio and stock returns that differentiated this year from others. This shows that the pandemic year had a modest but partially significant moderating influence on key financial indices, highlighting the delicate nature of stock market dynamics during global disruptions.

4.5. The interaction effect of operating sector on the relationship between equity multiples and stock returns

To address the research question, "How does the relationship between equity multiples and stock returns vary across different operating sectors?", a multiple linear regression model was implemented. The aim was to ascertain whether the relationships between the financial metrics - Price-to-Book (P/B) ratio, Price-to-Cash Flow (P/CF) ratio, and Price-to-Earnings (P/E) ratio - and stock returns manifest differently across various sectors.

In this model, the interaction effects between these financial metrics and a coded variable representing operating sectors (referred to as 'Sector_code') were examined. The 'Sector_code' served as a numerical proxy for the categorical representation of different industries or sectors in the data. This coding allowed for the quantification and assessment of interaction effects between continuous financial metrics and the categorical sector classifications, yet the code did not represent any ordinal meaning to the sectors.

The model's formulation is:

$$Return=\beta 0+\beta 1(P/B)+\beta 2(P/CF)+\beta 3(P/E)+\beta 4(Sector\_code)+\beta 5(P/B\times Sector\_code)+\beta 6(P/CF\times Sector\_code)+\beta 7(P/E\times Sector\_code)+\epsilon$$

While the direct effects of the P/B, P/CF, and P/E ratios on returns were captured in the model, our primary focus was on the interaction terms, which represent how these relationships might change when considering the operating sector. Similar to the main models tested in the previous section, P/CF has a positive, statistically significant relationship with stock returns ($p<0.05$). However, both P/B and P/E is not statistically significant. The variable Sector_code is also insignificant, indicating that differences in the operating sectors of the sampled companies from 2017-2021 is not strongly correlated with stock returns.

Of particular note, the interaction term for the P/CF ratio and the sector code was highly significant (p-value less than 0.01). This underscores the importance of considering sector variations when analyzing the relationship between the P/CF ratio and stock returns. The interaction effect suggests that the influence of the P/CF ratio on return is not uniform across sectors but varies depending on the specific sector. The interaction between the P/B ratio and the sector code was marginally significant with a p-value of 0.0723, hinting that the relationship between the P/B ratio and stock returns might be different across sectors. This suggests a nuanced approach is required when considering the P/B ratio as it may interact differently with stock returns depending on the sector. On the other hand, the interaction effect between the P/E ratio and sector code was not statistically significant, suggesting that the relationship between P/E and returns remains consistent across the different sectors represented by the 'Sector_code'. This model had a Multiple R-squared value of 0.055, suggesting that about 5.5% of the variability in returns can be explained by the predictors and their interactions. This model, as a whole, was statistically robust, as evidenced by the very low overall p-value (less than 0.001).

In conclusion, the interactions between financial metrics and sectors provide valuable insights. Particularly, the P/CF ratio's effect on return varies significantly across different sectors, necessitating sector-specific considerations when using this metric for financial analyses (see table 6 for more detailed regression results).

Table 6: Regression Table: The impact of market multiples and operating sector on Sharpe ratio

Variable	Sharpe Ratio
P/B	0.09
	(0.014)
P/CF	0.032***
	(0.005)
P/E	-0.001
	(0.001)
Sector_code	0.021
	(0.014)
P/B:Sector_code	0.004*
	(0.002)
P/CF: Sector_code	-0.004***
	(0.001)
P/E: Sector_code	0.0001
	(0.0001)
Constant	0.202**
	(0.090)
Observations	2,650
R2	0.055
Adjusted R2	0.052
Residual Std. Error	1.141 (df = 2642)
F Statistic	21.958*** (df = 7; 2642)
==========	==========
Note:	*p<0.1; **p<0.05; ***p<0.01

4.5. The interaction effect of firm size on the relationship between equity multiples and stock returns

In further examining the complexities of equity multiples' influence on stock returns, this section specifically interrogates whether and how a company's size moderated this relationship. By elucidating this interaction, the research aims to answer the question: "Does the size of the company moderate the relationship between equity multiples and stock returns, and if so, how?"

To capture firm size in a continuous, yet interpretable manner, the logarithm of the 2021 market capitalization, represented as log_Market_cap_2021, was employed. Utilizing the logarithm of market capitalization is an established approach in financial research, as it ensures the data's distributional properties are more consistent and linear relationships are more apparent. Moreover, it minimizes the influence of extremely large firms that could otherwise disproportionately affect the results.

The enhanced regression model thus incorporates this variable and its interaction terms with the financial metrics:

$$Return = \beta 0 + \beta 1(P/B) + \beta 2(P/CF) + \beta 3(P/E) + \beta 4(Sector\_code) + \beta 5(log\_Market\_cap\_2021) + \beta 6(P/B \times log\_Market\_cap\_2021) + \beta 7(P/CF \times log\_Market\_cap\_2021) + \beta 8(P/E \times log\_Market\_cap\_2021) + \epsilon$$

While the initial part of the model still considers the direct effects of equity multiples and their interactions with sectors, the addition of the log_Market_cap_2021 variable and its associated interaction terms is pivotal to understanding how firm size might impact these relationships. At first glance, the newly introduced variable of log_Market_cap_2021 has a positive, significant relationship with stock returns ($p<0.05$). This shows that larger companies (companies with higher market capitalization at the end of the period) was more likely to have higher stock returns.

The interaction term between the Price-to-Book (P/B) ratio and log_Market_cap_2021 was statistically significant at the 0.05 level, indicating that the relationship between the P/B ratio and stock returns is indeed moderated by firm size. Specifically, as the size of the company (as captured by its market capitalization) increases, the strength or nature of the relationship between P/B and returns adjusts.

