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

INSTITUTO POLITÉCNICO DE BRAGANÇA

Intangible assets, influence on the "return on equity" - evidence from S&P 100 Index

Jair Alejandro García y García

Final Dissertation submitted to *Instituto Politécnico de Bragança*

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

Supervisors:

Prof. Doutor Jose Carlos Lopes

Prof. Vladimir Zefirov

***Bragança, July* 2018.**

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

INSTITUTO POLITÉCNICO DE BRAGANÇA

Intangible assets, influence on the “return on equity” - evidence from S&P 100 Index

Jair Alejandro García y García

Supervisors:

Prof. Dr. Jose Carlos Lopes

Prof. Vladimir Zefirov

***Bragança*, July, 2018.**

Abstract

In the 21st century, the most valuable strategic resources for business enterprises will no longer be physical assets such as land and machines, as was the case at the beginning of the 20th century, but rather intangible assets (IA) such as knowledge, patents, and intellectual property rights. This shift responds to a transition towards a knowledge-based economy (Ipate & Pârvu, 2016; Park, 2015). Nowadays, as companies are acquiring and developing more non-physical assets, the question arises: what is the effect of IA in companies' performance? Therefore, 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). In order to analyze the influence of IA on ROE, 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 Three-Step DuPont Model, comprising of three factors - net profit margin, asset turnover and equity multiplier - was used to analyze the effect of IA on ROE. For the research purposes, the Dupont model was modified to isolate IA. The analysis was done using book and market values for the dependent variable. The research results were obtained using the Ordinary Least Square (OLS) method. According to our findings, with ROE at book value the influence of IA on ROE is 34% excluding goodwill and 31% including goodwill. At market value, the influence of IA on ROE is almost 20%. Additionally, the results indicated a significant gap between the financial Information and the market assessment of shareholders equity.

Keywords: Intangible assets, return on equity, knowledge economy, market value.

Resumo

No século XXI, os recursos estratégicos mais valiosos para as empresas não serão mais os ativos físicos, como a terra e as máquinas, como ocorreu no início do século XX (Bratianu, 2017), mas sim os ativos intangíveis (AI), como o conhecimento, patentes e direitos de propriedade intelectual. Este comportamento corresponde a uma transição para uma economia baseada no conhecimento (Ipate & Pârvu, 2016; Park, 2015). Atualmente, as empresas vêm adquirindo e desenvolvendo cada vez mais ativos intangíveis, o que faz surgir a questão de qual é o efeito destes ativos no desempenho das empresas. Este estudo considera os AI relevantes para o desempenho das empresas, no entanto, tem como objetivo analisar o efeito dos AI reconhecidos contabilisticamente nos balanços das empresas sobre a rentabilidade dos capitais próprios (ROE). Para analisar a influência dos AI no ROE, o estudo utilizou um conjunto de empresas pertencentes ao índice *"Standard &Poor 100" Index* (S&P100). O índice S&P100 é composto por 101 empresas de vários sectores de atividade; no entanto, devido aos requisitos do estudo, apenas 68 empresas foram selecionadas para comporem a amostra. O modelo de três etapas DuPont foi utilizado para analisar o efeito dos IA no ROE. O modelo inclui três fatores: a rentabilidade das vendas, a rotação dos ativos face às vendas (vendas/ativo total) e a relação do ativo total face aos capitais próprios (ativo total/capital próprio). O referido modelo foi modificado para introduzir como fator os AI e foram utilizados valores contabilísticos e valores de mercado na variável dependente. O método dos mínimos quadrados foi utilizado na análise. Os resultados obtidos demostram uma influência de 34% dos AI no ROE, utilizando valores contabilísticos, das empresas quando o *goodwill* esta a ser excluído e dum 31% quando está o *goodwill* incluído, , e uma influência de 20% dos AI no ROE, utilizando valores de mercado e excluindo o *goodwill*. Por outro lado, os resultados indicam um desfasamento significativo em termos contabilísticos e de mercado na avaliação no âmbito do ROE.

Palavras-chave: Ativos intangíveis, retorno sobre o património, economia do conhecimento, valor de mercado.

Resumen

En el siglo XXI, los recursos estratégicos más valiosos para las empresas comerciales ya no serán los activos físicos como la tierra y las máquinas, como fue el caso a principios del siglo XX, más bien activos intangibles (AI) como el conocimiento, patentes y derechos de propiedad intelectual, este comportamiento responde a la transición hacia una economía basada en el conocimiento (Ipate & Pârvu, 2016; Park, 2015). Hoy en día, las empresas están adquiriendo y desarrollando más activos no físicos, entonces surge una pregunta: ¿cuál es el efecto de los AI en el desempeño de las empresas? Por lo tanto, este estudio tiene como objetivo analizar el efecto de los AI (exclusivamente aquellos que se reconocen y muestran en el balance general) en el rendimiento del capital (*ROE*). Con el fin de analizar la influencia de los AI en el *ROE*, el estudio utilizó empresas que componen en el índice *Standard and Poor* 100 (S & P100). El índice S&P 100 comprende 101 compañías en múltiples grupos industriales; sin embargo, debido a los requisitos del estudio solo fueron seleccionadas 68 empresas como muestra para este estudio. El modelo de tres pasos de DuPont se usó para analizar el efecto de AI en el *ROE*. El modelo comprende tres factores: el margen de beneficio neto, la rotación de activos y el multiplicador del patrimonio. Para fines de esta investigación el multiplicador del patrimonio fue modificado para aislar los AI. El análisis fue realizado usando el valor en libros y el valor de mercado para las variables dependientes. Los resultados de esta investigación fueron obtenidos usando el método del Mínimo Cuadrado Ordinario (MCO). En concordancia con nuestros hallazgos, la influencia de los AI en el *ROE* es del 34% excluyendo el *goodwill* (fondo de comercio) y 31% incluyendo el *goodwill* (fondo de comercio), cuando el *ROE* utiliza el valor en libros; cuando el *ROE* utiliza el valor del mercado la influencia de los AI es cerca del 20%. Adicionalmente, los resultados también mostraron una brecha significativa entre la información financiera y la valuación de mercado en el capital.

Palabras clave: Activos intangibles, rentabilidad de los fondos propios, economía del conocimiento, valor de mercado.

To my beloved parents

Dulce and Alejandro

Acknowledgements

First and foremost, I would like to thank the International Credit Mobility Programme (ICM ERASMUS+) for providing me with a scholarship to carry out my studies in Instituto Politécnico de Bragança and giving me an opportunity to undertake a double degree program.

I would like also to express my sincere gratitude to my research supervisors Prof. Dr. Jose Carlos Lopes and Prof. Dr. Vladimir Zefirof for their valuable feedback and engagement throughout the learning process of this master thesis. I would like to thank Prof. Dr. Alcina Maria de Almeida Rodrigues Nunes for her with the econometric aspect of this thesis. This work could not have been done without their assistance and dedicated involvement.

Abbreviations and Acronyms

BV	Book Value
FAS	Financial Accounting Standard
FASB	Financial Accounting Standards Board
FL	Financial leverage book value
IA	Intangible Assets
IAR	Intangible Assets Ratio
IARg	Intangible assets ratio plus goodwill
IAS	International Accounting Standard
IASB	International Accounting Standards Board
IAT	Intangible assets turnover
IATg	Intangible assets turnover plus goodwill
IFRS	International Forms of Reporting Standards
KE	Knowledge-based Economy
MV	Market Value
OLS	Ordinary Least-Squares
PM	Profit margin
R&D	Research and Development
ROEbv	Return on equity book value
ROEmv	Return on equity market value
VIF	Variance Inflation Factor

Table of Contents

List of Tables

List of Figures

Introduction

At the beginning of the 20th century, physical assets such as land and machines were the predominant form of resources (Bratianu, 2017). However, in the 21st century these have been progressively displaced by intangible assets such as knowledge, patents, and intellectual property rights. This trend corresponds to the shift to a knowledge-based economy (Ipate & Pârvu, 2015; Park, 2015). 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 (2000) shows that companies who had intense research and development programs (R&D) obtained bigger gains than those without them. 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). 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? In order to answer the question, five operational objectives were established: i) Analyze the impact of IA on ROE, measured at book values, ii) Analyze the impact of "IA, including goodwill", on ROE, measured at book values, iii) Analyze the impact of IA on ROE, measured at market values, iv) Analyze the impact of "IA including goodwill" on ROE, measured at market values and v) Compare the results of book and market values approaches. In order to analyze the influence of the IA on ROE, 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.

Following this introduction is a review of the current literature on IA. In section 2, the methods used for this thesis are explained. Section 3 is dedicated to the empirical results, followed by the study's conclusions.

1. Literature Review

The following will first define the concepts of IA and ROE before presenting the relevant literature regarding intangibles and equity returns. Then the study looked for literature regarding IA, in specific for articles and studies where the effects of intangible resources on the company's returns were the objective.

The following method were used in conducting the relevant research: an exploration was performed on B-On, EBSCO, Research Gate, Taylor & Francis and Web of Science online databases. The keywords looked for were: "Intangible Assets", "Return on Equity", "Results on Equity", "Intangibles Tax Treatment" and "Intangibles and Equity". Though there is a substantial amount of information available, included in the following review are only those articles and studies most relevant to the study's main goal: to analyze the impact of the intangibles on the return on equity.

