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INTANGIBLE ASSETS – INFLUENCE ON THE "RETURN ON EQUITY ON MARKET VALUE" (S&P100 INDEX)

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ABSTRACT

This study aims to analyze the effect of IA (exclusively those that are recognized and shown in the balance sheet) on the return on equity (ROE) using a market value approach. In order to analyze the influence of IA on ROE using market value, the study used components of the Standard and Poor 100 Index (S&P100). The S&P100 index comprises 101 companies across multiple industry groups; however, due to the research restrictions, only 68 companies were selected as the study's sample. The research results were obtained using the Ordinary Least Square (OLS) method. The Pearson correlation test indicates a strong relationship of the IA to the ROE (excluding goodwill). According to our findings the influence of IA on ROEmv is 23% excluding goodwill. Additionally, the results indicated a significant gap between the models used. The limitations and future research directions are found at the bottom of the conclusion.

Keywords: Intangible Assets, Return On Equity, Ratio Analysis, Dupont Model.

INTRODUCTION

Nowadays, companies are acquiring and develop more non-physical assets. Therefore, a question arises – what is the effect of the intangible assets in companies' performance? A study performed by Aboody and Lev shows that companies who had intense research and development programs (R&D) obtained bigger gains than those without them (Aboody and Lev, 2000). Considering the relevance of the issue, this research aims to study the influence of the Intangible Assets (IA) - exclusively those that are recognized and showed in the balance sheet - on the Return on Equity (ROE) using market values. Due to the accounting segregation of the IA and the goodwill, the analysis considers both IA and "IA including goodwill". Therefore, the main research question can be stated as follows: what is the influence of IA (recognized in the balance sheet) on companies' performance, and, in particular, on the return on equity using market values? In order to answer the question, 2 operational objectives were established: analyze the impact of IA on ROEmv and analyze the impact of IA including the goodwill

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on ROEmv. In order to analyze the influence of the IA on ROEmv, the study is based on a group of companies that are components of Standard and Poor 100 Index (S&P100). The S&P100 index comprises 101 companies across multiple industry groups; however, due to the requirements established for this project, only 68 companies were selected as the study's sample. The Three-Step Dupont Model, which lies in a broken form of Return on Equity (ROE) original formula, is used as a starting point. The model comprises the three following factors: net profit margin, asset turnover and equity multiplier. For the study purposes the equity multiplier was modified to isolate the intangible assets, obtaining a modified version of the Dupont model. Next, the Ordinary Least Square (OLS) was used to analyze the impact of the intangible assets (recognized in the balance sheet) over the return equity using market values.

INTANGIBLE ASSETS AND RETURN ON EQUITY

Intangible Assets

The article has a comprehensive revision of the literature available and previous studies regarding intangibles and returns. Intangibles gained more importance in firms' accountancy at the end of the past century. Further, IA are a fundamental factor of value (Cañibano, *et al.*, 2000). International Accounting Standard (IAS) and International Forms of Reporting Standards (IFRS) have made major advances in defining and recognizing IA on financial statements. Although, today's accounting framework is distant to comprehends all intangibles resources. The term IA was first introduced in the mid-80's (Artsberg & Mehtiyeva, 2010; Bryan, *et al.*, 2017). Until the year 1997, the International Accounting Standards Board (IASB) issued the IAS No. 38. IA are contained in "other assets" section, that consist of permanent investments and the IA (Guerard & Schwartz, 2007), at the bottom of the assets section in the Balance Sheet financial statement. The Financial Accounting Standards Board (FASB) framework defines assets as the possible future economic benefits obtained as a result of past transactions and IA as an identifiable non-monetary asset without physical substance. This standard outlines the recognition, valuation and disclosure of IA on financial statements. Additionally, the IAS 38 provides the scope were the IA are to be found. The issue of this standard was in responds to the demand of an international demand on recognizing intangible resources. This demand came along with the surge of the Knowledge -based Economy (KE) The IA gained more importance after the surge of the KE. Aligned to the globalized economy, this microeconomic model is focused on intangible resources such as expertise, patents, data and information (Bratianu, 2017; Carrillo, 2015).