The interaction between the Price-to-Cash Flow (P/CF) ratio and log_Market_cap_2021 approached significance (p-value of 0.066), hinting that the association between P/CF and returns might also be influenced by firm size, albeit not as robustly as the P/B ratio.

Conversely, the interaction between the Price-to-Earnings (P/E) ratio and log_Market_cap_2021 was not significant, suggesting that the effect of the P/E ratio on returns does not significantly vary based on the size of the company.

The model had an enhanced Multiple R-squared value of 0.062, reflecting that approximately 6.2% of the variability in returns could be attributed to the predictors and their interactions. The comprehensive significance of the model was again confirmed by a very low overall p-value.

In conclusion, the results suggest that while equity multiples do provide insights into stock returns, the magnitude or direction of these insights can be contingent upon the size of the firm in question. This contextuality reiterates the importance of considering multiple factors in concert when analyzing stock returns. Table 7 shows the results with the updated interaction terms of Market capitalization 2021.

Table 7: Regression Table: The impact of market multiples, operating sector and market capitalization 2021 on Sharpe ratio

Variable	**Sharpe Ratio**
P/B	0.181**
	(0.087)
P/CF	-0.022
	(0.030)
P/E	0.001
	(0.007)
Sector_code	0.020
	(0.015)
log_Market_cap_2021	0.062**
	(0.024)
Sector_code: P/B	0.004*
	(0.002)
Sector_code:P/CF	-0.004***
	(0.001)
Sector_code:P/E	0.00004
	(0.0002)
P/B*log_Market_cap_2021	-0.008**
	(0.004)
P/CF*log_Market_cap_2021	0.002*
	(0.001)
P/E*log_Market_cap_2021	-0.0001
	(0.0003)

Constant	-1.191**
	(0.573)
Observations	2,650
R2	0.062
Adjusted R2	0.058
Residual Std. Error	1.137 (df = 2638)
F Statistic	15.868*** (df = 11; 2638)
Note:	*p<0.1; **p<0.05; ***p<0.01

4.6. Robustness Test

4.6.1. Alternative model specification

In our endeavor to assess the robustness of our empirical findings, we introduced quadratic terms to our regression model, thereby investigating potential non-linear relationships between equity multiples and stock returns. Our extended model incorporated squared terms of Price-to-Book (P/B), Price-to-Cash Flow (P/CF), and Price-to-Earnings (P/E) ratios.

The empirical results of this model are as follows:

$$Return = 0.281 + 0.059 \times P/B - 0.001 \times P/B2 + 0.011 \times P/CF - 0.000 \times P/CF2 + 0.001 \times P/E - 0.000 \times P/E2 + \epsilon$$

A notable observation from this augmented model is the significant coefficients attached to the quadratic terms. The P/B ratio's squared term is negative, suggesting a diminishing effect as the ratio increases. Specifically, for each unit increase in P/B, the stock return increases by approximately 0.059 units. However, this effect weakens by about 0.001 units with each incremental increase in P/B.

Similarly, the P/CF ratio also exhibited a diminishing effect, with stock returns increasing by 0.011 units for every unit increase in the ratio, but this effect attenuates by roughly 0.000 units for each additional increase.

Lastly, the P/E ratio showcases a positive relationship with returns, indicating a rise of approximately 0.001 units for every unit increment in the ratio. However, this positive relationship decelerates at a rate of 0.000 units.

The multiple R-squared value for the model is 0.053, indicating that around 5.3% of the variability in stock returns can be explained by our model, a marginal enhancement from our original specification. Additionally, the model's F-statistic indicates its statistical significance, corroborating the model's ability to predict returns better than an intercept-only model.

In conclusion, the introduction of quadratic terms illuminated non-linear relationships between equity multiples and stock returns, underscoring the importance of considering such terms in financial regression analyses. This extended model not only reinforces the validity of our initial findings but also provides a nuanced understanding of the relationships at hand. Table 8 illustrates the regression results for the alternative quadratic model used for the robustness test.

Table 8: Robustness test: Alternative quadratic terms table

Variable	**Sharpe Ratio**
P/B	0.059***
	(0.011)
I (P/B ^ 2)	-0.001**
	(0.0004)
P/CF	0.011***
	(0.001)
I (P/CF ^ 2)	-0.0001**
	(0.00002)
P/E	0.001**
	(0.001)
I (P/E ^ 2)	-0.0000***
	(0.0000)
Constant	0.281***
	(0.0035)

Observations	2,650
R2	0.053
Adjusted R2	0.051
Residual Std. Error	1.142 (df = 2643)
F Statistic	24.747*** (df = 6; 2643)
Note:	*p<0.1; **p<0.05; ***p<0.01

In furtherance of our robustness checks, we conducted additional empirical tests to discern the stability and sensitivity of our primary relationships. These tests revolved around the omission of the Sector_code and log_Market_cap_2021 variables from our regression models.

Excluding Sector_code

On excluding the Sector_code from our regression, the resulting model can be represented as:

$$Return = -1.0162 + 0.0341 \times P/B + 0.0085 \times P/CF - 0.0001 \times P/E + 0.0605 \times log\_Market\_cap\_2021 + \epsilon$$

We observe that the P/B ratio retains its significant positive relationship with stock returns, with a coefficient estimate of 0.0341. Similarly, the P/CF ratio is statistically significant, implying an increase of 0.0085 units in stock return for each unit increase in P/CF. On the other hand, the P/E ratio does not exhibit statistical significance, suggesting its limited explanatory power in the absence of sector categorization. The log_Market_cap_2021 variable demonstrated a positive relationship with returns, with an increase of 0.0605 units for every unit increment.