1.1. Intangible Assets

Intangibles gained more importance in firms' accountancy at the end of the past century. Further, IA are a fundamental factor of value (Cañibano, Garcia-Ayuso, & Sánchez, 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, Rafferty, & Wigan, 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. Other definitions of IA are available

by several organizations such as the Appraisal Institute, the American Society of Appraisers, the USA Internal Revenue Service or the International Valuation Standards Council, in addition many jurisdictions define IA in local law (*Understanding Intangible Assets and Real Estate: A Guide for Real Property Valuation Professionals*, 2016). 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, Simoni, & Zanni, 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 ,see Figure 1. 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 the key factors about KE is ownership of the intangibles, as Bratianu (2017) mentioned: knowledge is created by people and is stored in their minds. This process of creating knowledge can be considered an intangible resource. Since an idea cannot be show as part of the IA in the balance sheet financial statement, companies keep these intangibles resources as expenditures of R&D programs until the ideas are mature enough to be recognized as IA on the IAS 38 boundaries.

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, Popa, & Caloian, 2012; Pucci et al., 2015; Tahat, Ahmed, & Alhadab, 2017). The following graphic [Figure 1] shows the evolution of assets over the last 16 years in the world economy, dividing them into 4 categories. Tangible Net Assets, Disclosed Intangible Assets, Disclosed Goodwill and Undisclosed Value. On average, IA represent almost 50% of the total assets. Nevertheless, undisclosed intangibles constitute more than 70% of the total intangibles. This is to say that within the current accounting standards most of the intangibles are not recognized, leaving many intangibles unacknowledged. This traditional accounting approach to recognizing and determining the real value of intangibles is inefficient. Today's economy demands a more imaginative method of reporting and a revaluation of IA. Lev & Daum (2004) take up this issue: "*Traditional financial and management accounting is failing to adequately support management in today's environment: it is too narrow, too inflexible, and too much focused on the past and present.*" (Lev & Daum, 2004, p.8).

In traditional accounting framework it is to see a direct relationship between IA and future earnings. Whereas early research failed to establish a strong relationship between IA and the ROE, more in detail regarding R&D, and outlays and future earnings (Ballester, Garcia-Ayuso, & Livnat, 2003), novel studies promote and prove the benefits of IA on companies' performance.

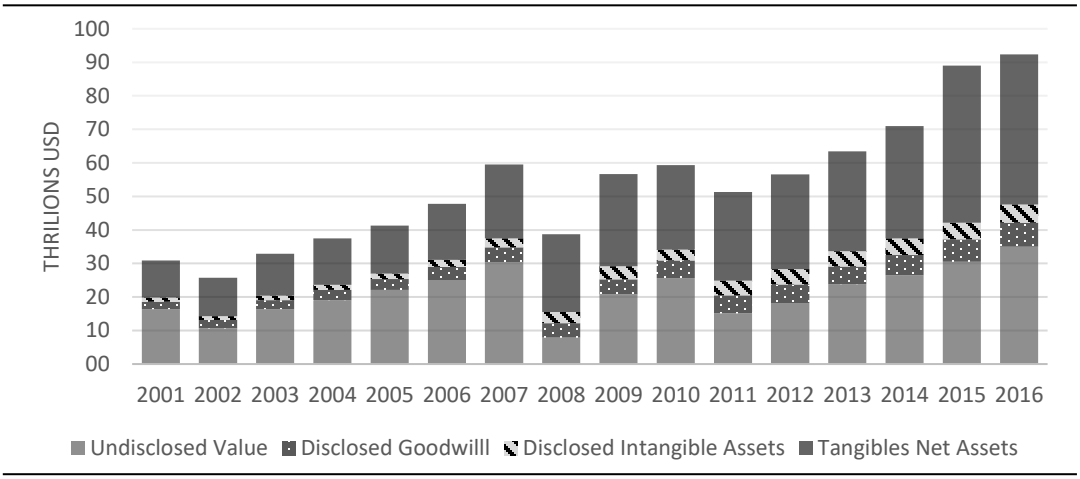

Figure 1. Global Enterprise Value - Absolute Breakdown From 2001 to 2016 for the largest multinational companies in the globe.

Source: Adapted from Global Intangible Finance Tracker (2017, p. 29).

Most of the studies use financial information disclosed by companies and third parties' publications, *i.e.* stock exchange information. A widespread practice is to allocate IA on low- tax countries/jurisdictions, also called "tax havens" where regulations allow companies to transfer intangibles to subsidiary companies in order to reduce the tax impact on the consolidated financial statements (Bridgman, 2014). Despite tangible assets, intangible capital and other intangibles, IA could have international headquarters for legal purposes. The study conducted by Bridgman (2014) shows a decay of IA investments in the USA from 1994 to 2010. Bridgman's study used information from the most important multinational firms in the USA. The study's statistics do not include many IA held by multinationals, such as trade secrets or organization capital. The results provide a better understanding of IA tax treatment and show the importance of IA in firms, and, furthermore, the need for new strategies to tax multinational's intangibles.

The study conducted by Heiens et al., (2007) regarding the implication of 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 proceeded using the resource-based 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 of a positive relationship between IA and shareholders' returns, specifically those intangibles resources that

are used for advertising that have a positive but slight impact on long-term returns. The study did not use traditional ratio measures since it is argued that ROE cannot help in market adjusted periods of time.

One study focused on IA such as trademarks and the acquisition of those types of intangibles. Sinclair and Lane Keller (2014) studied the disagreement between the accounting and financial standards regarding intangibles, specifically trademarks and self-generated IA. Sinclair and Lane (2014) studied the P&G corporation due to its importance in the financial market and because of the corporation intense acquisition of brands. They tested the inconsistency of accounting tools for measuring those IA owned by the company. The results exhibit a basic conceptual conflict between those standards and the need for an accounting framework that fits the new dimension of IA. Further, the results suggest that higher accumulation of IA, trademarks in this case, is a sight of growth.

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 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.

Intangibles affecting the present value and growth options were the aim of the study performed by Makrominas (2017). The study investigated the effects of present value growth options by IA apart from goodwill. Accompanying, the study correspondingly shows that the relation between the level of IA disclosure and market perception of growth options was positive. Makrominas' study used a cross-section of publicity trade US firms from 1976 to 2010. The data was obtained from the North American Annual Compustat. Overall, the results show an effective relationship between recognized IA and firms' growth options.

In the light of the above, the influence of IA on today's economy and companies' administration is notable. Sinclair and Lane Keller (2014) state that enterprise value increasingly has more to do with IA, rather than tangible ones. In recent years IA have gained more relevance for all companies, especially the technological sector, thanks to their capability to create unique value, adding knowledge and promoting substantiality of companies'. Considering that tangible assets are not likely to be sources of sustainable competitive advantage due to the ease in which tangibles can be duplicated (Carmeli, 2001), scholars tend to appreciate more the set of benefits in the IA. These properties allow companies to obtain competitive advantages by distinguishing themselves and stepping ahead of their competitors.

Intangibles play a critical role in business' planning. Therefore, many scholars have confidence in the power of IA to develop business, guarantee firms' subsistence and project superior shareholders returns (Ciprian, Valentin, Mădălina, & Lucia, 2012; Heiens et al., 2007; Tahat et al., 2017, sec. 2.1).

Globalization, knowledge economy and the management approaches in the late 2000's shifted the treatment of IA and business transactions. A variety of studies support the positive effects of IA on business performance and long-term success (Heiens et al., 2007; Nakamura, 2008). Moreover, several studies mention the necessity of singularity in business and predict that in a non-distant future each firm will opt to acquire a unique combination of intangible investments to step forward and distinguish themselves in the market. Further, authors and practitioners foretell management methods will be focused on IA treatment.

Assets are more than possessions that add value to the company. As El-Tawy & Tollington (2013) said, one should see assets as more than just their ability to generate future income, one should also see the power within assets, a power that could provide companies the opportunity to negotiate and trade.

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 future net cash inflows.
- The entity is able to receive the benefit and restrict other entities' access to that benefit.
- 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.

1. Intangibles should be identifiable.
2. Intangibles should possess evidence of legal ownership.
3. Intangibles should be capable of being separate and divisible from the real estate.
4. 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. For example, a hotel chain business is a fitting example to apply these 4-step test. The hotel's brand name is "True", and the firm has a trademark license describing the firm's logo, font type, colour and design. The firm decides to sell one of its hotels to a different hotel chain. The firm sells the facility, equipment and the land but not the brand. The True brand can be legally transferred, separate from the real estate, as it has a legal ownership and is identifiable.

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).

As it was said before, intangible resources are classified after being recognized, because they must meet the following conditions to be categorized as IA: Be able to be separated and measured. For accounting and tax purposes the classification found in the IAS 38 outlines the types of intangibles that could be part of the assets recognized on the balance sheet statement (IFRS Foundation, 2014). They are as follows:

- Computer Software
- Patents
- Copyrights
- Motion Picture Films
- Customer Lists
- Mortgage Servicing Rights
- Fishing Licenses
- Import Quotas
- Franchises
- Customer or Supplier Relationships
- Customer Loyalty
- Market Share and Marketing Rights

The standard requires proof of future benefits from the asset and a clearly measurable cost of development or acquisition.