This economy framework is stimulating firms to drive their business from massive production processes to fostering knowledge that produces innovative and cutting-edge products. Furthermore, this framework promotes a change in businesses' sources of value pivoting to intangibles (Pucci, *et al.*,

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2015). KE is habitually associated with technological, media, financial and medical industries. Nevertheless, this economic model affects all industries. The influence of this model can be seen by in the rise of IA, which has almost doubled in the last 16 years, from $19.8 trillion to $47.6 trillion. Most of the high-tech and pharmaceutical companies in 2005 had more than 90% of their assets in intangibles (Bryan *et al.*, 2017).

One of today's problems regarding IA is the disclosure of some intangibles. Scholars, professionals and audit firms have been discussing the need for a modern form of reporting of IA due to the improper recognition and valuation of some IA (Bryan *et al.*, 2017; Niculita, *et al.*, 2012; Pucci *et al.*, 2015; Tahat, *et al.*, 2017). This is to say that within the current accounting standards most of the intangibles are not recognized, leaving many intangibles unacknowledged.

The study conducted by Heiens *et al.*, (2007) regarding the implication of the IA on firms' holding returns suggests that IA other than goodwill have a significant positive impact, in contrast, high accumulation of goodwill and R&D expenditures have a negative impact on shareholders' returns. Heinens' study proceed using the resourced-base view, the mentioned study obtained data from 1.675 companies recorded by the Center for Research in Security Prices in 2001. The results support the premise for a positive relationship between the IA and shareholders' returns, specifically those intangibles that are used for advertising have a slight impact on long-term returns.

Tahat *et al.*, (2017) studied the impact of intangibles on firms' current and future financial and market performance within the companies constituting the United Kingdom's Index FTSE 150 from 1995 to 2015. The study was focused on the role of goodwill and R&D on firms' performance. The authors support the idea that financial statements are not revealing accurate present information regarding financial performance. Moreover, the study emphasizes the need for studies targeting future performance. The proxies employed in earnings per share were return on assets (ROA) and ROE. The findings display a positive impact of investments in intangibles on company's future performance, yet for the short term, the relationship goes in the opposite way. The results are consistent with market-based and resource-based theories, assuming IA are a relevant factor for sustainability of earnings and boost future performance. Additionally, the study though not significantly negative relationship between R&D and companies' current market operation.

A universal definition of IA has not been established hitherto, however identifiable IA have much in common with tangible long-lived assets. Assets are recognized only if they will bring future benefit to the firm (Tahat *et al.*, 2017), yet intangibles have the peculiar characteristic that besides providing future benefit, they are also recognized if they could prevent or block other competitors to enter in the market, e.g., patents, or licenses. The following characteristics must be present to qualify an item as an asset (Wittsiepe, 2008): The asset must provide probable future economic benefits that enable it to provide

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future net cash inflows, the entity is able to receive the benefit and restrict other entities' access to that benefit and the event that provides the entity with the right to the benefit has occurred.

As it was said before, a more complex framework is used to define IA. One case study had to integrate the federal court, local real estate laws, international financial standards and industry literature about IA to provide not a definition but a scheme to identify intangibles as assets (Understanding Intangible Assets and Real Estate: A Guide for Real Property Valuation Professionals, 2016). This exercise produced a 4-step test that helps managers and assessors to recognize easily if an intangible is subject to be considered part of the assets.

- Intangibles should be identifiable.
- Intangibles should possess evidence of legal ownership.
- Intangibles should be capable of being separate and divisible from the real estate.
- Intangibles should be able to be legally transferred.

These four qualifications in addition to the 3 previously mentioned must be present to determine an intangible as an asset. The IAS 38 (IFRS Foundation, 2014) defines an "intangible asset as an identifiable non-monetary asset without physical substance". For the purposes of this study, IA are defined as all identifiable resources that lack of physical substance that could be self-generated or traded, and for those intangibles that were acquired by past trade transactions their usage could last for a limited or unlimited period and are shown in the balance sheet financial statement. It is necessary to mention that only those IA which are recognized in the financial statements were used in this study. Intangible resources provide a composition of knowledge, information, intellectual property, and experience. IA could be acquired as a result of market transactions or self-generated and they could have a definitive or indefinite life (El-Tawy & Tollington, 2013; Wittsiepe, 2008). Goodwill has a singular treatment. It is, indeed, an intangible asset; nonetheless, depending on how it was gained (Saunders & Brynjolfsson, 2016), it could be treated as part of business combinations (IAS 3 and FAS 141) or as any other IA. The reason that self-generated goodwill is not recognized is, in most of the cases, because it is still under development and cannot be separated (Artsberg & Mehtiyeva, 2010; Saunders & Brynjolfsson, 2016). The literature reviewed of IA point towards IA as a strong component of a company's financial potential. However, it should be pointed out that IA by themselves are not enough to maximize profit or significantly increase ROE. IA must come along with tangible assets to develop continuous growth. Is also necessary to emphasize the need for proper classification and early recognition of IA.