The model yields an R-squared value of 0.0500, signifying that approximately 5.006% of the variability in returns can be explained by the aforementioned variables. The statistically significant F-statistic further strengthens the case for the overall significance of the model. Table 9 describes the full overview of the results.

Table 9: Robustness test: Excluding Sector_code

Variable	Sharpe Ratio
P/B	0.034***
	(0.006)
P/CF	0.008***
	(0.002)
P/E	-0.0001
	(0.016)
log_Market_cap_2021	0.061***
	(0.016)
Constant	-1.016***
	(0.372)
Observations	2,650
R2	0.050
Adjusted R2	0.049
Residual Std. Error	1.143 (df = 2645)
F Statistic	34.844*** (df = 4; 2645)
Note:	*p<0.1; **p<0.05; ***p<0.01

Excluding log_Market_cap_2021

On omitting the log_Market_cap_2021 variable from our regression, we are presented with the model:

$$Return = 0.4278 + 0.0381 \times P/B + 0.0089 \times P/CF - 0.0001 \times P/E - 0.0139 \times Sector\_code + \epsilon$$

In this specification, both P/B and P/CF retain their statistically significant positive relationship with stock returns, demonstrating respective increases of 0.0381 and 0.0089 units for every unit rise. The P/E ratio, however, continues to lack statistical significance in this configuration. The Sector_code, which was reintroduced, did not showcase a statistically significant relationship with returns.

With an R-squared of 0.0460, this model elucidates that around 4.6% of the variance in returns can be ascribed to these variables. The F-statistic of the model remains statistically significant, suggesting the overall utility of this specification in predicting returns.

In summary, the omission of key variables in our model has provided a valuable perspective on the intrinsic relationships between equity multiples and stock returns. While certain relationships retained their significance, others wavered, shedding light on the importance of holistic modeling in empirical finance research. Table 10 describes the results of this robustness test.

Table 10: Robustness test: Excluding log_Market_cap_2021

Variable	Sharpe Ratio
P/B	0.038***
	(0.005)
P/CF	0.009***
	(0.002)
P/E	-0.0001
	(0.0003)
Sector_code	-0.014
	(0.009)
Constant	0.428***
	(0.065)
Observations	2,650
R2	0.046
Adjusted R2	0.045
Residual Std. Error	1.146 (df = 2645)
F Statistic	31.896*** (df = 4; 2645)
Note:	*p<0.1; **p<0.05; ***p<0.01

4.6.2. Outlier analysis

Outlier analysis is an instrumental procedure to ensure the robustness of empirical results. Extreme observations, though few in number, can have a disproportionate influence on regression outcomes. To safeguard our findings against such potential distortions, we delved into an outlier detection and removal procedure.

In the process of evaluating standardized residuals, seven observations were identified as potential outliers, falling beyond the generally accepted thresholds for such residuals. To ascertain the impact of these potential outliers, they were excluded and the regression analysis was conducted again using the refined dataset. In this revised regression model, the coefficients

for the variables were as follows: P/B registered a coefficient of 0.0388, exhibiting significance at the 0.1% level. Similarly, P/CF demonstrated a coefficient of 0.0096, also significant at the 0.1% level. However, P/E showed a coefficient of -0.00001, which was not statistically significant, evidenced by a p-value of 0.974. The adjusted R-squared for this model was 0.0485, which represents the proportion of the variance in the dependent variable that is predictable from the independent variables.

Compared to our initial regression, the coefficient of P/B showed a slight increase, while the coefficient for P/CF also rose marginally. Interestingly, the coefficient for P/E remained statistically insignificant, which parallels our original model's results. The adjusted R-squared saw a negligible change, indicating that the overall explanatory power of our model remained relatively consistent even after outlier removal.

The outlier analysis underscores that while our results are slightly sensitive to extreme observations, the overall interpretations and the significance of the primary predictors remain largely unchanged. This enhances our confidence in the robustness of our initial findings, suggesting that they are not merely artifacts of a few extreme data points.

4.6.3. Autocorrelation and Heteroskedasticity

Robust Standard Errors Analysis

Following the adjustment for potential heteroskedasticity via robust standard errors, the regression results on the refined dataset exhibited specific outcomes. The intercept was discerned to possess an estimated value of 0.324, accompanied by a standard error of 0.0323. Its statistical significance was evident with a t-value of 10.0432 and a p-value smaller than 0.01. In relation to the coefficient for P/B, it was gauged at 0.0388 and found to be statistically significant, boasting a standard error of 0.006, a t-value of 6.4812, and a p-value of 0.0000. The P/CF coefficient was determined to have a value of 0.0096, which was significant at a t-value of 5.5120 and a p-value of 0.0000, while the standard error for this coefficient stood at 0.0017. Conversely, the P/E coefficient, despite its estimated figure of -0.0000, did not reach statistical significance, reflecting a t-value of −0.0360, a p-value of 0.9713, and an associated standard error of 0.0003.

Autocorrelation Test:

The Durbin-Watson test, which checks for the presence of first-order autocorrelation in the residuals, has yielded a DW statistic of 1.4006. This is indicative of a positive autocorrelation since the value is substantially less than 2. The associated p-value is less than 0.01, suggesting that the autocorrelation is statistically significant and the null hypothesis of no autocorrelation is rejected.

Heteroskedasticity Test

Upon conducting the studentized Breusch-Pagan test to ascertain the presence of heteroskedasticity, the BP statistic was found to be 1.6805 with a degree of freedom (df) of 3. The corresponding p-value is 0.6413, indicating that the null hypothesis of homoscedasticity cannot be rejected at conventional significance levels. This suggests that heteroskedasticity is not a significant concern in our cleaned dataset.

In conclusion, while autocorrelation appears to be a significant factor to consider in this model, heteroskedasticity does not seem to present a major concern. Adjusting for heteroskedasticity using robust standard errors has provided a refined understanding of the significance and magnitude of our coefficients.

