Carlos Alberto Pais de Azevedo Aguiar

Measuring Public Higher Education Institutions Financial Performance:

An application of the EVA® approach

Dissertação de Mestrado apresentada à Faculdade de Economia da Universidade de Coimbra
para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Gestão

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FEUC FACULDADE DE ECONOMIA
UNIVERSIDADE DE COIMBRA

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Orientador: Prof. Doutor Paulo Miguel Marques Gama Gonçalves

Coimbra, Julho de 2017

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Abstract

The HEI sector, not only in Portugal but worldwide, is facing a dynamic and turbulent environment. Driven by the economic crisis, demographic and social changes in student population, the decline in public funding and global competition, HEI are shifting now from a public service to a market-driven-one, and a value-driven approach is starting to taking part on these entities strategic plans. Primarily based on scorecard systems or composite indexes, which rely on budgetary and traditional ratio measures, they are unable to evaluate a value-based performance.

The Economic Value Added (EVA®) methodology have been referred in the literature as a privileged performance metric for measure value generation and integration in the corporate strategical decision process. The present work pretended to extend the concept and use of EVA® as a financial performance measure in the public HEI context.

For this purpose, the EVA® method was initially applied to the public HEI sector using the case study methodology in the University of Coimbra, considering the individual and consolidated accounts levels and two different approaches to the cost of capital, in the 2011 to 2016 time horizon. The results evidenced that, in the study time horizon, UC has been continuously increasing the financial created value.

Thereafter, the empirical analysis was extended to the Portuguese public HEI sector. The results evidenced an increasing value creation in the analysis period. The results evidence an increasing of EVA®, and therefore, value creation in HEI. As Portuguese HEI tend to present positive adjusted EBIT and similar invested capital evolution, the main determinant of EVA® evolution in the Portuguese HEI sector is the cost of capital, which is negatively correlated with the HEI EVA® results.

Corroborating the claim that EVA® is suitable to measure and explain the value creation in HEI sector was conducted a multivariate study to determine which variables can induce the HEI value generation. The results evidenced that general operational efficiency and productivity and quality in research, are the variables that can, significantly, explain

the created in Portuguese HEI sector. Finally, the study suggest that large HEI tend to generate less value than medium and small HEI, and also, that created value between the foundational regime and the public law regime do not differ significantly.

However, the study was limited by the difficulty in obtaining publicly available information of the Portuguese HEI in an extended time horizon. The reduced number of observations has an impact on the obtained results, namely in the in the significance and explanatory capacity of the statistical model. Therefore, the present conclusions require further future research.

Keywords: Economic Value Added; Higher Education Institutions; Value Creation; Financial Performance; Cost of Capital.

Resumo

Atualmente o setor do ensino superior está a enfrentar um período de mudança e turbulência. Impulsionado pela crise financeira, pelas mudanças demográficas e sociais na população estudantil, pelo declínio no financiamento público e pela competição global, o ensino superior tem vindo a transformar-se, de um serviço público, para um serviço orientado para o mercado, e uma abordagem assente na criação de valor começa a surgir nos planos estratégicos destas entidades. Principalmente assentes em *scorecards* e índices compostos, estes baseiam-se em indicadores de natureza orçamental ou rácios tradicionais, que não são, de todo, os mais adequados para avaliar o desempenho baseado na criação de valor.

O Economic Value Added (EVA®) tem sido referido na literatura como uma medida de desempenho privilegiada, não só ao nível da medição do valor criado, mas também na sua integração com o processo de decisão estratégica. Com o presente trabalho pretende-se estender o uso EVA® como uma medida de desempenho financeiro no contexto das Instituições de Ensino Superior (IES) públicas.

Inicialmente, o método EVA® foi aplicado ao setor das IES públicas através da metodologia de estudo do caso na Universidade de Coimbra, considerando duas abordagens diferentes do custo do capital e os níveis das contas individuais e consolidadas, no período de 2011 a 2016. Os resultados evidenciaram que, no período em análise, a UC tem vindo de forma contínua a aumentar o valor financeiro criado.

Posteriormente, a análise foi ampliada para o setor em Portugal, onde, igualmente se observou um aumento do valor financeiro criado. Considerando que as IES portuguesas tendem a apresentar um EBIT ajustado positivo e uma evolução semelhante ao nível do capital investido, pode-se concluir que o principal determinante da evolução do EVA® no setor das IES portuguesas é, portanto, o custo do capital, sendo negativamente correlacionado com os resultados EVA® das IES portuguesas.

Corroborando a afirmação de que o EVA® é adequado para medir e explicar a criação de valor no setor de IES foi realizado um estudo estatístico para determinar quais variáveis podem influenciar a geração de valor ao nível das IES públicas. Os resultados evidenciaram que a eficiência operacional, bem como a produtividade e qualidade na investigação, são as variáveis que, de forma significativa, podem explicar o criado no setor de IES Português. Finalmente, o estudo sugere que uma maior dimensão tende a gerar menor valor, bem como, que o valor criado entre o regime fundamental e o regime de direito público não diferem significativamente.

Contudo, o presente estudo encontra-se limitado pela dificuldade em obter informação pública disponível das IES portuguesas num horizonte temporal alargado. O número reduzido de observações tem impacto nos resultados obtidos, nomeadamente na significância e capacidade explicativa do modelo estatístico. Portanto, os resultados atuais exigem investigação futura neste âmbito.

Palavras-chave: Valor Económico Adicionado; Instituições de Ensino Superior; Criação de Valor; Desempenho Financeiro; Custo do Capital.

List of acronyms and symbols

AEVA: Adjusted Economic Value Added

APT: Arbitrage Pricing Model

AVAR: Academic Value Added Ratio

CAPM: Capital Asset Pricing Model

CDS: Country Default Spread

CFROI: Cash Flow Return On Investment

CPC: Cost of Public Capital

CVA: Cash Value Added

CWUR: Center for World University Rankings

EBIT: Earnings Before Interest and Taxes

EBITDA: Earnings Before Interest, Taxes, Depreciation, and Amortization

EM: Economic Margin

EPS: Earnings Per Share

ERP: Enterprise Resource Planning

EVA: Economic Value Added

GAAP: Generally Accepted Accounting Principles

GDP: Gross Domestic Product

HEI: Higher Education Institutions

IC: Invested Capital

KPI: Key Performance Indicators

MVA: Market Value Added

NFO: Not-For-Profit Organizations

NOPAT: Net Operating Profits After Taxes

NPM: New Public Management

NPO: Non-Profit Organizations

NPV: Net Present Value

OLS: Ordinary Least Squares

OT: Obrigações do Tesouro

PER: Price-Earnings Ratio

PI: Performance Indicators

PMS: Performance Measurement Systems

POC-E: Plano Oficial de Contabilidade para o setor da Educação

REVA: Refined Economic Value Added

RJIES: Regime Jurídico das Instituições de Ensino Superior

RAROC: Risk-Adjusted Return On Capital

RI: Residual Income

ROA: Return On Assets

ROE: Return On Equity

ROI: Return On Investment

SIR: Scimago Institutions Rankings

SME: Small and Medium Enterprises

SNC: Sistema de Normalização Contabilística

SNC-AP: Sistema de Normalização Contabilística para as Administrações Públicas

SOC: Social Opportunity Cost

SRTP: Social Rate of Time Preference

SVA: Shareholder Value Added

UC: University of Coimbra

VBM: Value Based Management

WACC: Weighted Average Cost of Capital

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1. Introduction

The structure of today's economic context is changing quickly, generating a significant amount of uncertainty. The Higher Education Institutions (HEI) sector, not only in Portugal but worldwide, is facing a dynamic and turbulent environment driven by the economic crisis, the demographic and social changes in student population, the decline in public funding and global competition. This environment in the last decades forced HEI to be innovative and to increase their excellence level in order to respond to the stakeholders growing demands, and to survive in the industry.

Higher Education is shifting now from a public service to a market-drive-one as a result of the pressure to improve financial capacity (resilience) and financial sustainability, and therefore, create value for the money (Asif and Searcy 2014; Bowman 2011).

With the adoption in the earlier 90's of the New Public Management (NPM) principles and the implementation, in 2007, of the new legal regime (RJIES), the Portuguese HEI performance evaluation, underlying the chosen governance model, became conceptually based on the value for the money concept, and therefore, as stated in almost of the Portuguese universities statutes, in the 3E's principle: economy, efficiency and effectiveness. In this regard, the main questions are: the present models are suitable for assessing HEI financial performance by the value for the money concept? How to measure economy, efficiency, and effectiveness, and therefore the financial performance in HEI context?

Although there is starting to appear a value-driven approach in this entities, the current financial performance measures demanded by HEI stakeholders or present in their strategic plans, are primarily based on scorecard systems or composite indexed that relies on budgetary and traditional ratio measures (Abraham 2003; Abraham 2004; Bowman 2011; Chen, Yang, and Shiau 2006; Leal, Carvalho, and Santos 2012; Prowle and Morgan

2005; Pursglove and Simpson 2001; Taylor 2014), which are unable to evaluate value-based performance.

In this context, there is a demand to establish a set of value-based financial performance measures, and HEI should look to, and learn, from for-profit sector in this regard (Chen, Yang, and Shiau 2006; Taylor 2014; Valentinov, Hielscher, and Pies 2015), where the economic value added (EVA®) methodology is presented as a privileged performance metric in the measurement of value generation and integration of the corporate strategical process.

The present work pretends to discuss and extend the use of EVA® in the context of HEI financial performance measurement, more specifically in the measurement of HEI value generation. For this purpose, initially, the EVA® method will be applied to the public HEI sector using the University of Coimbra as a case study, and then, the empirical analysis will be extended to the Portuguese public HEI sector.

Considering the proposed objective, the dissertation is structured in five chapters. In addition to the present chapter, the second will correspond to the literature review, where will be presented the main thematics in the financial performance evaluation. Namely, will be presented the financial performance systems and value creation, the EVA® approach, the EVA® in HEI industry, and the problematic of the cost of capital estimation in public entities.

The third chapter is dedicated to the research framework, where the background and the problematic of the study will be presented to support the definition of the objectives and research design.

In the fourth chapter, will be addressed the case study, by the validation and discussion of the obtained results for the proposed study hypothesis.

Finally, the fifth chapter is dedicated to present the conclusions of the study, its main limitations and also the suggestions for future research.

2. Literature review

In this chapter will be presented a review of the main concepts found in the literature, which are relevant to the theoretical framework of the HEI management based on a logic of value creation, which further will guide the empirical analysis that will be developed. This chapter addresses the following issues: first, will be presented the financial performance evaluation and value creation methodologies; in the second section, will be discussed the EVA® methodology; the third section is dedicated to the evidence of EVA® in HEI industry; and finally, the last section will present the problematic of the cost of capital estimation, namely the estimation of the cost of equity in public or non-traded entities.

2.1. Financial performance evaluation and value creation

Compton and Heim (1992) *apud* Ghalayini and Noble (1996:63) quoted Lord Nelson (1824-1907):

> When you can measure what you are speaking about and express it in numbers, you know something about it … (otherwise) your knowledge is a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely in thought advanced to the stage of science.

The organizational performance evaluation is a broad and complex concept. In the management control context, the performance evaluation goes beyond a mere comparison between forecasts and realizations, because achieving budgeting results or objectives could not be a symptom of good performance, and more important, does not permit to assess the efficiency and effectiveness of the internal resource allocation (Neves 2005). According to Gomes and Yasin (2011), the recent literature clearly points to the increasing importance of the different facets of performance measurement: tracking, monitoring, improvement, and benchmarking,

Although there isn't a generally accepted definition, Gomes and Yasin (2013:75), define the performance measurement systems (PMS) "as the set of metrics used to quantify both the efficiency and effectiveness of actions […]. It can also be viewed as a balanced, dynamic system which supports the decision-making process by monitoring, gathering, and analyzing performance-related information".

The main capabilities and characteristics that should incorporate the design of the PMS are: accuracy, relevance, timely, and accessibility. "A well-designed PMS is vital for ensuring that an organization is able to deliver cost-effective and high-quality services which are capable of meeting and exceeding the evolving needs and wants of customers" (Gomes and Yasin 2013:75). However, there are several difficulties, namely in Healthcare and public services, which can be "attributed, in part, to the diverse interests of the stakeholders [… that] may have different or conflicting agendas and performance expectations" (Gomes and Yasin 2013:75).

Ghalayini and Noble (1996) identified two distinct phases or perspectives in the financial performance evaluation theory. The first, which started in the late 1880 decade and extended until the end of the 1980 decade, emphasized the determination of profit, return on investment, and productivity as the main measures to assess managerial performance. The second phase appeared in the late of the 1980 decade in result of the globalization and competition process, by linking performance evaluation to value creation, and by the combination of financial and non-financial measures in performance assessment. Drucker (1995:58) observed that organizational performance must reflect an evaluation system based on a set of reliable information about the success of the organization strategy and beyond traditional financial data, because "enterprises are paid to create wealth, not control costs".

In more recent years, appeared a new concept associated with the performance evaluation theory: sustainability. Mamede and Gomes (2014), refer that this new approach takes into account three main conceptual dimensions into performance measurement: organizations should only be concerned with the value creation by focusing on economic sustainability and shareholder satisfaction; organizations should integrate the impacts of

their activities according to critical global issues affecting ecological and social systems; and managers of businesses, operating under a third conceptual foundation, believe that they should promote their operations within a framework that meets stakeholder expectations.

2.1.1. Financial performance evaluation systems

According to Brealey and Myers (1998), the performance evaluation systems are instruments that provide useful information which can contribute to improve the quality of the future decision process and can redefine the scope of the present decision-making process, which lead to a commonly cited axiom in management theory 'what you measure is what you get'. In this context, despite the different perspectives and lack of agreement in the literature, there are a set of different models and indicators, financial and non-financial, which support the performance evaluation thematic. In the next sections will be presented and discussed the main models of financial performance measures.

2.1.1.1. Market-based model

Merchant (2006:896) refer that one way of assessing financial performance is by using market-based measures which "are based on changes in the market value of the entity being managed or, if dividends are also considered, returns to shareholders". The same author points out that market measures have broad appeal, in part because they provide high correlation in shareholder wealth by giving direct indications of the amount of value that has been created or destroyed. This same conclusion could be found in the literature by other authors, for example, Stewart (1991; 1994), (Stern, Stewart, and Chew (1995), Bacidore *et al.* (1997), Wallace (1997), Jensen and Murphy (1990) and Rutledge (1996).

The market-based performance measures have some significant advantages and limitations, such as:

Table 1 – Advantages and limitations of market-based performance measures

Advantages	Limitations
Highly congruence with firm value, as they are, perhaps, the best suitable indicator to assess the value created or destroyed in a given period.	However, they incorporate a potential of congruence failure, because market valuations are not perfect, as they are not always congruent with the true intrinsic value of the entity. Market valuations cannot reflect information that is not available to it.
They are accessible on a timely basis (yearly, quarterly, monthly or daily) for publicity traded entities.	They have a severe feasibility constraint, as they are only available for publicity traded firms. They are not available for privately-held corporations or wholly owned divisions and subsidiaries, and they are not applicable to non-profit organizations.
They are accurate because market values can be measured precisely, and the values are usually objective, not manipulated by the managers whose performances are being evaluated.	Market values are not always reflective of realized performance, as they are heavily influenced by future expectations, and it is risky to pay bonuses based on expectations because those expectations might not be achieved.
They are understandable, at least in the sense that people understand what they represent. Also, they are cost-effective, as they do not require any measurement expense.	They are largely uncontrollable by lower hierarchy individuals, except the top management individuals, and even for those there are many uncontrollable influences (e.g.: macroeconomic activity, interest or exchange rates, factor prices, and other competitive factors).

Source: own elaboration based on Merchant (2006:898–901)

2.1.1.2. Accounting-based model

Accounting-based performance measures are indicators that can be compiled from the companies accounting systems or financial reports, and can be classified into two distinct categories (Merchant 2006):

i. residual or accounting profit measures (e.g. net income; earnings before interest and taxes (EBIT); earnings before interests, taxes, depreciation, and amortization (EBITDA); residual income);

ii. ratio or accounting return measures (e.g. return on investment (ROI), return on equity (ROE); return on assets (ROA); risk-adjusted return on capital (RAROC)).

The accounting-based performance measures have some significant advantages and limitations, such as:

Table 2 – Advantages and limitations of accounting-based performance measures

Advantages	Limitations
They are congruent with the organizations' goals of profit maximization, as they present the illusion of being congruent with market returns. Many managers believe that markets respond vigorously to changes in reported accounting profit, and the define the organizations' objectives regarding accounting profits or returns.	They evidence a controllability problem, as financial performance measures are affected by many of the same macroeconomic distortions that affect the market-based performance measures. They are also not highly congruent with changes in value, although the correlation between accounting profits and firm value is positive, it is poor or virtually inexistent.
They are timeless because accounting profits and returns can be measured on a timely basis.	Accounting systems are transaction-oriented. Most changes in value do not result in transactions and aren't recognized in income.
They are relatively accurate, in the conception as they are regulated by mandatory accounting standards which reduce the measurement variance. Also, they are largely objective because external auditors provide a periodic objectivity validation	Profit measures focus on the past while the economic value is derived from future cash flows, and there is no guarantee that past performance is a reliable indicator of future performance.
They are understandable, as they are settled or derived from the accounting standards, so virtually every manager knows through formal education or experience what accounting measures represent.	Accounting profit is derived from measurement rules (accounting standards) that are often conservatively biased or permits the choice of different measurement methods to account identical economic events.
They usually can be tailored and controlled to match all the organizations' authority limits, of any level of managers to the lowest level.	Profit ignores the cost of investments in working capital, even these investments tie up capital and, hence, have real economic costs. Profit reflects the cost of borrowed capital but ignores the cost of equity capital, and firms only can earn real income when the returns on capital are greater than the cost of that capital.
They are cost-effective, as firms are required to produce measures for financial reporting purposes, so there is a little or no incremental cost.	Accounting profit ignores risk and changes in risk. Entities that have not change the patterns of their expected future cash flows, but made the cash flows more certain (less risky), have increased their economic value.

Source: own elaboration based on Merchant (2006:901–904)

2.1.1.3. Combined measures model

This final measurement approach involves the use of a combination of distinct types of measures. Merchant (2006), identified two main types:

i. the combination of market-based and accounting-based measures;
ii. the combination of financial (accounting measures or specific disaggregated elements, for instance, revenues, expenses, margins, assets or liabilities) with non-financial measures (e.g. product quality, yields, customer satisfaction or days since last lost-time accident).

