

# Determinants of stock price of companies from Ibex 35

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## Intermediate Report

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**ABSTRACT:** This dissertation analyses the financial ratios that explain better stock prices in foreign markets. Provides empirical evidence using a multiple regression analysis of the determinant stock the prices of Ibex 35 companies in the Spanish stock exchange market.

## 1. Introduction

The literature has studied financial ratios that make possible to explain outstanding performance in subsequent stock prices with the purpose to anticipate to those prices. Authors from many countries had analyzed companies listed in diverse stock exchange markets from around the world. Price to Earnings ratio, Dividend yield and Book value per share ratio were the most common ratios that were found to have a significant relationship with stock prices. Additional ratios that were not as well received as the previous ones but had an important role in the literature such as Debt to Equity ratio were statistically proved to have a significant relationship with stock prices. Most of the studies take a sample of Nort-American and Asian stock markets and very few analyze companies listed in the Spanish stock markets. Studies conducted by (Covarsí & Torres, 2014b) proved with empirical evidence that a significant relationship of Price Earnings ratio and Price to book value with a multiple regression model. However, the author did not use the Book Value per Share ratio that this research analyses and did not merge other most relevant financial ratios most used by the literature in the same regression model. (Cabestre & Escuer, 1996) shows the relation with dividend payments and profitability using a residual profitability analysis from secondary data of companies listed in Madrid Stock Exchange market. A later analysis was developed by (Priede Bergamini Tiziana et al., 2000) did not found significance evidence that there was a relationship between stock prices and dividends studying a sample of Spanish companies.

The contribution to this final dissertation is an analysis in the Spanish stock markets that combine some of the most discussed financial ratios that were found to be explicative of subsequent stock price changes by the authors that studied this field before. A multiple regression analysis using a unique combination of variables help to answer the research question: Does is corroborated financial ratios that are known to better explain the stock prices in foreign markets, are able to explain changes in stock prices of Spanish companies?

the average stock price in one year as a dependent variable with the Price to Earnings ratio (PER), the Dividend Yield (DV), and the Book Value Per Share (BVPS). In addition, to enrich the model the variables Debt to Equity ratio (DE) and the categorical variable sector (TI) which differentiates the companies analyzed with its respective industries they operate, are added to the analysis.

This research analyzes the relationship between the stock prices and some of the main financial ratios, such as the Price to Earnings ratio (PER), the Dividend Yield (DV), and the Book Value Per Share (BVPS). In addition, to enrich the dissertation the variables Debt to Equity ratio (DE) and the categorical variable sector (TI) which differentiates the companies analyzed with its respective industries they operate, are added to the analysis.

The first part of the project is an explanation of the stock and the stock price variable that is analyzed. Explaining the differences with stock exchange markets and reasoning the focus on secondary market in this research. the research in addition of the motivation of the research, justification and objectives explained. Then the variables PER, DY and BVPS are explained along with the previous literature for each financial ratio. Furthermore, an explanation of DE and DI is redacted plus the justification of why the variables are added to the study.

The subsequent section is be the hypothesis suggested that responds to the research question previously stated. Then the methodology is explained with the justification and how the empirical analysis is being approach.

## **1.2 Justification and Motivation**

The stock price it is an element really important since it determines the value of a company. Those factors affecting the price are not completely disclosed and are extremely difficult to predict. However, there is an extensive literature that have been studied the variables that effect the most stock market prices. Cases of Apple that when they report a huge level of cash in their balance accounts it is perceived that the company do not know where to allocate their capital resources losing investors in consequence.(Krantz Matt, 2021; The Guardian, 2021). Or the case of Tesla that its stock price is trading at an astonishing high price which is 846 USD in February of 2022, more than 4.5 times the stock price of Toyota, the second highest stock price of

automotive industry, without significant difference in the number of outstanding shares of both companies. This is explained by several reasons including a well above average Tesla's gross margin relative to the industry average, or the data that the company is generating for autonomous driving that investor value. (Forbes, 2021) By looking at the accounting data and using metrics like financial ratios it is possible to understand how the business and even the industry works.

The author of this final dissertation has a deep interest in finance and intends to specialize his professional career in this field. As part of his Bachelor's degree in business and innovation management, the subject short-term investments and inference for businesses where the subjects that motivated the selection of this topic for the final dissertation. In order to deepen his knowledge on these issues, the author has carried out a study that involves both areas to contribute with a significant outcome.

## **2. Objectives**

The main objective is to determine the relationship between average stock prices of the Spanish companies from Ibex35 with the Price to Earnings ratio, the Dividend Yield ratio, the Book Value Per Share ratio. This helps to answer the research question of the analysis: Does the financial ratios that have been proved to have a significant relationship with stock prices in foreign stock markets have a significant relationship in Spanish stock markets?

Furthermore, additional secondary objectives are set to extract multiple conclusions to have a better understanding of the outcome of the research. The secondary objectives are to indicate which of the four variables studied has more effect in predicting subsequent changes in security prices in Spain. In addition, since Ibex35 is composed by firms from different industries, another goal is to conclude which of those financial ratios are the best indicators of stock prices changes for each industry covered.



### **3. Theoretical framework**

#### **3.1. Stocks**

Stocks are pieces of an ownership of a business that entitles to benefits and rights. Companies gain capital to fund their operations by selling these pieces of ownerships to investors. Those who buy stocks become owners of a company in portion of the equities purchased. Determined by the type of shares, the security holder has certain privileges. One of the privileges are voting rights, which enables to vote at the company's annual shareholder meetings. Another important right is collecting dividends which are a share of the company's profits but not always the company decided to distribute dividends. Furthermore, the capital appreciation that occurs when the stock price of a company raises so the shares of the investors increase in value. (E. Napoletano & Benjamin Curry, 2021)

##### **3.1.1 Different type of stocks**

Firms issue different types of stocks that define dividend payments, voting rights and rights related to hedge investment against bankruptcy. Habitually, companies also issue different classes of stock assorted by letters that have a different voting right in order to help founders keep a broader control over the firm. The most conventional varieties are common stock and preferred stock. Common stocks provide voting rights, have an unlimited potential to gain when the stock price rises and common shareholders have priority in receiving payment due bankruptcy. While preferred stocks are more secure than common stocks since they provide more programmed dividend payments but they do not have equal voting rights and they have less potential for gain when the value of the preferred stock rises since they depend on market interest rates. Also, the firm can recall preferred stocks at the par value or little higher price while common stocks are not callable. (Miranda Marquit & Benjamin Curry, 2020)

##### **3.1.2 Stock prices in secondary market**

Private companies can sell shares to general public throughout an Initial Public Offering (IPO). In the course of that process, the firm that has decide to go public, has to reveal how many shares to issue and set a price for those shares. Once all the IPO process has concluded, the securities will be traded from that moment in the secondary market where supply and demand will make fluctuate the stock price. This paper focuses on determining the stock price in the secondary market. Although many external factors influence the demand and supply of stock price which make it more complex, there is much more information of public entities for an insightful study apart of the usefulness

for many future predictions since the IPO occurs just once. Stocks need to be admitted in a regulated market in order to be able to be traded, entities that issue those shares need to meet certain requirements such as record of profit distribution or size of the company. (CNMV, 2022)

There are innumerable reasons postulated for a business to decide to open up their doors to public investors. Many factors are considered during the decision, evidence suggest that the most relevant component is market conditions followed by business 's life cycle. (Ritter & Welch, 2002)

## **3.2 Financial ratios**

### **3.2.1 Definition**

Financial ratios are numerical variables that are computed from data from financial statements. Balance sheet, cash flow statements and income statements are used as a source for a quantitative analysis and they are an important part of considering an investment decision within the fundamental analysis. This analysis is a method to quantify the intrinsic value of a security studying financial and economic factors (Segal Troy, 2021). The main purpose is to analyze the different components of the company and get an insight of how the business operates. Tracking company performance by looking at changes in values of determined individual financial ratios over time can help to spot trends that might affect the developing in a company. In addition, a performance examination comparing financial ratios with other competitors in the industry can help the company to make comparative judgements to determine better or worse execution of their business activity than industry average.

People that have incentives to access to this data are known as external users including: creditors, retail investors, tax authorities, competitors, financial analysts and industry observers. In addition of internal users: employees, board of directors and capital owners. There are different categories for financial ratios which consider several aspects of a company structure. While ones determine the revenue part, margins, costs and how efficient the assets of the company are, other considers the risk factor which includes debt, liquidity and companies' valuation.