Return on Equity

Many financial tools are available to measure companies' financial performance. On the one hand, investors, managers and shareholders can perform a financial statement analysis to determine if a

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company is profitable or not. On the other hand, ratios are useful tools to measure the extent of profit earned by companies in a certain period of time (Jensen, 2008). Financial ratios were created to provide quick indicators regarding companies' financial situation and to measure economic effectiveness. Most ratios use book values. This means that information is taken from companies' financial statements. Some other ratios use market value for forecasting purposes and better decision making. Financial ratios that use market values provide more accurate information about companies in "real time", compared to the historical information provided by financial statements. One of the most used and well-known profitability ratios is the return on shareholders' equity (ROE). This ratio has been used to measure companies' efficiency in profit generation, and due to the ratio uses the net income as a benchmark to measure profitability (Kijewska, 2016). Profitability ratios, as ROE is, are likely to confirm that a company is able to efficiently use available resources available to increase sales or/and net profit (Ciurariu, 2015). The simple formula for this ratio is as the Eq. 1 displays:

$$Return\ on\ Equity = \frac{Net\ income}{Total\ Equity} \quad (1)$$

Approximately a century ago, the DuPont Corporation designed a formula to understand company's profitability and performance, the formula was first called return on equity. Thereafter, this ratio was fragmented into several more sub-ratios to obtain a better analysis of companies' corporate performance. Due to their simplicity and versatility in fulfilling almost every company's needs, these ratios were easily implemented (Stockert, Kavan, & Gruber, 2016). Measuring profitability responds to the need of every firm's intention: to increase profit. Therefore, how to maximize ROE? the question could not be answered without identifying the factors that affect net income and the relation to equity. These factors are known as profit margin (PM), assets turnover and equity multiplayer. Eq. 2 shows the 3 factors described affecting ROE.

$$ROE = \frac{Net\ Income}{Total\ Equity} = \frac{Net\ Income}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Equity} \quad (2)$$

PM presents how much profit the company can generate per unit sold (net income/sales). AT shows the percentage of sales a company produces from a unit of assets (sales/assets). Equity multiplayer represents the leverage used by the company to finance its assets (assets/equity). Having the ratios separated enables a precise examination of the factors that affect the companies' increment of profit. Furthermore, by analyzing those ratios separately, a company's strategies are clearly revealed: for each of the previously mentioned ratios - PM, assets turnover and equity multiplayer - correspond to the following financial strategies: volume of sales strategy, margin assets strategy or leverage strategy. These strategies play an important role in the organization's planning, and managers should wisely consider which of those strategies would fulfil the company's demands. For example, a company could use leverage to finance more equipment; by doing this, the assets turnover rate would be reduced while

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the equity multiplayer would increase. This example exhibits the correlation between the ratios, and hence the strategies, to maximize ROE. A high result of ROE represents a favourable financial position of a studied company (Rutkowska-Ziarko, 2015). The third factor, equity multiplayer, has considerable relevance to this study because this factor evidences the impact of intangibles on the ROE.

METHODOLOGY

Data and Sample

Data was collected from the companies that composed the Standard &Poor 100 Index (S&P 100) in 2016. The S&P 100 consists of 101 companies blue chip companies across multiple industry groups. The study decided to choose this index due to the relevance of the USA economy and its impact on the global economy. A full list of the companies was obtained from the official website of Standard and Poor Index. Microsoft Excel was used to create a database that shows the companies' net profit, sales, total assets, intangible assets, goodwill and total equity. This data was collected from the firms' financial statements, those financial statements were extracted from the annual report known as the 10k form. The 10k forms were extracted using the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR). Most of the financial statements are issued for the calendar year, compelling from January first 1st to December 31st of 2016. The firms Starbucks, Target, The Home Depot and Wal-Mart Stores issued their financial statements in January 2017. Lowes Companies in March 2017. Medtronic in April 2017. For FedEx, Nike and Oracle the month was May 2017. Microsoft, Procter & Gamble and Twenty-First Century Fox, Inc. issued in June 2017. In July 2017, SISCO Systems issued its financial statements. The companies Accenture, Monsanto Co. and Walgreens Boots Alliance, Inc. issued in August 2017. On September 2017 Qualcomm, Apple, Emerson Electric, Visa and Walt Disney allotted theirs.