Table 3 – Advantages and limitations of combined measures

Advantages	Limitations
The multiple measures might provide a more complete reflection of performance by capturing aspects of performance that are not reflected or are not weighted highly enough in importance by other types of measures.	The combined measures can be quite simple to highly complex ones, such as the performance prism, the intellectual capital navigator, or the balanced scorecard, which can affect its understandability and cost effectiveness.
Measurement combination can help to address a major weakness of accounting-based measures, which are known to be backward-looking and, hence, excessively short-term oriented.	Measurement combination systems exist in so much variety, so empirically, it is difficult to test them rigorously. It is congruence and accuracy could vary or be uncertain.
Measurement combination is more flexible because inflows and outflows can be weighted with distinct importance.	
Measurement combination can improve the reflection of the shareholders' view in the organization.	

Source: own elaboration based on Merchant (2006:906–908)

Merchant (2006:906) refer that one argument that supports the use of the measurement combination approach is "that no single measure, no matter how good it is, can reflect organizational performance sufficiently well to motivate optimal management decision-making".

2.1.2. Traditional performance measures

The most common performance measures adopted by organizations are the measures based on market or accounting profitability, also referred as 'traditional', because of its computation simplicity. Despite of the general acceptance of traditional measures by organizations, this subject has been widely discussed over some decades in the academic community. The results of empirical tests that have been conducted led to a vast spectrum of critics once they do not consider critical aspects of the real performance of organizations, such as the cost of capital, financial risk, the effects of accounting standards and other weaknesses referred in the previous section (Bacidore et al. 1997; Biddle, Bowen, and Wallace 1999; Chen and Dodd 1997; Chen and Dodd 1998; Copeland, Koller, and Murrin 2000; Ferguson, Rentzler, and Yu 2005; Ghalayini and Noble 1996; O'Byrne 1997; O'Hanlon and Peasnell 2000; O'Hanlon and Peasnell 2002; Stewart 1991; Stern, Stewart, and Chew 1995). In the next sections will be presented the main traditional measures used in financial practice.

2.1.2.1. Traditional market measures

The Earnings Per Share (EPS) ratio is one of the most used measures by financial analysts. With a simple concept, it quickly enables to determine the share valorisation of a company (Ross 2009). Rappaport (1998), argues that on EPS, the increment on share valorisation does not necessary leads to an increase in the market value of shares. It can be calculated as:

$$\text{EPS} = \frac{\text{Net income}}{\text{Shares outstanding}}$$

Another commonly used measure is the Price-Earnings Ratio (PER), which determines how much investors or shareholders are willing to pay, in multiples, of current

earnings. At the current earnings levels, the PER also represents the number of years to recover the price. A higher PER is indicative of significant prospects of future growth or a more secure profit generation structure. If a company achieve its break-even and present null profits, its PER is infinite, so, as always, care is needed in interpreting this ratio (Brealey and Myers 1998; Ross 2009). It can be calculated as:

$$\text{PER} = \frac{\text{price per share}}{\text{earnings per share (EPS)}}$$

Finally, the Market-to-Book Ratio is another widely used measure. This ratio compares the value of a share with its book value, noticing that book value per share is total equity, and not only common stocks, divided by the number of shares in circulation. By comparing the market value of the investments to their (historical) costs, a value less than one means that the firm has not managed to create value for its shareholders (Brealey and Myers 1998; Ross 2009). It can be calculated as:

$$\text{Market-to-book ratio} = \frac{\text{market value per share}}{\text{book value per share}}$$

2.1.2.2. Traditional profitability measures

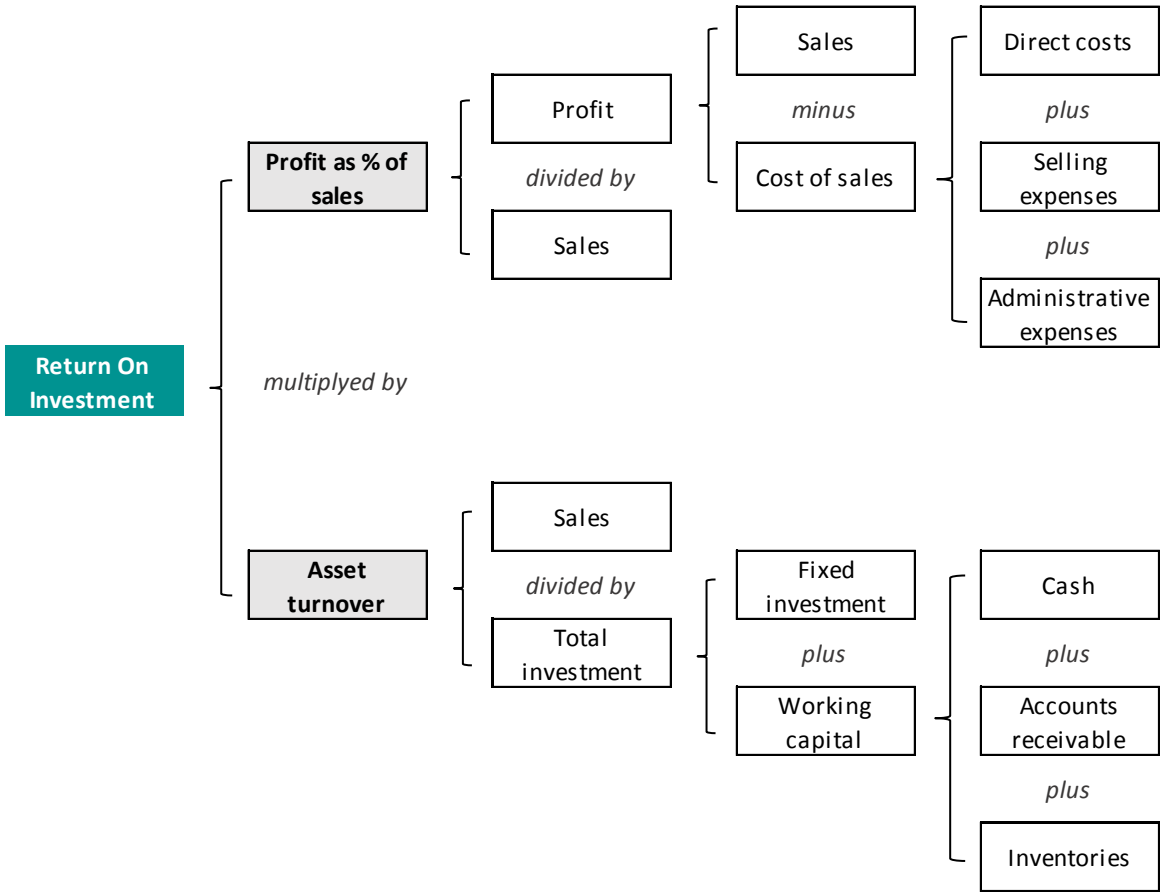
The Return On Investment (ROI) is one of the most used measures to assess organizations performance, and especially, as a performance measure to determine compensations of top levels management teams and business division or units. The ROI is a measure created by the DuPont Company and introduced in the 1920 decade "as a response to increased organizational size and complexity" (Merchant and Van der Stede

2007:445), reflected in divisionalize or vertically integrated organizations. It can be calculated by (Neves 2012)[1]:

$$ROI = \frac{EBIT}{invested\ capital} = \frac{EBIT}{sales} \times \frac{sales}{invested\ capital}$$

The analysis of profitability through the ROI measurement can be decomposed to understand which variables and variances can induce the organizational performance, as illustrated in figure 1:

Figure 1 – Relationship between factors affecting ROI



Source: adapted from Merchant and Van der Stede (2007:446)

[1] Considering the elimination of the tax effect, the ROI can be presented as: $ROI = \frac{EBIT \times (1\text{-tax rate})}{invested\ capital}$

Another profitability measure is the Return On Assets (ROA), which permits to assess if the organization is generating results (profitability) through its investments in a determined period of time. It can be defined in several ways, but the most common is (Ross 2009):

$$ROA = \frac{\text{net income}\ ^{2}}{\text{total assets}\ ^{3}}$$

Finally, the Return On Equity (ROE) is another widely used measure. ROE compares, in a determined period, the company's profitability with the cost of capital at its book value, enhancing shareholders to judge if the actual equity return is acceptable facing the current market return. It is the "measure of how the stockholders fared during the year […], ROE is, in an accounting sense, the true bottom-line measure of performance" (Ross 2009:53).

It can be calculated as:

$$ROE = \frac{\text{net income}}{\text{total equity}\ ^{4}} = \frac{\text{net income}}{\text{assets}} \times \frac{\text{assets}}{\text{total equity}} = ROA \times \text{equity multiplier}$$

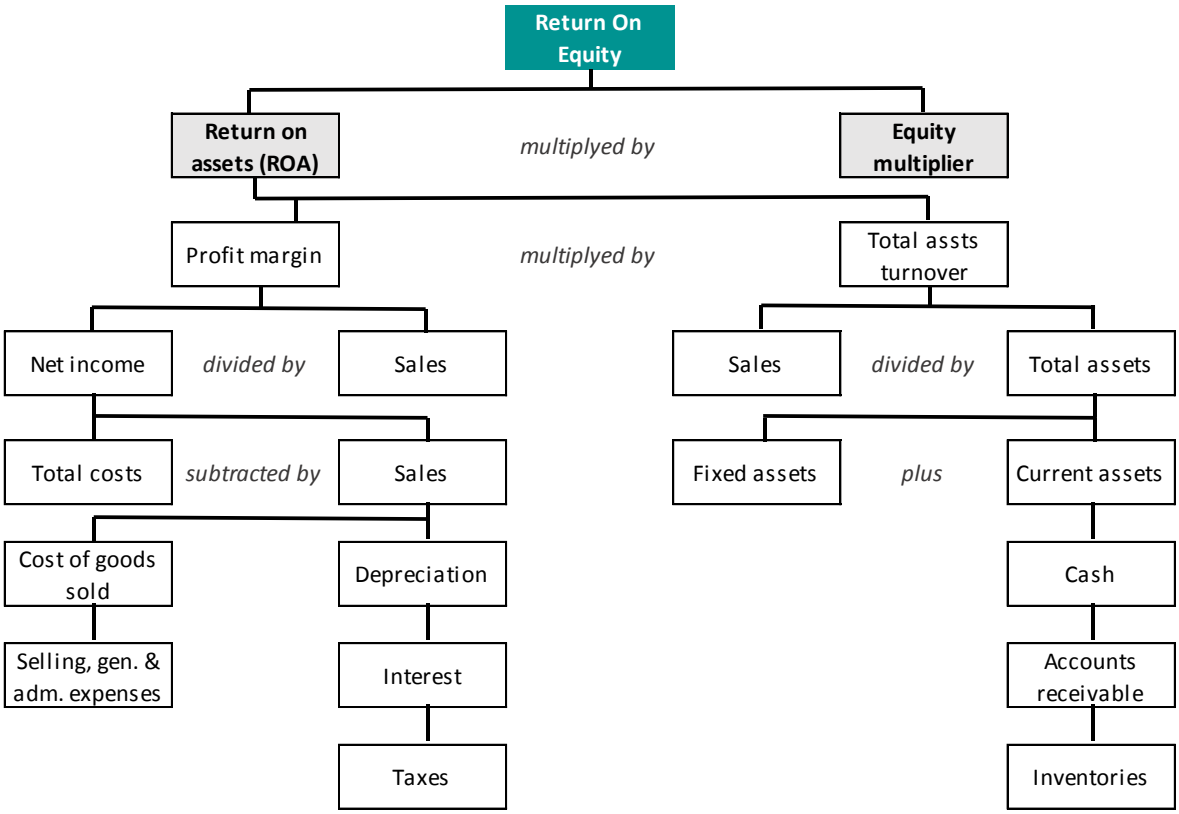
As the ROI measure, ROE can also be decomposed as presented in figure 2, to "a closer look at how key parts of a firm's operations feed into ROE" (Ross 2009:57):

[2] Neves (2005; 2012), consider the use of EBIT in the numerator in order to eliminate non-operational effects in its computation.

[3] Brealey and Myers (1998), refer that as net income is a floating variable and assets are a momentary variable, its frequent analysts to consider the average assets in the period instead of total assets.

[4] Brealey and Myers (1998:772), suggests the use of the weighted average equity in the case of existing new capital entries in the period of ROE calculation.

Figure 2 – Relationship between factors affecting ROE



Source: adapted from Ross (2009:58).

2.1.3. Value-based performance measures

The idea of value creation as the ultimate organization's objective and manager's primary responsibility gained widespread acceptance in the United States since 1986 with Rappaport's (1998) theory. Until then, the management decisions were based on short-time results, but with the globalization of the competition in the capital markets, this concept rapidly became a global standard in the management practice (Rappaport 1998).

Rappaport (1998), also discuss the extension of the value creation theory from the shareholder model to the stakeholder model. Organizations are ecosystems widely beyond its capital property, where employees, clients, suppliers, Governments, or its adjacent communities have some kind of interests on the wealth of determined organization. "The

mutual interdependence among shareholders and other stakeholders makes it imperative that they engage in a partnership for value creation" (Rappaport 1998:11), in order to develop or maximize a 'socially responsible' management decisions, and consequently, the corporate wealth.

Besides of the lack of emphasis and support with the stakeholder model in theory and on the management practice, there is an opportunity to explore the application of the VBM model in the third-sector or non-profit organizations. Maximizing the third-sector organizations' created value, induces to, and is induced by an efficient resource allocation and effective management decisions, which improves accountability to its stakeholders and contributes to the organization's long-term sustainability.

The maximization of created value to shareholders as the fundamental corporate objective lead to the adoption of a Value Based Management (VBM) systems.

Arnold and Davies (2000), define the VBM model as an approach to the corporate strategy where the organizational culture in the operational processes is subordinated to the main objective of the maximization of the shareholder value. According to (Copeland, Koller, and Murrin 2000), VBM is an integrator system with the purpose of improving the strategical and operational decision process in the organization.

Martin and Petty (2000), argue that to support the value creation process, the management's performance should be measured and rewarded, whereby organizations must set corporate value drivers, that can be financial or non-financial metrics or measurable factors, which directly induce the value creation to shareholders. Considering that VBM enables to evaluate the managements' decisions and define its compensations plans, managers wealth "becomes inextricably linked with that of the shareholders", so the "shareholders' agenda becomes the managers' agenda" (Young 1997:337). In this context, the VBM model also reveals as an regulation instrument of the relationship between stakeholders and managers, which was originally characterized by Jensen and Meckling (1976), as the agency problem or theory.

Considering that traditional measures can't generate the most suitable information to assess the value creation or destruction, new metrics have been developed, such as: Economic Value Added (EVA®), Market Value Added (MVA), Shareholder Value Added (SVA), Adjusted Economic Value Added (AEVA), Refined Economic Value Added (REVA), Cash Value Added (CVA), Cash Flow Return On Investment (CFROI), or the Economic Margin (EM).

These metrics will be presented and discussed in the next section, in particular, the Economic Value Added (EVA®), which is the main thematic of the present study.

2.2. Economic Value Added (EVA®)[5]

2.2.1. EVA® history and background

The concept of Economic Value Added appeared in the literature in the earlier 90's but was not completely an innovation. In fact, its roots go back to the XVIII century through an accounting performance measure called residual income (RI), that is "based on the premise that, in order for a firm to create health for its owners, it must earn more on its total invested capital than the cost of that capital" (Biddle, Bowen, and Wallace 1999:70). According to the same author *apud* Neves (2005), one of the first references to the residual income concept came by Hamilton in 1777, and later, by Marshall in 1890, when "defined economic profit as total net gains less the interest on invested capital at the current rate" (Makelainen 1998:4). Since the idea of residual income has been evidenced in the accounting and management theory, assumed other various designations, has observed Biddle, Bowen, and Wallace (1999), Dodd and Chen (1996) and Neves (2005):

- Excess earnings: *Canning (1929) and Preinreich (1961)*;
- Super-profits: *Edey (1957)*;
- Excess realizable profit: *Edwards and Bell (1961)*;
- Excess-income: *Kay (1976) and Peasnell (1981)*;
- Abnormal earning: *Felthan and Ohlson (1995)*
- Residual income: *Church (1917), Scovell (1924), Anthony (1965) and Solomons (1965)*;
- Economic profit: *Copeland, Koller & Murrin (1990)*;
- EVA® or Economic Value Added: *Stewart (1991)*.

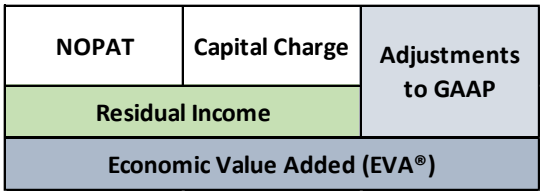
[5] EVA® is a registered service mark for financial management and consulting services in the area of business valuation of Stern Stewart & Co, since 04.10.1994 (registration number: 1856961 / serial number 74404471). No trademark infringement is intended with all references to EVA®.

Taking advantage of the favorable environment around the perspective of creating value for shareholders led by Rappaport (1998), and the fact of residual income was rarely used by managers and companies, although its advantage in terms of applicability or by complementing other valuation approaches such as NOPAT, EPS, ROI, ROE or others, the Stern Stewart & Co., reinvented and renamed it as Economic Value Added or EVA®. Some authors (Biddle, Bowen, and Wallace 1999; Dodd and Chen 1996; Makelainen 1998; Shil 2009; Wallace 1997) argue that the EVA® success accrued from the development of a good marketing campaign around the results obtained with notorious companies by the Stern Stewart & Co consulting work. However, Young (1997) attributes the EVA®'s success to the deregulation of capital markets, because companies were unable to convince investors of their ability to deliver adequate returns and, until EVA® appears they had a competitive disadvantage in the race for global capital resources.

2.2.2. EVA® definition and conceptualization

EVA® is a value performance measure that Stewart (1991:3), defined as "operating profits less the cost of all of the capital employed to produce those earnings". According to the same author, the idea of value creation to shareholder, relies on the differential between the rate of return on invested capital, which can also be defined as the company profitability rate, and the cost of the different financing sources (both equity and debt) that have been employed, so, therefore, EVA® is residual income. Considering that residual income can be defined as "operating income minus imputed interest charge for investment" (Chen and Dodd 1997:321), the main difference between this two performance measures, is the adjustments to the General Accepted Accounting Principles (GAAP) proposed by the Stern Stewart & Co in order to mitigate the distortions introduced in accounting earnings by accrual-based accounting conventions (Chen and Dodd 1998:4; Young 1997:336).