Ratio analysis stated with the development of a single ratio that took liquidity as a key element to appraise credit worthiness with the current ratio. Accounting data that are the premise of financial ratios can be assessed in regard to utility and that utility could describe predictive ability to measure changes in stock prices. (Beaver, 1966)

### 3.2.2 Previous literature

Financial literature had been studying how data of financial statements could be used to predict subsequent changes in stock prices. The study of financial statement takes part of the fundamental analysis, a method of stock's intrinsic value measurement that scrutinize economic and financial factors. Those factors affecting the stock price are not completely disclosed and are extremely difficult to predict. However, there is an extensive literature that have been studied those factors that affect stock market prices the most. (Collins, 1957) was the first to study the determinants in stock market prices after analyzing 10 of the largest wall street banks plus 27 largest financial institutions from United States. The author had the purpose to give a trustworthy answer explaining how a given stock at a given time is priced. He found a rational behavior among stock prices of Wall Street banks throughout the high coefficients of correlation of the variables studied such as Earnings per share, Dividend yield, Book value per share and net profits per share. Subsequently a great number of authors studied further this question providing a relevant insight of what are the most relevant financial ratios. The literature review so far could be classified in three ratios that impact the most stock processes.

The importance of Price to Earnings ratio and the key role that EPS and earnings play determining stock price changes was empirically proved with a positive relationship by (Harkavy, 1953; Nidhi Malhotra & Kamini Tandon, 2013). In other markets such as UAE, (Arkan, 2016; Musallam, 2018) financial ratios, especially the earnings per share, have an important association with stock price prediction. In addition, a studied carried out in United States by (Harkavy, 1953; Nidhi Malhotra & Kamini Tandon, 2013)

Dividend yield affecting the stock price has been a topic of discussion among the literature which has been divided in two main opinions. (Miller & Modigliani, 1961) elaborated the irrelevant dividend theory by which they claimed that dividend yield did not affect stock prices. Many authors such as (Allen & Rachim, 2010; Musaed S. AlAli, 2019; Uddin & Chowdhury, 2005) conducted studies in different stock markets which result in favor of their theory. (Gordon, 1963) had an opposite opinion formulating the bird in the hand theory which stated that investors do care about dividends. (Aharony & Swary, 1980; Barclay & Smith, 1995; Harkavy, 1953a) supported the bird and the hand theory. Due to the higher acceptance of (Gordon, 1963) theory, a significant positive relationship of dividend yield and stock prices is expected in this research.

Book value of a company was found that has a positive relationship with stock price by many authors such as (Hidayat, 2019; Sharif et al., 2015; Warrad & Warrad, 2017) and

(Collins, 1957) who used the Book Value Per Share ratio in their analysis to demonstrate a positive relationship with stock prices but previous authors evidenced the implication of book value thought Book to Market Equity such as (Fama & French, 1993) or other similar ratios.

### 3.2.3 Types of financial ratios

Previous literature showed that the manifested that the financial ratios that have a most significantly relationship with stock prices were the valuation ratios among all the other financial ratios. In the following Table 1 there are classified the different main categories of financial ratios along the most common and popular ratios used for each according to (Corporate Finance Institute, 2022b)

Table 1 Classification of different types of financial ratios

Types of ratios	Utility	Common ratios
Liquidity	Measure the ability to face short- and long-term debt without external capital raising. A higher value in these ratios indicates a better coverage of debts. However, values really high could indicate a poor management of current assets.	<p>Current ratio: <math>\frac{\text{Current Assets}}{\text{Current Liabilities}}</math></p> <p>Acid-test ratio: <math>\frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}}</math></p> <p>Cash ratio: <math>\frac{\text{Cash and equivalents}}{\text{Current Liabilities}}</math></p> <p>Operating cash flow ratio: <math>\frac{\text{Operating cash flow}}{\text{Current Liabilities}}</math></p>
Leverage	Measure the quantity of debt used as a source of funds and whether a business is able to meet its financial obligations. They are used for stress test and determine the effect on operating income.	<p>Debt ratio: <math>\frac{\text{Total Liabilities}}{\text{Total Assets}}</math></p> <p>Debt to equity ratio: <math>\frac{\text{Total Liabilities}}{\text{Shareholder's equity}}</math></p> <p>Interest coverage ratio: <math>\frac{\text{Operating income}}{\text{Interest expenses}}</math></p> <p>Debt service coverage ratio: <math>\frac{\text{Operating income}}{\text{Total debt service}}</math></p>
Efficiency	Analyzes a company's assets and liabilities to evaluate their performance. How the assets are able to generate income. An enhancement of these ratios could lead to a improved profitability of a business.	<p>Asset turnover ratio: <math>\frac{\text{Net Sales}}{\text{Average total Assets}}</math></p> <p>Inventory turnover ratio: <math>\frac{\text{COGS}}{\text{Average Inventory}}</math></p> <p>Receivables turnover ratio: <math>\frac{\text{Net credit sales}}{\text{Average accounts receivable}}</math></p> <p>Days sales in inventory ratio: <math>\frac{365 \text{ days}}{\text{Inventory turnover ratio}}</math></p>

Profitability	<p>Are used to appraise the ability of a company to produce earnings relative to its revenue, assets, shareholder's equity and operating costs. A higher value tends to indicate better performance.</p>	<p>Gross margin ratio: <math>\frac{\text{Gross profit}}{\text{Net Sales}}</math></p>
		<p>Operating margin ratio: <math>\frac{\text{Operating income}}{\text{Net Sales}}</math></p>
		<p>Return on assets ratio: <math>\frac{\text{Net income}}{\text{Total Assets}}</math></p>
		<p>Return on equity: <math>\frac{\text{Net income}}{\text{Shareholder's Equity}}</math></p>
Valuation	<p>Manifest the relationship between the equity of a company and its market value. The main objective is to indicate what an investor is paying for some of revenues, cash flows or stream of earnings.</p>	<p>Book value per share ratio: <math>\frac{\text{Shareholder's Equity} - \text{Preferred equity}}{\text{Total common shares outstanding}}</math></p>
		<p>Dividend yield ratio: <math>\frac{\text{Dividend per share}}{\text{Share price}}</math></p>
		<p>Earnings per share ratio: <math>\frac{\text{Net Earnings}}{\text{Total shares outstanding}}</math></p>
		<p>Price-earnings ratio: <math>\frac{\text{Share price}}{\text{Earnings per share}}</math></p>

Source: Own source

### 3.3 Financial ratios studied

#### 3.3.1 Price to Earnings ratio

##### 3.3.1.1 What is P/E ratio

It is a valuation ratio used to examine a company value based on its earnings. The ratio measures a company current share price relative to earnings per share. This measure is used to calculate the relative value of a company's share as well as it is compared with its historical record. It helps to estimate whether the company is overvalued or undervalued. We can differentiate two main two metric factors within the types of P/E ratios. The forward P/E that uses future earnings guidance to compare the company to the current earnings providing a look of how earnings of the company are. However, there are risks associated with this metrics due a misinterpretation of next quarter's earnings announcement. While the trailing P/E ratio relies on preceding performance dividing the current share price by the las 12 months EPS. It is the most objective technique and the most widely used despite the fact that the stock price changes on a daily basis while EPS remains constant since earnings are reported quarterly. (Simon Constable, 2013)

Equation 1 Price to Earnings ratio formula

$$P/E \text{ ratio} = \frac{\text{Current stock price}}{\text{EPS}}$$

### 3.3.1.2 EPS

PER is calculated as a company's net income divided by the outstanding shares of its common stock. It is a metric used to indicate the profitability of a company so the higher the EPS the better for a company. This metric indicates the money a company is making for each share and is broadly use to determine corporate value. Investors will pay more for a company with high EPS since indicates a good profit relative to their share price although it is not enough to make an investment decision.

*Equation 2 Earnings per Share ratio formula*

$$EPS = \frac{\textit{Profit} - \textit{dividends}}{\textit{n of shares outstanding}}^1$$

The numerator of the equation is more accurate and important if it is adjusted for ongoing operations of the business analyzed. The price of stock will be compared with its EPS to ascertain the value of earnings and future growth predictions.

There is another formula to compute EPS that include the dilutive effect of shares that might be issued by a business. If the capital structure of a business includes different financial products such as stock options, warrants or restricted stock units, the denominator of the equation could increase due the higher number of shares outstanding and the EPS value could be reduced. For a better picture of extra securities on per-share earnings, companies might report de diluted EPS.(Jason Fernando, 2022b)

EPS can be also warped due deliberately or unintentionally factors that could lead to a misinterpretation. An extraordinary item such as windfall income due a disposable of fix assets could boost artificially the numerator which increase the value of EPS. Since it is a one-time transaction and the company will not repeat the same transaction in the following years, the extraordinary item should be removed to calculate the earnings per share.