During the data analysis process, 2 companies were left out of the selection due to the lack of information. The companies were Google Inc (GOOG. Symbol) and Twenty-First Century Fox, Inc. (FOX. Symbol). This due to in the 2016-year Twenty-First Century Fox, Inc. changed its symbol to FOXA. For Google Inc., the firm changes its name to Alphabet Inc. using the symbol GOOGL. The following firms were put aside as well: American Intl, Chevron, Conocophillips, Costco Whole Sale, Duke Energy, Halliburton, Metlife, Occidental Petroleum, The Allstate And Union Pacific. The mentioned companies did not disclose the amount of their intangible assets on their financial statements nor in their annual reports. Thus, these firms were irrelevant to our study. Three more firms were taken out of the scoop due to their deficit in total equity, the reason was a repurchased of more than 70% on their own shares. The magnitude of this buyback action affected the financial ratios

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results. The companies were: Colgate-Palmolive, McDonald's and Philip Morris. 85 organizations comprised the study's final sample.

The data refers to the business year 2016, all variables were measured at the same moment in time, making this a cross sectional database. All the variables are presented and defined in detail in the next section where their importance for achieving the objective of the research study is explained.

DuPont Model

The DuPont analysis was chosen to this study because it goes further on the financial analysis, recognizing that ROE can be separated into return on sales, asset turnover and equity multiplier, this delves deeper into the cause of the ROE results. The DuPont Analysis gives us exceptional insight into the reasons for a company's performance. Perhaps the most important consequence of the DuPont Analysis is that it suggests to an analyst that he or she has the ability, and license, to develop specific ratios that enable him or her to see indicators relevant to a specific analysis being performed or particularly relevant to the company being analyzed (Sherman, 2015). This study used reported information in financial statements, such as, balance sheet and income statement. Additionally, stock price and shares outstanding were some of the values used to calculate market ratios. By separating the factors composing the net income on the main ROE formula (3), the factors are net profit, sales and total assets. The formula is as follows:

$$\text{Return on Equitiy} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Shareholders'equity}} \quad (3)$$

For our purposes, we will break down the formula to separate the intangible assets from the total assets. The intangibles were isolated by tearing the assets turnover ratio (Sales/total assets) (4). The financial leverage was modified as well. The result divides tangible assets over shareholders' equity.

$$\text{Return on Equitiy} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Intangible Assets}} \times \frac{\text{Intangible Assets}}{\text{Total Assets}} \times \frac{\text{Tangible Assets}}{\text{Shareholders'equity}} \quad (4)$$

As the result of this split, the formula now provides the framework of the variables used. The formula shows the 4 independent variables: 1) Profit Margin, 2) Intangible assets turnover, 3) Intangibles ratio and 4) Financial leverage ratio (modified). See table 1.

Ratio	Description	Ratio Formula
Return on equity (ROEmv)	Return on the shareholders' investment over a year. Measuring profitability, using market value.	$ROEmv = \frac{Net\ Profit}{Shareholders'equity} \times 100\%$
Profit Margin (PM)	Expresses the percentage of money collected from net sales turned into profit.	$PM = \frac{Net\ Profit}{Sales} \times 100\%$
Intangible assets turnover (IAT)	Shows how intangible assets are deploying in generating revenue.	$IAT = \frac{Sales}{Intangible\ Assets} \times 100\%$
Intangible assets turnover + goodwill (IATg)	Shows how IA and goodwill are deploying in generating revenue.	$IAT_g = \frac{Sales}{Intangible\ Assets} \times 100$
Intangible assets ratio (IAR)	This one represents the amount of IA from the total assets1.	$IAR = \frac{Intangible\ Assets}{Total\ Assets} \times 100\%$

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Intangible assets ratio + goodwill (IARg)	This variable represents the amount of IA plus goodwill from the total assets.	$IAR_g = \frac{Intangible\ Assets}{Total\ Assets} \times 100$
Financial leverage (FL)	Represents how much of the equity was used to fund tangible assets.	$FL = \frac{Tangible\ Assets}{Shareholders'equity}$

Table 1. *Independent and dependent variables description*

Ordinary Least-Squares

The econometric method used in this study to process the selected data was The Ordinary Least-Squares (OLS) method. This method is attributed to Carl Friedrich Gauss and is well known as a useful, reliable and compelling regression analysis method. This method is a variation of the Least Squares Principle and is one of the most used linear regression models in econometrics. Heij *et al.*, (2004) described the OLS as the first step in estimating economic relations and could provide a valuable insight in the essence of the relation between variables.