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 following scheme summarizes accurately the classification of IA (Vilora, Nevado, & Lopez, 2009), see Figure 2. From right to left, the scheme divides IA into visible or hidden assets. From left to right, the mapping categorizes intangibles for separability, acquisition, (internally generated or acquired) and ends with the most common examples.

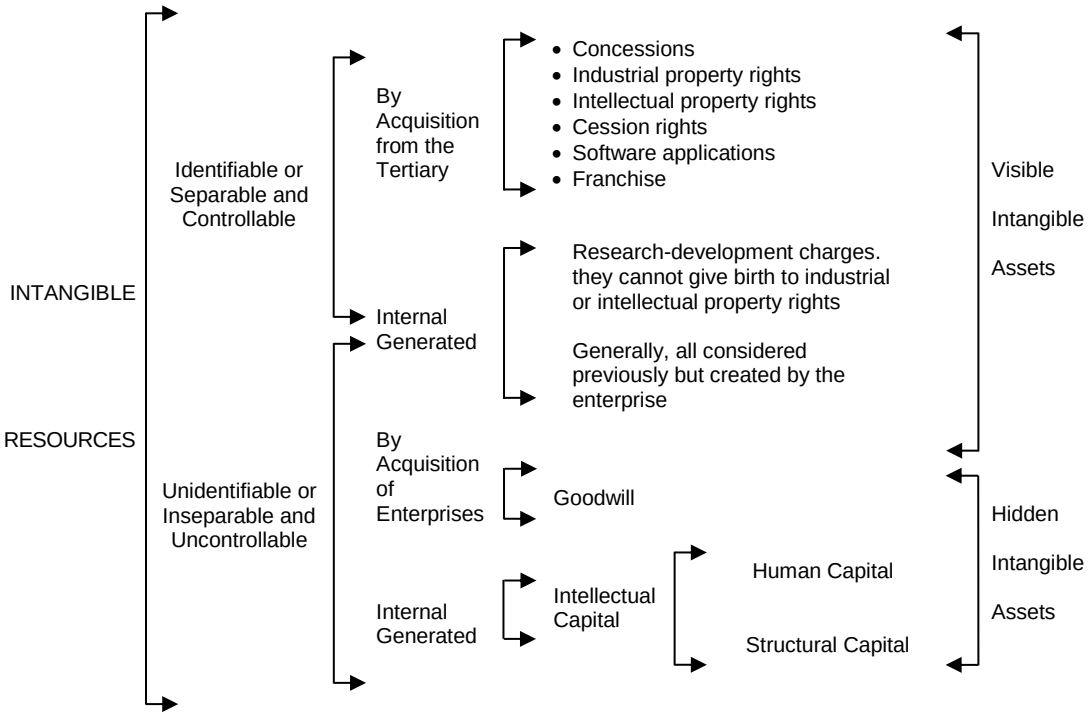

Figure 2. Classification of IA.

Source: G. Vilora, D. Nevado and V. R. Lopez (2009, p. 22).

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.

I found several studies where a cross-sectional analysis was used to study the IA, see Table 1. The studies are from different countries and apply to diverse fields (though the financial field is the most examined). The studies provide a variety of conclusions where IA are not a key factor for present or future economic benefit.

Table 1. Previous studies on IA using cross-sectional analysis.

Author(s)	Name / Sphere	Method	Conclusions
(Easton, 1998)	Revalued Financial Tangible and Intangible Assets Financial	Cross-sectional regression	In view of the somewhat vague motivation for price-levels regressions, there appears to be no compelling reason for running price-levels regressions at all.
(Lee & Yeo, 2016)	The Association Between Integrated Reporting and Firm Valuation Financial	Cross-sectional variation in integrating reporting	The study predicts that Integrated Reporting reduces the information processing costs in firms with complex operating and informational environment. Consistent with our prediction, we find that the positive association between firm valuation and Integrated Reporting is stronger in the firms with higher organizational complexity, suggesting that Integrated Reporting improves the information environment in complex firms such as firms with high IA, firms with multiple business segments and large firms.
(Ballester et al., 2003)	The Economic Value of the R&D, Intangible Asset Economic	Cross-sectional and time-series	The time-series estimates of the R&D asset are negatively associated with size, past profitability, and the growth rates in sales and R&D expenditures. Moreover, the results document the existence of significant differences between the firm-specific, time-series, estimates of the economic value of the R&D asset and the cross-sectional, industry-wide, estimates generally used in the literature. The time-series approach seems to yield estimates of the economic value of the R&D asset that show stronger associations with both subsequent stock returns and the contemporaneous difference between the market and book value of equity.
(Yu, Lin, Oppenheimer, & Chen, 2008)	Intangible Assets and Firm Asset Risk-Taking: An Analysis of Property and Liability Insurance Firms Risk	Cross-sectional regression	It presents evidence that IA deter property and liability insurers from taking on extra asset risk, opposite to the effect of tangible assets that often expand insurers' asset risk-taking capacity. In addition to the inverse relation between insurers' asset risk and IA, we find that insurers' going-for-broke incentives strongly affect insurers' asset risk-taking incentives.
(Makrominas, 2017)	Recognized Intangibles and The Present Value of Growth Options Financial	Cross-sectional	Overall, our results shed light on how recognized intangibles, as a summary balance sheet item, must be interpreted in relation to firm growth and are useful to users of financial statements forming investment and credit decisions, to policymakers aiming at stimulating firm growth, and to standard setters aiming at improving value relevance.

Continue of Table 1. Previous Studies on IA using Cross-Sectional Regression Method

Author(s)	Name / Sphere	Method	Conclusions
(Li, Liu, & Xue, 2014)	Intangible Assets and Cross-Sectional Stock Returns: Evidence from Structural Estimation Financial	Cross-sectional regression	The estimation shows that incorporating intangible investments into the q-theory framework is critical for the model to explain cross-sectional stock returns and generate a reasonable estimate of the adjustment costs of tangible investments. It is costlier to accumulate IA than tangible assets.
(Heiens et al., 2007)	The Contribution of Intangible Assets and Expenditures to Shareholder Value. Manufacturing Firms	Cross-section	Overall, our research indicates that for the manufacturing firms in our sample, advertising, goodwill, and research and development do not have a significant positive impact on shareholder value as measured by holding period returns. Only intangible assets other than goodwill appeared to have a statistically significant and positive impact on shareholder value.
(Mehralian & Reza, 2012)	The Impact of Intellectual Capital Efficiency on Market Value: An Empirical Study from Iranian Pharmaceutical Companies Pharmaceutical	Cross-sectional and time series	The results of this research did not confirm that companies with higher value-added intellectual coefficient have a higher market valuation. The current research also implies that an insignificant relation exists between human capital and the company's market value in Iran.

Source: Author's ownership.

1.2. 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 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. A study by Cañibano, Garcia-Ayuso and Sánchez, (2000) provided significant information about market value usage. 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 companies 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.

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

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 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. Due to this, this study focuses on this ratio because it can be deployed using book and market values.

2. Methodology

2.1. Objective of the Study

IA are the object of this study due to the remarkable increasing within companies over the last 3 decades, as mentioned by Lev and Daum (2004). The intention of this study is to add knowledge to the scientific community regarding how IA influence the ROE. According to some literature, the IA has a positive effect on income generation, while other research has not found this positive effect in relation to those IA recognized on the balance sheet. Thus, it is important to add new knowledge and to answer the question: what is the influence of IA, recognized in the balance sheet, on companies' ROE?

Therefore, to answer the question, and considering only the IA recognized in the financial statements, the main objectives of this study are:

1) Analyze the impact of IA on ROE, measured at book values.
2) Analyze the impact of "IA, including goodwill" on ROE, measured at book values.
3) Analyze the impact of IA on ROE, measured at market values.
4) Analyze the impact of "IA, including goodwill" on ROE, measured at market values.
5) Compare the results of book and market value approach.

2.2. Data and Sample

In pursuance of the study's main goal, data was collected from the companies that constituted the Standard & Poor 100 Index (S&P 100) in 2016. The S&P 100 consists of 101 companies selected from the S&P 500 index. The Index comprises 101 major blue-chip companies across multiple industry

groups. The S&P 100 index was chosen due to the relevance of the USA economy and its impact on the global economy.

For this study, the full list of the companies comprising the S&P 100 index was obtained from the official website of Standard and Poor Index (Appendix n°1 shows the list of the 101 companies). The software Microsoft® Excel® 2016 was used to create a database that displays the companies' name, net profit, sales, total assets, IA, goodwill, total equity, shares outstanding and price per share. This information was collected from the firms' financial statements. The financial statements were extracted from the annual report known as the 10k form of the U.S. Securities and Exchange Commission. The 10k forms were obtained using the Electronic Data Gathering, Analysis, and Retrieval system (EDGAR)1. Regarding the price per share, the information was taken from the website Yahoo Finance.2. All the information was collected in the 3rd week of November 2017.