Figure 3 – EVA® and RI conceptual model



Source: adapted from Chen and Dodd (1998:5)

The EVA® formula can be stated as follows (Stewart 1991):

$$EVA® = NOPAT - capital\ charge$$

Since NOPAT (Net Operating Profits After Taxes) is equivalent to EBIT after taxes, and capital charge can be stated as WACC (Weighted Average Cost of Capital) times IC (Invested Capital or capital employed), the EVA® formula can be derived as:

$$EVA® = [EBIT_n \times (1 - t)] - (WACC_n \times IC_{n-1})$$

Considering that "NOPAT can be expressed alternatively as a rate of return on invested capital (i.e., return on assets, ROA) times capital", the EVA® expression can be restated by separating the total return on capital from the cost of capital (Biddle, Bowen, and Wallace 1999:70):

$$EVA® = (ROI_n \times IC_{n-1}) - (WACC_n \times IC_{n-1})$$

The same author also observed that by regrouping the right-hand side of the above into the followingexpression, EVA® can be restated as a spread or rate of return (*s*) between the return on invested capital and the cost of capital, times invested capital:

$$EVA® = (ROI_n - WACC_{n-1}) \times IC_{n-1}$$

$$EVA® = s \times IC_{n-1}$$

2.2.2.1. NOPAT – Net Operating Profits After Tax

NOPAT means Net Operating Profits After Tax, which is the same as profits before taking out the cost of interest. Setting off from the income statement, under the main Portuguese GAAP for for-profit entities [*Sistema de Normalização Contabilística – SNC* (Portaria n.º 986/2009, vol.173 2009:6008)] and public Higher Education Institutions [*Plano Oficial de Contas para o Setor da Educação – POC-E* (Portaria n.º 794/2000, vol.218 2000:4988–4989)], there are two different approaches to calculate NOPAT, as represented in figure 4.

Figure 4 – NOPAT calculation from income statement[6]

Profit and Loss Statement (for-profit entities)	N		Profit and Loss Statement (public HEI's)	N	
Sales and services	+		Sales and services	+	
Operating subsidies	+		Income from taxes and fees	+	
Variation in production inventories	+/-		Variation in production inventories	+/-	
Own benefit works	+	Operational Perspective	Own benefit works	+	
Cost of sales	-		Supplementary income	+	
External Services	-		Transfers and subsidies obtained	+	
Staff costs	-		Other operational income	+	
Impairments on inventories (losses/reversions)	-/+	NOPAT =	Cost of sales	-	
Impairments on accounts receivables (losses/reversions)	-/+	EBIT * (1 - tax	External Services	-	
Provisions (increases/reductions)	-/+	rate%)	Staff costs	-	
Other impairments (losses/reversions)	-/+		Current transfers granted and social benefits	-	
Increases/reductions in fair market value	+/-		Other operational costs	-	
Other incomes and gains	+				
Other expenses and losses	-				
EBITDA	**= ∑**		**EBITDA**	**= ∑**	
Expenses/reversions in depreciation and amortisation	-/+		Depreciation and provisions	-/+	
EBIT	**= ∑**		**Operational results (EBIT)**	**= (A)**	
			Interest and similar income obtained	+	
Interest and similar income obtained	+		Interest and similar expenses obtained	-	
Interest and similar expenses obtained	-	NOPAT =	**Financial results (FR)**	**= (B)**	NOPAT =
Profit before tax	**= ∑**	NI + [interest *	Extraordinary income	+	NI - ER - FR
Income tax expense	+/-	(1 - tax rate%)]	Extraordinary costs	-	
		Financial	**Extraordinary results (ER)**	**= (C)**	
Net income / loss for the year (NI)	**= ∑**	Perspective	**Net income / loss for the year (NI)**	**= (A)+(B)+(C)**	

Source: own elaboration

The operational perspective starts on the top of the income statement, by calculating the operating profit (EBIT) and then deduct the adjusted tax charge (1 - tax rate).

From the financing perspective, it starts at the bottom-line of the income statement by adding net income to the net cost of interest, which can be computed by multiplying the interest by one minus the tax rate. Since the interest is not considered for

[6] Also, referred as a profit and loss statement (P&L), statement of profit or loss, revenue statement, statement of financial performance, earnings statement, operating statement, or statement of operations. Income statements under the main Portuguese GAAP for public sector (HEI). Author's free translation.

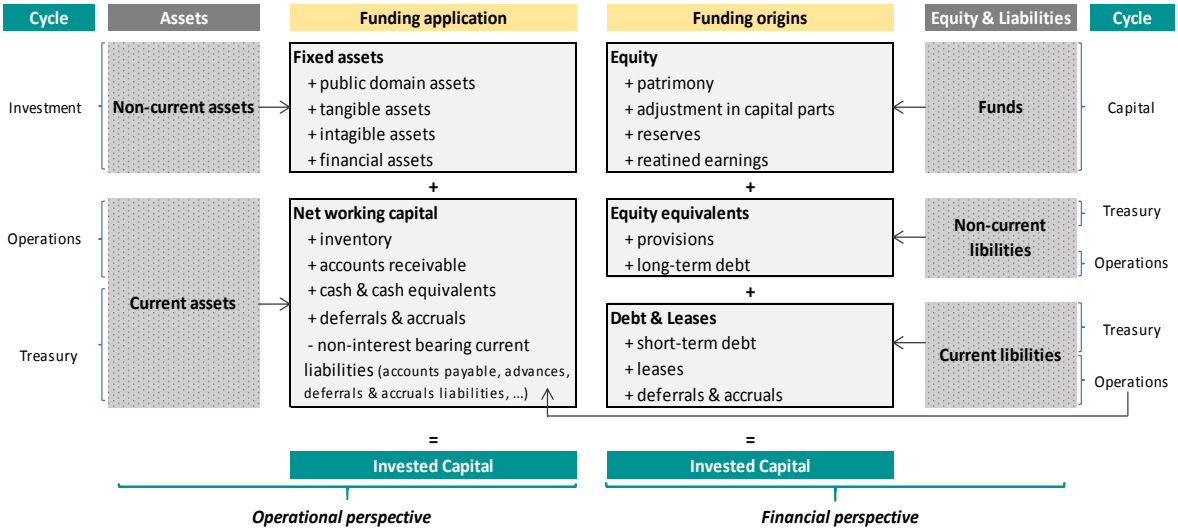
NOPAT purpose, it is also necessary to remove the tax benefit from it. The tax charge should be adjusted because it includes the tax benefit from interest, and since the interest is a tax-deductible item, denote that the effective tax charge is lower (Ryan 2011).

Portuguese public HEI's are exempt from income tax, therefore NOPAT is equal to EBIT in the operational perspective. From the financing perspective, it can be calculated by adding the extraordinary and financial results to the net income.

2.2.2.2. Invested capital

Stewart (1991:86) defines invested capital as a measure of "all cash that has been invested in a company's net assets over its life and without regard to financing form, accounting name, or business purpose – much as if the company were a savings account". Young (1997:336), precise this concept by defining it as "the sum of all the firm's financing, apart from non-interest-bearing operating liabilities, such as accounts payable, accrued wages, and accrued taxes", which is the same as "the sum of shareholder's equity and all interest-bearing debt, short-term and long-term". The same author, further state that invested capital can also be "calculated by subtracting operating liabilities from total assets, which yields 'net' assets" that can be "thought of as investments from which the firm's capital providers should expect, and managers must deliver, a competitive return". Neves (2012), presents an approach from the traditional balance sheet towards a functional perspective that allows relating the company's funding origins and applications, and the different financial cycles. This path, as illustrated in figure 5, correspond to the investment capital calculation, in both operational and financial perspectives.

Figure 5 – Invested capital calculation from the balance sheet[7]



Source: own elaboration based on Neves (2012:149–153) and Stewart (1991:91, 100–101)

2.2.2.3. EVA® adjustments to NOPAT and invested capital

NOPAT and invested capital are based on the financial data produced by traditional accounting systems under GAAP principles, and so, do not reflect the economic value generated by the organization. Stewart (1991:112–127) identified 120 potential adjustments to GAAP[8] with the aim of eliminating the distortions induced by the GAAP towards measuring the true economic cash-flow generated by the organizations and discouraging profits management practices.

Neves (2005), question if it's acceptable to proceed to all 164 adjustments proposed by Stewart, more specifically, in what extent could those adjustments produce significantly different results from the use of unadjusted values, or if they can produce another interpretation on the company's evolution, and also if they result in different behaviours from managers that could improve the company's performance.

[7] Balance sheet under the main portuguese GAAP for public HEI: *Plano Oficial de Contas para o Setor da Educação – POC-E* (Portaria n.º 794/2000, vol.218 2000:4986–4988). Author's free translation.

[8] Further studies by Stern & Stewart Co., increased the number of identified adjustments to GAAP to 164 (Stewart 1994).

Bauman (1999) *apud* Neves (2005), refers that adjustments to the balance sheet and income statement can be compensated and produce identical EVA® estimates. Chen and Dodd (1997), presented some evidence regarding the use of adjustments in EVA®, which demonstrated that they did not produce a significant competitive advantage over the traditional performance measures. Young (1997), observed that no company intend to apply all the 164 proposed adjustments, in fact, most of the company's that adopt EVA® limit the number of adjustments to fewer than ten, and others make no adjustments at all, otherwise the system can be complicated to administer and comprehend. Neves (2005) also argues that external analysts can only grid to the publicly information presented in corporate reports, while internal analysts can assess all information necessary to make the proposed adjustments.

Therefore, Young (1997:338) propose that adjustments in EVA® calculation should be made only if:

i. "the amounts are significant" or materially relevant;
ii. "the required information is readily available";
iii. "nonfinancial professionals can understand them".

Considering the previous conditions, the most common accounting adjustments referred in literature, are present in table 4.

Table 4 - EVA® accounting adjustments

GAAP	Adjustment
Research and Development (R&D) The standard accounting treatment is to expense all R&D costs as incurred	R&D should be treated as an investment by capitalizing with an amortization period equal to the number of future periods expected to benefit from whatever products or services are developed from research. An easier approach is to amortize R&D costs over an arbitrary period of 5 to 10 years.
Deferred taxes Some companies could have timing differences between their taxable income and the book income recognized under GAAP. The biggest cause of deferred taxes is the depreciation on fixed assets because companies can use different depreciation accounting methods that could be not accepted by tax authorities, so it causes a temporary difference in tax and book income (normally results in more book value than tax income, thus a deferred tax liability). Deferred tax assets occur when companies make provisions that are not tax deductible until the company spends the cash in a later accounting period.	In EVA® calculation the depreciations should follow an economic pattern, that is, they should reflect the assets true usage over the assets life, and not a standard rate of depreciation. Adjustment is made by adding the change in deferred taxes for the year operating profit, that is, add an increase and subtract a decrease. Thus this removes the influence of GAAP on income tax expense for EVA® purposes turning it closer to the company actually owes that year to the tax authorities.
Provisions Provisions are estimates of costs of future obligations in the result of past events, such as warranties and guarantees, litigation, environmental damage and clean-up, inventories depreciation, or doubtful debts. From a GAAP point of view, provisions have the virtue of being conservative because changes are recorded immediately instead of in the future periods when the cash will actually be paid. Unfortunately, this offers unique opportunities for manipulating reported profits, by making large provisions when the company is doing well, which reduces profits in that year, but create 'hidden reserves' that managers can use when the company is doing less well.	The usual approach is to focus on the cash-flow effects of the provisions by identifying year-on-year change on the account. When provisions have increased during the year, the company have made a non-cash charge to profit, so the increase is added back to operating profit. When provisions have decreased during the year, means that provisions made in previous years have been at least partially paid off, so the decreases in the provisions account are subtracted from operating profit. Also, the balance in the cumulative provisions account should be added to invested capital.
Goodwill The accounting treatment of goodwill varies from country to country. Some accounting standards require capitalization and subsequent amortization, while others, permit the immediate write-off of goodwill to reserves. According to EVA® proponents, both approaches are wrong, because, immediately or gradually through amortization, removes a part of the acquirer's investment from the balance sheet.	Goodwill is not amortized for EVA® calculations. Any annual amortization of goodwill must be added back to operating profit, and all cumulative goodwill amortizations from prior years must be added back to invested capital. In addition, if goodwill was written off at the time of acquisition for companies that are still owned, that goodwill too must be restored.
Inventories Valuation Under the common GAAP, companies can opt from different inventories valuation methods, such as	The use of LIFO distorts the balance sheet value, and therefore a reserve value must be estimated in

GAAP	Adjustment
first-in-first-out (FIFO), last-in-first-out (LIFO) or weighted average method.	the balance sheet by the difference between the cost of replacement and the cost of LIFO. The annual increase/decrease in the inventory valuation reserve should be added/subtracted from the operational result.
Operating Leases Leasing is the most common form of financing for the acquisition of fixed assets, and companies are often able to structure their lease contracts in such way as to keep the implied debt off the balance sheet, or to work around costs that are not eligible for tax purposes. The lease payments are treated as a rent expense, and the asset acquired through the lease is not capitalized. The effects of this accounting treatment are to understate net assets, invested capital, and operating income because a portion of the lease payments includes the implied interest costs of the lease.	Considerer noncancelable operating leases to be 'debt equivalents'. The proper adjustment is to add the present value of future lease payments, discounted at the company's borrowing costs to the invested capital. The adjustment for interest expense is calculated by multiplying the capitalized value of the leases by the borrowing rate, and then add this value to operating income.
Nonrecurring items Unusual or infrequent items, such gains or losses from the divestiture of assets, discontinued operations or restructuring costs (full cost reserves); Extraordinary items which are defined as events that are unusual in nature, infrequent in occurrence, and material in impact; Gains or losses associated with accounting changes.	Unusual or extraordinary earnings or losses must be write-off from the income statement, and, also the cumulated values from the balance sheet.

Source: adapted from Damodaran (2001:89–92), Neves (2005:76), Stewart (1991:112–117) and Young (1997:337–338)

The Portuguese HEI, when subordinated to the GAAP defined by the '*Portaria n.º 794/2000 (POC-Educação)*', have to consider two more adjustments.

First, the recognition of investment subsidies income is classified as extraordinary income in the same proportion of its corresponding amortizations, that are considered in the NOPAT calculation. Thus, as these values are typically associated with the HEI research activities, they should be reclassified as operational income and balancing with the respective amortizations in NOPAT calculation. Also, the extraordinary income item considers the recognition of income and costs corrections related to prior years. As these

values are related to the operational activity of HEI, they also should be considered in NOPAT calculation.

Secondly, the non-incorporated amount of investment subsidies contracted grants is recognized in the balance sheet liabilities, on deferrals item. Thus, as these values in the future incorporate equity as its respective depreciations occur, they should be considered as equity in the invested capital calculation.

The main adjustments presented previously to NOPAT and invested capital can be resumed as follows in figure 6:

Figure 6 – Computation of main adjustments to NOPAT and invested capital

main adjustments to NOPAT		main adjustments to Invested Capital
NOPAT	**Invested Capital**	
+ increase in deferred taxes	+ deferred taxes reserve	
+ increase in LIFO reserve	+ LIFO reserve	
+ goodwill amortization	+ goodwill cumulated reserves	
	+ unrecorded goodwill	
+ increase in intangible assets	+ net capitalized intangibles	
+ increase in full cost provision	+ full cost provision	
+ increase in unusual losses	+ cumulative unusual loss	
- increase in unusual gains	- cumulative unusual gains	
+ increase in provisions	+ provisions	
bad debt reserve	*bad debt reserve*	
inventory reserve	*inventory reserve*	
warranty reserve	*warranty reserve*	
deferred income reserve	*deferred income reserve*	
= Adjusted NOPAT	**= Adjusted Invested Capital**	

Source: adapted from Damodaran (2001:93–95) and Stewart (1991:112)

2.2.2.4. Cost of capital

Stewart (1991:431), resumed the definition of cost of capital as "the minimum acceptable return on investment. It is an invisible dividing line between good and bad corporate performance, a cutoff rate that must be earned in order to create value".

The cost of capital is the return rate which investors could expect to earn by investing in a portfolio of assets with comparable risk. Consequently, it is an opportunity cost that incorporates, in a trade-off relationship, the definitions of profitability and risk (Brealey and Myers 1998; Stewart 1991).

The capital structure of an organization is the result of a mix of different funding sources, for instance, equity and debt, so consequently, the cost of capital is the result of the individual costs of the different funding sources. In this context, Stewart (1991) purpose the use of the Weighted Average Cost of Capital (WACC) approach to the EVA® calculation. The cost of capital, represented by WACC, "equals the sum of the cost of each of the components of capital – short-term debt, long-term debt, and shareholders' equity – weighted for their relative proportions in the company's capital structure" Young (1997:336).

Considering the presence of preferred stocks and earning taxes, the WACC formula can be presented as follows (Damodaran 2001:218; Ross 2009:353):

$$WACC = \frac{E}{E+P_S+D} \times K_E + \frac{P_S}{E+P_S+D} \times K_{Ps} + \frac{D}{E+P_S+D} \times K_D \times (1 - t)$$

Where:

E: equity

P_S: preferred stocks

D: debt

K_E: cost of equity

K_{Ps}: cost of preferred stocks

K_D: cost of debt

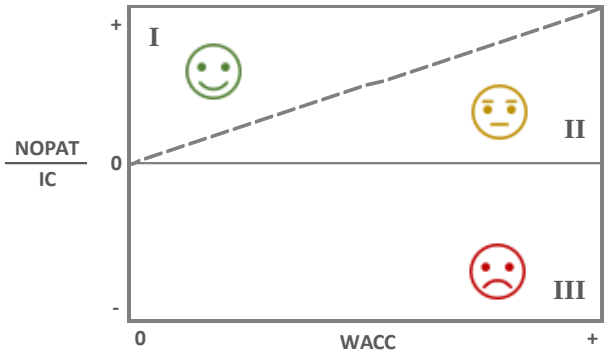
t: earnings tax rate

The calculation of the different components of the cost of capital, and in particular in the HEI, will be further fully exposed and discussed in section 2.4.

2.2.3. Interpretation of EVA® results

If EVA® is positive, value has been created to the company or business shareholders (figure 7, quadrant I). If EVA® is zero, it means that shareholders have been properly remunerated for the incurred risk (figure 7, dashed line). If EVA® is negative, value has been destroyed, meaning that in the shareholder's point of view, no real profit was made and their investment risk was not properly compensated (figure 7, quadrants II and III). In quadrant II (figure 7), although the WACC is positive, there is no value creation since the cost of capital is higher than the return on invested capital (NOPAT / CI), while in quadrant III (figure 7) there is a total destruction of value in all management perspectives (operational, financing and investment).