Outstanding shares are the corporate stock held by all the shareholders. It including banks, hedge funds or any other large institutional investors that held blocks of corporate shares and also restricted shares owned by insiders and company's officers.

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<sup>1</sup> (Jason Fernando, 2022a)

### 3.3.1.3. PER and Stock Prices

Recent studies concluded that PER ratio has a considerably power prediction on stock price changes. (Musallam, 2018) in his paper analyzed a data set of 26 companies of Qatar Stock Exchange over a period from years 2009-2015. The WLS results displayed that dividend yield, earnings yield ratio and earnings per share, are significantly associated with market stock return which agrees with (Delen et al., 2013) who point out the importance of earnings and earnings before taxes as a key component of financial ratios to measure future performance of the company after having developed a predictive modeling. The author (Arkan, 2016) undertook a statistical examination to determine the prediction power of financial ratios were carried out in Kuwait financial market, another country of the UAE. The results showed that profitability and valuation ratios where the financial ratios groups that have a significant effect on stock price prediction. He also found differences in the most statistically significant ratios across sectors. While in the industry sector the ratios with more predictability power were book value ratio and market to book value, in the services sector were PE ratio, market to book value ratio, net profit ratio and short-term debt to equity ratio.

A research developed by (Nidhi Malhotra & Kamini Tandon, 2013) the same financial ratios in the US stock market. Throughout a linear multiple regression model, a secondary data set was analyzed of a sample population of NSE 100 companies during 2007 and 2012. The most relevant findings where a inverse association among stock price and dividend yield and a positive relation among stock market price and firm's book value, price earnings ratio and earnings per share. All four financial ratios managed to explain a half of the model while the other half was due external factors. (Basu, 1983) analyzed NYSE firms in the US market as well. The author showed empirically evidence of the relation between earning yield and sock return. The results showed that common stocks that had higher P/E ratio earn, on average, larger risk-adjusted returns than common stock companies that had lower P/E ratio.

Current changes in financial statement data inform about subsequent changes in earnings. They found underlying associations between accounting fundamentals and security prices (Abarbanell & Bushee, 1997). Although not all fundamental sings set out by (Lev & Thiagarajan, 1993) were justified when explaining future security prices, earnings played an important role in the study.

A study by (Muhammad, 2018) aimed to study historical accounting data to predict future stock returns throughout a regression model. The accounting information were from companies listed on Karachi stock exchange from the period 2007 and 2017.

Among all financial ratios studied from diverse areas such as profitability, liquidity, or solvency, the ratios that were proved it have a greater impact on stock return where market-based ratios and profitability ratios. The results indicated that EPS have a significant positive relation with stock returns but Price to earnings ratio was the best indicator that explain variation in stock prices having a positive relationship.

(Witkowska, 2006) carried out a study relationship among fundamental indices and future stock return in Poland, following the previous studied by (Abarbanell & Bushee, 1997; Lev & Thiagarajan, 1993). The sample was formed by 187 companies listed on the Warsaw Stock Exchange. The study support that statistically significant relationship is found between future stock returns and fundamental factors which the strongest evidence of relationships is placed in the long term. Those fundamental factors were sales and administrative expenses, gross margin and return on assets. Furthermore, the price earnings ratio was significant in explaining future stock returns. The importance of Price to Earnings ratio was demonstrated in the asset pricing model of (Fama et al., 1992). They analyzed nonfinancial companies since the high level of leverage used would interfere in the result in the intersection of the AMEX, NYSE and NASDAQ from 1962 to 1989. Variables like leverage or Price to earnings ratio and book market were all scaled versions of a business's stock price and therefore some of them were expected to explain average returns. Aligned with the conclusions of studies previously made in other foreign markets, (Covarsí & Torres, 2014b) found that extreme values in of P/E of a group of companies listed in the Madrid Stock Exchange from 1982-1997 are associated with significant earnings.

### **3.3.2 Dividend yield**

#### **3.3.2.1 Definition**

Dividend yield is the financial ratio within the valuation category that measures quantum of cash dividends paid out to shareholders relative to the market value per share. (The Economic Times, 2022)

Businesses distribute a portion of their net revenues as dividends whereas the other portion is kept in the company as an internal fund to finance their operations.

Companies that pay a higher ratio tend to operate in the public utility industry and essential products industry. In Spain, companies that pay more dividend and are part of the Ibex35 are electric and energetic companies which provide basic services for customers.



Table 2 Highest DY paying companies of Ibex35

Company	Telefónica	Repsol	Engás	Endesa	Mapfre	Naturgy	Red Electrica
<b>Dividend yield</b>	9,8%	9,5%	9,3%	7,7%	7,6%	7%	6,2%

Source: (SelfBank, 2021)

Well established companies tend to pay a higher dividend yield than companies that are in an early stage who will need more resources to finance their growth. (Harkavy, 1953a)

However, a high dividend yield it could not be a signal of a well-established company with rock solid streams of cashflows. Assuming constant dividends, an increment of the dividend yield ratio will be caused by a drop in price per share since it is the denominator of the equation. Due this relativity to stock price, the ratio can look oddly high for stocks that are losing value rapidly. (Jason Fernando, 2021)

Equation 3 Dividend yield ratio formula

$$\text{Dividend Yield} = \frac{\text{Annual Dividends Paid Per Share}}{\text{Price Per Share}}$$

Source: (The Economic Times, 2022)

### 3.3.2.2. Dividends

Dividends are the part from net profit of a company that decides to distribute among their shareholders. It is an income the investor receives for being owner of a company. Once a company closes the business year, if profits have been made, the company must decide a proportion to be distributed among the shareholders. This decision must be voted in the Annual General Meeting. Those payments are not necessarily made in a unique installment. Companies have a rough idea of how their earnings are going to be at the last months of a year so that's why they might anticipate part of their dividend payments. Once all annual accounts are closed with the certainty of how the earnings were, companies might pay a complementary dividend installment. Those dividends based in the earnings from the regular operation activity of the business are called ordinary dividends. However, companies can also make money with an extraordinarily activity such as the sale of a fix asset. The income produced from that sale could be distributed among the shareholders through an extraordinary dividend payment. Those examples would be cash dividends but the investor can be rewarded in a different way. In the las few years it became popular the flexible dividend policy among Spanish

companies by which shareholders were paid with additional shares instead of cash dividends. (Caixabank, 2022b)

### **3.3.2.3 Previous literature**

Previous literature about whether dividends are important to determine the company stock price are divided in two different opposite opinions.

(Miller & Modigliani, 1961) argue that a company's policy regarding dividends are unrelated with stock price or its costs of capital throughout the Miller and Modigliani theory. The way a company finance their operations do not affect their stock price. (Adesola & Okwong, 2009) after having conducted an analysis of a pool of data about Nigerian stock exchange (NSE) companies and (Uddin & Chowdhury, 2005) having measured the impact of dividends announcement on shareholders with market-adjusted abnormal return and daily cumulative abnormal return, provided empirical evidence in favor of the irrelevance of dividends role in stock prices.

A regression model to study the dividend policy effect on the share prices of insurance companies registered in Kuwait stock exchange during the period 2009 to 2017 was developed by (Musaed S. AlAli, 2019). The authors concluded that there was a statistically significant negative relation between dividend yield and dividend payout ratio while market to book value and earnings per share have a positive relationship. The results supported M&M theory.

(Allen & Rachim, 2010) developed a study of a sample of 173 Australian listed companies within the years 1972-1985. A cross-sectional regression analysis of the relationship between stock price volatility and the business policy regarding the dividends payout. No evidence was found that changes in stock prices are related with dividend yield. The scientific article reworks in an Australian framework the main findings of (Baskin, 1989), who made research in US considering 378 Fortune 500 companies from 1960-1984 which only large public traded corporation that survived where included. The resulted found that the theory of static optimal capital structure appears to have little power. The empirical evidence demonstrated that debt leverage varies positively with previous growth and inversely with preceding profits. Firms with higher payout dividends tend to borrow more therefore the way companies fund themselves matter to explain stock price.