Most of the financial statements are issued for the calendar year, from January 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 issued theirs.

During the data analysis process, 2 companies were left out of the selection due to a lack of information. The companies were Google Inc (GOOG. Symbol) and Twenty-First Century Fox, Inc. (FOX. Symbol). This was due to the fact that in the 2016-year Twenty-First Century Fox, Inc. changed its symbol to FOXA. Regarding 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 IA on their financial statements nor in their annual reports. The use of tax haven entities (e.g. "patent box" companies) located in low-tax jurisdictions could explain the absence of IA. As Bryan et al. (2017) argued in their study on capital affluence between countries, there is an increase in reallocating capital and IA in foreign countries that have lower taxation rates on intangibles. Thus, these firms were not useful in this study. Three more firms were taken out of the group due to their deficit in total equity, due to a repurchasing of more than 70% of their own shares. The magnitude of this buyback action could affect in a significant manner the financial ratios results. The companies were: Colgate-Palmolive, McDonald's and Philip Morris. The data presented 4 outliers: these companies exhibit values far outside of the average (mean) of the sample. For this reason, the companies Home Depot, Lockheed Martin, Boeing and United Parcel Service were taken out of the

[1] US Securities and Exchange Commission. https://www.sec.gov/edgar.shtml
[2] Yahoo Finance, https://finance.yahoo.com/

sample. Finally, the financial institution entities were left out due to their particular accounting framework and regulation - American Express, Bank of America, Bank of New York Mellon, Berkshire Hathaway, Capital One Financial, Citigroup, J.P. Morgan Chase, Mastercard, Morgan Stanley, The Goldman Sachs, Group, U.S. Bancorp, Visa and Wells Fargo.

To summarize, 68 organizations comprised the study's final sample (see appendix n° 2). The data refers to the business year 2016: all variables were measured at the same moment in time, making this a cross-sectional database. This database is constituted by 4 independent variables: Net profit divided by Sales, Sales over Intangible Assets, Intangible Assets divided by Total Assets and Tangible Assets over Shareholders' Equity. All the variables are presented and defined in detail in the sub-section 2.3.1, where their importance for achieving the objective of the research study is explained. ROE is the dependent variable.

2.3. Methods

The methods used in this thesis are described in the following sub-points. First, the DuPont method is described then the OLS method.

2.3.1. DuPont

The DuPont analysis was chosen for this study because it gives a more in depth financial analysis, recognizing that ROE can be separated into return on sales, asset turnover and equity multiplier. By doing this, the analysis delves deeper into the cause of the ROE results. As was mentioned in the previous chapter, this disaggregation is known as the Three-Step Dupont model. The DuPont Analysis gives strong insight into the reasons for a company's performance. Perhaps the most important consequence of the DuPont Analysis is that it allows analysts to develop specific ratios that enable them to formulate indicators relevant to a specific analysis being performed or that are particularly relevant to the company being analyzed (Sherman, 2015).

This study used reported information in financial statements, such as balance sheet and income statements. Additionally, stock price and shares outstanding were some of the values used to calculate market ratios. By using the Three-Step DuPont Method this study will evaluate its third objective, the relevance of the IA on the ROE. As was outlined in the previous chapter, by separating the factors composing the net income on the main ROE, Eq. 3, the factors are net profit over sales, sales divided by total assets and total assets over shareholders equity. The formula is as follows:

$$\text{Return on Equity} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Shareholders}'\text{equity}} \quad [3]$$

For our purposes, we will break down the formula to separate the IA from the total assets, using the book value. The intangibles were isolated by segregating the assets turnover ratio (Sales/total assets), see Eq. 4. The split formula divides total assets over shareholders' equity.

$$\text{Return on Equity}_{bv} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Intangible Assets}} \times \frac{\text{Intangible Assets}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Shareholders}'\text{equity}} \quad [4]$$

As the result of this split, we obtained an adjusted formula from the original Dupont Model. The formula provides a framework of the variables that were to be used in this study. The formula above, Eq. 4, shows the 4 independent variables to be used in this study: 1I) Profit Margin, 2I) IA turnover, 3I) IA ratio and 4I) Financial leverage ratio. The formula also shows a dependent variable, 1D) ROEbv. See Table 2 for further description of the variables. IA turnover measures the profit of sales over IA, and the outcome depends on the type of business and the effective use of IA. However, this does not show the weight of IA on the total assets. The variable intangible assets ratio (IAR) represents the weight of IA over total assets and it will measure the effect of the IA on the ROE.

In this study, we also used the market value formula to compare the ROE as an accounting measure to the ROE based on the market value[3], Eq. 5. The difference between the previous formula is solely in the ROE; the independent variables remain as in the previous one. Return on equity market value was calculated by multiplying the price per shares and shares outstanding for each company.

$$\text{Return on Equitiy}_{mv} = \frac{\text{Net Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Intangible Assets}} \times \frac{\text{Intangible Assets}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Shareholders}'\text{equity}} \quad [5]$$

With this procedure we obtained a new modified Dupont model, where the dependent variables are the same as those used in the Eq. 4, but the ROE is measured at market value. An extended description of the variables is found in Table 3, where market values are implemented on the modified ROE formula.

One of our main objectives was to study the impact of the "IA including goodwill" on ROE. Therefore, the ratios IATg and IARg were added to Table 2 and Table 3. To summarize, 6 independent variables and 2 dependent variables were recognized to achieve the main aim of the study. All the formulas depicted in Table 2 and Table 3 may differ from other sources, as different studies use diverse ratio formulas to calculate financial indicators.

[3] The ROE based on the market value of equity is equivalent to a "return on investment" without considering capital gains.

Table 2. Description of all variables, book value.

Ratio	Abbreviation	Description	Ratio Formula	Expected effect
Return on equity book value	ROEbv	Return on the shareholders' investment over a year. Measuring profitability, using book values.	$ROE_{BV} = \frac{Net\ Profit}{Shareholders'equity} \times 100$	n/a
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 IA are deploying in generating revenue, excluding the goodwill.	$IAT = \frac{Sales}{Intangible\ Assets} \times 100$	+
Intangible assets including goodwill turnover	IATg	Shows how IA and goodwill are deploying in generating revenue.	$IAT_g = \frac{Sales}{Intangible\ Assets} \times 100$	+
Intangible assets ratio	IAR	This variable represents the amount of IA from the total assets, excluding the goodwill.	$IAR = \frac{Intangible\ Assets}{Total\ Assets} \times 100$	+
Intangible assets including goodwill ratio	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 total assets.	$FL = \frac{Total\ Assets}{Shareholders'equity} \times 100$	+/-

Note: Positive expected effect of the independent variables is represented by the symbol "+". On the contrary, the symbol "-" stands for a negative effect on ROE by the independent variables. All variables are presented in percentage.

Source: Author's own authorship.

Table 3. Description of all variables, market value.

Ratio	Abbreviation	Description	Ratio Formula	Expected effect
Return on equity market value	ROEmv	Return on the shareholders' investment over a year. Measuring profitability, using market values.	$ROE_{MV} = \frac{Net\ Profit}{Shareholders'equity\ MV} \times 100$	n/a
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 IA are deploying in generating revenue, excluding the goodwill.	$IAT_1 = \frac{Sales}{Intangible\ Assets} \times 100$	+
Intangible assets including goodwill turnover	IATg	Shows how IA and goodwill are deploying in generating revenue.	$IAT_2 = \frac{Sales}{Intangible\ Assets} \times 100$	+
Intangible assets ratio	IAR	This variable represents the amount of IA from the total assets, excluding the goodwill.	$IAR_1 = \frac{Intangible\ Assets}{Total\ Assets} \times 100$	+
Intangible assets including goodwill ratio	IARg	This variable represents the amount of IA plus goodwill from the total assets.	$IAR_2 = \frac{Intangible\ Assets}{Total\ Assets} \times 100$	+
Financial leverage	FL	Represents how much of the equity was used to fund total assets.	$FL = \frac{Total\ Assets}{Shareholders'equity} \times 100$	+/-

Note: Positive expected effect of the independent variables is represented by the symbol "+". On the contrary, the symbol "-" stands for a negative effect on ROE by the independent variables. All variables are presented in percentage.

Source: Author's own authorship.

2.3.2. Ordinary Least Squares (OLS)

The econometric method used in this study to process the selected data is the OLS method. The OLS 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, De Boer, Franses, Kloek and Dijk, (2004) described the OLS as the first step in estimating economic relations, providing a valuable insight into the relationships between economic variables. The main objective of using the OLS method is to minimize error of estimation.

For this research study, this method was applied to the data selected from the S&P 100 Index to analyze the influence of the IA recognized in the balance sheet financial statement on the ROE. The software GNU Regression, Econometric and Time-Series Library© version gretl 2017d was used to perform the OLS analysis. Along with the main purpose, it was intended to determine which among the four designated variables for this study (Profit Margin, Intangible Assets Turnover, Intangible Assets Ratio and Financial Leverage) influence the ROE for market and book value of companies listed in S&P 100. The equation of the OLS method for a multiple regression, Eq. 6, is as follows:

$$Y = \alpha + \beta_1 X_1 + \cdots + \beta_k X_k + \varepsilon \qquad [6]$$

where *Y* stands for the dependent variable, α stands for the constant (intercept), β stands for the coefficient of the independent variable, *X* stands for an independent variable and ε stands for the error term (the unobserved disturbance).