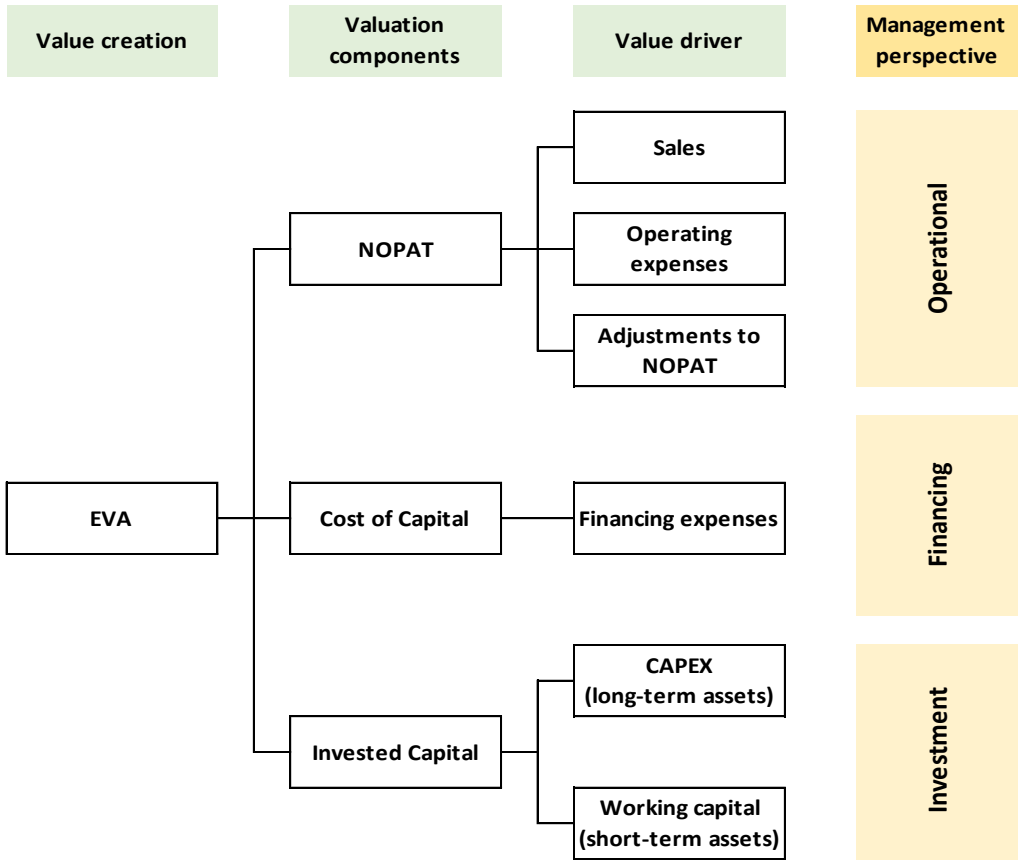
Figure 7 – EVA® matrix



Source: adapted from Neves (2012:593)

Figure 8 resume and illustrates the value creation network through the different management perspectives, representing the link between the corporate objective (value creation), the valuation components (EVA® formula), and the core valuation drivers.

Figure 8 – EVA® value network



Source: adapted from Rappaport (1998:56) and Bahri, St-Pierre, and Sakka (2011:606)

As Peter Drucker (1995:59) observed, "until a business returns a profit that is greater than its cost of capital, it operates at a loss. Never mind that it pays taxes as if it had a genuine profit. The enterprise still returns less to the economy, than it devours in resources […] until then, it does not create wealth, it destroys it", thus EVA® is a fundamental measure of total factor productivity, reflecting all dimensions by which a manager can add value.

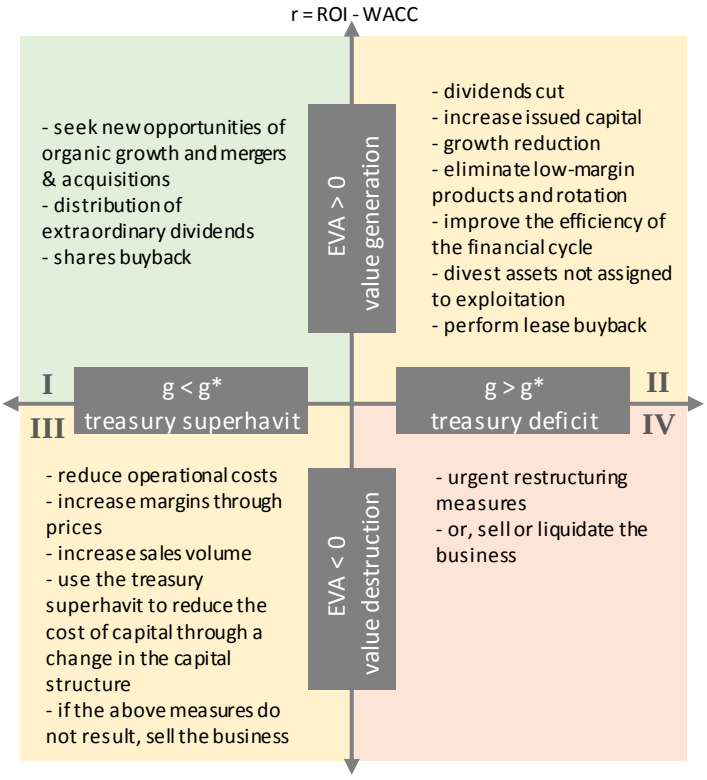
According to Stewart (1991:3, 137–138), there are only three ways to increase value (EVA®):

i. raising operating profits without tying up any more funds or capital, which is the same as, improving the rate of return on the existing base of capital. In this context, EVA® can also be used as a driver for efficiency measuring;
ii. additional capital is invested in projects that return more than the full cost of obtaining new capital. In this context, EVA® can be used as a driver for effectiveness evaluation;
iii. less use of capital for the same level of operation, where capital is withdrawn or reallocated from the projects or operations that earn less than the cost of capital employed in those activities. It means that shareholder value can be increased by a WACC reduction, so in this context, EVA® can be used as a driver for economic evaluation.

Neves (2012), argues that the EVA® growth should be sustainable to avoid triggering imbalances that may withdraw its intended effect. In addition to the EVA results, it is important to assess whether it is appropriate to a sustainable value creation through the strategic orientation financial matrix (figure 9). This matrix associates the value creation represented by the spread of the return on capital invested and the average cost of capital, with the difference between the effective growth rate and the sustainable growth rate[9].

[9] The concept of sustainable growth was originally developed by Robert Higgins in 1977. The sustainable growth rate (g*) is the turnover maximum growth rate that an organization can pursue, considering its profitability, dividend policy, the rate of invested capital and the level of financial leverage (Neves 2012).

Figure 9 – Strategic orientation financial matrix



Source: adapted from Neves (2012:594)

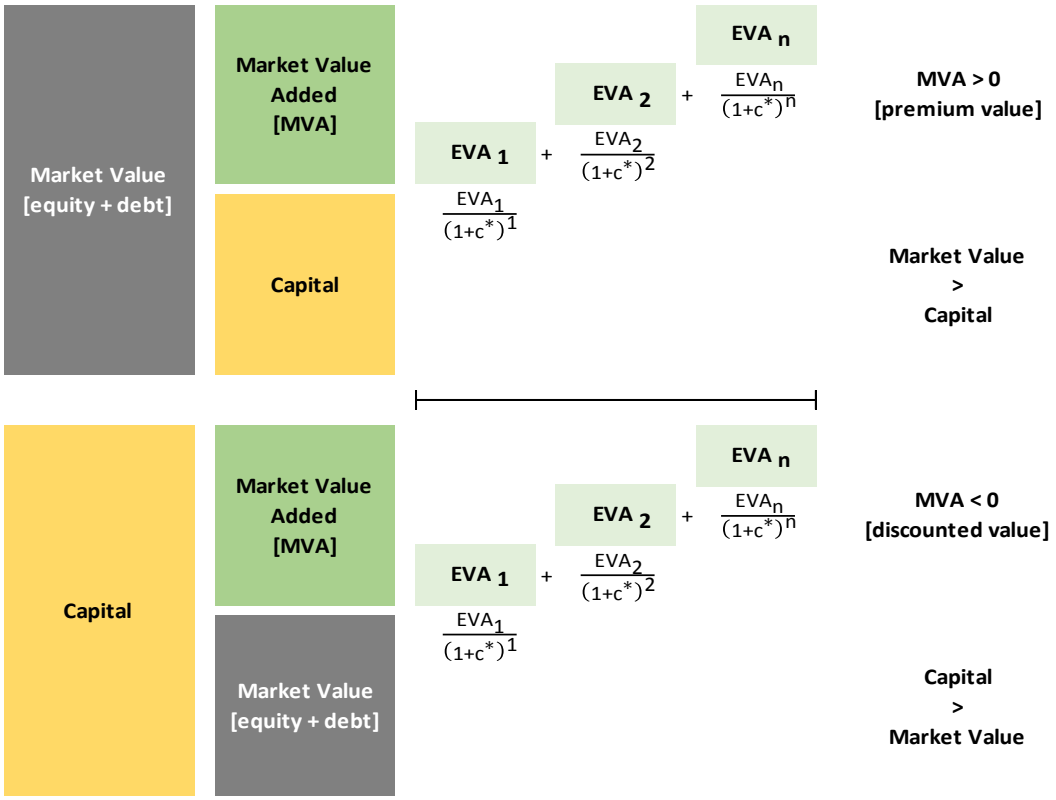
2.2.4. EVA® applications

2.2.4.1. Market value added (MVA)

As exposed before, EVA® measures the value that has been created or destroyed in a defined period. However, investors and shareholders do not evaluate companies based on their past and present, but essentially through the expectations of future gains. Stewart (1991) emerged with the Market Value Added (MVA) concept to fill this insufficiency.

Stewart (1991:741), define MVA as "the difference between a firm's market value and its capital employed", measuring the value created in excess of the resources already committed to the organization, therefore, "in theory, MVA represents the net present value of all past and projected capital investment projects".

Figure 10 – Relationship between EVA® and MVA



Source: adapted from Stewart (1991:154)

As represented in figure 10, MVA is a cumulative measure of corporate performance, because it represents the market's assessment, at a particular time, of the net present value of a company's past and projected activities; but also definitive, because represents the difference between the invested capital and its shares liquidating value in the markets (Stewart 1991). Consequently, MVA can be calculated as follows:

MVA = market value – capital

MVA = present value of all future EVA®

2.2.4.2. EVA®-based incentive systems

The value-based management, and therefore the EVA®, "is far more than a measurement tool" (Stern 2003:20). Considering the problematic associated with the agency theory in corporate governance, the compensation or incentive systems emerge as a regulatory tool to align shareholders and managers interests and agendas.

The traditional incentive systems, for example, based on EPS, ROI, ROA, ROE or operating profits have been criticized for distinct reasons.

Stern (2003:148–149), refers that "apart from being grounded on the wrong criteria […] they are typically based on the achievement of budgetary goals for the following year", which managers try to keep them as realistic as possible, creating slacks and transposing past inefficiencies to the future (Pardal 2005a). This same author (2005b), goes further and argue that in the public sector, in heavily bureaucratized organizations, budgeting is no more than a expenses legitimation, which if materialized, they are not object of any value judgement in the efficiency and efficacy perspectives; and in the Portuguese SME geo-economic space, the budget is confined to the function of the definition of punishments and rewards in the hierarchy.

As metrics based accounting systems, have frequently limits on their upside, "managers are tempted to adopt income-reducing accounting policies to create profit reserves that can be used to top up bonuses in less profitable years" (Young 1997:337). Wallace (1997:297), observed that they tend to "lead to dysfunctional management actions such as sub-optimal investment decisions and the reluctance of managers to pay out free cash flow".

Rappaport (1998) suggests that the design of incentive systems should be based or aligned with the value creation process. Stewart (1991), argues that EVA® is the most appropriate performance measure because help managers to enhance value with a framework that clearly links their prospective operating and strategic decisions with subsequent evaluation of their performance, providing "strong motivation for growth combined with capital discipline" (Stern 2003:156).

The EVA® incentive system relays in three main elements (Neves 2005; Stern 2003):

i. EVA® target: the annual expected EVA® improvement tied to the performance of the previous year to avoid the same problems of the budgeting objectives;
ii. Bonus or pay-out target: pay-out compensation for achieving the EVA® target, which is uncapped to avoid accounting manipulating;
iii. EVA® interval: value deducted to EVA® target that will determine the point from which the target bonus will be exceeded or shoved.

Stewart (1991:247) presents the following system which allows managers to be rewarded, in a long term period, through two strands, the EVA® improvement, and the EVA® absolute value:

$$\text{EVA® bonus} = [M1\% \times \Delta\text{EVA®}] + [M2\% \times \text{EVA®}]$$

where:

M1: percent of the EVA® improvement (positive or negative)

M2: percent over the positive absolute EVA®, or 0% flat rate if negative.

According to Stewart (1991) and Neves (2005), M1 should be superior to M2 to provide an incentive for performance improvement or a penalty if performance decrease, but in the long term, can lead managers to prefer sustainable growths instead of taking advantage of opportunity gains. If a manager improves EVA® (M1), there is an immediate and substantial reward coming through from the first term of the equation. The assumption of M2 is zero as long as EVA® is negative is related to a sense of not penalizing managers for sunk causes, to put effort into turning the business to its economic viability. Neves (2005), also argue that this assumption should be valid only if the manager were recruited to make the turnaround in the company, but if his management decisions are the cause of the negative EVA®, he should be penalized for that results, which is also my opinion.

With the purpose of purge the possibility of manipulations in EVA® improvement to subsequent years, Stewart (1991) propose the figure of the bonus bank. The bonus bank retains a part of the excess bonuses, from which, negative performance results are debited. Stewart (1991) and Neves (2005) argue that this function also has other advantages as:

i. induces a long-term perspective into executive teams;
ii. smooths bonuses over the long-term, retaining executives with superior performance in the company;
iii. encourages low-performance managers to leave the company by hindering the possibility of obtaining future rewards.

There are no perfect or bulletproof incentive systems, and the EVA® system is no different. Instead of its limitations, is one of the most interesting and robust systems, as it can improve corporate performance through the regulation of executive team's behavior and management decisions (act like owners) in the interest of the company (shareholders), contributing by this form to mitigate the agency theory dilemma.

2.2.5. Advantages and limitations of EVA®

Stewart (1994:75), states that EVA® is the superior performance management measure, so it "stands well out from the crowd as the single best measure of wealth creation on a contemporaneous basis". Despite Stewart's arguing, EVA® has it owns advantages and limitations as the others performance measures, as evidenced in the literature.

The main advantages of EVA® referred in literature are:

i. The EVA® concept is easily perceived and simple enough to apply and calculate (Makelainen 1998; Stern 2003);
ii. Other virtue of EVA® is its adaptability. EVA® is not only a measurement system for a company as a whole, but "but it can readily be broken down to the level of a division, a factory, a store, or even a product line" (Stern 2003:23), and also could be applied to any type of organizations (Bahri, St-Pierre, and Sakka 2011; Jensen and Meckling 1998; Zimmerman 1997);
iii. EVA® is a system of financial management that allocates capital in a logical economic framework, which permits to evaluate and communicate management decisions in all organizational cycles (operational, investment and financing) (Stern 2003);
iv. EVA® can align the interests of managers with those of shareholders, resolving the main dilemma of corporate governance, the agency problem (Stern 2003; Young 1997). Wallace (1997), observed significant increases in RI for the firms adopting residual income-based compensation plan, overperforming the market by over 4% in cumulative terms. Although Biddle et al. (1999) are from the opinion that evidence does not prove that EVA® creates shareholder health, but it demonstrates that RI incentive-based plans are effective in altering management decisions in ways that should contribute to shareholders health;
v. EVA® drives the market value of shares (Stewart 1991). Chen and Dodd (1997; 1998), observed with further research that EVA® does not suggests a path to superior stock returns, but provide relatively more information than traditional measures of accounting profit in capturing created value. Various other studies (Biddle, Bowen, and Wallace 1999; Makelainen 1998; Sharma and Kumar 2010) pointed out that besides of Stewart's research, they did not found any statistical evidence that EVA® can better explain stock returns and firm value.

As limitations of EVA®, are referred the following:

i. As others traditional performance measures, EVA® is based on the past (accounting results) and does not incorporate future expectations, although "future returns cannot be measured, they can only be subjectively estimated" (Makelainen 1998:15), so this is a common limitation for all performance measures.

   To respond to this insufficiency, Stewart developed the MVA concept;

ii. EVA® is criticized for being a short-term performance measure. Such other traditional measures, EVA® is poor in periodizing the return of a single investment (Makelainen 1998), and underestimates the return in short-term and overestimates it in the long-term periods. Therefore it could probably "not be a suitable primary performance measure for companies that have invested heavily today and expect positive cash flow in a distant future" (Shil 2009:174).

   To solve this insufficiency, the Boston Consulting Group proposed a new measure called Cash Value Added (CVA)[10] based on EBITDA instead of NOPAT, but according to Neves (2005) is not consistent with NPV approach and overestimates the created value;

iii. The periodic EVA® fails to estimate the value added to shareholders by the effects of the inflation and other factors, which causes distortions between market values and accounting values at historical costs (Shil 2009).

   Facing this problem, appeared in the literature two alternatives:

   De Villiers (1997), developed the concept of Adjusted Economic Value Added (AEVA)[11], which considers capital at current values, that according to the author drives a better estimation of profitability in an inflation scenario;

[10] CVA = EBITDA × (1-t) - WACC × Invested capital ⇔ EVA® + depreciations + provisions.

[11] AEVA = NOPAT - k × IC_c, where k = cost of capital, and IC_c = invested capital at current values.

While EVA® holds the perspective of the invested capital into the company, Bacidore et al. (1997), presented an alternative called Refined Economic Value Added (REVA)[12], which considers the cost of capital at market values, retrieving the perspective of the shareholder which acquires its position in the market;

iv. Traditional financial ratios are commonly used for distress prediction, although it was observed that EVA® does not have incremental value in predicting (Shil 2009);

v. As referred before, the adjustments proposed in EVA® calculation have a marginal effect, therefore in some cases, its application can be expendable (Bowman 2011; Neves 2005; Young 1997). Some other alternatives measures emerged to resolve this problem:

The Cash Flow Return On Investment (CFROI)[13] was developed by Holt Value Associates based on the assumption that performance measurement must be evaluated with the same criteria used for investment decisions by adjusting accounting values to current values and considering an internal rate of return.

The Shareholder Value Added (SVA)[14] was developed by Alfred Rappaport based on the discounted cash flow model (DCF), by measuring the incremental value of a business that affects the net present value of cash to shareholders.

[12] REVA = NOPAT - k × MV, where k = cost of capital, and MV = market value of the firm.

[13] CFROI = cash flow / market value of capital employed.