(Gordon, 1963) with the bird in hand theory that stated that investors would sooner have a preference for stock dividends than likely capital gains due to the uncertainty involved. This theory was conceived as a counterpoint to the M&M theory about dividend irrelevance theory. He provided another point of view about the dividend yield policy and

claimed the relevance of dividends to determine stock price. Authors such as (Barclay & Smith, 1995) that proved empirically the factors that determine corporate debt maturity. The study supported that firm's with few growth opportunities issue more short-term debt and have lower payout dividends while the large regulated companies do the opposite. This result support the (Harkavy, 1953b) study of the relation of retained earnings with common stock prices in large businesses. The author made several correlation analyses with companies from different industries using Cowles all stock index for the period 1871-1937 and from the Standard and Poor's Industrials, Rails and Composite Index for the period 1934-1950. The study demonstrated empirically two main prepositions. Given two well established companies similar in all financial aspects but the proportion of earnings distributed, the stock price will be higher for the company with bigger dividends payout. The other preposition stated higher proportion of retained earnings of companies that are growing rapidly it is associated with self-funding their expansion and their stock price tends to increase. A conclusion that could be make from the article's results could be that the way of finance a company has different associations and therefore, it matters when it comes to pricing stock of a company.(Aharony & Swary, 1980) proved empirically that stock market adjusts in a efficient manner to new quarterly dividend information which supports as well the theory that investors do care about dividends.

(Cabestre & Escuer, 1996) undertook research in the Spanish market with 62 shares selected for having a significant weight in the Madrid stock exchange. Then they were compared with their ex-dividend rates<sup>2</sup>. The time period of the sample was from 1980 to 1992. The results of the study indicate that on average, the payment of dividends affect positively the behavior of stock prices, whose maximum manifestation occurs on the ex-dividend date. They found a clear preference for capital gains in relation with divided which agrees on (Gordon, 1963) theory.

However, another study carried out in Spain (Priede Bergamini Tiziana et al., 2000) took a sample of randomly Spanish companies big enough to include several dividends policies from the periods 1992 to 1998. They did not find enough empirical evidences to support changes in dividends payments are related with variation in remuneration, therefore they accept the (Miller & Modigliani, 1961) irrelevance theory.

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<sup>2</sup> Ex dividend are the date on which the shares are no longer entitled to the payment of the previously announced dividend. This date is also known as the ex-date. (Caixabank, 2022)

### 3.3.3. Book value per share ratio

#### 3.3.3.1 Definition

BVPS is a metric used to compute the per-share book value of a business. The ratio is the difference between total assets and total liabilities, which would be the book value of a company, per share. Once all the assets are converted and the liabilities faced considering historical costs, the book value per share denote the dollar value outstanding for common shareholders. (Adam Hayes, 2021)

Preferred shares have a priority when it comes to dividend payout and higher claim on assets. Those investors that hold these securities are not included in the ratio calculation.

A stock might be under valued when a BVPS value ratio it is larger than its market value per share. The numerator of the formula indicates what a business receives for issuing common equity since the preferred shareholders are subtracted.

Earnings could increase the numerator while losses and dividends could decrease it. Another factor that could affect the ratio is a stock buyback. When businesses decide to repurchase their stocks typically due to excess of cash allocating those resources or tax benefits. A company's book value per share could be reduced by a stock buyback.

Businesses could use part of its earnings to acquire assets that would boost common equity as well as BVPS. Earnings could be used to lessen liabilities with would have the same result, a rise in BVPS and common equity.

The denominator is an average of diluted common shares from the last year that is why a stock buyback does not affect the denominator. It considers all additional shares including all convertible instruments such as warrants and preferred shares.

*Equation 4 Book value per share formula ratio*

$$BVPS = \frac{\text{Total Shareholder Equity} - \text{Preferred Equity}}{\text{Total common shares outstanding}}^3$$

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<sup>3</sup> (Corporate Finance Institute, 2022b)

### **3.3.3.2 Book value**

The equity of a company is known as book value which is commonly observed in relation to the company's stock value. Book value is computed subtracting all claims such as liabilities to common equity. It could be understood as the accounting practice of recording an asset at initial historical costs in a company's books but for the all firm. The book value of a company can be increased by profit making through using the assets they have. Comparing the book value of a company with their market value through BVPS it is an appropriate valuation method when try evaluate stock prices and determine whether they have a fair price. (Fernández, 2008)

Those stocks that are traded under book value are usually contemplated as an opportunity since for investors since they could anticipate an appreciation of that company's stock. Investors that manage to acquire stocks with low costs in relation to the firm's book value are in an excellent situation to make an ample profit. Nevertheless, book value might not precisely account for intangible assets in certain firms. Investors would need to consider each business and the company it operates. (Corporate Finance Institute, 2022a)

### **3.3.3.3 Previous literature**

Valuation ratios have a significant role explaining stock price performance of a companies. (Warrad & Warrad, 2017) used a quantitative approach in order to quantify the relationship between stock price and valuation ratios. The researchers used a sample of data of financial reports of several Jordanian banks that were cataloged in ASE during 2008-2014. After rejecting the null hypothesis stated, the authors found statistically evidence that the Book value per share had a significant effect in stock price.

A regression model using secondary data from Indonesia Stock Exchange about the business that operated in the mining industry by (Hidayat, 2019) found, among other ratios, that the BVPS had a significant positive correlation on share price of businesses from that sector found. (Martani & Khairurizka, 2009) research resulted in the same conclusion after having carried out a study of the manufacturer companies from the same stock market, some years before. (Sharif et al., 2015) conducted similar research in the Middle East markets which were the first study that highlighted the determinants of stock prices in Bahrain with the purpose of providing an insight for investment strategy to investors in an emergent market. The research analyzed 48 companies listed in the stock exchange from several industries such as insurance sector, banking sector or tourism

and industrial sector within the years 2006 to 2010. Having tested eight hypothesis using normality tests, regression analysis and variance inflation, the authors determined that BVPS had a positive as well as significant relationship with the firm size. The dimension of companies where computed multiplying market capitalization by the number of outstanding shares which suggested that BVPS is an active stimulus in shaping the stock market prices.

(Dorantes Dosamantes, 2013) examined the importance of accounting fundamentals to explain stock price fluctuation in the Mexican Stock Market (BMV). The author intends to provide evidence of the accountant fundamentals relevance in emergent markets using financial ratios previously tasted such as valuation ratios in developed markets. As well as (Rocío Durán Vázquez et al., 2007) did with a sample of businesses listed in the BMV from 1991 to 2003 using a Ordinary Least Squared Regression analysis proved that Book value was pertinent in Mexican stock market firms. (Ahmadi, 2017) examined as well the importance of accounting information whether it represented determinants that affect stock price of Tunisian firms. The sample include 28 firms listed in the Tunisian Stock Exchange from the period 2010-2015. The author provided demonstrated empirically that changes in share price and BVPS have a positive relationship. Those authors that demonstrated empirically in emergent markets what (Bao & Chow, 1999) did as well in his paper examining listed Chinese companies. They found out that book vale and EPS have incremented their explanatory power regarding stock prices overtime and they were in fact, important determining stock price performance.

In Spain, (Covarsí & Torres, 2014a) conducted a regression analysis with 177 firms listed on the Madrid Stock Exchange during 1985-2000. The increase in the own resources imply a subsequent increase in the stock prices so the book value has an important role to determine future stock prices. The authors empirically demonstrate that the implications of the book value are significant positively related with increase future returns. The variable Price to book value is used to demonstrate the value of book value and their prediction power was proved to increase in the long term. The study carried out in Spain coincide with the theory of (Fama & French, 1993) theory about the three stock market factors to predict stocks returns which one of them is the book to market equity value. Although those actors do not use precisely the BVPS ratio, demonstrate empirically the relevance of the book value which is one of their determinants when it comes to predict future returns.

### 3.3.4. Additional financial ratios studied

In order to enrich the analysis, additional variables are being analyzed. Authors that dedicated to analyze the three main financial ratios above, they included some other variables that were found to have a positive relationship with stock prices fluctuation.

#### 3.3.4.1 Debt to Equity ratio

D/E ratio it is a leverage ratio that is used to apprise a firm's financial leverage. The ratio is computed by dividing the total liabilities of a business by its shareholders equity. This metric shows the shareholders' ability to cover all outstanding debts if the firm suffered a downturn. Higher value of the numerator indicates more liabilities compared with the equity of the company and therefore more risk associated with this stock.

*Equation 5 Debt to Equity ratio*

$$\text{Debt to Equity ratio} = \frac{\text{Total Liabilities}}{\text{Shareholder's Equity}}$$

(Bhandari, 1988) conducted research analyzing an equally weighted NSYE portfolio that contained data from 1946. The author concluded that expected returns on common stock are positively related to debt-to-equity ratio, also corroborated by (Fama & French, 1993) with the leverage being as one of the factors that affect stock prices.