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, if Eq. 4 and 5 were transformed using the logarithmic function, the formulas will represent the logarithmic values of the variables. 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 formulas, Eq. 7, 8, 9 and 10, 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.

The following formula, Eq. 7, presents the multiple regression model to explain the ROE (measured in growth rate) at book values:

$$lROEbv_i = \alpha + \beta_i lPM_i + \beta_i lIAT + \beta_i lIAR_i + \beta_i lFL_i + \varepsilon_i \quad [7]$$

The following formula, Eq. 8, presents the multiple regression model to explain the growth rate of the ROE using its market value:

$$lROEmv_i = \alpha + \beta_i lPM_i + \beta_i lIAT + \beta_i lIAR_i + \beta_i lFL_i + \varepsilon_i \quad [8]$$

The following formula, Eq. 9, presents the multiple regression model to explain the growth rate of ROE at book values adding goodwill to IA:

$$lROEbv_i = \alpha + \beta_i lPM_i + \beta_i lIATg_i + \beta_i lIARg_i + \beta_i lFL_i + \varepsilon_i \quad [9]$$

The following formula, Eq. 10, presents the multiple regression model to explain the growth rate of ROE using its market value adding goodwill to IA:

$$lROEmv_i = \alpha + \beta_i lPM_i + \beta_i lIATg_i + \beta_i lIARg_i + \beta_i lFL_i + \varepsilon_i \quad [10]$$

As in Eq. 6, for these last 4 last equations, 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 (for book values and market values) are linear in their parameters; second, data is a randomly selected sample of the population, in other words, uncorrelated from each other; third, independent variables are measured exactly such that measurement error is negligible; and, finally, independent variables are not too rigidly collinear.

These assumptions were verified, as it is explained in the following section. Regarding the first assumption, the results of the estimations show the book and market values are linear in their parameters. Regarding the second assumption, most of the cross-sectional databases fail to be free of homoscedasticity. However, such a problem can be overcome by using the robust standard errors function on the OLS analysis. Applying this function, the standard errors obtained in the OLS estimation are robust which means that the error is constant from observation to observation. The error term is

homoscedastic. Concerning the third assumption, the variables were measured according to the way they are presented publicly, which leads to the conclusion that the measurement error is insignificant in this research study. The last assumption deserves greeter attention throughout the estimation of the models and presentation of the results.

The last assumption requires data to not be too strongly collinear. The importance of this assumption lies in the statistical problem of multicollinearity. It is frequently presented in regression analysis with more than a single independent variable since this problem occurs when two or more variables are moderately or highly correlated. To corroborate that multicollinearity is not present in this study, the so-called Variance Inflation Factor (VIF) test will be implement: one of the most common tests implemented to test for collinearity among independent variables. The test will be calculated after running an OLS model. The results of the VIF test are easy to interpret. If the value of the VIF test is higher than 10 the independent variable is strongly correlated with other (or others) independent variables. The solution, when it is not possible to add more observations or manipulate the variables, is to withdraw from the model the variable (s) that caused the multicollinearity.

Working with multiple linear regression models requires performing the Regression Specification Error Test, better known as RESET. Researchers run this test to ascertain that there is no misspecification on the functional form of the model. In other words, scholars use RESET to test the null hypothesis of correct specification. The test indicates if something is wrong on the model, this is the usefulness of this test. Implementing the REST help us to be sure that there were no omitted variables or incorrect descriptions of the independent variables that affect the relationship with the dependent variable. Both errors could lead to severe complications in the interpretation of the OLS results and lead to inaccurate conclusions.

3. Empirical Results

The current section contains a descriptive statistical analysis, the results of the Pearson correlation test and finally the results of the OLS method applied to the sample of companies (68 companies). The descriptive analysis is presented first. Then, a Pearson correlation test is presented to show how the variables could be related (as a way to understand the signs of the correlation and the strength of that correlation) and at the end, the results of the OLS method conclude the results section. The results will show the effects of the independent variables, profit margin (lPM), IA turnover (lIAT), IA ratio (lIAR) and financial leverage (lFL), on the return on equity book value and market value.

3.1. Descriptive Statistical Analysis

It is necessary to understand the indicator values before this study undertakes analysis of the results of the OLS Method. Table 4 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 the Table 4. 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.

Table 4. Descriptive statistics of all variables.

Indicator	Mean	Median	Min	Max	Standard Deviation	Coefficient of Variation	Skewness	Kurtosis
ROEbv	0,25	0,19	-0,04	1,28	0,23	0,90%	2,38	7,16
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 results are presented in the same unit of measurement as the variables, excepting the coefficient of variation

Source: Authors' calculations.

The variables "intangible assets turnover" and "intangible assets turnover including goodwill" project the longest distance between their means and maximums. Intangible assets turnover excluding goodwill 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 intangible assets ratio including and excluding goodwill. Intangible assets turnover ratio including and excluding the goodwill 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 intangible assets turnover including goodwill presented 108,65% of deviation. That means the data for intangible assets turnover adding goodwill (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 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. Return on equity market value exhibits the highest value with 50% of kurtosis. 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 "profit margin" and "intangible assets ratio" 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 the profit margin variable and for the intangible assets ratio 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). In other words, thought the majority of the variables' values that are close to the average, there is a few number of values that are far away from the average. Moreover, the intangible assets ratio and profit margin have narrower dispersions in contrast to intangible assets turnover and financial leverage ratios. To wit, the variables intangible assets turnover and profit margin have values that are close to each other, which is not present in the intangible assets ratio and financial leverage.

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.

3.2. Pearson Correlation

This subsection presents the results of the Pearson correlation test applied on the study's sample. Performing this test will help the study to answer the research questions, in order to know if the IA recognized according to IAS 38 have a positive impact on the return on equity. As explained in section 2, a set of 68 companies listed on the S&P 100 index in 2016 compose the dataset.

The study includes a Pearson correlation coefficient test on the designed independent and dependent variables. 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 for both sets, book and market value, are displayed in Table 5. The table shows in the first column the name of the logarithmic function of the dependent variables (lROE), for each one of the types of the evaluation values, and the following columns display the independent variables and the results of the Pearson correlation coefficient test. For each computed value the level of statistical significance is also presented.

Table 5.Results of Pearson correlation for both sets.

Dependent variables	Independent variables			
	lPM	**lIAT**	**lIAR**	**lFL**
Logarithmic ROE Book Value	0,44*	0,05	0,19*	0,37*
Logarithmic ROE Market Value	0,15*	0,02	0,12	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.

Source: Author's calculations.

The results show an intense and positive relation between the logarithmic version of the variables return on equity book value and profit margin in comparison to the rest of the independent variables; this means that the observations in the profit margin correspond with observations of the return on equity book value. Intangible assets ratio and intangible assets turnover present low correlation coefficient for return on equity while using book and market values, for the market value set the variable intangibles assets turnover is the weakest. Until this point, the IA recognized in the financial statements show almost insignificant influence on neither book or market value of the return on equity.

To accomplish the main objectives, the Pearson correlation coefficient test was performed for the variables, adding goodwill value to intangible assets. The following table, Table 6, has the same structure as Table 5, but the variables lIAT and lIAR were substituted for lIATg and lIARg.

Table 6. Results of Pearson correlation for both sets, including goodwill.

Dependent variables	Independent variables			
	lPM	**lIATg**	**lIARg**	**lFLbv**
Logarithmic ROE Book Value	0,44*	-0,01	0,14*	0,37*
Logarithmic ROE Market Value	0,15*	-0,03	0,08	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.

Source: Author's calculations.

Most of the independent variables are positively correlated with their respective dependent variables (return on equity). The variable profit margin presents similar results as in the previous test, for book and market value. The FL variable exhibits the highest results, representing as the most related independent variable to the logarithmic function of the return on equity. The logarithmic function of intangible assets turnover plus goodwill has a negative coefficient lower than 3% on both book and market value on the return on equity. Moreover, the logarithmic function of intangible assets ratio plus goodwill exhibits the lowest results. This is to say that the logarithmic function of the variables carrying IA do not have a significant correlation to the growth rate of lROE using either book or market values.

3.3. OLS Regression Analysis Results

In this section, the study presents the results of the OLS regression using the Eq. 7, 8, 9 and 10 explained in subsection 2.3.2.

The format of Table 7 displays in the first column the adjusted independent variables that, in this study, are being analyzed to find out if they influence the growth rate of lROE. The second column shows the results obtained for the estimated coefficients – the estimated coefficients indicate how a change of 1% in the independent variable changes, in percentage, the rate of growth of the dependent one. The growth rate of the dependent variable will change in the same direction as the independent variable if the value of the estimated coefficient is positive; on the contrary, it will change in an opposite direction if the estimated coefficient presents a negative sign. This analysis requires that all the other variables remain constant. 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) which allow for conclusions about the independent variables' strong multicollinearity. The table correspondingly displays the number of observations using the letter n, the results for the joint statistical significance test (F-test) and the Adjusted R-squared (adjusted for the degrees of freedom).