[14] SVA = present value of cash flows from operations + residual value + marketable securities ⇔ NOPAT – (WACC x Capital).

The traditional performance measures, as NOPAT, EPS, ROI, ROE or others, have been criticized due to their unidimensionality and inability to incorporate the full cost of capital, thereby accounting income is not a consistent predictor of firm value and cannot be used for measuring corporate performance (Sharma and Kumar 2010). For this purpose, EVA® is a comprehensive measure, and therefore, relatively superior facing traditional measures.

Sharma and Kumar (2010), however, found several empirical studies highlighting that there is no single accounting measure which can explain the variability in the shareholder's wealth and should not be subjected to the randomness inherent in it.

2.3. EVA® in higher education sector

Sharma and Kumar (2010), observed that most of the EVA® studies in the literature focused on the manufacturing industry across the world, although it has identified some studies about the application of EVA® in non-traditional areas, as hospitality and tourism, health, agricultural or education.

Rompho (2009), presents a model of the application of EVA® in the higher education sector as a capital budgeting tool, which contributes to the awareness of the importance of asset utilization and guides universities to a better resource management.

The proposed model starts with the assumption of each university "has two totally different types of organization: the for-profit part, where most income is self-generated; and the non-profit part, where most income is supplied by the government budget" (Rompho 2009:6), so the EVA® model must be segmented for each different part.

To the for-profit part, the author suggests the use of the traditional EVA® formula applied to the business units' level for measure their financial performance, instead of the evaluation by budgeting control, and as a tool for resource allocation in competing programmes or projects. In this context, Rompho states (2009:7) that "when programs are judged only on expected profit, the answer is simply to invest in all programs, as they are all profitable, but in the valuations perspective, taking in consideration the capital as a driver for resource utilization, "the best programme is one that generates profits without tying up many resources".

As a result, Rompho (2009:8) consider that "EVA is certainly a useful tool to help university management arrive to the most optimal decisions regarding allocation of its limited resources".

Furthermore, the author observed that universities are judged, particularly in the rankings context, by the size of their investments. The higher investment in assets by HEI, tend to result in lower asset utilization rates, but also leads staff and students to face the

use of these assets as a free resource. Therefore, "by applying the concept of the EVA in such a way that assumes every asset in a university has its associated costs, there is created a sense of 'leasing'" (Rompho 2009:8).

To apply the EVA® concept to the non-profit segment, the author argues that "NOPAT seems irrelevant but capital charge is relevant" (Rompho 2009:8), consequently the pertinent question, is what should be measured against the capital cost.

The first solution proposed by Rompho (2009) consists on identifying the financial value of objectives of the HEI non-profit units, although it considers that is tough to achieve those values in terms of market values.

A second solution proposed by the author is based on "the argument that is not necessary to quantify the financial value of non-financial measures […], as NOPAT is not the main objective of the university" (Rompho 2009:10). Hence, it has presented a rearrangement of the traditional EVA® formula to a ratio of NOPAT and capital charge[15], which could be called Ratio of EVA[16]:

$$\text{Ratio of EVA} = {}^{\text{NOPAT}}/_{\text{capital charge}}$$

Rompho (2009) perceived that this ratio form enhances the ability of the numerator no longer needs to be in financial terms and can be replaced for any variable that can reflect the objective of an HEI, while the denominator sum the expenses and their capital charge that are associated to produce the outcome.

This idea results in a more academic-oriented measure that the author calls Academic Value Added Ratio (AVAR):

$$\text{AVAR} = \frac{\text{objective of university}}{\text{expense + capital charge}}$$

[15] Remembering that Capital Charge = Invested Capital x Cost of Capital.

[16] While traditional EVA® breakeven at zero, the Ratio of EVA breakeven point is one. Although the change in interpretation the concept remain exactly the same (Rompho 2009).

With this measure, that is similar to other productivity measures, but different by the use of the capital charge concept, “the best university is no longer the university that spends much but is the university that spends less and obtains impressive results, such as high quality graduates and research” (Rompho 2009:12).

2.4. Cost of capital

As referred before, the cost of capital is derived from the organizations' capital structure by the individual costs of its different funding sources, weighted for their relative proportions. The WACC approach is a development of the Modigliani and Miller (1958) cost of capital theory, where their three propositions theorem is based on the assumption of perfection in capital markets, ignoring, therefore, the risk associated with debt leverage.

Considering the WACC formula presented in section 2.2.2.4, it is necessary to determine the cost of the main individual funding sources:

2.4.1. Cost of debt

The cost of debt "is the required return for credit risk" (Stewart 1991:432), represented by the yield-to-maturity defined in the organization debt contracts.

As interests are tax deductible, they produce a tax saving (K_dT), where T is the company's marginal tax rate, which will increase the company's free can flows, and therefore should be deducted from the cost of debt (K_d). The marginal cost of debt can be given by Martins *et al.* (2011:70):

$$K_d - K_dT = K_d(1-T)$$

2.4.2. Cost of preferred stocks

The preferred stocks, also called hybrid securities, combines characteristics or instruments of debt and equity, as it involves the payment of fixed dividends and has the potential of asset valuation as a common share, respectively. They distinguish from the ordinary stocks by an contractual and preferred dividend, which the company must pay

before the common shareholder's dividend distribution, although they do not confer any voting rights (Damodaran 2001; Martins et al. 2011).

The cost of preferred stocks (K_p) can be stated as (Damodaran 2001:214):

$$K_p = \frac{\text{preferred dividend per share}}{\text{market price per share}}$$

As the payment of preferred dividends is not tax deductible, there are no tax savings. Therefore it is not necessary to adjust into an after-tax yield-to-maturity.

2.4.3. Cost of equity

The cost of equity is the return required or expected by shareholders for their investment, compared to alternative investments with similar risk levels. From the company's perspective, it represents the required rate of return on a particular project or investment.

Equity capital can be obtained by capital providers or investors entities or thru the retention of earnings. The retention of returns in the organization represents a cost for shareholders as they are deprived from dividend distribution, which must be measured by the trade-off of benefits they receive from the dividend distribution (Martins et al. 2011). Although some managers consider that such funds do not have associated any cost, considering the shareholders or the stakeholder's interest, they represent an opportunity cost, as common folkloric expression states 'there is no such thing as a free lunch'.

The use of retained earnings in the entity operations, for example, for improving solvency through debt amortization, to improve liquidity through higher levels of net working capital, or to investment in assets or staff training, also represents an opportunity cost, so far as the entity does not have to recourse to other funding sources to execute those investments (Martins et al. 2011).

In the third-sector, the estimation of the cost of equity raises some questions about its applicability. Moreover, considering hybrid entities, while in their for-profit segment it is natural that entities incorporate a determined return for their investment, in their non-profit component, equity is also or is the main funding source of these entities. Besides of the fact that normally there is no dividend distribution to compensate investors, it is expectable that stakeholders require an effective and efficient resource allocation of their consigned funds or investments, therefore, the non-profit entities equity incorporates, somehow, an implicit minimum level of required return. The investment of retained earnings in operations is the most common situation in non-profit entities, which also represents the existence of an opportunity cost. For those reasons, the cost of equity should also be determined and evaluated in non-profit entities, notwithstanding that must be carefully interpreted.

In the literature, are described various models to estimate the cost of equity, that could be resumed them in three distinct groups (Bastos 2015; Kask 2014):

i. models based, entirely or partially, in the capital markets information, that are suitable for listed companies, such as the Capital Asset Pricing Model (CAPM) or the Gordon Model, and multifactorial models as the Arbitrage Pricing Model (APT), the Abnormal Earnings Method or the Fama and French Model;
ii. models based on the company's internal information suitable for entities that are not listed in the capital markets. This segment includes the Pure Play Approach (Bottom-Up Betas), the Accounting Beta Model and Heuristic Models;
iii. models based on governmental entities or projects.

In the following sections will be presented and discussed the most relevant methods or models for estimating the cost of equity.

2.4.3.1. Market-based models

2.4.3.1.1. Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM), proposed by Lintner and Sharp, is the most used method and still is the standard in the most real-world analysis (Damodaran 2001; Ross 2009). This model is based on the market portfolio theory developed by Harry Markowitz, which considers the direct relationship between risk and returns in the definition of an optimized and diversified investment policy. The main difference between this two approaches is that CAPM also consider the addition of a riskless asset to the portfolio mix, because, "the riskless asset, by definition, has expected return that will always be equal to the actual return" Damodaran (2001:164), and although risky assets' returns vary, the absence of variance in the riskless assets returns makes it uncorrelated with returns of any of these risky assets.

The CAPM model assumes that markets are efficient, there are no transaction costs, investments are infinitely indivisible, and the relationship between risk and return is linear in time (Bastos 2015; Damodaran 2001; Ross 2009). Therefore, can be represented by the following equation:

$$\text{CAPM } K_E: E(R_i) = R_f + \beta \times [E(R_m) - R_f]$$

where:

$E(R_i)$: expected return on asset *i*

R_f: risk-free rate

β: beta of investment

$E(R_m)$: expected return on the market portfolio

Therefore, the cost of equity, represented by the expected return given by CAPM, is supported by three variables:

1. Risk-free rate (R_f):

The risk-free rate is represented by the return of a riskless asset or portfolio, non-correlated with other economic factors, corresponding to a zero beta. Damodaran (2001:188), refer that are two conditions to be met: "there is no default risk, which generally implies that the government has to issue securities", and "there is no uncertainty about the reinvestment rates, which implies that there are no cash flows prior to the end of our time horizon, since these cash flows have to be reinvested at rates that are unknown today".

The same author suggests that the risk-free rate should be indexed to the same time horizon of the cash flows that are being analyzed, and also, to a riskless rate in the same currency[17]. If the analysis is done in real terms, as if there is no inflation in the currency, the risk-free rate also has to be converted from nominal rate to a real riskless rate.

2. Risk premium ($E(R_m) - R_f$):

The risk premium represents "the 'extra return' that would be demanded by investors for shifting their money from a riskless investment to an average risk investment" (Damodaran 2001:190), which is given by the difference between the average return on stocks and the risk-free securities for a determined time horizon.

According to Damodaran (2001)[18], there are two main approaches to estimate the risk premium, the historical premium, and the implied premium.

[17] Damodaran (2001:189) suggests the use of a riskless rate in the same currency instead of a specific country riskless rate, as "the country default risk premium is best reflected in the risk premium component and not in the riskless rate". If the cash flows are in Euro currency, the risk-free rate has to be a Euro riskless rate, independent if the object of analysis is based in Portugal or in Deutschland.

[18] The next paragraphs are based on this bibliographic reference, Damodaran (2001:190–195).

The historical risk premium is the most common approach and is based on historical data over an extended period of average stock returns and average risk-free securities. Although since stock returns volatile, short-term periods can provide premiums with large standard errors[19]. Authors diverge about the use of arithmetic averages and geometric averages. While Damodaran refers that, since arithmetic average premiums overstate the expected returns over long periods, they can provide a more appropriate estimate for longer time horizons, while other authors as Indro and Lee (1997), argue for the use of a weighted average of arithmetic and geometric averages.

If the market analysis cannot provide robust and reliable data in a long-term horizon, the equity risk premium can, alternatively, be calculated by (Damodaran 2016):

Equity risk premium (R_m) = country equity risk premium + risk premium for mature markets

where:

Country equity risk premium = default spread × relative volatility of equity

The default spread could be estimated using a hurdle rate associated with the country rating or, alternatively, by market-based estimates, on which the long-term country yield is compared to the risk-free rate. The relative volatility of equity can be estimated by the standard deviations of the stock and bonds markets in that country (Damodaran 2016)[20]:

$$\text{Relative volatility of equity} = \frac{\text{standard deviation of equity market in country}}{\text{standard deviation of long-term bonds issued by the country}}$$

[19] Damodaran (2001), observed that from short-term periods, for instance 25 years of data, will have a standard error of about 4% or 5%, therefore is more appropriated to base the analysis in the United States market which range goes back as 1929.

[20] Godfrey and Espinosa (1996), suggest a variant to calculate the cost of equity by adding the country default spread to the US risk-free rate, and multiplying the US equity risk premium by the volatility of the country equity market. The cost of equity is given by:

$$K_E = \text{U.S. risk-free rate} + \text{Country default spread} + \beta\ (\text{U.S. risk premium}) \times \left(\frac{\sigma \text{ foreign equity index}}{\sigma \text{ U.S. index}}\right)$$

The second approach, the implied equity premiums, use the premium extracted by looking how markets price risky assets today, assuming that overall market prices are correctly priced, and does not require surveys or historical data. It can be formulated as follows:

$$\text{Current level of markets} = \frac{\text{expected dividends next period}}{\text{expected returns on equity - expected growth rate}}$$

3. Beta (β):

The beta value represents the systemic risk coefficient for investments, measuring the sensibility, by a regression, of stock returns (R_j) against market returns (R_m):

$$R_j = a + b \,.\, R_m$$

where:

a: intercept from the regression

b: slope of the regression = $\frac{\text{cov}\,(R_j, R_m)}{\delta^2 m}$

Therefore, the beta value (β) can be expressed as follows:

$$\beta = \frac{\text{cov}\,(R_j, R_m)}{\text{var}\,(R_m)} = \frac{\delta\, j,m}{\delta^2 m}$$

The practical estimation of the beta could raise some questions which Bastos (2015), Damodaran (2001) and Ross (2009) resumed as:

i. the time horizon interval in beta estimation (10, 5, 3 years);
ii. the time horizon interval in the market returns calculation (annual, quarterly, monthly, weekly, daily basis, intra-day);
iii. the choice of the market index in the market returns calculation;
iv. the use of adjusted betas which reflect the standard errors of the beta estimate and its tendency to the market or industry average;
v. the effects of the company size and the transactions frequency (liquidity of the title);
vi. the choice of the risk-free time horizon (short or long-term).

This approach for beta calculation only works for assets that have been traded and have a market value. For non-listed entities, there are alternative approaches for estimating the beta value that will be exposed in section 2.4.3.2.

2.4.3.1.2. Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory (APT) is a multifactorial capital asset pricing model suggested by Ross in 1976 as an alternative to CAPM (Bastos 2015). The main difference between this two models is, while CAPM have only one factor (beta) that captures all systemic risk, the APT results from different arbitrage opportunities for investors, as it presents multiple and distinct sources of systemic risk and measure the sensitivity of investments to changes in each source (Bastos 2015; Damodaran 2001). Therefore, the expected return on an asset can be formulated as (Damodaran 2001:169):

$$\text{APT: } E(R_j) = R_f + \beta_1 [E(R_1) - R_f] + \beta_2 [E(R_2) - R_f] + \ldots + \beta_n [E(R_n) - R_f]$$

where:

R_f: expected return on a zero-beta portfolio

$E(R_j)$: expected return on a portfolio with factor beta of 1 for factor j and zero for all other factors

Bastos (2015) and Damodaran (2001) observed that some proxies used in this model are macroeconomic factors, such as the inflation, changes in default premium on corporate bonds, changes in GDP, changes in real interest rates, or oil prices changes.

2.4.3.2. Non-listed entities models

The historical approach to estimate the beta it is only applicable to companies or assets that have been traded or have a market value. As the temporal regression elements are not available or the markets do not have the due temporal maturation (Damodaran 2001), the systematic risk, or the cost of capital, can be estimated through the next alternative methods.

2.4.3.2.1. Industry betas

The industry betas approach, also known as the Pure Paly Approach or Bottom-up Betas, estimates the non-observable beta of a company based on information of comparable company's or business to use in the CAPM[21].

[21] Considering that "the beta for a firm is the weighted average of the betas of all different business it is in", therefore: $\beta_i = \sum_{j=1}^{n} \left(\frac{S_{ij}}{S_i}\right) \times \beta_{ij}$ (Damodaran 2001:205).

The first step is to calculate the average of unlevered betas of other publicly traded firms that are primarily or only in the same industry or business. In this step, authors diverge in the unleveraging process. While some support that unleveraging should be made in each company considered to compute the average beta, others propose that unleveraging should be done in the average levered beta value with cumulative market values of equity and debt for the whole sector, because "this average values is less affected by extreme values for the debt to equity ratio that individual firms may possess" (Damodaran 2001:206).

To remove the degree of financial leverage from a company beta is used the formula proposed by Hamada in 1972, modified to ignore tax effects (Damodaran 2001):

$$\beta_u = \frac{\beta_L}{1 + (1 - t) \times \left(D/E\right)} \Leftrightarrow \beta_L = \beta_u \times \left[1 + (1 - t) \times \left(D/E\right)\right]$$

where:

β_u: unlevered beta of the firm without any debt

β_L: levered beta of the firm

t: corporate tax rate

D/E: debt-to-equity ratio

Finally, considering the industry average unlevered beta, it is essential to estimate the current market values of equity and debt of the company, to calculate its levered beta.

2.4.3.2.2. Accounting betas

Another method to estimate the beta value is to infer the systemic risk through accounting values.

The Fundamental Beta is one methodology referred by Damodaran (2001:202), on which three variables determine the beta of the firm:

i. the type of business the firm is in and its sensitiveness to market conditions induce the beta value as it measures the risk of a firm relative to a market index;

ii. the degree of operating leverage is related to the propensity to generate cash flows, and hence dividends. Therefore, changes in operating profit imply changes in shareholders remuneration and market valuations. By this method, the unlevered beta is an approximate measure of the operating leverage, which is given by the relation between fixed and total costs, or alternatively, by a relative measure:

$$\text{Operating Leverage} = \frac{\%\ \Delta \text{ in operating profit}}{\%\ \Delta \text{ in sales}}$$

iii. finally, the firm's financial leverage increases the variance in net income and the risk associated with the equity investment. Therefore, the unleveraged beta must be adjusted to a levered beta value to incorporate that risk.

Bastos (2015), refer another accounting beta method, the Hill and Stone Method. This approach considers an accounting analogy of the market's beta and is based on the assumption that accounting returns are generated by a statistical process similar to the generation of market returns.