5. Discussion

5.1. Interpretation of key findings

The primary goal of this study was to examine the relationship between various equity multiples and risk-adjusted stock returns, taking into account a variety of factors such as the impact of the COVID-19 pandemic, sector variations, and company size. Our regression analysis results present an arrangement of interconnected findings that provide answers to the research questions posed.

Starting with the relationship between the P/E ratio and risk-adjusted stock returns as measured by the Sharpe ratio, our findings revealed that it was not statistically significant. In all of our models, the P/E coefficient was close to zero and failed to achieve significance in both our main model and the robustness tests. This finding suggests that, for the dataset under consideration,

the P/E ratio may not be a strong predictor of risk-adjusted returns. This may seem counter-intuitive to some financial analysts who use P/E as their primary valuation indicator. However, keep in mind that the effectiveness of the P/E ratio can be influenced by various sectoral and macroeconomic conditions, and its relationship with returns can be nonlinear or even non-monotonic in some contexts. Hypothesis 1 is therefore rejected.

In contrast, there was a statistically significant positive correlation between the Price-to-Cash Flow (P/CF) ratio and the Sharpe ratio. This implies that firms with higher P/CF ratios generate higher risk-adjusted stock returns. Because cash flows are a more direct measure of a company's ability to generate value, they may be a more reliable predictor of stock returns in volatile conditions like the one caused by the pandemic. We can derive to the conclusion that hypothesis 2 is accepted.

In addition, the Price-to-Book (P/B) ratio had a significant positive relationship with risk-adjusted stock returns. When risk is taken into account, the strong positive coefficient indicates that higher P/B ratios are associated with better stock performance. This is consistent with traditional financial theories that a higher P/B ratio may indicate an undervalued stock or that the company is earning a return on assets that exceeds its cost of capital. From the results, hypothesis 3 is accepted.

Our findings were suggestive of a potential moderating effect of the COVID-19 pandemic years on the relationship between equity multiples and stock returns. The study used data from the years 2020 and 2021 to simulate the onset of the pandemic and its economic consequences. For these years, the log transformation of market capitalization showed a significant positive relationship with returns. This could be interpreted as larger companies (with higher market capitalizations) being better positioned to weather the financial challenges posed by the pandemic, providing better risk-adjusted returns as a result. The results indicate that while equity multiples, particularly P/B and P/CF, have strong predictive power over stock returns, the events of the pandemic years had a limited moderating effect on these relationships. There is no significant interaction between year 2020 and any of the three equity multiples. The only exception was the P/E ratio in 2021, which saw a distinct relationship with stock returns compared to other years. We can come to the conclusions for H4a and H4b. Hypothesis H4a is rejected because the relationships between the equity multiples (P/B, P/CF, and P/E) and stock returns were not emphasized or altered by the events of 2020. Hypothesis H4b is partially accepted. While the year 2021 did not significantly modify the relationships between P/B or P/CF and stock returns, it did emphasize the relationship between the P/E ratio and stock returns.

When the researchers looked into sector-specific variations, they discovered an intriguing story. While the 'Sector_code' variable was not significantly related to risk-adjusted returns, removing it caused variations in the strength of other predictors, particularly the P/B and P/CF ratios. This implies that there are sectoral differences in how equity multiples relate to returns. Some industries may be more sensitive to specific equity multiples due to their inherent business models or market dynamics. From the results, H5 is accepted for the P/CF ratio and potentially for the P/B ratio (given the marginal significance $p<0.1$). However, H4 is rejected for the P/E ratio, as there was no significant interaction effect between P/E and Sector_code.

Finally, when it came to the impact of company size on the relationship between equity multiples and stock returns, our findings were unequivocal. In our regression models, the positive coefficient of the logarithm of market capitalization 2021 indicates that larger companies have higher risk-adjusted returns. This could imply that larger firms, with more diverse portfolios and potentially more robust risk management strategies, could provide more consistent returns in volatile market conditions. Similar to H5, H6 is partially accepted. Company size (as captured by log_Market_cap_2021) does moderate the relationship between equity multiples P/B (p-value<0.05) and stock returns in a statistically significant way, and a hint of moderation with P/CF (p-value<0.1). However, company size was not robust enough to say that company size plays a consistent moderating role for all equity multiples, given that the P/E ratio showed no significant interaction with company size.

In conclusion, this study sheds light on the complex relationships that exist between various equity multiples and risk-adjusted stock returns. It emphasizes the importance of taking into account multiple variables when evaluating stock performance, particularly in the context of unprecedented economic events such as the COVID-19 pandemic. The findings are critical for investors, financial analysts, and policymakers, as they guide investment strategies and financial decision-making in the evolving economic landscape. The summary of hypotheses and their results are described in Table 10.

Table 10: Summary of hypotheses' results

Hypothesis description	Test result
H1: Companies with higher P/E ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.	Rejected
H2: Companies with higher P/CF ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.	Accepted
H3: Companies with higher P/E ratios are more likely to have higher Sharpe ratios, signifying superior risk-adjusted returns.	Accepted
H4a: The year 2020 emphasizes the relationship between equity multiples and stock returns.	Rejected
H4b: The year 2021 emphasizes the relationship between equity multiples and stock returns.	Partially accepted
H5: The operating sectors of companies have significant impact on the relationship intensity and direction between equity multiples and stock returns.	Partially accepted
H6: Bigger company size emphasize the positive relationship between equity multiples and stock returns.	Partially accepted

5.2. Theoretical and Practical Implications

Our study of the relationship between equity multiples and risk-adjusted stock returns has important implications for both theoretical and practical understanding of financial concepts.