The following tables display the results of the OLS using logarithmic values for the book value set excluding goodwill, Table 7, and including goodwill, Table 8.

Table 7. Results of the OLS analysis of book value.

Model 1. Logarithmic book value, excluding goodwill					
Variables	**Estimated coefficient**	**Standard robust error**	**P-value**	**Statistical Significance**	**VIF**
Constant	-0,95	0,30	<0,001	***	-
lPM	0,67	0,13	<0,001	***	1,20
lIAT	0,41	0,17	0,0,2	**	3,80
lIAR	0,34	0,18	0,07	*	3,52
lFLbv	0,73	0,14	<0,001	***	1,02
n=66					
F-Test (4, 61) = 9,62***					
Adjusted R-squared = 0,64					

Note. The symbol (***) means 1% level of significance, (**) means 5% of level of significance and (*) means 10% of level of significance. The symbol (-) stands for "not applicable".

Source: Author's calculations.

From the results shown in Table 7, it is possible to state that all the estimated coefficients are statistically significant, including the estimated coefficient for the constant. Indeed, with a level of confidence of 99% it is possible to trust the values computed for the coefficients of the constant, lPM and lFLbv. With a level of confidence of 95% is possible to trust the value computed for the coefficient of lIAT and with a confidence level of 90% is possible to trust the coefficient computed for the lIAR. This means, for instance, that if the financial leverage (lFLbv) grows 1%, the book value of the return on equity (lROEbv) will grow in the same direction by 0,73%. Regarding the profit margin, if it also grows 1% (lPM) this will cause a 0,67% grow in the book value of the return on equity. With respect to intangible assets turnover (lIAT), if it grows 1% the growth in the return on equity will be almost 0,4%. Finally, as for the intangibles assets ratio, if lIAR increases 1% the lROE will grow 0,35%.

The model presented in Table 7 has 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 ROE). The results of the F-test (the test for joint statistical significance) indicates the existence of a statistically significance, which means that the variables together compose a good model. This result is supported by the value of the adjusted R-squared. The value of this indicator shows that 64% of the growth on the return on equity is caused by changes that occurred in the independent variables included in the model. Still, 36% of the changes on the return on equity are due to the error term included in the model, this is not explained by the model itself. Finally, it should be noted that the values for the VIF (Variance Inflation Factors) are all smaller than 10, which excludes any collinearity problems among the independent variables.

The following table presents the same format as in the previous table. However, this table presents the logarithmic function of the variables including goodwill. See Table 8.

Table 8. Results of the OLS analysis of book value, including goodwill.

Model 2. Logarithmic book value, including goodwill					
Variables	**Estimated coefficient**	**Standard robust error**	**P-value**	**Statistical Significance**	**VIF**
Constant	-0,73	0,21	<0,001	***	-
lPM	0,76	0,10	<0,001	***	1,28
lIATg	0,48	0,10	<0,001	***	2,87
lIARg	0,31	0,10	<0,001	***	2,48
lFL	0,69	0,15	<0,001	***	1,03
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”.					

Source: Author’s calculations.

The Model 2, exhibited in Table 8, 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. The profit margin shows the highest estimated coefficient. This is to say that if the variables change 1%, the return on equity will change in the same direction. For the lPM variables, the growth of lROEbv will grow 0,76%. In the case of lFL, the change will be 0,69%. Concerning lIATg, if it increases 1% the growth in the lROE will be close to 0,48%. Finally, the lIARg presents the weakest effect with 0,31%. That is, that the growth in ROE will be almost 0,30%.

The model presented in Table 8 was estimated using 66 companies, as with the previous models. The result of the F-test signifies the existence of a statistically significant result, meaning that the variables together comprise a good model. This is supported by the result of the adjusted R-squared. The value of this indicator shows that 72% of the growth on the lROEbv is caused by changes in the independent variables that were adjusted in the model. Nevertheless, 28% of the changes on the return on the equity book value are due to the error term included in the model, this is not explained by the model itself. The values of the VIF are presented in the last column, for all variables the results are not higher than 10, this excludes any collinearity problems among the independent variables.

The following models aim towards the third goal of this thesis, to study the effects of the intangible assets using market values on the return on equity excluding and including goodwill. As was presented for the previous models, the following two tables display the same format and columns. The results of the OLS regression method for the logarithmic function of the independent variables where the goodwill is excluded are exhibited in Table 9. The results for IA including goodwill are shown in Table 10.

Table 9. Results of the OLS analysis of market value.

Model 3. Logarithmic market value, excluding goodwill					
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”.

Source: Author’s calculations.

Table 9 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 - as in the previous model, 2 companies were left out of the test due to presenting negative values on the ROE. 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 2 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 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.

Model 4 displays the results of the logarithmic function of the independent variables including goodwill using market values. See Table 10. The settings and columns are similar as in the previous models of this study.

Table 10. Results of the OLS analysis of market value, including goodwill.

Model 4. Logarithmic market value, 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	0,38	0,12	<0,001	***	10,88
lFL	0,47	0,19	0,02	**	1,08
n=66					
F-Test (4, 61) = 4,79**					
Adjusted R-squared = 0,10					

Note. The symbol (***) means 1% level of significance and (**) means 5% of level of significance. The symbol (-) stands for “not applicable”.

Source: Author’s calculations.

The Model 4, exhibited in Table 10, shows that all the variables present estimated coefficients with high statistical significance. All independent variables, the constant included, exhibit a level of confidence at

99%: therefore, it is possible to trust the values computed for all of them. 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.

3.4. Accounting Versus Market Value

The following subsection addresses the fifth objective of this study. This subsection undertakes a comparison of the results of OLS regression analysis of book and market sets: in other words, a comparative analysis of accounting measurements and market measurements. In doing so the study aims to draw conclusions regarding the impact of the logarithmic function of the independent variables on return on equity for the two sets, market and book value. Along with such comparisons, the results are also compared to other studies. A comparison of the logarithmic function of the variables tested in both sets, book and market value, is shown in Table 11. The table presents the results of the estimated coefficient in the second column, p-value in the second one and the statistical significance in the third for each set and for the four logarithmic function of the independent variables excluding goodwill.

Table 11. OLS comparison between sets, excluding goodwill.

OLS results in the comparison between book and market value, excluding goodwill						
	Book value			**Market Value**		
Variables	**Estimated coefficient**	**P-value**	**S.S.**	**Estimated coefficient**	**P-value**	**S.S.**
Constant	-0,95	<0,001	***	-2,84	<0,001	***
lPM	0,67	<0,001	***	0,26	0,04	**
lIAT	0,41	0,0,2	**	0,23	<0,001	***
lIAR	0,34	0,07	*	0,20	<0,001	***
lFL	0,73	<0,001	***	0,37	0,03	**

Note. The symbol (***) means 1% level of significance, (**) means 5% of level of significance and (*) means 10% of level of significance. S.S. stands for statistical significance.

Source: Author's calculations.

The results show a significant difference between the estimated coefficients. On average, all the variables present a reduction in their estimate coefficient by 49% in comparison from book to market value. The lIAR presents a reduction in its estimated coefficient of 41% from book to market value. Even though the lIAR presents a higher statistical significance in the market value set, the whole set has a low value of 11% of Adjusted R-squared. This means IA are better represented in the book value set than the market one. By comparing the two sets we could state that the lFL is the most influential variable because, even though it presents a 95% confidence level for the market set, it shows the highest results of estimated coefficient. As said in the previous subsection, the low values presented in Table 8 and Table 10 are due to the fact that the accounting does not properly reflect the market information. That is, the gap between the measurements based on the accounting framework and on the market is considered significant.

Due to the fact that the Model 4, exhibited in Table 10, presents a collinearity problem it is not possible to make a comparison of the logarithmic function of the variables tested in both sets, book and market value.

In comparison with other studies, our results were compared to 2 studies where the approach and the method were similar to ours. A recent study by Pucci et al., (2015) concludes that the value of IA have a positive effect on the companies' economic performance. Their study used several financial ratios, one of which was the return on equity. Even though the general conclusion indicates a positive influence of the IA on companies' economic performance, the study showed a low influence of the IA when the ROE was tested. Tahat et al. (2017), studied the impact of IA, specifically intellectual capital, on the financial performance of companies, using market values. Their results show no influence of the intellectual capital and other IA on companies' financial performance, using financial ratios as ROE and the return on assets. The authors pointed out that one of the limitations of the study was the conventional financial tools for valuation companies.

Conclusions, Limitations and Future Research Lines

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 book values or market values).

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, such as Ballester et al., (2003), Mehralian and Reza, (2012) and Easton, (1998).

According to our findings, based on the intangible assets ratio (IIAR), “IA excluding goodwill” shows an influence of 34% on the return on equity; that is, if the IA without goodwill factor grows 1%, the ROE will increase 0,34%.

Considering “IA including goodwill”, the ratio IIARg exhibits an influence of 30% on the ROE; it explains almost 0,30% of the growth in ROE when it changes 1%.