For this purpose, Hill and Stone defined the ROA_i as the accounting measure of operational systemic risk for company *i* (B_i^O), and ROE_i as the accounting measure of the equity systemic risk for company *i* (B_i^C), from which "the accounting equity beta is measured relative to an index of equity and the accounting operating beta is measured relative to an

index of operating returns" (Hill and Stone 1980:605), ROE_m and ROA_m respectively. Therefore, these measures can be expressed by the following equations:

$$B_i^O = \frac{d\,(ROA_i)}{d(ROA_m)} \Leftrightarrow \frac{cov\,(ROA_i\,,\,ROA_m)}{var\;ROA_m}$$

$$B_i^C = \frac{d\,(ROE_i)}{d(ROE_m)} \Leftrightarrow \frac{cov\,(ROE_i\,,\,ROE_m)}{var\;ROE_m}$$

where:

$$ROA_i = \frac{net\ income}{total\ assets}$$

$$ROE_i = \frac{net\ income}{total\ equity}$$

$$ROA_m = \sum_{i=1}^{n} w_i \times ROA_i$$

$$ROE_m = \sum_{i=1}^{n} w_i \times ROE_i$$

w_i = weights of returns in each index

"An alternative measure of operating earnings is return on investment" (Hill and Stone 1980:601). ROI measures financing structure as a portion of the total investment, although ROA measures a portion of total assets. Also, ROA is a very criticized measure as it considers the use of net income rather the economic income. Therefore, although Hill and Stone (1980) maintain the use of ROA, it is preferable to replace this measure by ROI to determine the operational risk.

Considering the risk composition and financial leverage can be derived "an equity beta based on return on common equity (ROE) and an operating beta based on return on assets (ROA)" (Hill and Stone 1980:602), which is related to the risk composed equity beta (B_i^R) expression:

$$B_i^R = \left(\frac{B_i^O}{1 - t}\right)\left[\sum_{k=1}^{n} \frac{w_k\, B_m^O}{1 - t}\right]^{-1} \Leftrightarrow \frac{B_i^O\,(1 - t)}{\sum_{k=1}^{n} w_k\, B_k^O\,(1 - t)}$$

Considering the chain rule, the expression can also be derived as (Hill and Stone 1980:603):

$$B_i^R = \left(\frac{B_i^O}{1 - t}\right)\frac{d\ ROA_m}{d\ ROE_m}$$

2.4.3.2.3. Other methods

In the literature, are present other alternative methods to estimate the cost of capital for non-listed companies. Bastos (2015) refer the Heuristic Method[22], the ABC-EVA Method[23], the Analytical Hierarchy Process[24], or the Cheung Method[25].

These alternatives are based on surveys, risk assessment matrixes or on internal informational, from which the systemic risk is graded by different pre-determined hurdle rates. Therefore, for that reason, those methods will not be exposed and discussed in the present work.

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2.4.3.3. The cost of public capital

The application of the cost of capital in public sector has been discussed for several years in the literature, although important insights have been brought, still remains wide differences and a lack of consensus on some fundamental issues.

Spackman (2004:468) observed that "some differences arise from fundamental beliefs", such the nature of capital markets, relative roles of expert or wide public opinion, while other's "arise from pragmatic judgements about the feasibility of quantifying a government bureaucracy", or "some author's reject even the concept of governments discount future costs and benefits". Kask (2014:114) refer that "the main problem arises from the well-recognized fact that the government should allocate its budget to maximize social welfare".

A first position is that the government projects (or entities) cost of capital should follow a financial or a 'state preference approach' (Arrow 1965; Kask 2014), instead of the market-based approaches such as CAPM, assuming, therefore, the incompatibility and the distortions from the competitive equilibrium between government and private entities (Arrow 1965; Bailey and Jensen 1972; Spackman 2004).

The main arguments that support this position are the following presumptions (Bailey and Jensen 1972:4):

i. "private risk is inherently greater than social risk";
ii. "all government project benefits and costs and therefore risks are distributed over the entire population of the country (the 'distribution' problem)";
iii. "insuring risks through the government is the cheapest way to do it (the 'cost' problem)".

Giving these assumptions, the cost of public capital should be lower than the private sector (Spackman 2004), "as the public sector can raise capital cheaper than the private sector" (Moszoro 2014:113), because "taxpayers bear the residual risk of government investment" (Brealey, Cooper, and Habib 1997:22).

Therefore, various author's, namely Arrow (1965) and Lind (1970) *apud* (Kask 2014; Moszoro 2014; Spackman 2004), suggests that the government's long-term borrowing rate is a good proxy for the cost of public capital, where the country default spread represent the risk (systematic and non-systematic) sustained by the country.

A second position is that the government projects (or entities) cost of capital should follow a socially optimal approach (Kask 2014). Based on the assumption that "a government cost of capital is needed for the pricing of government outputs, for comparison with market prices, as in financing appraisals and the setting of government fees and charges" (Spackman 2004:497), the cost of public capital should incorporate risk as the private investment does. In fact, "the public sector's lower borrowing cost does not reflect a more efficient management of risk, but the fact that public sector does not default and that it can levy taxes to repay debt" (Moszoro 2014:112).

Therefore, in an open economy, the relevant cost of capital for public entities is the market-based methods, where the opportunity cost of capital and risk could be determined by market-determined rates, or alternatively through the social rate of time preference (SRTP), social opportunity cost (SOC), weighted average of SRTP and SOC or even by shadow price of capital.

In this context, (Spackman 2004:498) refer that "central governments are increasingly adopting accrual accounting, and sometimes accrual budgeting" for presenting the "full cost [of their activities] and avoid any subsidy (or monopoly exploitation) by the government".

3. Research framework

The aim of this section is to present the background of the study, the research problem and research objectives, and the research design that will guide the empirical study.

3.1. Background of the study

Non-profit organizations (NPO) or not-for-profit organizations (NFO), have been defined as organizations with predominantly non-business characteristics, as they play a variety of social, economic, and political roles in the society, which heavily influence its operations (Boris and Steuerle 2006; FASB 1980). NPO are entities that can "provide services as well as educate, advocate, and engage people in civic and social life" (Boris and Steuerle 2006:66). Therefore, educational institutions are considered non-profit organizations (Drucker 2016).

The Portuguese HEI sector is predominantly based on the Napoleonic style, where HEI are public institutions on the dependence of the Government central administration and mainly financed by the state (Mano and Marques 2012).

The influence and adoption of the New Public Management (NPM) principles in the earlier 90's, led Portuguese HEI on the path of change. The new legal regime of HEI (RJIES – Decreto-Lei n.º 62/2007, vol.1ª série 2007) introduced a new framework of autonomy and new models of governance structure. The Portuguese public HEI have two main models of governance: the traditional model (public law university) and the foundation model. State, market, and autonomy (or academic oligarchy) are the three influential factors of the HEI governance but, constraints on the government funding in the last years, promoted the appearance of the entrepreneurial university archetypal, as these institutions were implied to diversify their funding sources (Mano and Marques 2012).

The need for accountability systems in HEI arise from two sources: one is an internal requirement that supports the decision-making process, the nature of its mission and the sources of revenue which demanded a high degree of internal control systems; and secondly, there is the external demand for accountability, where stakeholders expect a resource utilization consistent with its mission (Abraham 2003; Abraham 2004). The implementation of the NPM and RJIES principles in Portugal required an accurate accountability system, which Portuguese HEI started to develop on an exigency basis.

Underlying the chosen governance model, the Portuguese HEI performance evaluation became conceptually based on the value for the money concept, and therefore, as stated in almost of the Portuguese universities statutes, in the 3E's principle: economy, efficiency, and effectiveness. This raises the question of how to measure economy, efficiency, and effectiveness, and therefore the financial performance in HEI context. Chen, Wang, and Yang (2009), refer that performance measures in HEI should focus on:

i. the efficient and disciplined use of resources;
ii. achievement of value for money;
iii. increased productivity;
iv. measurement of achievement against declared objectives by comparison across institutions.

In addition, Taylor (2014), refer that HEI financial management performance should focus on:

i. efficient resource allocation to ensure value for money;
ii. transparency, to ensure public accountability and good governance;
iii. sustainability, to ensure stability, investment and asset replacement, opportunity exploitation and survival.

3.2. Problem statement and research objectives

Higher Education is shifting now from a public service to a market-drive-one as a result of the pressure to improve their financial capacity (resilience) and financial sustainability, and therefore, to create value for the money (Asif and Searcy 2014; Bowman 2011).

Although there is starting to appear a value-driven approach in this entities, the current financial performance measures demanded by stakeholders or present in their strategic plans, are primarily based on scorecard systems or composite indexed that relies on budgetary and traditional ratio measures (Abraham 2003; Abraham 2004; Bowman 2011; Chen, Yang, and Shiau 2006; Leal, Carvalho, and Santos 2012; Prowle and Morgan 2005; Pursglove and Simpson 2001; Taylor 2014). However, are the present models suitable for assessing HEI financial performance by the value-based performance?

In my opinion, they are not. In Portugal, as in many countries of the European Union, such as the United Kingdom, "universities are 'charities by decree': they do not need to make profit to distribute to shareholders" (Pursglove and Simpson 2001:3). The Governmental financial evaluation of public HEI is based on the premise that these institutions, on an annual basis, must consistently maintain a surplus, or at the minimum, is expected to break even at their budgetary or cash basis balance. Consequently, "any sets of financial PIs, which are based upon bottom line profit, are inappropriate here" (Pursglove and Simpson 2001:3).

Also, most of the Portuguese public HEI strategic plans, incorporate the pursuit of economic and social value generation, the efficiency, effectiveness, and economy in resource allocation, or other value for money objectives, but based on budgetary drivers, which are unable to evaluate value-based performance, as usually incorporate creating slacks, past inefficiencies, and sometimes a sense of expenses legitimation disproved of any value judgement in the efficiency and efficacy perspectives (Pardal 2005a; 2005b).

The modern financial literature evidences a new financial performance paradigm, where is a demand to establish a set of value-based financial performance measures, and HEI should look to and learn from for-profit sector in this regard (Chen, Yang, and Shiau 2006; Taylor 2014; Valentinov, Hielscher, and Pies 2015).

In this context, the study pretends to discuss the extension of the EVA® concept and use in the context of HEI financial performance measurement, and more specifically in the measurement of HEI value generation.

For this purpose, initially, the EVA® method will be applied to the public HEI sector using the University of Coimbra as a case study, and then, the empirical analysis will be extended to the Portuguese public HEI sector, where, is also intended to identify which are the key EVA® drivers in the HEI sector.

3.3. Research design

3.3.1. Case study approach

Given the nature of the research problem, objectives and questions, the case study design strategy was selected as being the most suitable for this research project. According to Yin (2004:xii), the goal of a case study research is to capture "both a phenomenon (the real-life event) and its context (the natural setting)", and tend to be exploratory, rather than focusing on mere frequencies or incidence. An exploratory study is a significant method of observing "what is happening; to seek new insights; to ask questions and to assess phenomena in a new light" (Saunders, Lewis, and Thornhill 2009:139), offering therefore a picture for a better understanding of the nature of the problem and proved to be useful as well as successful in the clarification of an issue. Therefore, from the observation of a particular reality will be applied an inductive approach, where general inferences will be inducted by "moving from individual observation into general patterns or laws" (Collis and Hussey 2014:7).

The selection of the UC as the case study object relies on the four main factors pointed by Yin (1994): relevance, feasibility, access, and application:

i. relevance represents the extent on which the organization selected for the case study suits the purpose of the study. The university of Coimbra holds a history for over than 725 years as one of the oldest universities in continuous operation in the world. Pioneer in the adoption of advanced management methods and tools, the UC was the first Portuguese university, to implement in 2003 an ERP - Enterprise Resource Planning and obtaining the certification according to the ISO 9001:2000 norm.

ii. feasibility requires that the researcher should be able to conceptualize, plan, execute and report back on the research project with the case study organization. Developing this study with all Portuguese public HEI's would be very complex and extensive, so developing the research questions with one state of the art organization is considering more effective.

iii. the case study organization should be accessible, and full cooperation of the organization should be ensured during the research. As a public entity, UC is compelled to provide and publish a broad set of information.

iv. applicability represents the extent on which the case study method can be applied in a particular situation. In identifying possible candidates for the research, a number of factors were taken into account, like size (unit of analysis considerations), industry sector (nature of the business), and the status of the knowledge management and sharing, providing therefore, the potential to leverage the findings of the research. As described before, UC is a reference in public HEI's industry and relatively open and mature in its approach to knowledge management. Taking all these factors into account, UC represents the most suitable subject for the proposed research.

Case study assumptions:

The present case study work will follow the external analyst perspective, on which all collected data and information will only be based only on publicly available information, in the 2011 to 2016 time horizon.

The EVA® calculation for the University of Coimbra will follow the Stewart's (1991) methodology, including the proposed adjustments that can be made with publicly available information. The tax rate considered is zero percent, as Portuguese public HEI are exempt from income tax. Therefore, will be considered the following EVA® expression:

$$EVA® = [EBIT_n \times (1 - t)] - (WACC_n \times IC_{n-1})$$

The University of Coimbra, although endowed with administrative and financial autonomy, is a public entity in the government consolidation perimeter. Therefore, the UC has a core non-profit mission, but also develop for-profit activities where act in a purely competitive market. As the main literature does not provide a clear model to evaluate the cost of capital in this type of hybrid entities, will be considered two different approaches to the cost of capital estimation, the cost of public capital approach and the WACC based on the CAPM approach.

Considering the relevant literature, the cost of capital in government should not incorporate the specific systematic and non-systematic risks of equity markets, so, therefore, the cost of public capital is determined by the risk-free rate (R_f) added by the country default spread (CDS), or in a simpler expression, the country borrowing rate.

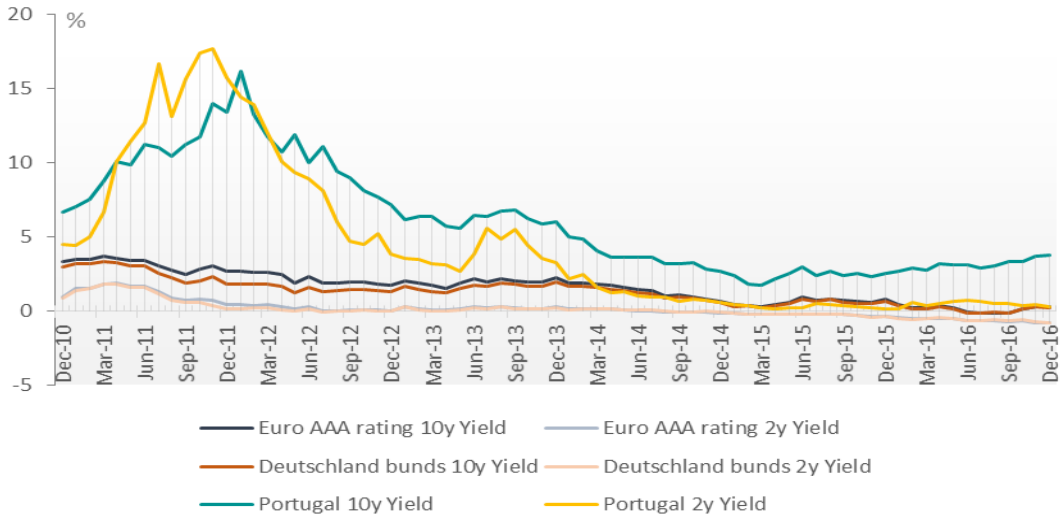
$$\text{Cost of Public Capital (CPC): } K = R_f + CDS$$

The risk-free rate (R_f) represent the return of a riskless asset or portfolio, non-correlated with other economic factors, and correspond to a zero beta. In the present study, (R_f) will be represented by the yield of Euro Area Government bonds with triple A rating, nominated in Euro currency, and with a two-year maturity.

As the Portuguese bonds (graphic 1) shown an atypical behavior by incorporating an implicit interest rate, which corresponds to the country default risk, it raises the reasonableness of its use as an approximation to the risk-free rate indicator. The choice of this proxy to determine the risk-free rate is related to the unfolding of the international financial crisis that occurred in the study time horizon, where is observed a significant instability in the financial markets, especially regarding the sovereign debt (ANACOM 2013). As can be observed in graphic 1, the Euro Area Government bonds with AAA rating yield also evidence a similar behaviour or evolution comparing the Deutschland bunds yield. Considering the elimination of the distortion caused by the international financial crisis, namely in the years 2011 and 2012, the cost of capital time horizon will be reduced to the 2013 to 2016 period.

To the CDS calculation will be considered the Portuguese sovereign fixed rate bonds yield ('Obrigações do Tesouro') with two years maturity, since the long maturity incorporates an increased risk.

Graphic 1 – Risk-free yields evolution comparison



Source: own elaboration with data from (Banco de Portugal 2017; European Central Bank 2017)

The WACC approach will also be explored because, "a public sector cost of capital, derived from market rates and adjusted for corporate taxation, to provide an efficient comparison with private sector prices, is a theoretically sound basis for deriving the opportunity cost of public sector outputs" (Spackman 2004:503). The WACC is determined by:

$$WACC = \frac{E}{E+P_S+D} \times K_E + \frac{P_S}{E+P_S+D} \times K_{Ps} + \frac{D}{E+P_S+D} \times K_D \times (1 - t)$$

The WACC considers the different funding sources of capital. As the University of Coimbra and other Portuguese HEI does not have, in the study time horizon, preferred shares, the WACC is equal to its cost of equity and debt.

The cost of equity (K_E) by the Capital Asset Pricing Model (CAPM) approach, is determined by:

$$CAPM\ K_E: E(R_i) = R_f + \beta \times [E(R_m) - R_f]$$

where:

$E(R_i)$: expected return on asset *i*

R_f: risk-free rate

β: beta of investment

$E(R_m)$: expected return on the market portfolio

For the market risk premium ($R_m - R_f$) will be followed the historical approach, from where the equity risk premium is estimated by (Damodaran 2016):

Equity risk premium (R_m) = country equity risk premium + risk premium for mature markets

Country equity risk premium = default spread × relative volatility of equity

$$\text{Relative volatility of equity} = \frac{\text{standard deviation of equity market in country}}{\text{standard deviation of long-term bonds issued by the country}}$$

Default spread = country sovereign bonds yield - risk-free rate

The standard deviation of Portuguese equity market will be calculated with the PSI20 index daily values for the last five years, like as the standard deviation of long-term sovereign bonds that will be computed by using the daily values for the previous five years of Portuguese fixed rate bonds (OT's) with ten years maturity. It is accepted in the present work, that the use of the last five years in the standard deviation calculation could be insufficient to retrieve an adequate relative volatility of equity free from standard deviation errors, and hence, criticized, although will be used to test a simplified demonstration.

In the risk premium for mature equity markets, as the Portuguese market does not have the sufficient dimension and maturity, will be used the value calculated by Damodaran (2017a), although being aware that those values are correlated with a different risk-free proxy.

As the University of Coimbra is, obviously, non-listed in capital markets, the systematic risk coefficient (β) estimation will be calculated through three alternative methods: the industry betas, the fundamental betas and the Hill and Stone method.

The industry beta approach, referred by Damodaran (2001), estimates the non-observable beta of a company based on information of comparable company's or business. For this purpose, will be considered the educational sector beta in Europe, retrieved from Damodaran (2017b).