The main objective by using the OLS method is to minimize the remains of the estimated errors. As was said before, the main objective of this study is to identify whether there is a positive effect of IA on the return of the shareholders' investments of the 68 selected companies on the S&P100 index, as was outlined in the literature review. Since independent variables are presented in the adjusted formula of DuPont, this study fits the independent variables on a multiple linear regression analysis.

Of note for this study is that the growth rate of the dependent variable (ROE) is linearly related to the 4 independent variables - profit margin (PM), IA turnover (AT), IA ratio (AR) and financial leverage (FL). The following formula, Eq. 6, show the OLS equations adapted for the study purposes using the logarithmic function. Indeed, all the previous variables were transformed into are the logarithmic values (lROE, lPM, lIAT, lIAR and lFL) used in each of the formulas. Formula of the OLS analysis (6):

$$lROEmv_i = \alpha + \beta_i lPM_i + \beta_i lIAT + \beta_i lIAR_i + \beta_i lFL_i + \varepsilon_i \quad (6)$$

The formula shows the constant is displayed as α, the coefficient of the estimator of the population intercept of each independent variable is represented by β, the estimation errors are projected by the OLS method and shows the impact of each independent variable on the dependent one and the error term, ε. Lastly, the symbol i represents each one of the observations in the dataset, in other words, it represents every single firm in the study's sample.

In order to keep the results of the OLS in this cross-sectional study unbiased, the model takes the following assumptions: first, the models are linear in their parameters; second, data is a randomly selected sample of the population; third, independent variables are measured exactly such that measurement error is negligible; and, finally, independent variables are not too rigidly collinear.

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RESULTS

Descriptive Statistics

It is necessary to understand the indicator values before this study undertakes analysis of the results of the OLS Method. Table 2 was elaborated using the sample to provide a clear understanding of the indicators' distribution of values of the descriptive statistics. Furthermore, indicators of central tendency, variability and shape can be observed in Table 2. The second column presents the statistical mean, which is the most widely used measure of central tendency, while the median, represented in the third column, halves the data. The minimum (min) and the maximum (max) are displayed on the fourth and fifth columns. The standard deviation (the sixth column) and coefficient of variation (seventh column, expressed in percentage) are indicators of dispersion, and are both based on the average squared distance between the elements of a data set and the mean. Skewness and kurtosis, in the eighth and ninth columns, are indicators of distribution shape. Kurtosis measures the tailedness and flatness of the normal distribution: in other words, the relative amount of observations in the tails as compared to the number of observations around the mean. Skewness is a measure of the symmetry of the mean for a given studied variable.

Indicator	Mean	Median	Min	Max	Standard Deviation	Coefficient of Variation	Skewness	Kurtosis
ROEmv	0,07	0,05	-0,01	1,48	0,18	2,44%	7,05	51,30
PM	0,15	0,13	-0,06	0,55	0,11	0,75%	1,26	2,19
IAT	44,57	8,69	0,45	766,67	116,51	2,61%	4,58	22,79
IATg	24,95	2,20	0,26	766,67	108,65	4,36%	5,88	34,54
IAR	0,11	0,07	<0,001	0,49	0,12	1,08%	1,43	1,35
IARg	0,30	0,28	<0,001	0,86	0,21	0,69%	0,46	-0,41
FL	3,47	2,84	1,10	14,26	2,19	0,63%	2,68	8,78
Note: All values are presented in the same unit of measurement of the variables except the coefficient of variation that is presented in percentage.								

Table 2. *Descriptive statistics of all variables (Autor's calculatoins)*

The variables "IAT" and "IATg" project the longest distance between their means and maximums. IAT exhibits an outstanding maximum value close to 767% whereas its mean is close to 45%. The distance from the mean to the maximum value is more than 17 times its mean. On the other hand, the minimum values from all the indicators are not far away from their means, with the exception of IAR and IARg. IAT and IATg present the highest values of standard deviation regarding their means. Therefore, their coefficient of variation shows a high degree of dispersion; in particular the result of IATg presented 108,65% of deviation.