In the market value approach, the adjusted R-squared is 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 IIAR ratio presents the lowest value: 20%. Which means that a growth of 1% of the ratio will lead to an increase of 0,20% on the ROE. In the market value approach, the alternative “IA including goodwill” shows the IIARg 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 ROE. Therefore, the model is not suitable for conclusions.

By putting in contrast the book and market values, that is, financial accounting information vs market data, we found a notable gap between them. Regarding the IIAR independent variable, it shows a substantial difference in its estimated coefficient between sets (book and market). It goes from 0,34% at book value to 0,20% at market value, meaning that the model’s explanatory power and the coefficient of the variables of the market value model are lower than the book value

Based on the findings of this study, in answer the research question, the IA recognized on the balance sheet show some influence on the ROE. However, not very significant influence. If the goodwill is included in the IA, the influence on the ROE will decrease about 3% (many companies did not have goodwill).

Our results align with the findings of other studies (Berrone, Surroca, & Tribó, 2007; Ciprian et al., 2012; Lee & Yeo, 2016; Niculita et al., 2012; Saunders & Brynjolfsson, 2016) where IA are not the main factor in boosting companies’ performance.

Limitations and future research directions

For scheduling reasons, 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. As Artsberg and Mehtiyeva, (2010) conclude in their work on intangible assets literature, the IA recognized in the actual framework of the IASB are not well evaluated and measured, and the literature reviewed argues that a considerable amount of intangibles are left out of the scope of today's accounting standards. For taxation purposes (tax planning), a number of companies do not disclose their IA on their financial statements, instead they hide the IA in subsidiaries commonly known as "Patent-box companies" located in offshore jurisdictions, consequently, if all intangible resources were disclosed in the balance sheet, the results of studies such as these could be different.'.

For future research we suggest the use of broad indexes (e.g. S&P 500 index), creating a time-series approach.

References

Aboody, D., & Lev, B. (2000). Information Asymmetry , R & D , and Insider Gains. *The Journal of Finance*, *55*(6), 2747–2766. https://doi.org/10.1111/0022-1082.00305

Artsberg, K., & Mehtiyeva, N. (2010). A literature review on intangible assets. *Dept of Business Administration*, (June). Retrieved from http://www.stir.ac.uk/media/schools/management/documents/accountingfinance/eufin2010/EUFIN - Artsberg - Mehtiyeva.pdf

Ballester, M., Garcia-Ayuso, M., & Livnat, J. (2003). The Economic Value of the R&D Intangible Asset. *European Accounting Review*, *12*(4), 605–633. https://doi.org/10.1080/09638180310001628437

Berrone, P., Surroca, J., & Tribó, J. A. (2007). Corporate ethical identity as a determinant of firm performance: A test of the mediating role of stakeholder satisfaction. *Journal of Business Ethics*, *76*(1), 35–53. https://doi.org/10.1007/s10551-006-9276-1

Bratianu, C. (2017). The Knowledge Economy: The Present Future. In *Management Dynamics in the Knowledge Economy* (Vol. 5, pp. 477–479). https://doi.org/10.25019/MDKE/5.4.01

Bridgman, B. (2014). Do intangible assets explain high U.S. foreign direct investment returns? *Journal of Macroeconomics*, *40*, 159–171. https://doi.org/10.1016/j.jmacro.2014.03.006

Bryan, D., Rafferty, M., & Wigan, D. (2017). Capital unchained: finance, intangible assets and the double life of capital in the offshore world. *Review of International Political Economy*, *24*(1), 56–86. https://doi.org/10.1080/09692290.2016.1262446

Cañibano, L., Garcia-Ayuso, M., & Sánchez, P. (2000). Accounting for intangibles: a literature review. *Journal of Accounting Literature*, *19*, 102–130.

Carmeli, A. (2001). High- and low-performance firms: do they have different profiles of perceived core intangible resources and business environment? *Technovation*, *21*(10), 661–671.

Carrillo, F. J. (2015). Knowledge-based development as a new economic culture. *Journal of Open Innovation: Technology, Market, and Complexity*, 1:15. https://doi.org/10.1186/s40852-015-0017-5

Ciprian, G. G., Valentin, R., Mădălina, G. (Iancu) A., & Lucia, V. (Vlad) M. (2012). From Visible to Hidden Intangible Assets. *Procedia - Social and Behavioral Sciences*, *62*, 682–688. https://doi.org/10.1016/j.sbspro.2012.09.116

Ciurariu, G. (2015). The Du Pont de Nemours System within the Company Diagnostics. *Economy*

Transdisciplinarity Cognition, *18*(2), 25–32. Retrieved from http://www.ugb.ro/etc/etc2015no2/06_Gabriela_Ciurariu.pdf

Easton, P. D. (1998). Discussion of Revalued Financial, Tangible, and Intangible Assets: Association with Share Prices and Non-Market-Based Value Estimates. *Journal of Accounting Research*, *36*(Studies on Enhancing the Financial Reporting Model), 235–247.

El-Tawy, N., & Tollington, T. (2013). Some thoughts on the recognition of assets, notably in respect of intangible assets. *Accounting Forum*, *37*(1), 67–80. https://doi.org/10.1016/j.accfor.2012.10.001

Guerard, J. B., & Schwartz, E. (2007). *Quantitative corporate finance*. *Quantitative Corporate Finance*. https://doi.org/10.1007/978-0-387-34465-2

Heiens, R. A., Leach, R. T., & McGrath, L. C. (2007). The contribution of intangible assets and expenditures to shareholder value. *Journal of Strategic Marketing*, *15*(2–3), 149–159. https://doi.org/10.1080/09652540701319011

Heij, C., De Boer, P., Franses, P. H., Kloek, T., & Dijk, H. K. Van. (2004). *Econometric methods with applications in business and economics* (First edit). Oxford University Press.

IFRS Foundation. (2014). International Accounting Standard number 38. Retrieved from http://www.ifrs.org/issued-standards/list-of-standards/ias-38-intangible-assets/

Ipate, D. M., & Pârvu, I. (2016). The Impact of Intangible Assets on Companies in Emerging Markets, *11*(April), 94–99.

Jensen, M. C. (2008). Erratum: Paying people to lie: The truth about budgeting process (European Financial Management (2003) 9:3 (379-406)). *European Financial Management*, *14*(2), 375–376. https://doi.org/10.1111/j.1468-036X.2008.00424.x

Kijewska, A. (2016). Determinants of the return on equity ratio (ROE) on the example of companies from metallurgy and mining sector in Poland. *Metalurgija*, *55*(2), 285–288. https://doi.org/UDC – UDK 669.061.5:622.01.061:658.15=111

Lee, K. W., & Yeo, G. H. H. (2016). The association between integrated reporting and firm valuation. *Review of Quantitative Finance and Accounting*, *47*(4), 1221–1250. https://doi.org/10.1007/s11156-015-0536-y

Lev, B., & Daum, J. H. (2004). The dominance of intangible assets: consequences for enterprise management and corporate reporting. *Measuring Business Excellence*, *8*(1), 6–17. https://doi.org/10.1108/13683040410524694

Li, E. X. N., Liu, L. X. L., & Xue, C. (2014). Intangible Assets and Cross-Sectional Stock Returns: Evidence from Structural Estimation. Retrieved from http://dx.doi.org/10.2139/ssrn.1560014

Makrominas, M. (2017). Recognized intangibles and the present value of growth options. *Review of*

Quantitative Finance and Accounting, *48*(2), 311–329. https://doi.org/10.1007/s11156-016-0552-6

Mehralian, G., & Reza, H. (2012). The Impact of Intellectual Capital Efficiency on Market Value : An Empirical Study from Iranian Pharmaceutical Companies. *Iranian Journal of Pharmaceutical Research*, *11*(2012), 195–207.

Nakamura, L. I. . (2008). *Intangible Assets and National Income Accounting: Measuring a Scientific Revolution*. Philadelphia. Retrieved from www.philadelphiafed.org/research-and-data/publications/working-papers/

Niculita, A. L., Popa, A. F., & Caloian, F. (2012). The Intangible Assets–A New Dimension in The Company's Success. *Procedia Economics and Finance*, *3*(12), 304–308. https://doi.org/10.1016/S2212-5671(12)00156-6

Park, S. O. (2015). Interaction of corporate and urban systems: Accumulation of intangible assets. *Urban Geography*, *36*(6), 864–882. https://doi.org/10.1080/02723638.2014.934522

Pucci, T., Simoni, C., & Zanni, L. (2015). Measuring the relationship between marketing assets, intellectual capital and firm performance. *Journal of Management and Governance*, *19*(3), 589–616. https://doi.org/10.1007/s10997-013-9278-1

Rutkowska-Ziarko, A. (2015). The Influence of Profitability Ratios and Company Size on Profitability and Investment Risk in the Capital Market. *Folia Oeconomica Stetinensia*, *15*(1), 151–161. https://doi.org/10.1515/foli-2015-0025

Saunders, A., & Brynjolfsson, E. (2016). Valuing Information Technology Related Intangible Assets. *MIS Quarterly*, *40*(1), 83–110. Retrieved from https://login.cyrano.ucmo.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=112750558&site=ehost-live

Sherman, E. H. (2015). *A Manager's Guide to Financial Analysis: Powerful Tools for Analyzing the Numbers and Making the Best Decisions for Your Business* (6th ed.). Ama Self-Study.