The fundamental beta is another methodology, on which the beta of the firm is determined by three variables: the type of business and its sensitiveness to market conditions; the degree of operating leverage; and, the financial leverage.

Considering that the type of activity will be represented by the industry beta, will be adjusted by the degree of operational leverage. As the relation between fixed and total costs cannot be applied because that information is unavailable, will be used an alternative measure suggested by Damodaran (2001):

$$\text{Operating Leverage} = \frac{\%\ \Delta \text{ in operating profit}}{\%\ \Delta \text{ in operating income}}$$ [26]

Finally, the unlevered beta must be adjusted to a levered beta value to incorporate that risk. To remove the degree of financial leverage from a beta will be used the formula proposed by Hamada in 1972, modified to ignore tax effects (Damodaran 2001), although HEI are exempt from income tax:

$$\beta_u = \frac{\beta_L}{1 + (1 - t) \times \left(D/E\right)} \Leftrightarrow \beta_L = \beta_u \times \left[1 + (1 - t) \times \left(D/E\right)\right]$$

where:

β_u: unlevered beta of the firm without any debt

β_L: levered beta of the firm

t: corporate tax rate

The Hill and Stone method is considered an accounting analogy of the market's beta and is based on the assumption that accounting returns are generated by a statistical process similar to the generation of market returns.

To determine the risk-composed beta (β_R) will be applied the proposed expression by Hill and Stone (Hill and Stone 1980:609), to a sample of Portuguese HEI[27], with the use of ROI as an alternative measure to ROA, as argued in the literature review:

$$B_i^R = \left(\frac{B_i^O}{1 - t}\right) \frac{d\ ROI_m}{d\ ROE_m}$$

[26] In the present study is considered the '% Δ in operating income' instead of '% Δ in sales' as referred in the relevant literature. In the Portuguese GAAP, the concept of sales is more restrict compared to international standards, therefore it is more appropriate to consider the use of operating income, but also include the adjustment to the investment subsidies item.

[27] For this purpose will be used the sample described in section 3.3.2 – multivariate study.

where:

$$B_i^O = \frac{d\,(ROI_i)}{d(ROI_m)} \Leftrightarrow \frac{cov\,(ROI_i\,,\,ROI_m)}{var\;ROI_m}$$

$$ROI_i = \frac{EBIT}{Invested\;Capital}$$

$$ROI_m = \sum_{i=1}^{n} w_i \times ROI_i$$

w_i= weights of equity of each entity

$$ROE_i = \frac{net\;income}{total\;equity}$$

$$ROE_m = \sum_{i=1}^{n} w_k \times ROE_i$$

w_k= weights of equity of each entity

As HEI are not listed in capital markets, the w_i and w_k variables, which originally represent the weights of returns in each index, must be adjusted to weights of equity in each entity. EBIT and Invested Capital values will be considered including the proposed adjustments in EVA® calculation. The tax rate considered is zero percent, as Portuguese HEI are exempt from income tax.

Because financial statements prior to 2010 are almost unavailable to obtain, it determines the use of the last five years in the beta calculation, and hence, will make unfeasible to obtain values for the 2011 to 2013 period. Also, the use of the previous five years in the calculations is not completely acceptable to retrieve adequate covariances[28], although it will be used to test a simplified demonstration.

[28] In their study, Hill and Stone (1980), used a 40 year's time series in order to calculate the variables.

Finally, is pretended to determine which variables are related and can improve the EVA® at the University of Coimbra. For this purpose, from the UC management reports available information, will be collected a set of measures that represent the HEI performance in financial, education, research, and resources dimensions.

In the financial dimension, the measures were intuitively defined on an efficiency basis, resulting in the choice of: ROI (investment efficiency), ROA (operational efficiency), ROE (equity efficiency), and the treasury or budgetary result (treasury efficiency). The budget measure is present as a size determination component.

In the educational dimension, was selected: the number of courses and number alumni (excluding non-degree courses) representing size determination variables. Also, the graduates/alumni ratio which reflects the educational productivity, and a quality component represented by the relative inverse position in the Center for World University Rankings (CWUR)[29] were included.

In the research dimension, the selected measures were: the number of research projects (size), number of active patents (productivity), number of publications in Web of Science in the last 5 years (productivity), and the relative inverse position in Scimago Institutions Rankings (SIR)[30] (productivity and quality).

In the resources dimension, the choice of measures is made thru a mix of intuition and available information. Therefore, the selected measures were: number of teachers and researchers, percentage of doctorates (of teachers and researchers), and the diversification level[31].

[29] CWUR uses eight objective and robust indicators to rank the world's top 1000 universities: quality of Education, alumni employment, quality of faculty, publications, influence, citations, broad impact, and patents (Center for World University Rankings 2017). The measure value is calculated by: (1000 - #ranking position) / 1000.

[30] SIR is a classification of academic and research-related institutions ranked by a composite indicator that combines three different sets of indicators based on research performance, innovation outputs and societal impact measured by their web visibility (Scimago Institutions Rankings 2017). The measure value is calculated by: (number of ranking observations - #ranking position) / number of ranking observations.

[31] The diversification level, determine the degree of dependence of government funding by the university and is measured by: government funding/total income. A value of one represents a total dependence of government funding, and a zero value represents no government funding.

3.3.2. Multivariate study

Corroborating the claim that EVA® is suitable to measure and explain the value creation in HEI sector, the present work will be extended to the Portuguese HEI sector.

For the EVA® benchmark study will be defined a sample of the Portuguese public HEI, following the same methodology present in the previous section, although will only be applied the cost of public capital approach in the cost of capital estimation. Considering the HEI industry in Portugal, and restricting to public entities, there are 35 institutions divided into universities (15) and polytechnic institutes (20). For comparability purposes, will only be considered the university sector, from where was formulated an unbalanced sample of 7 institutions based on individual accounts, and of 12 institutions based on consolidated accounts, as management reports and financial statements were not at all available. Data from more two universities (Universidade dos Açores e Universidade do Algarve) was obtained, although discarded in the present study. While for the first, was only obtained complete data from one period, the second evidence a negative equity, which could affect and mislead the results.

With the EVA® benchmark for the Portuguese HEI sector, in parallel with the statistical analysis defined for the UC, is also pretended to respond to the following questions:

Q1: Which variables, financial and non-financial, can enhance the HEI value generation, and therefore the EVA® results?

Q2: The created value, measured by EVA®, is more efficient in HEI under the foundational regime, than HEI in public law regime.

Assuming that value creation is generated from the HEI activity, the objective is to determine which are the main key drivers of value creation measured by EVA® in the HEI

sector. Also, considering that the foundational regime has associated a greater level of administrative, patrimonial and financial autonomy than the public law regime, it can be expected, thru the higher levels of flexibility and efficiency, that these entities can also obtain a higher EVA® result.

To respond and validate these questions, was constructed a panel, based on the statistical results obtained in the UC case study, collected from the HEI managements reports and the calculated EVA® result (Annex IV). Considering the correlations between the selected variables, two statistical models were formulated and will be tested thru a multivariate study.

Model I

The model I considers as the dependent variable the EVA® value and, as independent variables, the size[32] and type regime[33] as dummy values, and also the ROA and the relative inverse position in Scimago Institutions Rankings (SIR) values, where:

$$EVA® = f\,(\text{size, type of regime, ROA, SIR})$$

Model II

The model II considers as the dependent variable the EVA® *per capita*[34] value and, as independent variables, the same variables considered in model I. Comparing to model I, it pretends to mitigate the size effects on absolute values of EVA® results, where:

$$EVA® \textit{ per capita} = f\,(\text{size, type of regime, ROA, SIR})$$

[32] For size determination was considered the number of students, where if ≥20.000 = 1 and if <20.000 = 0.

[33] The type of regime is represented at the model by a dummy variable, where one represents the HEI foundational regime, and zero the HEI public law regime.

[34] For the EVA® *per capita* value was considered the EVA® result divided by the number of teachers and researchers in a determined year.

4. Empirical study

In this chapter will be presented the empirical study. By applying the research framework defined in the previous section, will be presented and discussed the obtained results.

4.1. EVA® application in University of Coimbra

4.1.1. Characterization of the study object

The application of the case study methodology will be developed with reference to the University of Coimbra (UC)

The University of Coimbra is a public university, located in Coimbra, Portugal. Founded in 1290[35], is one of the oldest universities in the world and the oldest university of the Portuguese-speaking community, with a unique mix of tradition, contemporaneity, and innovation has more than 725 years of experience in education, training, and research. With an inheritable historical legacy, the UC preserve a unique material and immaterial heritage classified as World Heritage by the UNESCO in 2013, for its role as the center of production of Portuguese language literature and thinking and for the universal value of its campus, which dates to the 16th century.

[35] By signing "Scientiae thesaurus mirabilis", King D. Dinis created the General Survey, which is recognized in the same year by Pope Nicholas IV. It begins to function in Lisbon, until being transferred definitively to Coimbra in 1537, by order of King D. João III, after a period of migration between these two cities (Universidade de Coimbra - História 2014).

Vision:

"The affirmation of the University of Coimbra as the best Portuguese-speaking university and as a major player in the forefront of the advancement of knowledge, capable of attracting the best students and teachers and of decisively contributing to the progress and well-being of society" (Universidade de Coimbra 2015a)

Mission and values:

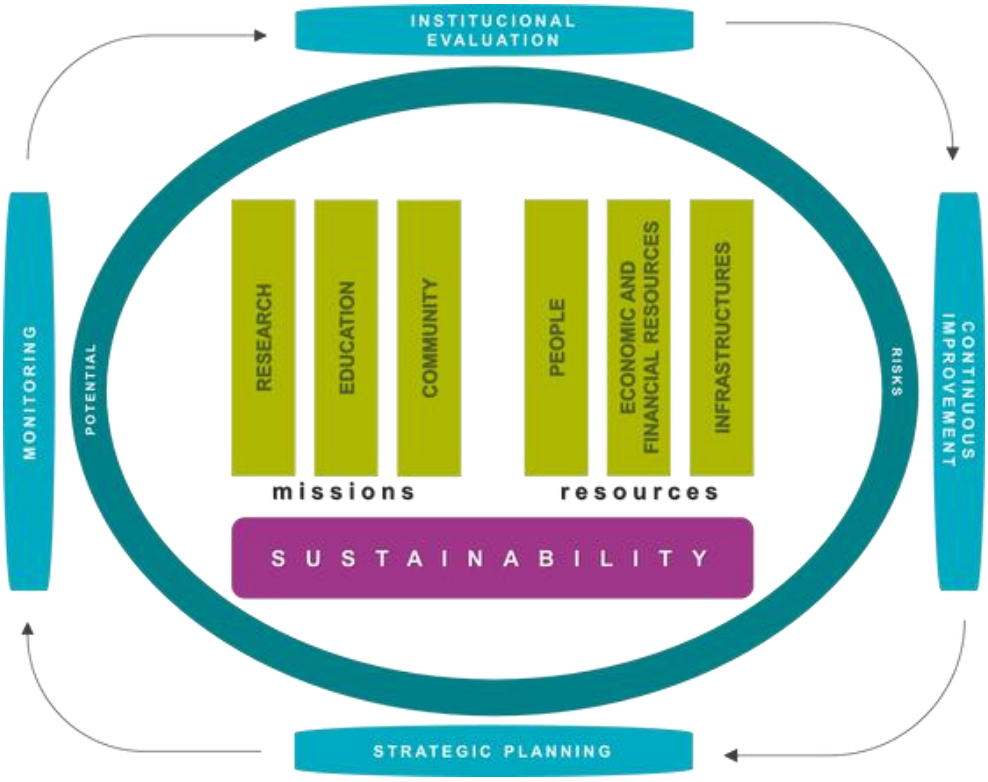
Figure 11 – University of Coimbra mission and values

Source: (Universidade de Coimbra 2015b)

Strategic framework:

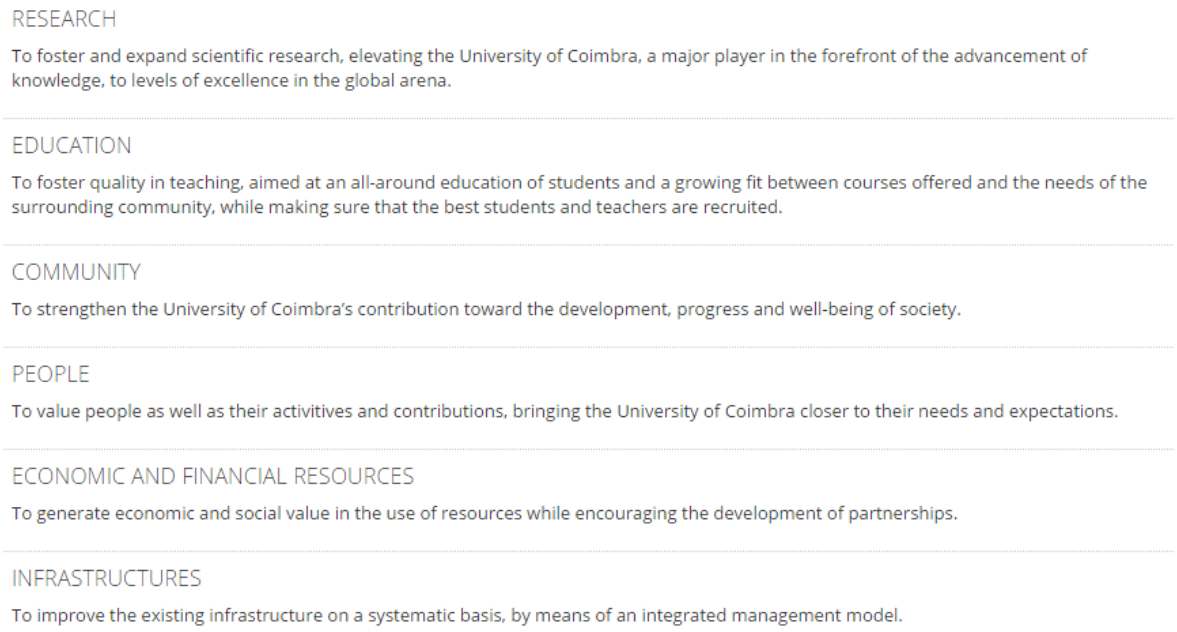
According to the UC strategic plan for 2015/2019 (Universidade de Coimbra 2015c), the university strategy, as illustrated in figure 12, relies on a set of two groups of pillars: mission pillars and resource pillars, from which is developed a perspective of sustainable management, allowing the university to respond effectively and efficiently to its present necessities, in order to ensure the future.

Figure 12 – University of Coimbra strategic framework



Source: (Universidade de Coimbra 2015d)

Figure 13 – University of Coimbra strategic pillars definition



Source: (Universidade de Coimbra 2015e)

To generate economic and social value, the UC economic and financial resources regard the fulfillment of four strategical initiatives (Universidade de Coimbra 2015c):

i. foster a culture of rigor and transparency in the accountability available to stakeholders and society in general;
ii. reinforce the competitive funding, through an active fund-raising of alternative sources of income, to ensure the economic and financial equilibrium;
iii. improve the management of economic and financial resources, enhancing their value added and promoting higher efficiency levels in their use;
iv. promote the attainment of the financial, economic and social return on the projects and activities developed.

The main UC objectives to 2015/2019 in the financial pillar are: increase 25% in the competitive funding and achieve 80 million euros of financing in '2020' grant programs. Although UC pretends to generate value, its objectives and respective the key performance indicators (KPI) are primarily based on cash basis income, instead of profitability and productivity measures. Therefore, the defined KPI for financial resources in the UC 2015/2019 strategic plan are (Universidade de Coimbra 2015c):

i. volume of competitive funding;
ii. volume of funding obtained in the 'Horizon 2020', 'Portugal 2020' and 'Centro 2020' grant programs;
iii. level of diversification of the financial structure;
iv. level of revenue from specialized services;
v. approval rate in applications for granted projects.

Organization:

The organizational structure of the UC, s illustrated in Annex I, is constituted by ten teaching and research organic units (Faculty of Arts and Humanities, Faculty of Law, Faculty of Medicine, Faculty of Sciences and Technology, Faculty of Pharmacy, Faculty of Economics, Faculty of Psychology and Education Sciences, Faculty of Sports Sciences and Physical Education, Institute for Interdisciplinary Research, and College of the Arts), one research unit (Institute of Nuclear Sciences Applied to Health) and 9 units of cultural extension and training support (General Library, UC Archive, UC Press, 25 April Documentation Centre, Health Sciences Library, Science Museum, University Stadium, and the Botanical Garden).

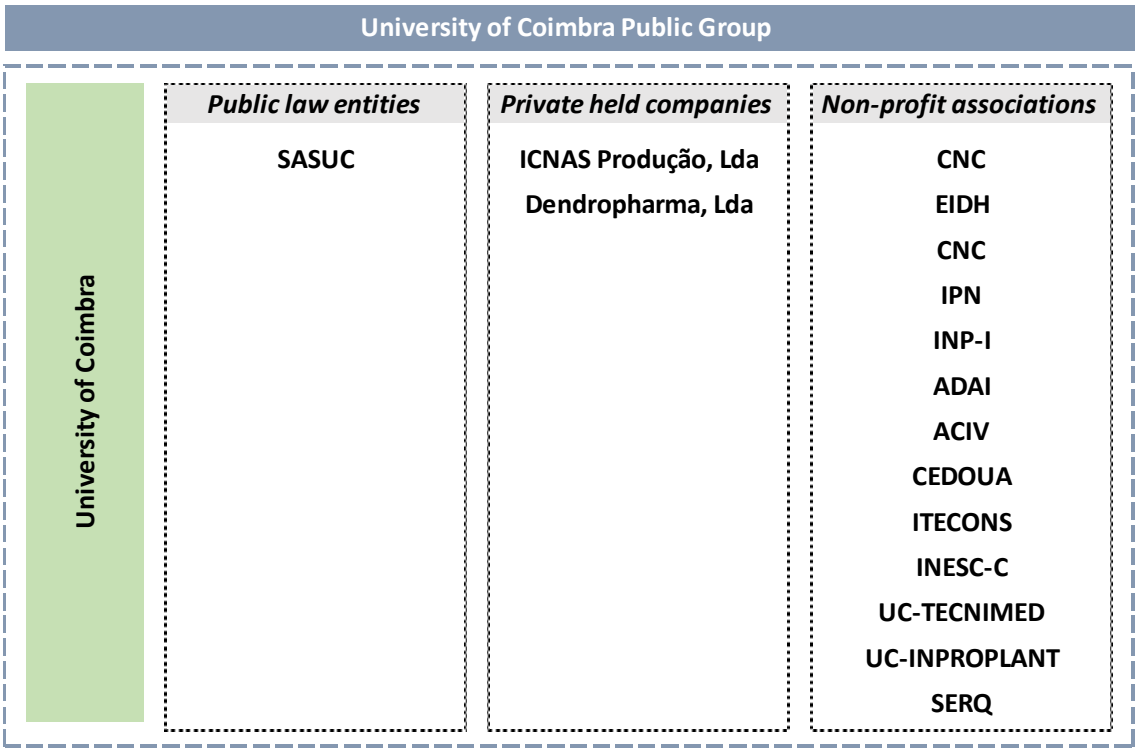
The Administration which is the central support service for the organizational units and to the UC governance, is structured in a Shared Services Center and a Specialized Services Center. Even though they have administrative and financial autonomy, the Social

Action Services is also a support service for governance that is active in the field of student support and university social action.