That means the data for IATg is broadly spread out. Furthermore, these variables present an abnormal skewness, that is to say, their distributions are asymmetric. Additionally, their long right tails mean

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that the samples are positively skewed; simply put, the data are distributed mainly around the mean. Nevertheless, some data is distant from the mean representing a longer right tail in a graph. The variables' kurtosis results exhibit a property known as "fat-tails" due to the spread distribution. Fat tails occur where the actual probability of extreme outcomes is greater than the normal distribution: put in short, the extreme outcomes of the data is expected to be greater than the normal distribution. The variables PM and IAR present low values in contrast with the rest of the variables. Their deviations are close to their respective means and their dispersion is short, as their coefficient of variation is close to 0,8% for PM and almost 100% for IAR. Kurtosis values are 220% for PM and for IAR is almost 135%.

These results indicate a platykurtic or long tail distribution, meaning that the normal distribution is flat. Regarding the Skewness values, the results show a narrow dispersion around the means.

In summary, all variables are positively skewed due to median values being lower than the means, most of them having maximum values in their data far away from their means (outlier values). Moreover, IAR and PM have narrower dispersions in contrast to IAT and FL. To wit, the variables IAT and PM have values that are close to each other, which is not present in the IAR and FL.

Note that the descriptive statistical analysis showed that some variables present high range values. Therefore, the linear functional form adjusted into a logarithmic functional form has another added advantage. Logarithmic values are known to decrease the degree of dispersion of a variable's values.

OLS regression analysis results

The test is used to assess a possible linear association between two or more variables. For the purpose of this research, the test will help the study to explore which of the 4 independent variables are positively or negatively related to lROE, and the magnitude of such relations. The results of the Pearson correlation coefficient test for all the variables using logarithmic values, see Table 3.

The table shows in the first column the name of the logarithmic function of the dependent variable (lROEmv), and the following columns display the independent variables and the results of the Pearson correlation test.

Dependent variables	Independent variables					
	lPM	lIAT	lIAR	lIATg	lIARg	lFL
Logarithmic ROEmv	0,15*	0,02	0,12*	-0,03	0,108	0,20*
Note. The symbol (*) stands for a 10% level of significance. A set of 66 observations were used to perform this test, two observations presenting negative values were left out. The symbol (-) stands for not applicable.						

Table 3. *Results of Pearson correlation coefficient between independent variables and the ROE (Autor's calculatoins)*

The results show an intense and positive relation between the logarithmic version of the variables lROEmv and lFL in comparison to the rest of the independent variables; this means that the observations in the financial leverage correspond with observations of lROEmv. lIAR, lIARg, lIAT and

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lIATg present low correlation coefficient for ROEmv. Until this point, the IA recognized in the financial statements show almost insignificant influence on ROE.

The following models, Table 4 and 5, show the regression tests for the dataset selected by this study. The models have been estimated using information from the total sample - 66 companies (two of them were taken out of the test for presenting negative values on the ROEmv). The format of the tables displays in their first column the adjusted independent variables. The second column shows the results obtained for the estimated coefficients. The third column displays the outcomes of the standard robust errors to assure that the assumption of the homoscedasticity of the error term is not infringed and the results are robust, accurate and it is possible to trust them. The fourth column presents the results of the p-values. This column is related to the fifth column, which indicates the statistical significance of the estimated coefficient. The last column shows the results of the Variance Inflation Factor (VIF). The table correspondingly displays the results for the joint statistical significance test (F-test) and the Adjusted R-squared (adjusted for the degrees of freedom)

Variables	Estimated coefficient	Standard robust error	P-value	Statistical Significance	VIF
Constant	-2,84	0,31	<0,001	***	-
lPM	0,26	0,12	0,04	**	1,20
lIAT	0,23	0,06	<0,001	***	3,81
lIAR	0,20	0,05	<0,001	***	3,52
lFL	0,37	0,16	0,03	**	1,02
n=66 F-Test (4, 61) = 6,74*** Adjusted R-squared = 0,11					
Note. The symbol (***) means 1% level of significance and (**) means 5% of level of significance. The symbol (-) stands for "not applicable".					