#### 3.3.4.2. Unique sector approach

A categorical variable is being included in the analysis in order to determine previous differences among sectors that have being detected by several authors. Some of the authors did not include financial firms such as (Fama & French, 1993) or dedicated only to study a particular sector such as (Collins, 1957) that considered only financial institutions or (Martani & Khairurizka, 2009) that worked only with manufacturing companies. The study of (Arkan, 2016) mentioned that the analysis of individual financial ratios must be undertook with determinate standards to ascertain properly their behavior. Within the cross-sectional comparison, the author classified as an important the intra industry comparison which is the comparison of financial ratios of companies from the same sector to obtain insightful results. Later in their conclusions the author saw a significantly stronger relationship among the financial ratios studied, such as Book value ratio, with the stock price of companies from the industrial sector.

### **3.4 Theoretical framework conclusions**

There is an extensive literature that has studied the financial ratios that have a large predicting power for stock returns and fluctuations of stock prices. Researches from around the world had been studying through an empirical analysis what those financial ratios are with samples of companies operating in their respective countries stock exchange markets. While some authors provide theories such as (Fama & French, 1993; Gordon, 1963; Miller & Modigliani, 1961) other authors try to apply those theories in their particular markets of study and corroborate them

This paper outlines three main ratios that have been most well-liked for the authors. The first one is Price to Earnings ratio (PER) which earnings play a key role to determine this ratio as well as EPS ratio that composes the PER formula. The other main ratio is Dividend yield which it is a very discussed topic whether investors care or not about the dividends policy and if they affect the future stock prices. There is one theory stated by (Miller & Modigliani, 1961) that says that dividends are not relevant and some authors after developing the respective analysis have supported the same theory. While in the other hand, the (Gordon, 1963) theory suggested otherwise and several authors tried as well demonstrate that dividends influence in stock prices. The other factor which has been to prove empirically by the previous literature of this topic is book value of the company. Recent studies used the Book value per share ratios to analyze empirically the effect of book value of a company in explaining stock prices fluctuations. Nevertheless, previous important studies such as (Fama et al., 1992) used the book to market equity ratio.

Some other variables that are being included in the research are financial ratios that also have been studied in the previous literature. Empirical evidence was provided by different authors in common that financial ratios were correlated with stock prices. Debt to equity ratio that also appeared in some analysis of (Bhandari, 1988), and (Fama & French, 1993). Finally a dummy variable is being introduced since the literacy of this topic has noticed differences between industries from companies analyzed, some of them for instance did not include financial firms in order to do not disrupt the outcome such as (Fama & French, 1993)

The methodology followed by most of the authors was a multiple regression model such as (Adesola & Okwong, 2009; Nidhi Malhotra & Kamini Tandon, 2013)

Therefore, the contribution of this research is to provide empirical evidence of the relationship between Price to Earnings ratio, Dividend yield, Book Value Per Share and



Debt to Equity ratio with stock price that the literature has been proved the existence of these relationships, in the Spanish market with companies from Ibex35.

Since the most common analysis is the multiple regression model, this research contributes with a combination of these financial ratios that have a relationship with stock price in the same model. The main hypothesis tested in this research aim to corroborate whether the relationship among PER, DY and BVPS with stock prices that have been proved in foreign markets, exists also in the Spanish stock markets. The second hypothesis intends to isolate the financial ratio among those studied in the previous literature that have the strongest relationship with stock prices. The third and four hypotheses are liked with the other variables included to enhance the model. Some authors included Debt to Equity ratio and considered differences among industries to have a relationship with stock prices. So, DE ratio is also being tested to determine if it has a relationship with stock price in the Spanish market. Finally, the last hypothesis envisages differences among relationships of the ratios studied and stock prices regarding the typo of the industry that operate their companies.

#### 4. Hypothesis

In order to answer the research question and meet the objectives proposed in this research, four hypotheses are stated. The financial ratios PER, DY and BVPS that were corroborated to have a significant relationship with stock prices in foreign markets by the previous literature. Therefore, the first hypothesis is the following:

*Hypothesis 1: The financial ratios PER, DY and BVPS have a significant relationship with stock prices of Spanish companies from Ibex35.*

Then, additional hypothesis that are being lay out based on the previous one. Since the most popular ratios among the authors that previously analyzed this topic were PER, DY and BVPS, the second hypothesis is being made to detect which financial ratios explain better the stock price:

*Hypothesis 2: The financial ratios PER, DY and BVPS have differences in the strength of the significant relationship with stock prices of Spanish companies from Ibex35*

Previous literature found evidence of the relationship of the Debt-to-Equity ratio and also differences in which financial ratio was better to explain the stock prices of companies from different industries. These evidences were found by several authors but are not as popular as the evidences for the other three ratios. Since the variables DE and TY are added no enrich the model, the third and fourth hypothesis goes as follows:

*Hypothesis 3: The Debt-to-Equity ratio has a significant relationship with stock prices of Spanish companies from Ibex35.*

*Hypothesis 4: The financial ratios PER, DY, BVPS and DE have different relationships with stock prices regarding of the sector of the companies.*

## 5. Methodology

### 5.1 Data

A collecting process of secondary data is carried out gathering the accounting information from the different companies of Ibex35 from the period 2011-20219. This period is expected to provide representative current information about the companies as well as enough for making significant conclusions. Using database, the following table shows the variables that are being searched and collect in order to proceed with the regression model.

*Table 3 Variables of the analysis*

<b>Variable</b>	<b>Description</b>
PER	Price to Earnings ratio
DY	Dividend yield
BVPS	Book value per share
DE	Debt to Equity ratio
SPA	Stock Price Average

The variable Stock price Average is computed using the same formula that (Nidhi Malhotra & Kamini Tandon, 2013) used in their regression analysis for their depended variable Market price. Where Highest Price represents the most expensive stock price reached in a financial year while the Lowest Price accounts for the cheapest stock price achieved.

$$SPA = \frac{Highest\ Price + Lowest\ Price}{2}$$

### 5.2 Methodology Analysis

The most common analysis used by all the authors that had been dedicated to study this topic is multiple regression analysis. Due the nature of the database the dependent variable SPA is in annual terms. The other independent variables are the financial ratios treated in this study which are the Price to Earnings ratio, Dividend yield, Book value per share, Det to Equity ratio, Type of industry which are averages of annual terms. The assumption is as follow:

$$\gamma = f(PER, DY, BVPS, DE)$$

Therefore, the regression analysis formula can be translated into the subsequent equation:

$$\gamma(SPA) = \beta_0 + \beta_1 PER + \beta_2 DY + \beta_3 BVPS + \beta_4 DE + \mu$$

With SPA being the endogenous variable and PER, DY, BVPS, DE as an exogenous variable, the model determines the explicative power of those variables regarding dependent variable. Therefore, the main hypothesis is being tested since the financial ratios that were proved to have a significant relationship by previous literature with stock price in foreign markets, constitute the model that is applied in Spanish companies.

Allocating together the financial ratios that resulted in having a significant relationship with stock helps also to test the second and third hypothesis that was to determine differences among the variables with their respective explicative power regarding to stock prices of Ibex 35 companies and a significant relationship among DE and SPA. One of the main goals is being met since it isolates the variable that has a stronger relationship with stock prices. The parameters  $\beta$  determines the contribution of each variable to the model and differences among contributions indicates which financial ratio has a stronger relationship with stock prices of Ibex35 companies.

In order to test the fourth hypothesis which expects different relationships between independent variables and the dependent variable regarding the variable sector of the company. The variable DI is being converted in a dummy variable and several models are being built in order to include all the sectors separately and determine differences among them.

## 6. Empirical Analysis

### 6.1 Description of the variables

The following table shows the data description of the variables that constitute the regression model that pretends to test the hypothesis formulated. The sample has 140 observations that are the financial information of the 7 companies with their respective quarters. The standard deviation for SPA is high due to the big difference of stock prices of some electrical companies. Naturgy or Enagás have stock prices normally above 20 euros and other companies such as Solaria Energía y Medio Ambiente, that has the lowest stock prices, is remarkably less with an average of 2,45 euros per share.

PER is the variable that has the highest standard deviation. Since the numerator is the stock price that do not fluctuate excessively of the companies studied, is the denominator, the EPS that makes PER differ so much in particular cases. The key driver of EPS is commonly the earnings, the net income, because the number of outstanding shares do not change over quarters as much as earnings do. Therefore, big losses in some quarters can drive down the PER variable. Is the case of Endesa that had a significant reduction in net income of the 4rt quarter of 2019 that made their PER decrease to -5169.