The findings, from a theoretical standpoint, build on long-established financial theories while providing nuanced insights that both align with and deviate from previous research. The positive relationship between the P/B ratio and risk-adjusted stock returns is consistent with Graham and Dodd's (1934) seminal work Security Analysis. However, the emphasis on the P/CF ratio's predictive power for returns deviates from traditional valuation theories, which are frequently

centered on earnings and dividends (Gordon & Shapiro, 1956). The P/E ratio's diminished prominence, on the other hand, deviates from the dividend discount model emphasize (Williams, 1938), suggesting the multifaceted nature of stock valuation in modern markets. The findings also stress the profound influence of macroeconomic factors, such as the COVID-19 pandemic, on stock valuation, a concept acknowledged in early theories (Sharpe, 1964).

On the practical side, understanding the relationship between equity multiples and returns has practical implications for investors and financial analysts. A better understanding of these relationships can help investors make better decisions. The positive correlation between the P/CF ratio and stock returns, for example, emphasizes the importance of using cash flows as a reliable metric for evaluating stock performance. This implies a strategic shift for investors who have traditionally prioritized earnings or dividends when evaluating stocks.

Furthermore, the study's emphasis on the moderating effects of factors like global events, operating sectors, and company size provides useful insights for risk diversification. Portfolio managers may be able to improve their investment strategies by understanding how these variables interact with equity multiples, potentially maximizing returns and minimizing risk. Bigger companies are also expected to generate higher returns over time.

Besides, acknowledging the P/E ratio's diminished significance in predicting stock returns may prompt changes in investment strategies. Given the volatility of earnings, which is influenced by a variety of external factors, investors may choose to diversify their investment criteria. Our research highlights the importance of adaptability in investment approaches in the context of the COVID-19 pandemic. Economic downturns, global events, or sectoral disruptions can all have a significant impact on the dynamics of equity multiples and their relationship to stock returns.

To summarize, the study provides critical insights for improving both academic theories and investment strategies in finance. As financial markets evolve, it becomes increasingly important to incorporate these insights into both theoretical explorations and practical investment decisions.

5.3. Limitations

Every rigorous research project, while providing valuable insights, inevitably has limitations. Recognizing these limitations not only helps to interpret the findings with caution, but it also paves the way for future studies to refine the methodology and approach.

One of our study's major limitations is its reliance on a single year's data for market capitalization. Using only market cap data from 2021 can introduce biases, especially given the dynamic and ever-changing nature of stock markets. Market capitalization changes can reflect a variety of factors, ranging from company-specific events like mergers or significant operational changes to broader macroeconomic trends. Because we used a snapshot from one year, our study may not have captured historical volatility or the multi-year trends in market capitalization, which can be integral in understanding the long-term performance and stability of companies.

The methodology used to adjust the Sharpe ratio is also worth considering. While adjusting the Sharpe ratio to produce positive numbers makes interpretation and statistical analysis easier, it may introduce a bias in assessing the risk-return trade-off. The Sharpe ratio, by definition, accounts for an investment's excess return over a risk-free asset, adjusted for volatility. Changing this metric may inadvertently minimize the inherent risks associated with specific stocks or industries. This deviation from traditional computation can result in overly optimistic assessments of certain equities' risk-adjusted returns, potentially misleading investors.

The dependability of the historical data sources adds to the complexity. While every effort is made to obtain data from reliable sources, the accuracy of the data cannot be guaranteed. Financial data can often be adjusted due to restatements, regulatory changes, or discovery of discrepancies. Moreover, the data's granularity or the methodologies employed by different data providers might vary, introducing inconsistencies. Thus, while the dataset forms the backbone of our analysis, potential inaccuracies or inconsistencies in the historical data could subtly influence the results and interpretations.

Furthermore, our research focused primarily on specific equity multiples, such as P/E, P/CF, and P/B ratios. While these are undoubtedly important valuation metrics, the world of finance is packed with other potential performance and valuation indicators. Dividend yields, growth rates, and debt-equity ratios may also play important roles in determining stock performance. Our study may have missed certain details in the relationship between valuation and stock returns because we did not include these additional metrics.

Also assumed in the methodology was a linear relationship between equity multiples and stock returns. However, because of their inherent complexities and multifactor influences, financial markets may not always operate under linear paradigms. Non-linear relationships, feedback

loops, or threshold effects could all play important roles in determining stock returns, and our linear regression models may fail to capture these complexities.

Furthermore, while our study took into account the moderating effects of events such as the COVID-19 pandemic, the binary nature of this consideration (pandemic years vs. non-pandemic years) may oversimplify the profound and multifaceted impact of such a global event. The nuances of how the pandemic affected different sectors, geographies, or company sizes at different stages may have been overlooked.

Finally, while our study's scope was broad, it was limited to specific geographies (EURONEXT Paris) and sectors (the distribution of sectors was not equal). Global financial markets can have distinct characteristics shaped by regional regulatory environments, cultural factors, or economic developments. We may inadvertently miss out on broader trends or insights applicable on a global scale by focusing on a specific subset.

In conclusion, while our research provides invaluable insights into the relationship between equity multiples and risk-adjusted stock returns, the limitations necessitate caution in interpreting and applying the findings. Future research can address these limitations by improving the methodology, broadening the scope, or delving deeper into the nuances to provide a more comprehensive understanding of the complex world of finance.

5.4. Future research directions

The vast field of financial research, defined by its dynamic and evolving nature, provides limitless opportunities for exploration. While our current study sheds light on the relationship between equity multiples and risk-adjusted stock returns, there is vast untapped potential that future studies could delve into to both refine and amplify our findings.