Table 4. *Results of the OLS regression analysis. Excluding goodwill (Autor's calculatoins)*

Table 4 displays the presence of statistically significant variables, including the constant. The outcomes for the variables lIAT, lIAR and constant display a 99% of confidence. For lPM and the lFL, the level is 95%, implying that if the logarithmic function of the IAT grows 1%, the return on the equity market value (lROEmv) will grow by almost 0,23% in the same direction. The variable lIAR will influence the growth of the return on equity market value by 0,20% if it changes 1%. Regarding the logarithmic function of the profit margin, it is possible to say that if it grows 1% the return on equity market value will also grow by 0,26%. In regard to the financial leverage variable, the result shows that if it grows 1% it causes a growth in the logarithmic function of the return on equity market value by 0,37%.

The sample used for Model 2 was composed of 66 observations (n), 2 companies were left out of the test due to presenting negative values on the ROEmv. The result of the F-test implies the existence of statistically significance. Despite the fact that the F-test presents statistical significance, the result of the adjusted R-squared does not confirm the model as a strong model, due to this indicator showing that 11% of the growth on the lROEmv is caused by changes in the independent variables. The reason for this low indicator is that accounting does not explain the changes in the market information. The values

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of the VIF come are presented in the last column, for all variables the results are not higher than 10, which excludes any collinearity problems among the independent variables.

The following model, Table5, presents the same format as in the previous table. However, this table presents the logarithmic function of the variables including goodwill.

Variables	Estimated coefficient	Standard robust error	P-value	Statistical Significance	VIF
Constant	-2,59	0,32	<0,001	***	-
lPM	0,36	0,13	<0,001	***	1,49
lIATg	0,36	0,10	<0,001	***	12,07
lIARg	0,36	0,12	<0,001	***	10,88
lFL	0,47	0,19	0,02	**	1,08
n=66 F-Test (4, 61) = 17,80*** Adjusted R-squared = 0,72					
Note. The symbol (***) means 1% level of significance. The symbol (-) stands for "not applicable".					

Table 5. *Results of the OLS regression analysis. Including goodwill (Autor's calculatoins)*

Table 5 shows that all the variables present estimated coefficients with high statistical significance. All independent variables, the constant included, exhibit a level of trustworthiness at 99% for the values computed. For this model, the independent variable which presents the highest estimated coefficient is the logarithmic function of the financial leverage. That is to say that if the variables change 1% the return on equity market value will change in the same direction. For the lFL variable, the growth on lROEmv will grow 0,47%. In the case of lIARg, the change will be 0,38%. Regarding lIATg and lPM, if they change the growth in the ROE will be close to 0,36%. The model presented in Table 10 was estimated using 66 companies, as for the previous models. The result of the F-test implies the existence of a statistical significance. Despite the fact that the F-test presents statistical significance with 95% confidence level, the result of the adjusted R-squared does not confirm the Model 4 as a strong model, due to this indicator showing that 10% of the growth on the lROEmv is caused by changes in the independent variables. The reason for this low indicator is that accounting does not explain the changes in market information. The values of the VIF are presented in the last column, the variables lIAT and lIAR present results higher than 10 which could indicate collinearity problems among them.

CONCLUSION

The main purpose of the study was to find out if the intangible assets, recognized in the balance sheet, have a positive influence on the return on equity using market value. The literature review showed that, on the one hand, there are studies that indicate a considerable influence of the IA on the ROE, while on the other hand, there are studies that did not find a relevant influence of the IA on the ROE. The model exhibited in Table 4 shows an adjusted R-squared of 11%; therefore, the model holds a very weak explanatory power. In general, in this model the coefficients of the independent variables are low. In the "IA excluding goodwill" alternative the lIAR ratio presents the lowest value: 20%. Which means

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that a growth of 1% of the ratio will lead to an increase of 0,20% on the ROEmv. Testing the "IA including goodwill" shows the lIARg ratio with a value of 0,38%, a significantly higher value than the "IA excluding goodwill". However, the model presents a collinearity problem on two variables. Consequently, the model is not trustworthy to study the growth on the ROEmv. Therefore, the model is not suitable for conclusions.

The study used only a cross-sectional method to analyze the impact of the IA for a single year. We have a strong belief that future studies should add a time-series approach and use broad indexes.

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