The variable DY has the smallest standard deviation. Most of the companies do not have a cashflow in every quarter for dividend payments and Solaria do not pay dividends at all, whilst other companies such as REC or Endesa reached the 0.4 being one of the companies that pay more dividends of all the Companies that constitute the Ibex35 relative to their outstanding shares within the time period analysed.

BVPS was not excessively found extravagantly dissimilar among firms, however bigger companies have much more outstanding shares that smaller companies. Iberdrola has more than 6 thousand million shares outstanding while Solaria and Enagas have less than half a million.

DE has a relatively small standard deviation compared with other variables in the sample. Electric companies of IBEX35 use, on average, not more than twice of their Equity to finance their Assets. Repsol at some quarters, use more own resources to finance their Assets than debt whereas Solaria exceed 5.0 of DE at some moment. (Expansión, 2017)

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. dev.</b>	<b>Min</b>	<b>Max</b>
SPA	140	15,324	7.598	0.62	27.188
PER	140	22.176	443.657	-5169.534	197.7748
DE	140	2.121	0.827	0.8330	5.571
BVPS	140	9.982	6.388	0.250	22.241
DY	140	0.008	0.124	0	0.434

## 6.2 Correlation analysis

The following table is a correlation matrix that shows the correlation among all the exogenous variables that are pretended to constitute the regression model to explain the SPA. All the variables have slight correlation among each other which mans that are valid for constituting the regression model. However, there is a noticeable higher correlation among DE and BVPS compared with other correlation coefficients that is - 0.6692. The negative relationship might be caused by how a company finance their assets. The severe use of debt implies a reduction of equity to finance the assets of a company. Other companies that rely more on equity as a source of funds, will have consequently smaller proportion of debt.

	<b>PER</b>	<b>DY</b>	<b>BVPS</b>	<b>DE</b>
<b>PER</b>	1.000			
<b>DY</b>	0.0516	1.000		
<b>BVPS</b>	0.0103	0.1792	1.000	
<b>DE</b>	-0.0958	-0.0509	-0.6992	1.000

## 6.4 Regression model

### 6.4.1 Initial Model

The subsequent table shows the data of the first regression model with all the financial ratios, that were found to have a significant relationship with stock prices, merged as an independent variable. The Adjusted R-squared is 0,38 indicates that there is not a significant correlation between the independent variables and the SPA which only explain 38% of the average stock prices of electric companies.

The particular observation of each variable allows to see all the variables have a p-values inferior to 0.05, so they are suitable for the model since the null hypothesis is rejected and therefore the correlation of the variables is not 0. However, the p-value of PER is 0.1 which is superior to 0.05 and the null hypothesis cannot be rejected so PER is not valid enough to explain the variability of average stock prices because it cannot be statistically rejected that they correlation might be 0.

The coefficient of the independent variables indicates their contribution to the model. The coefficient of PER is negative, despite not being statistically significant, a negative relationship with SPA could be explained by the high PER values of the sample. Since high values of PER are often perceived as an overrated company, taking just the quarterly earnings to calculate the EPS made the number smaller and consequently the division of stock price and EPS has a bigger result. Therefore, smaller earnings could lead to a higher PER despite the fluctuations of average stock prices.

SPA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
PER	-0.001859	0.0011566	-1.61	0.110	-0.0041464	0.0004285
DY	192.9102	41.77308	4.62	0.000	110.2959	275.5245
BVPS	0.7542692	0.1140368	6.61	0.000	0.5287394	0.9797989
DE	2.920994	0.8715973	3.35	0.001	1.197243	4.644745
-_cons	-0.779651	2.787056	-0.03	0.978	-5.589904	5.433973
Number of obs		140			R-squared	0.3964
F(4,135)		22.17			Adj R-squared	0.3785
Prob > F		0.0000			Root MSE	5.9904

#### 6.4.1.1 Study of the residuals

Having carried out the regression analysis previously, the following table indicates the results of White test to detect heteroskedasticity in the model studying the variance of errors. The p value of Heteroskedasticity is inferior to 0.05, therefore the null hypothesis is rejected and there is not heteroskedasticity but homoscedasticity instead.

The variance of error is not distributed constantly so there are errors calculating the variance and covariance matrix estimator of the least square's estimators. Efficiency is usually lost on the least squares estimator and the model do not hold the homoscedasticity principle for being a valid model.

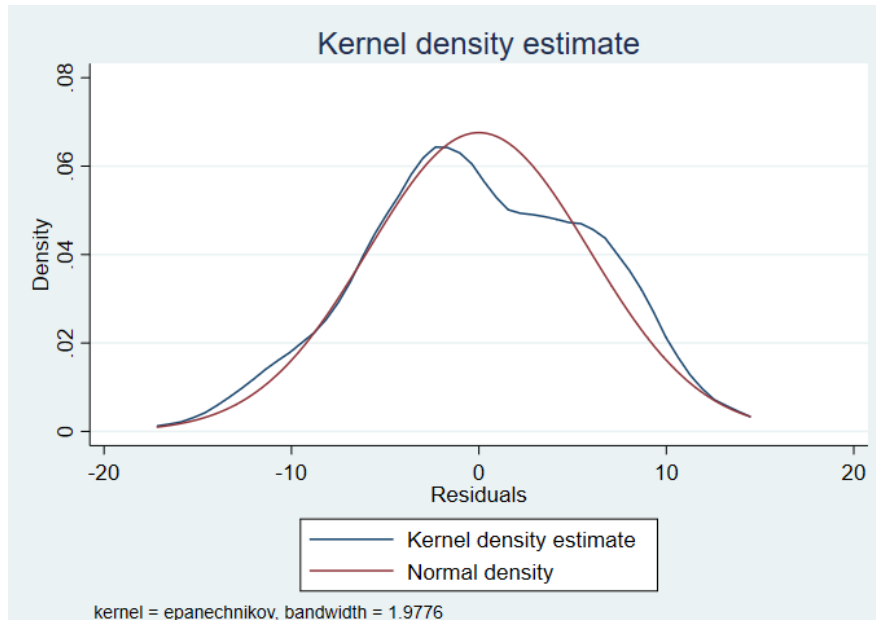
Source	Chi2	df	p
Heteroskedasticity	95.77	14	0.0000
Skewness	42.03	4	0.0000
Kurtosis	4.16	1	0.0414
Total	141.96	19	0.0000

The subsequent table shows the results of a sktests made to detect normality in the distribution of errors. The value of Prob>chi2(2) that is 0.27 is greater than 0.05 which enables to not rejecting the null hypothesis. Consequently, normality is accepted. The errors of this model are distributed normally holding the normality principle of the regression models.

Variable	Obs	Pr (skewness)	Pr (Kurtosis)	Join test Adj chi2(2)	Prob>chi2(2)
Error	140	0.6504	0.1256	2.60	0.2730



The subsequent graphs help to visualize how the principle of normality holds. The red line is the normal distribution curve and the blue line is the error distribution of the sample that has a similar distribution.



#### 6.4.2 Model Enhancement

In this section, the initial model stated is being improved by different techniques. At the first correlation analysis of the independent variables, a significant correlation between BVPS and DE was detected. Furthermore, the R Adjusted-squared was found particular low, being 0.38 and PER variable's p-value was superior than 0.05 which indicates that it is not a good fit for the model. While the normality principle is present in the model, there is a heteroscedasticity issue detected that impairs the model.

All of those insights extracted in the previous section are considered to provide techniques for a model enhancement.

##### 6.4.2.1 Replacement of PER

PER had a negative coefficient with a statistically insignificant relationship with the dependent variable due their relatively high p-value that was 0,1. Proceeding to remove PER variable from the model and exchange it for EPS. Earnings per Share is a ratio that constitutes PER and is directly related to PER so is meaningful to answer the research question and hypothesis.

The p value of EPS is inferior to 0.05 so is valid to constitute the model. Consequently, there is a slight improvement of Adj R squared that almost reaches the 0.4 which is still not a good correlation indicator regarding the explanatory variables with SPA.

SPA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
EPS	2.285669	0.9981162	2.29	0.024	-0.3117019	4.259635
DY	177.586	41.56688	4.27	0.000	95.37946	259.7925
BVPS	0.7614313	0.1125573	6.76	0.000	0.5388276	0.9840349
DE	2.989532	0.8573815	3.49	0.000	1.293895	4.685169
-_cons	-0.6401079	2.739112	-1.23	0.816	-6.057229	4.777013
Number of obs		140		R-squared		0.4079
F(4,135)		23.25		Adj R-squared		0.3903
Prob > F		0.0000		Root MSE		5.9333

#### 6.4.1.2 Replacement of DE

Correlation matrix previously seen indicated all the correlation coefficient of the financial ratios that were supposed to explain the stock price average. Despite not being high correlation among some variables, there was a significant negative relationship among DE and BVPS that could impair the model.