One such avenue is a more extensive temporal examination of market capitalization. Given our reliance on data from 2021, a longitudinal approach would provide more in-depth insights. Researchers could capture the cyclical nature of markets and the ramifications of significant global events by studying market capitalization trends over several years. In 1992, Fama and French's seminal work asserted the critical role of company size in determining stock returns, emphasizing the significance of understanding the temporal dynamics of market capitalization.

Expanding the range of financial metrics under consideration could provide another enlightening perspective. While our investigation focused on specific equity multiples, incorporating metrics such as dividend yields, debt-equity ratios, or even metrics specific to specific industries would provide a more comprehensive understanding. Incorporating principles from Modigliani and Miller's 1958 capital structure theory, future research could investigate the relationship between a firm's debt-equity composition and stock performance, as compared to equity multiples.

While our study assumed a linear relationship between equity multiples and stock returns, this could be refined further. Exploring non-linear models, or even experimenting with emerging machine learning techniques that, as Sirignano and Cont highlighted in 2019, are making inroads in financial research, can be critical. Such advanced methodologies can shed light on patterns potentially eluding linear frameworks.

Extending the study's geographical and sectoral scope is another potential improvement. While our research was thorough, it did not cover all global and sectoral nuances. Focusing on regions or more specific industries that were not highlighted in our study would bring to light the distinct financial practices that are unique to them. Levine (1997) drew attention to the ways in which regulatory architectures and socioeconomic landscapes can shape financial market behavior. Extending research to different geographies can thus uncover these regional differences.

The pandemic's impact on our study, while significant, was handled in a binary manner. A more granular dissection, taking variables like sectoral resilience, government interventions, and regional economic recoveries into account, can provide profound insights. Baker, Bloom, and Davis (2016) documented economic uncertainties similar to those that ushered in by the pandemic, exert multifaceted impacts on financial terrains.

Combining behavioral finance insights can add a holistic dimension to subsequent investigations. Traditional financial theories frequently base their assumptions on rational investors. However, the pioneering work of scholars such as Kahneman and Tversky in 1979 demonstrated the range of behavioral biases influencing investor decision-making. Incorporating these into future research frameworks can provide a better understanding of how these biases influence the interaction between equity multiples and stock returns.

Beyond the pandemic, an array of global events, such as geopolitical shifts, environmental crises, or technological revolutions, can have a tangible impact on financial ecosystems. Understanding

how such pivotal events interact with the dynamics of equity multiples and stock returns holds the promise of providing more nuanced insights.

Finally, alternative risk-adjusted metrics, such as the Sortino or Treynor ratios, can be incorporated into future studies. Each metric provides a distinct perspective on risk and performance, and their combination can broaden our understanding even further.

To summarize, our investigation into the relationship between equity multiples and risk-adjusted stock returns lays the groundwork for a variety of future investigations. Future research can continue its odyssey in the intricate world of finance by building on this foundation and venturing into the aforementioned directions, delivering insights of enormous value to scholars, investors, and practitioners.

6. Conclusion

Studies that bridge theoretical underpinnings with empirical realities serve as pivotal waypoints in the vast and intricate world of financial research, guiding scholars, investors, and industry practitioners. This thesis attempted to shed light on the relationship between equity multiples and risk-adjusted stock returns by drawing insights from historical data, modern statistical analyses, and robust financial theories.

We set out with one goal in mind: to determine the impact of three key equity multiples—Price-to-Earnings (P/E), Price-to-Cash Flow (P/CF), and Price-to-Book (P/B) ratios—on risk-adjusted stock returns as measured by the Sharpe ratio. These equity multiples, which have long been recognized as important valuation tools, have historically been used by investors to assess a company's inherent value. However, their direct relationship with stock returns, especially when adjusted for risk, remained a topic requiring in depth exploration.

We discovered that the P/B ratio had a significant positive relationship with stock returns after conducting extensive research. Companies with higher P/B ratios appeared to have better risk-adjusted returns. Providing similar significant result is the P/CF ratio, which measures a company's financial health, demonstrated a significant correlation, reinforcing the notion that cash flows continue to be an important factor in determining a company's valuation and subsequent stock performance. In contrast, despite its prominence in the investor lexicon, the P/E ratio did not show a significantly influential relationship in our model.

An important aspect of our research was considering the long-term impact of the COVID-19 pandemic in 2020 and 2021. The global turmoil, which included economic disruptions, changes in consumer behavior, and unprecedented fiscal interventions, added layers of complexity to our research. The pandemic put financial models and theories to the test, with certain relationships intensifying while others becoming muted. Our findings suggest that the pandemic years had a partial moderating effect on the relationship between equity multiples and stock returns, demonstrating the impact of external macroeconomic shocks on intrinsic financial dynamics.

One of the more nuanced revelations of our research revolved around the variance of these relationships across operating sectors and company sizes. Industries reacted differently to economic stimuli, with some sectors, like technology, seeing surges in valuation, while others, like travel and hospitality, navigated turbulent waters. Similarly, company size, as depicted by market capitalization, revealed its role as a moderator, underpinning the idea that larger firms might have different financial dynamics than their smaller counterparts.

The practical and theoretical implications we derived from our findings extend beyond mere academic interest. They guide investors in their decision-making, help companies in their strategic planning, and offer regulators insights into the financial markets' inner workings. The synthesis of practice and theory, as witnessed in our research, propels the finance discipline forward, ensuring its relevance and applicability.

Reflecting upon the limitations, it becomes evident that every study, regardless of its depth, has scopes for improvement. Our reliance on market capitalization data from 2021, the adjustments made to the Sharpe ratio, and the sources of historical data, all introduce potential avenues of bias or inaccuracy. Future researchers might want to address these by leveraging more extensive datasets, refining methodologies, or integrating more advanced analytical tools.