Sinclair, R. N., & Lane Keller, K. (2014). A case for brands as assets: Acquired and internally developed. *Journal of Brand Management*, *21*(4), 286–302. https://doi.org/10.1057/bm.2014.8

Stockert, P., Kavan, S., & Gruber, M. (2016). What drives Austrian banking subsidiaries ' return on equity in CESEE and how does it compare to their cost of equity ? *OeNB, Financial Stability Report*, *33*, 78–88.

Tahat, Y. A., Ahmed, A. H., & Alhadab, M. M. (2017). The impact of intangibles on firms' financial and market performance: UK evidence. *Review of Quantitative Finance and Accounting*, 1–22. https://doi.org/10.1007/s11156-017-0657-6

Understanding Intangible Assets and Real Estate: A Guide for Real Property Valuation Professionals.

(2016). Kansas City.

Vilora, G., Nevado, D., & Lopez, V. R. (2009). *Medición y valoración del capital intelectual*. Madrid: Pearson Education.

Wittsiepe, R. (2008). *IFRS for small and medium-sized enterprises: Structuring the transition process*. *IFRS for Small and Medium-Sized Enterprises: Structuring the Transition Process*. https://doi.org/10.1007/978-3-8349-9754-8

Yu, T., Lin, B., Oppenheimer, H. R., & Chen, X. (2008). Intangible Assets and Firm Asset Risk Taking: An Analysis of Property and Liability Insurance Firms. *Intangible Assets Facilitate Insurers' Capacity to Retain Existing Business and Attract New Clients. In This Study We Analyze How the Incentives to Protect Intangible Assets Affect Asset Risk-Taking Behavior of Property and Liability Insurers. The Result* , *11*(1), 157–178.

.

Appendix

Appendix 1 – S&P 100 Index 2016

#	**Symbol**	**Company**
1	MMM	3M
2	ABT	ABBOTT LABORATORIES
3	ABBV	ABBVIE INC
4	ACN	ACCENTURE
5	GOOG	GOOGLE
6	GOOGL	ALPHABET INC.
7	MO	ALTRIA
8	AMZN	AMAZON.COM
9	AXP	AMERICAN EXPRESS
10	AIG	AMERICAN INTL
11	AMGN	AMGEN
12	AAPL	APPLE
13	T	AT&T
14	BAC	BANK OF AMERICA
15	BK	BANK OF NEW YORK MELLON
16	BRK.A	BERKSHIRE HATHAWAY
17	BIIB	BIOGEN INDEC
18	BLK	BLACKROCK
19	BMY	BRISTOL-MYERS SQUIBB
20	COF	CAPITAL ONE FINANCIAL
21	CAT	CATERPILLAR
22	CELG	CELGENE
23	CVX	CHEVRON
24	CSCO	CISCO SYSTEMS
25	C	CITIGROUP
26	KO	COCA COLA
27	CL	COLGATE-PALMOLIVE
28	CMCSA	COMCAST
30	COP	CONOCOPHILLIPS
31	COST	COSTCO WHOLESALE
32	CVS	CVS CAREMARK
33	DHR	DANAHER
34	DUK	DUKE ENERGY

Continue S&P 100

35	LLY	ELI LILLY
36	EMR	EMERSON ELECTRIC
37	EXC	EXELON
38	XOM	EXXON MOBIL
39	FB	FACEBOOK, INC.
40	FDX	FEDEX
41	F	FORD MOTOR
42	GD	GENERAL DYNAMICS
43	GE	GENERAL ELECTRIC
44	GM	GENERAL MOTORS
45	GILD	GILEAD SCIENCES
46	HAL	HALLIBURTON
47	HD	HOME DEPOT
48	HON	HONEYWELL INTL
49	INTC	INTEL
50	IBM	INTL BUSINESS MACHINE
51	JNJ	JOHNSON & JOHNSON
52	JPM	JP MORGAN CHASE
53	KMI	KINDER MORGAN
54	LMT	LOCKHEED MARTIN
55	LOW	LOWES COMPANIES
56	MA	MASTERCARD
57	MCD	MCDONALDS
58	MDT	MEDTRONIC
59	MRK	MERCK
60	MET	METLIFE
61	MSFT	MICROSOFT
62	MDLZ	MONDELEZ INTERNATIONAL INC
63	MON	MONSANTO CO
64	MS	MORGAN STANLEY
65	NEE	NEXTERA ENERGY
66	NKE	NIKE
67	OXY	OCCIDENTAL PETROLEUM
68	ORCL	ORACLE
69	PYPL	PAYPAL HOLDINGS, INC.
70	PEP	PEPSICO
71	PFE	PFIZER
72	PM	PHILIP MORRIS
73	PCLN	PRICELINE.COM

Continue S&P 100

74	PG	PROCTER & GAMBLE
75	QCOM	QUALCOMM
76	RTN	RAYTHEON
77	SLB	SCHLUMBERGER
78	SPG	SIMON PROPERTY GROUP
79	SO	SOUTHERN
80	SBUX	STARBUCKS
81	TGT	TARGET
82	TXN	TEXAS INSTRUMENTS
83	ALL	THE ALLSTATE
84	BA	THE BOEING
85	KO	THE COCA-COLA
86	GSBD	THE GOLDMAN SACHS GROUP
87	KHC	THE KRAFT HEINZ COMPANY
88	TWX	TIME WARNER
89	FOX	TWENTY-FIRST CENTURY FOX, INC.
90	FOXA	TWENTY-FIRST CENTURY FOX, INC.
91	UNP	UNION PACIFIC
92	UPS	UNITED PARCEL SERVICE
93	UTX	UNITED TECHNOLOGIES
94	UNH	UNITEDHEALTH GROUP
95	USB	US BANCORP
96	VZ	VERIZON COMMUNICATIONS
97	V	VISA
98	WBA	WALGREENS BOOTS ALLIANCE, INC.
99	WMT	WAL-MART STORES
100	DIS	WALT DISNEY
101	WFC	WELLS FARGO

Obtained from the website of S&P Down Jones Indices LLC.[4]

[4] https://us.spindices.com/indices/equity/sp-100

Appendix 2 – Data sample. 68 companies from S&P 100 Index 2016.

#	**Symbol**	**Company**
1	MMM	3M
2	ABT	ABBOTT LABORATORIES
3	ABBV	ABBVIE INC
4	ACN	ACCENTURE
5	GOOGL	ALPHABET INC.
6	MO	ALTRIA
7	AMZN	AMAZON.COM
8	AMGN	AMGEN
9	AAPL	APPLE
10	T	AT&T
11	BIIB	BIOGEN INDEC
12	BLK	BLACKROCK
13	BMY	BRISTOL-MYERS SQUIBB
14	CAT	CATERPILLAR
15	CELG	CELGENE
16	CSCO	CISCO SYSTEMS
17	KO	COCA COLA
18	CMCSA	COMCAST
19	CVS	CVS CAREMARK
20	DHR	DANAHER
21	LLY	ELI LILLY
22	EMR	EMERSON ELECTRIC
23	EXC	EXELON
24	XOM	EXXON MOBIL
25	FB	FACEBOOK, INC.
26	FDX	FEDEX
27	F	FORD MOTOR
28	GD	GENERAL DYNAMICS
29	GE	GENERAL ELECTRIC
30	GM	GENERAL MOTORS
31	GILD	GILEAD SCIENCES
32	HON	HONEYWELL INTL
33	INTC	INTEL
34	IBM	INTL BUSINESS MACHINE
35	JNJ	JOHNSON & JOHNSON
36	KMI	KINDER MORGAN
37	LOW	LOWES COMPANIES

Continue sample data.

38	MDT	MEDTRONIC
39	MRK	MERCK
40	MSFT	MICROSOFT
41	MDLZ	MONDELEZ INTERNATIONAL INC
42	MON	MONSANTO CO
43	NEE	NEXTERA ENERGY
44	NKE	NIKE
45	ORCL	ORACLE
46	PYPL	PAYPAL HOLDINGS, INC.
47	PEP	PEPSICO
48	PFE	PFIZER
49	PCLN	PRICELINE.COM
50	PG	PROCTER & GAMBLE
51	QCOM	QUALCOMM
52	RTN	RAYTHEON
53	SLB	SCHLUMBERGER
54	SPG	SIMON PROPERTY GROUP
55	SO	SOUTHERN
56	SBUX	STARBUCKS
57	TGT	TARGET
58	TXN	TEXAS INSTRUMENTS
59	KO	THE COCA-COLA
60	KHC	THE KRAFT HEINZ COMPANY
61	TWX	TIME WARNER
62	FOXA	TWENTY-FIRST CENTURY FOX, INC.
63	UTX	UNITED TECHNOLOGIES
64	UNH	UNITEDHEALTH GROUP
65	VZ	VERIZON COMMUNICATIONS
66	WBA	WALGREENS BOOTS ALLIANCE, INC.
67	WMT	WAL-MART STORES
68	DIS	WALT DISNEY

Selected of the obtained data from the website of S&P Down Jones Indices LLC 2016.