Among all the combination possible of excluding one or other variable and exchanging the variable excluded by one of their elements considered in the ratio calculation. The most Adj R-squared and p-value effective combination of variables was excluding DE and replacing it for the variable Current Assets. This variable is shown in millions in the database and it is the first variable that it is not a financial ratio.

The replacement causes a considerable enhancement of R Adjusted rising it to 0.53 which is considered a good indicator of correlation among SPA and the other independent financial ratios. Furthermore, the PER p-value is being reduced to 0.015 which is lower than 0.05. The replacement makes PER perfectly feet in the model decreasing their p-value to an optimal level. Since DE ratio was included to reach the model, his replacement enables to maintain PER and test for the first hypothesis

suggested. *H1* pretended answer whether PER, DY and BVPS, the most popular financial ratios for the previous literature, had a significant relationship with stock prices.

SPA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
PER	-0.0024375	0.0009931	-2.45	0.015	-0.0044016	-0.0004735
DY	120.5092	37.70258	3.20	0.002	45.94509	195.0733
BVPS	0.98082	0.0948764	10.34	0.000	0.7931836	1.168456
Current Assets	-0.0008103	0.0001046	-7.75	0.000	-0.0010171	-0.0006034
-_cons	9.75739	0.8496286	11.48	0.000	8.077086	11.43769
Number of obs		140		R-squared		0.5474
		F(4,135)		Adj R-squared		0.5340
		Prob > F		Root MSE		5.1874

### 6.4.3 Logarithmic application

All of the financial ratios are provided in different measures. While PER and BVPS and DE are proportions, DY is a percentage. In addition, the particular case of Solaria does not pay dividends so DY has plenty of outliers that could impair the model.

The logarithmic application of all the variables of the model enables to eliminate the unitary effect of the variables on their respective coefficients regardless if DE is measures in proportion and DY in percentage. A change Furthermore, a change in narrow the range of the variable to a smaller amount than the original. This effect reduces the sensitivity of the estimates to extreme or outlier observations such as the DY of Solaria, both for the independent and dependent variables.

Once created the new variables are created, a new regression model is built from the natural logarithms of the financial ratios used in the initial model. The most notorious factor of this new model is that Adj R-squared has sharply increased to 0.8 which now is considered to be a good indicator of a high correlation among independent and the dependent variable. The number of observations have decreased to 72 since the outliers have been removed.

The overall p-values of all the variables are correct since all of them are inferior to 0.05 which indicates correlation with SPA, except for PER that its p-value is  $0.6 > 0.05$ .

SPA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
PERln	0.0422547	0.0850748	0.50	0.621	-0.1275553	0.2120647
DYln	0.0318619	0.0149676	2.13	0.037	0.0019864	0.0617374
BVPSln	0.9739822	0.0681196	14.30	0.000	0.8380148	1.10995
DEln	1.46579	0.1178845	12.43	0.000	1.230491	1.701088
-_cons	-0.4132299	0.4149278	-1.00	0.323	-1.241429	0.4149695
Number of obs		72	R-squared		0.8150	
F(4,67)		73.79	Adj R-squared		0.8040	
Prob > F		0.0000	Root MSE		0.19204	

Although the model has a severe Adjusted R-squared, the model could be improved by replacing PER by another variable that has a lower p-value. Therefore, logarithms are applied to the factors that compose PER such as EPS, net income and number of shares variables.

Among all the combination possible were the logarithms of EPS and DPS that really improved the model with all the p values of independent variables inferior to 0.05. The introduction of EPS made increase the p-value of DY and implies a subsequent replacement of DY for DPS that constitute the dividend yield.

The following tables shows how the logarithms of the variables increased the Adjust R-squared to 0.86. The independent variables explain the 86% of the variability of the dependent variable, SPA and only 14% it is explained by external factors.

The p values of all the financial ratios are below 0.05 which enables to reject null hypothesis so the logarithms of ESP, DEPS, BVPS and DE have a significant relationship with the logarithms of stock price average of electric companies from Ibex 35. The coefficient of the variables points out the percentage change of 1% in each variable how SPA increase consequently. Since all coefficients are positive, all relationships are positive. A raise of 1% in EPS spouses an increase of 30% in SPA. An increase of 1% in DPS supposes an increase of 3% in SPA, being the least weighted variable in the model. If BVPS increased 1%, consequently, it would raise the SPA 69%. Book Value per Share is the second financial ratio that has a strongest relationship with the dependent variable.

The positive beta value of DE is the largest coefficient in the model. A change in 1% of DE would imply a growth of 100% in SPA.

SPA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
EPSIn	0.2982404	0.0601275	4.96	0.000	-0.1782253	0.4182554
DPSIn	0.0284017	0.0122763	2.31	0.024	0.0038981	0.0529052
BVPSIn	0.63358	0.0824626	7.68	0.000	0.4689841	0.798176
DEIn	1.048805	0.1218926	8.60	0.000	0.8055066	1.292104
-_cons	1.089199	0.318078	3.42	0.001	0.4543125	1.724085
Number of obs		72		R-squared		0.8741
F(4,67)		116.32		Adj R-squared		0.8666
Prob > F		0.0000		Root MSE		0.15841

#### 6.4.3.1 Study of the Residuals

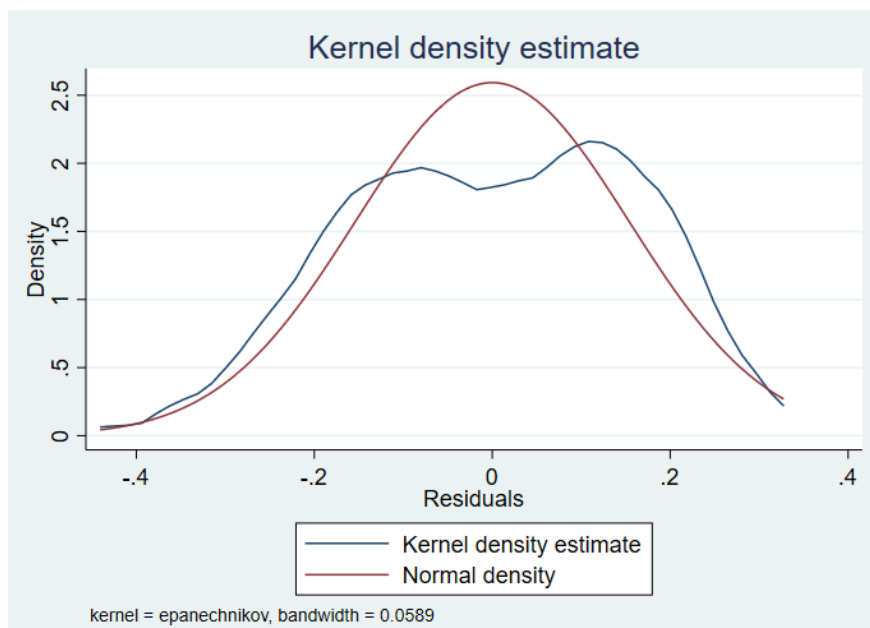
Logarithms application of the model has improved as well the results of White tests. The following table signals how p values have grown with logarithms, being much larger than 0,05. In this case, the null hypothesis can not be rejected and homoscedasticity is accepted.

Source	Chi2	df	p
Heteroskedasticity	14.59	14	0.4066
Skewness	3.80	4	0.4338
Kurtosis	5.87	1	0.0154
Total	141.96	19	0.1863

Normality is being checked in the table form below. Sk tests results indicate that Adj chi2(2) has a p-value of 0.06 which is slightly superior to 0.05. Null hypostasis can not be rejected and Normality is accepted in the model.

Variable	Obs	Pr (skewness)	Pr (Kurtosis)	Join test	
				Adj chi2(2)	Adj chi2(2)
Error	72	0.4206	0.0228	5.59	0.0610

The following graph also shows the normality in errors distribution of the sample that follows the normal distribution curve having most of the values within the normal distribution line.



## 7.Results

Having carried out the regression analysis, the table from below indicates the main most important values of each regression model studied. The initial model suggested intend to explain the variability of SPA by a merge of all of the financial ratios that were found to have the strongest relationship with stock prices in the literature. All the p value of the variable were found smaller than 0.05 so optimal for the model but PER. Price Earnings ratio have no significant relationship with average stock price in the initial model. The Adj R-squared of the initial model is 0.37 which is relatively low since it is lower than 0,7 where it is considered to be a strong indicator of correlation. It might be understood as a poor combination of independent variables.