Looking ahead, it is clear that the world of financial research holds enormous potential for exploration. Future research could delve deeper into behavioral aspects of finance, incorporate machine learning tools, broaden their geographical scope, or investigate the impact of emerging global phenomena. The need for in-depth, methodical, and insightful research will only grow as financial landscapes evolve.

Finally, our journey through the maze of equity multiples and risk-adjusted stock returns was illuminating. It not only reaffirmed the significance of some long-standing financial theories, but it

also paved the way for further research. As the baton is passed to future researchers, practitioners, and academicians, the hope is that the insights gained today will shape financial decisions in the future. Through this thesis, we hope to inch closer to understanding the intricate dance of numbers, theories, and real-world phenomena that define the world of finance.

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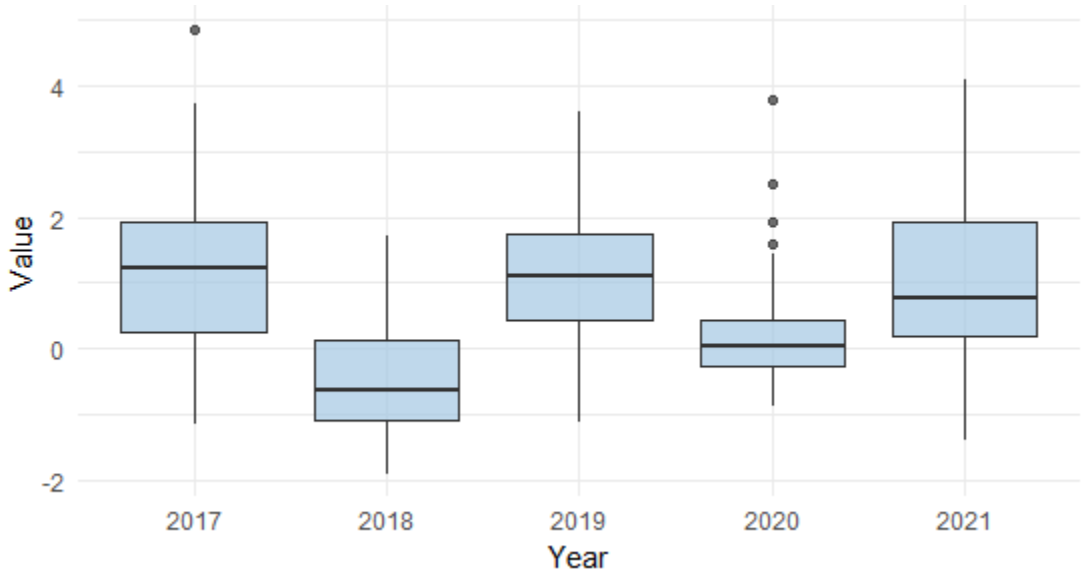
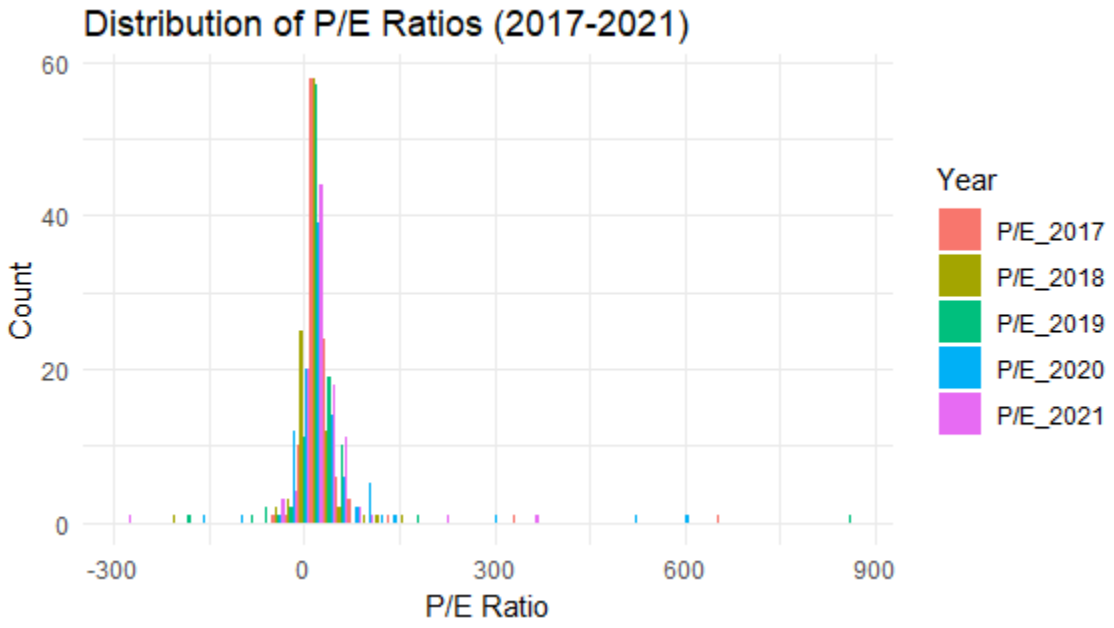
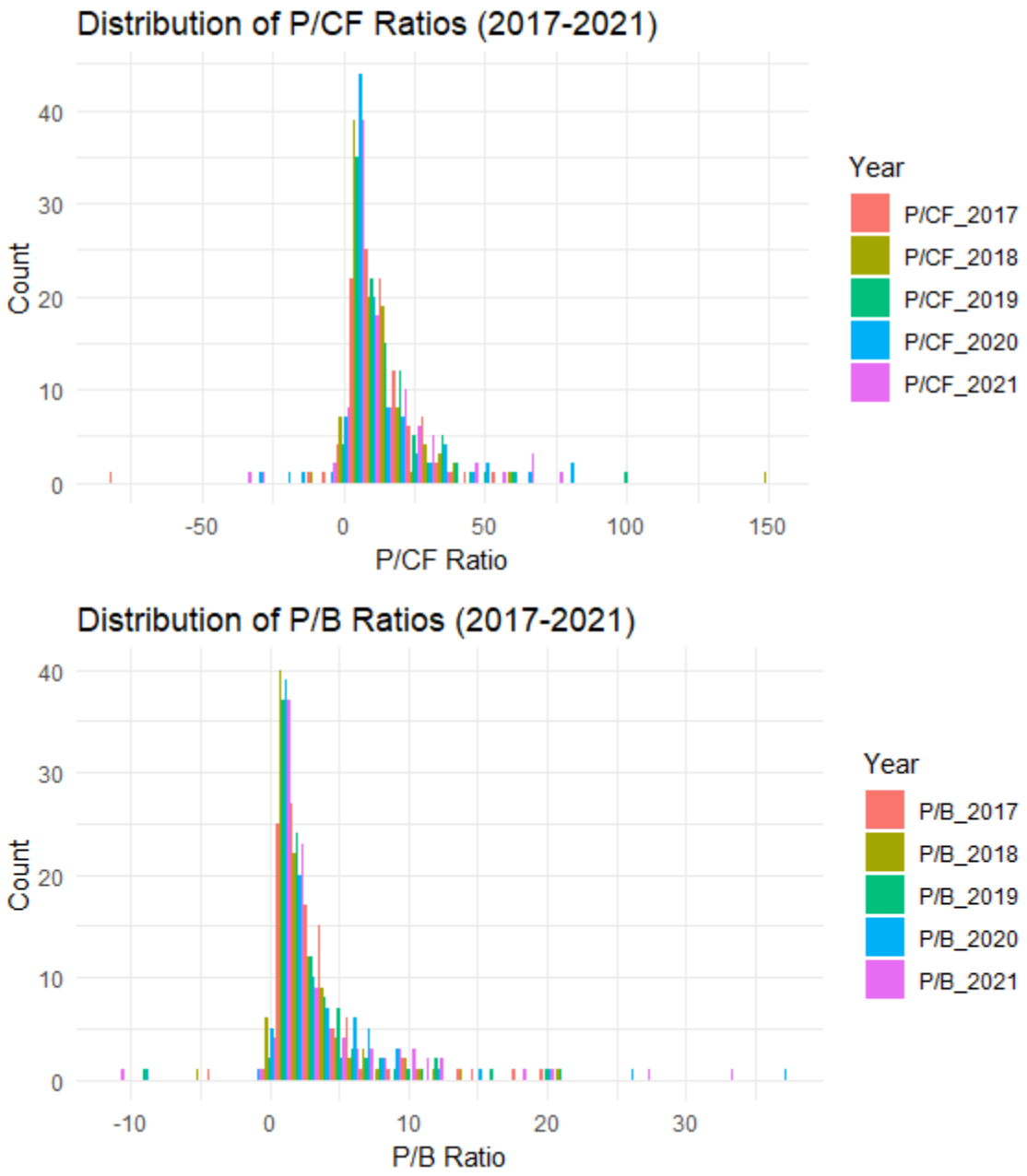
Appendices