Despite the lower p-values of the model, it can be enhanced by some modifications that can lead to a better efficiency of the model. The first modification was to remove one variable and allocate another one that was directly related to nuance the harm for hypothesis testing. Debt to Equity was removed and allocated Current Asset instead. Current Assets were added because breaking down the Debt-to-equity ratio components did not add value to the model. Instead, Current Assets that are indirectly related with debt and specially with Curren Liabilities that is part of the denominator of DE. P-values of all the variables were decreased with this modification and PER adopted a optimal p-value of 0,015 which is inferior to 0.05. The dividend yield is weighted even more reaching 99% of weighted average among all the coefficient which means that it is the financial ratio that better explains average stock prices followed by 1% of BVPS.

Logarithms are applied in the last model to enhance even more the Adjusted R-squared to have an overall strong correlation in the model. Outliers where removed and unit measures unified and the Adj R-squared grow sharply to 0.86%. The variables within the model explain 86% of fluctuations in stock price movements. PER was exchanged by EPS and DY by DPS in order to not harm the logarithmic model. All of the variables have a p-value below 0.05 with positives coefficients. There is a significant change here about with variables weights more regarding the overall coefficient. Debt to Equity ratio was found to be the variable that weighted more, 54% of all the coefficients meaning that is the variable that better explain the average stock price movement. An increment 1% supposes a 100% grow of stock price average. The second most important determinant of SPA was BVPS with a 32% of weight within the 86% explained by the model followed by EPS with 15% and DPS with just 1%.

x	Initial Model			Replacement Model			Logarithmic Model		
	Coeff.	W.%	P-val	Coeff.	W.%	P-val	Coeff.	W%	P-val
PER	-0.001	0.0%	0.1	-0.002	0%	0.01**			
EPS							0.298	15%	0.***
DY	192.9	98%	0.***	120.5	99%	0.00**			
DPS							0.028	1%	0.02**
BVPS	0.75	0.4%	0.***	0.98	1%	0.***	0.633	32%	0.***
DE	2.92	1.5%	0.**				1.048	52%	0.***
CurrA				-0.0008	0%	0.***			
-Cons	-0.77		0.9	975.7		0.***	1.089		0.0**
	Adj-R2	0.37		Adj-R2	0.53		Adj-R2	0.86	

\*p<0.10 \*\* p<0.05 \*\*\*p<0.001

## 7.1 Hypothesis testing

The studied has been carried out with the be purpose of test the hypothesis stated before developing the empirical study. There were 3 main hypothesis that were established to meet the objectives of the meet the two objectives. Determine the relationship between average stock prices and PER, DY and BVPS of Spanish companies that operate in the Energetic and Oil sector of Ibex 35, and indicate which has a strongest relationship.

*Hypothesis 1: The financial ratios PER, DY and BVPS have a significant positive relationship with stock prices of Electric and Oil sector Spanish companies from Ibex35.*

The first hypothesis helps to meet the first objective. Since PER, DY and BVPS were found to have a smaller p value than 0.05 in regression models that have a Adjusted R-squared bigger than 0.5. There is statistically evidence that the 3 variables have a



positive significant relationship with SPA. Therefore, the first objective is being archived since it could have been determined those relationships with SPA and the three ratios.

*Hypothesis 2: The financial ratios PER, DY and BVPS have differences in the strength of the significant relationship with stock prices of Electric and Oil sector Spanish companies from Ibex35.*

The second hypothesis helps to meet the second objective that is has been achieved. There are differences in the strength of the relationships. In the regression model with the highest Adjusted R-squared, BVPS represented the 32% of the total contribution of the independent variables to the model. There is statistical evidence that BVPS has the strongest positive relationship with SPA of the 3 main financial ratios studied.

*Hypothesis 3: The Debt-to-Equity ratio has a significant positive relationship stock prices of Electric and Oil sector Spanish companies from Ibex35.*

The third hypothesis contributes to achieve the second objective as well. Debt to Equity ratio was found to have statistically evidence to have a positive relationship with SPA. Despite not being one of the most used for the authors of the literature, it is the financial ratio that explained more the SPA with a 52% of total contribution of the independent variables in the regression model with the higher Adj R-squared.

In order to provide a response for the research question. The study finds statistical evidences that the most common financial ratios used by studies in foreign markets to explain stock prices, help to explain average stock prices of energetic and oil companies of Ibex35, listed in the Spanish stock market.

## **7.2 Regression model equation comparison**

The first formula that was suggested to determine the regression model and be the best combination of variables differ from the actual regression model. As previously suggested, the first regression line function goes as follows:

$$\gamma = f( PER, DY, BVPS, DE, )$$

Therefore, the regression analysis formula is represented by the subsequent equation:

$$\gamma(SPA) = \beta_0 + \beta_1 PER + \beta_2 DY + \beta_3 BVPS + \beta_4 DE + \beta_5 TI + \mu$$

Once the regression analysis has been carried out, the best regression model has the following equation.

$$y = f( EPS, DPS, BVPS, DE, )$$

It can be represented as it follows:

$$(\log y) = 1.08 + 0.3\log(EPS) + 0.03\log(DPS) + 0.63\log(BPS) + \beta_3BVPS + 1.05\log(DE) + \mu$$

## 8. Conclusions

This research intended to demonstrate empirically the influence of financial ratios in stock prices that had been previously studied by the literature. Those studies were carried out in foreign markets such as North America, Middle East and Asia but there were a few that studied the Spanish stock market. The study analyses the quarterly data of the Energy and Oil sector of Ibex35 considering the years 2015 to 2019 in order to find out whether the financial ratios that previously were found to have a significant relationship with stock prices by the literature, have significant statistically relationships with Spanish companies of the Energy and Oil sector that composed the main stock index in Spain.

The study found statistical evidence that Price to Earnings ratio has a positive relationship of average stock prices in accordance to the studies made in US from (Collins, 1957) and (Nidhi Malhotra & Kamini Tandon, 2013) or other studies that analyzed companies in the middle East (Muhammad, 2018). However, it does not have a small enough p-value to fit in the best combination of variables and when it does, the weighted explicative power considering the coefficient, is very low.

There were statistical evidences that the Dividend Yield has a positive impact being the most important variable in the initial model which explained almost all the total stock price average movement explained by all the independent variables. The regression model that has the best combination of variables to explain the stock prices do not count with DY but Dividends per Share instead. DY and DPS were found to have a positive significant relationship with SPA. The study provides to claim that dividend matter for investors for the sample analyzed so it is accepted the (Gordon, 1963) theory and reject the M&M theory.

The models where logarithms are not applied, BVPS have a relatively low contribution to the model compared with other variables despite having a low p-value. There is statistical evidence that BVPS has a positive relationship with stock prices as (Covarsí & Torres, 2014a) found analyzing companies of Spanish stock markets. The contribution of BVPS to the model when logarithms are applied being the second explanatory variable. Debt to Equity ratio starts with low contribution to the model despite having a p-value below 0 but when logarithms are applied is the variable that

contribute the most in the regression model with higher Adjusted R-squared. There is statistical evidence that the DE has positive significant relationship with average stock prices of the companies analyzed in this sample, as (Bhandari, 1988) and (Fama et al., 1992) explained in studies of foreign stock markets.

A regression analysis model provided is capable of explaining the 86% of the price fluctuation among average stock prices of companies from the Electric and Oil sector of Ibex35. It is reasonable to assume that the other 14% it is explained by external factors beyond the financial data provided by the firms in their quarterly reports.

There are some limitations in the study that the reader must be aware of. This final thesis dissertation intends to analyze how financial ratios, calculated with quarterly information, explain average stock prices of that quarter. Stock prices fluctuate at any second while the market is still open so the financial information to calculate the ratios cannot be updated constantly. Therefore, the explicative power of the regression model presented by the study could be overestimated. In addition, the analysis carried out in this research do not consider time variable since it is not important to answer the hypothesis suggested but it might not be accurate ignore time variable. Some authors use panel data and other advanced statistical techniques to consider the time variable.

Research questions might be extracted from this work for further studies. Some authors from the previous literature used advanced techniques to include time variable un their analysis. In addition, some extends studies analyze more than one sector to determine differences among them. This study has selected a time period that was not so close to the financial crisis in 2008 and the pandemic crisis of 2020. It can be a turning point for subsequent studies analyzing the impact of covid-19 in companies and analyze whether other financial ratios have gain relevance in determining the stock prices.

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