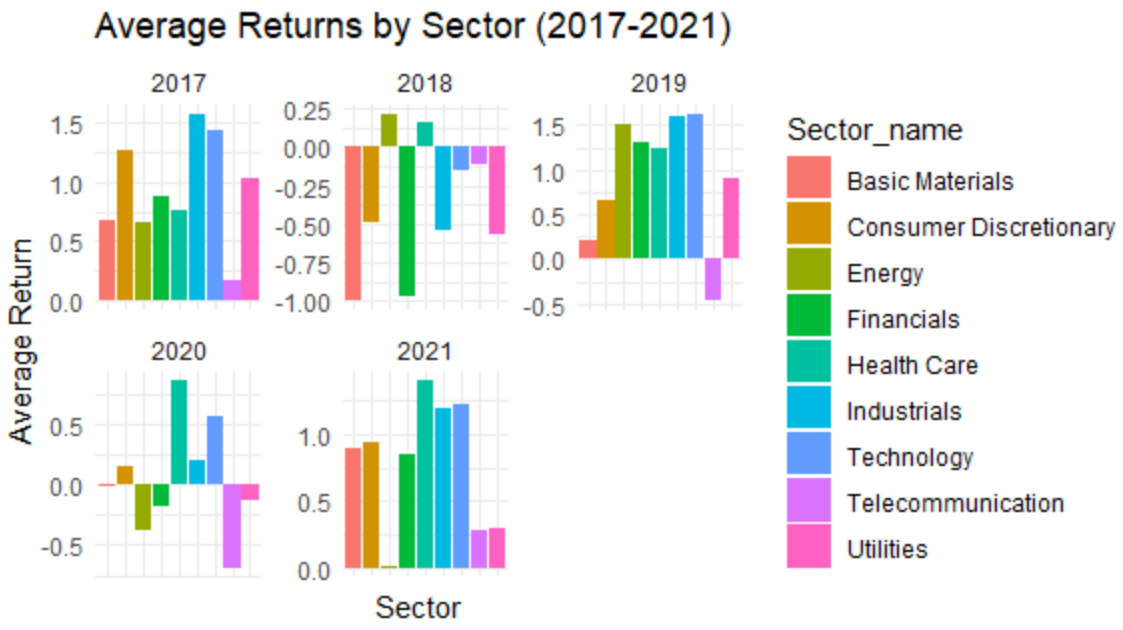


Appendix 1: Stock returns distribution by years





Appendix 2,3,4: Distribution of market multiples by years



Appendix 5: Distribution of average returns for each sector