Finally, the UC structure is supervised by the tree main governance bodies: the General Council, the Dean, and the Management Board. The Senate, which is an advisory body, the Student's Provider and the Board Auditor, are also part of the governance structure.

The UC dimension does not end in its organizational structure. The University also has the ability to constitute public or private held entities or participate in them. Hence, it is necessary to consider the group of entities listed in figure 14 that constitute the consolidation perimeter of the Public Group University of Coimbra in 2016, of which UC is the parent entity, and on which detain a position of control or potential control.

Figure 14 – University of Coimbra Public Group consolidation perimeter



Source: own elaboration based on (Universidade de Coimbra 2016a)

4.1.2. EBIT calculation

The EBIT calculation was prepared from the management reports of University of Coimbra individual and consolidated accounts from years 2011 to 2016, namely its profit and loss statements.

Table 5 – University of Coimbra EBIT (individual accounts)

	2011	2012	2013	2014	2015	2016
1 *sales and services*	*7.119.447 €*	*5.356.783 €*	*7.517.408 €*	*7.339.095 €*	*8.623.717 €*	*9.546.436 €*
2 *taxes and fees income*	*25.850.311 €*	*27.002.124 €*	*27.404.328 €*	*27.474.624 €*	*27.632.490 €*	*28.523.572 €*
3 *suplimentary income*	*503.847 €*	*757.051 €*	*769.151 €*	*731.024 €*	*895.746 €*	*862.759 €*
4 *transfers and subsidies*	*99.251.925 €*	*86.523.453 €*	*94.116.886 €*	*94.331.958 €*	*94.312.986 €*	*94.802.857 €*
5 *other operational income*	- *349.807 €*	*22.139 €*	*178.460 €*	*87.999 €*	*71.946 €*	*77.687 €*
6 Operational income [1+2+3+4+5]	**132.375.723 €**	**119.661.550 €**	**129.986.233 €**	**129.964.701 €**	**131.536.885 €**	**133.813.312 €**
7 *cost of sales*	*326.249 €*	*274.434 €*	*292.835 €*	*477.473 €*	*493.815 €*	*444.364 €*
8 *external services*	*20.047.226 €*	*20.264.665 €*	*18.858.129 €*	*17.912.122 €*	*17.543.962 €*	*17.161.226 €*
9 *staff costs*	*87.165.633 €*	*78.504.799 €*	*91.373.444 €*	*91.101.316 €*	*90.202.524 €*	*92.069.090 €*
10 *current transfers and social benefits*	*10.205.946 €*	*10.580.398 €*	*10.408.990 €*	*11.490.466 €*	*12.827.247 €*	*12.284.016 €*
11 *other operational costs*	*154.315 €*	*455.879 €*	*285.426 €*	*480.521 €*	*400.295 €*	*210.292 €*
12 *depreciations and provisions*	*14.776.322 €*	*14.495.556 €*	*13.272.527 €*	*14.534.006 €*	*14.099.549 €*	*14.203.425 €*
13 Operational costs [7+8+9+10+11+12]	**132.675.691 €**	**124.575.731 €**	**134.491.351 €**	**135.995.904 €**	**135.567.392 €**	**136.372.413 €**
14 EBIT [6-13]	- **299.968 €**	- **4.914.181 €**	- **4.505.118 €**	- **6.031.203 €**	- **4.030.507 €**	- **2.559.101 €**
15 Adjustments:	**5.291.719 €**	**5.510.417 €**	**4.659.998 €**	**6.285.984 €**	**6.370.764 €**	**6.864.942 €**
increase in provisions	2.092.235 €	1.969.503 €	549.807 €	1.401.629 €	490.876 €	524.959 €
investment subsidies	3.199.483 €	3.540.914 €	4.110.191 €	4.884.355 €	5.879.887 €	6.339.983 €
16 Adjusted EBIT [14-15]	**4.991.751 €**	**596.236 €**	**154.881 €**	**254.781 €**	**2.340.256 €**	**4.305.840 €**

Source: own elaboration with data from Universidade de Coimbra (2011a:48; 2012a:90; 2013a:75; 2014a:50; 2015f:66; 2016a:106)

Table 6 – University of Coimbra EBIT (consolidated accounts)

	2011	2012	2013	2014	2015	2016
1 *sales and services*	*14.553.852 €*	*14.160.932 €*	*16.884.063 €*	*18.422.694 €*	*20.634.751 €*	*21.417.950 €*
2 *taxes and fees income*	*25.848.362 €*	*26.996.703 €*	*27.385.884 €*	*27.474.729 €*	*27.595.471 €*	*28.485.028 €*
3 *suplimentary income*	*26.630 €*	*74.380 €*	*159.357 €*	*696.622 €*	*841.817 €*	*788.531 €*
4 *transfers and subsidies*	*117.094.528 €*	*102.891.667 €*	*112.025.185 €*	*114.315.216 €*	*111.901.880 €*	*110.033.694 €*
5 *other operational income*	*187.876 €*	*771.763 €*	*1.128.490 €*	*246.009 €*	*94.197 €*	*110.543 €*
6 Operational income [1+2+3+4+5]	**157.711.247 €**	**144.895.445 €**	**157.582.980 €**	**161.155.271 €**	**161.068.115 €**	**160.835.746 €**
7 *cost of sales*	*2.130.454 €*	*1.788.940 €*	*1.806.942 €*	*2.086.573 €*	*2.136.674 €*	*2.209.802 €*
8 *external services*	*27.553.915 €*	*28.559.897 €*	*27.163.005 €*	*28.038.076 €*	*26.122.885 €*	*24.723.386 €*
9 *staff costs*	*100.943.921 €*	*92.532.975 €*	*105.787.469 €*	*105.738.875 €*	*104.625.467 €*	*106.719.295 €*
10 *current transfers and social benefits*	*11.825.546 €*	*10.939.241 €*	*11.489.353 €*	*13.873.367 €*	*15.031.672 €*	*13.005.355 €*
11 *other operational costs*	*210.257 €*	*523.745 €*	*399.575 €*	*628.529 €*	*526.682 €*	*361.467 €*
12 *depreciations and provisions*	*16.929.690 €*	*17.143.693 €*	*16.388.439 €*	*18.594.928 €*	*18.747.037 €*	*19.379.746 €*
13 Operational costs [7+8+9+10+11+12]	**159.593.783 €**	**151.488.490 €**	**163.034.783 €**	**168.960.349 €**	**167.190.416 €**	**166.399.051 €**
14 EBIT [6-13]	- **1.882.535 €**	- **6.593.046 €**	- **5.451.803 €**	- **7.805.078 €**	- **6.122.301 €**	- **5.563.305 €**
15 Adjustments:	**6.822.149 €**	**7.458.863 €**	**6.978.039 €**	**9.399.799 €**	**9.872.236 €**	**10.958.456 €**
increase in provisions	2.095.026 €	2.145.709 €	800.866 €	1.553.767 €	521.663 €	594.107 €
investment subsidies	4.727.123 €	5.313.154 €	6.177.173 €	7.846.032 €	9.350.573 €	10.364.349 €
16 Adjusted EBIT [14-15]	**4.939.614 €**	**865.817 €**	**1.526.236 €**	**1.594.721 €**	**3.749.935 €**	**5.395.151 €**

Source: own elaboration with data from Universidade de Coimbra (2011b:81; 2012a:90; 2013a:75; 2014b:80; 2015g:92; 2016a:106)

From the proposed adjustments to the financial statements in the EVA® calculation, the present study only considered the provisions[36] and investment subsidies[37] adjustments, which is the most viable, taking into account the publicly available information.

4.1.3. Invested capital calculation

The invested capital (IC) used in EVA® calculation was prepared from the management reports of UC individual and consolidated accounts, from years 2010 to 2015, namely its balance sheet statements.

From the proposed adjustments to the financial statements in the EVA® calculation, the present study only considered the cumulative provisions[38] and investment subsidies[39] adjustments, which are the most viable, taking into account the publicly

[36] The provisions adjustment values were obtained from the 'Provisões' item, from years 2011 to 2016, in University of Coimbra Profit & Loss statements (Universidade de Coimbra 2011a:48; Universidade de Coimbra 2011b:81; Universidade de Coimbra 2012b:48; Universidade de Coimbra 2012a:90; Universidade de Coimbra 2013b:51; Universidade de Coimbra 2013a:75; Universidade de Coimbra 2014a:50; Universidade de Coimbra 2014b:80; Universidade de Coimbra 2015f:66; Universidade de Coimbra 2015g:92; Universidade de Coimbra 2016b:80; Universidade de Coimbra 2016a:106).

[37] The investment subsidies adjustment values were obtained from the note 38 (individual accounts) or note 40 (consolidated accounts), , from years 2011 to 2016, present in the University of Coimbra management report annex (Universidade de Coimbra 2011a:75; Universidade de Coimbra 2011b:102; Universidade de Coimbra 2012b:75; Universidade de Coimbra 2012a:110; Universidade de Coimbra 2013b:80; Universidade de Coimbra 2013a:92; Universidade de Coimbra 2014a:73; Universidade de Coimbra 2014b:99; Universidade de Coimbra 2015f:83; Universidade de Coimbra 2015g:105; Universidade de Coimbra 2016b:98; Universidade de Coimbra 2016a:119).

[38] The cumulative provisions adjustment values were obtained from the note 31 (individual accounts) or note 41 (consolidated accounts), from years 2011 to 2016, present in the University of Coimbra management reports annex (Universidade de Coimbra 2011a:72; Universidade de Coimbra 2011b:102; Universidade de Coimbra 2012b:72; Universidade de Coimbra 2012a:110; Universidade de Coimbra 2013b:78; Universidade de Coimbra 2013a:92; Universidade de Coimbra 2014a:70; Universidade de Coimbra 2014b:99; Universidade de Coimbra 2015f:81; Universidade de Coimbra 2015g:105; Universidade de Coimbra 2016b:97; Universidade de Coimbra 2016a:120).

[39] The investment subsidies adjustment values were obtained from the note 39 d) (individual accounts) or note 45 h) (consolidated accounts), from years 2011 to 2016, present in the University of Coimbra management reports annex (Universidade de Coimbra 2011a:77; Universidade de Coimbra

available information. For EVA® calculation purposes, will be considered the operational perspective calculated value.

Table 7 – University of Coimbra invested capital (individual accounts)

Operational Perspective	2010	2011	2012	2013	2014	2015	2016
17 *public domain assets*	- €	- €	- €	- €	- €	- €	- €
18 *tangible assets*	*940.918 €*	*1.347.894 €*	*1.631.863 €*	*1.465.424 €*	*1.277.594 €*	*1.308.516 €*	*1.160.654 €*
19 *intangible assets*	*354.761.847 €*	*343.796.853 €*	*341.301.200 €*	*339.957.337 €*	*341.799.541 €*	*344.677.484 €*	*337.746.308 €*
20 *finaicial assets*	*5.103.179 €*	*4.443.613 €*	*4.681.141 €*	*4.776.000 €*	*5.683.708 €*	*5.983.852 €*	*6.360.790 €*
21 Fixed assets [17+18+19+20]	**360.805.944 €**	**349.588.361 €**	**347.614.204 €**	**346.198.761 €**	**348.760.844 €**	**351.969.852 €**	**345.267.752 €**
22 *inventory*	*1.181.639 €*	*849.436 €*	*1.018.644 €*	*1.107.892 €*	*1.173.291 €*	*1.288.416 €*	*1.410.683 €*
23 *accounts receivable*	*28.783.247 €*	*99.498.631 €*	*104.462.731 €*	*116.565.995 €*	*97.024.691 €*	*78.546.775 €*	*74.241.892 €*
24 *cash & cash equivalents*	*30.274.578 €*	*24.570.012 €*	*30.440.260 €*	*31.719.645 €*	*38.010.435 €*	*38.595.509 €*	*53.835.974 €*
25 *deferrals & accruals*	*3.194.079 €*	*388.972 €*	*259.783 €*	*382.021 €*	*612.445 €*	*568.284 €*	*777.770 €*
26 *non-interest bearing liabilities*	*121.981.870 €*	*174.808.989 €*	*177.919.214 €*	*199.257.816 €*	*189.873.585 €*	*175.897.496 €*	*176.664.611 €*
27 Net working capital [22+23+24+25-26]	**- 58.548.328 €**	**- 49.501.938 €**	**- 41.737.795 €**	**- 49.482.263 €**	**- 53.052.722 €**	**- 56.898.512 €**	**- 46.398.291 €**
28 Invested Capital [21+27]	**302.257.616 €**	**300.086.423 €**	**305.876.409 €**	**296.716.498 €**	**295.708.122 €**	**295.071.340 €**	**298.869.460 €**
29 Adjustments:	**89.183.031 €**	**87.263.417 €**	**88.801.770 €**	**95.237.138 €**	**99.133.468 €**	**105.146.227 €**	**101.613.418 €**
cumulative provisions	5.955.586 €	8.047.576 €	10.017.078 €	11.476.607 €	12.878.236 €	13.369.112 €	13.676.146 €
investment subsidies	83.227.445 €	79.215.841 €	78.784.692 €	83.760.531 €	86.255.232 €	91.777.115 €	87.937.273 €
30 Adjusted Invested Capital [29+30]	**391.440.647 €**	**387.349.839 €**	**394.678.179 €**	**391.953.636 €**	**394.841.589 €**	**400.217.567 €**	**400.482.878 €**

Financial Perspective	2.010 €	2.011 €	2.012 €	2.013 €	2.014 €	2.015 €	2.016 €
31 *patrimony*	*314.328.561 €*	*314.328.561 €*	*314.328.561 €*	*314.328.561 €*	*314.328.561 €*	*314.328.561 €*	*314.328.561 €*
32 *reserves& adjust. in capital parts*	*1.480.531 €*	*837.750 €*	*868.409 €*	*633.550 €*	*651.103 €*	*656.356 €*	*663.134 €*
33 *retained earnings*	*- 13.885.336 €*	*- 15.413.749 €*	*- 9.654.422 €*	*- 18.579.473 €*	*- 19.605.403 €*	*- 20.247.437 €*	*- 16.456.095 €*
34 Equity [31+32+33]	**301.923.756 €**	**299.752.563 €**	**305.542.549 €**	**296.382.638 €**	**295.374.262 €**	**294.737.480 €**	**298.535.600 €**
35 *provisions*	*333.860 €*	*333.860 €*	*333.860 €*	*333.860 €*	*333.860 €*	*333.860 €*	*333.860 €*
36 *long term debt*	- €	- €	- €	- €	- €	- €	- €
37 Non-current liabilities [35+36]	**333.860 €**	**333.860 €**	**333.860 €**	**333.860 €**	**333.860 €**	**333.860 €**	**333.860 €**
38 *short-term debt*	- €	- €	- €	- €	- €	- €	- €
39 *leases*	- €	- €	- €	- €	- €	- €	- €
40 Debt & leases [38+39]	**- €**	**- €**	**- €**	**- €**	**- €**	**- €**	**- €**
41 Invested Capital [34+37+40]	**302.257.616 €**	**300.086.423 €**	**305.876.409 €**	**296.716.498 €**	**295.708.122 €**	**295.071.340 €**	**298.869.460 €**
42 Adjustments:	**89.183.031 €**	**87.263.417 €**	**88.801.770 €**	**95.237.138 €**	**99.133.468 €**	**105.146.227 €**	**101.613.418 €**
cumulative provisions	5.955.586 €	8.047.576 €	10.017.078 €	11.476.607 €	12.878.236 €	13.369.112 €	13.676.146 €
investment subsidies	83.227.445 €	79.215.841 €	78.784.692 €	83.760.531 €	86.255.232 €	91.777.115 €	87.937.273 €
43 Adjusted Invested Capital [42+43]	**391.440.647 €**	**387.349.839 €**	**394.678.179 €**	**391.953.636 €**	**394.841.589 €**	**400.217.567 €**	**400.482.878 €**

Source: own elaboration with data from Universidade de Coimbra (2011a:47; 2012b:47; 2013b:50; 2014a:49; 2015f:65; 2016b:79)

2011b:105; Universidade de Coimbra 2012b:78; Universidade de Coimbra 2012a:113; Universidade de Coimbra 2013b:83; Universidade de Coimbra 2013a:95; Universidade de Coimbra 2014a:75; Universidade de Coimbra 2014b:102; Universidade de Coimbra 2015f:85; Universidade de Coimbra 2015g:107; Universidade de Coimbra 2016b:100; Universidade de Coimbra 2016a:122).

Table 8 – University of Coimbra invested capital (consolidated accounts)

Operational Perspective	2010	2011	2012	2013	2014	2015	2016
17 *public domain assets*	- €	- €	- €	- €	- €	- €	- €
18 *tangible assets*	*386.336.846 €*	*381.672.973 €*	*389.491.144 €*	*398.140.529 €*	*403.305.488 €*	*410.703.887 €*	*400.627.427 €*
19 *intangible assets*	*1.172.130 €*	*1.607.560 €*	*1.943.538 €*	*1.825.604 €*	*1.542.986 €*	*1.505.781 €*	*1.321.055 €*
20 *finaicial assets*	*4.903.180 €*	*3.783.792 €*	*3.753.847 €*	*3.813.812 €*	*4.124.141 €*	*4.103.352 €*	*3.927.460 €*
21 Fixed assets [17+18+19+20]	**392.412.156 €**	**387.064.325 €**	**395.188.529 €**	**403.779.945 €**	**408.972.615 €**	**416.313.020 €**	**405.875.942 €**
22 *inventory*	*1.247.557 €*	*1.085.303 €*	*1.268.595 €*	*1.446.127 €*	*1.524.445 €*	*1.736.922 €*	*1.892.462 €*
23 *accounts receivable*	*28.888.275 €*	*140.182.953 €*	*135.339.141 €*	*144.686.146 €*	*126.835.018 €*	*111.172.492 €*	*108.066.268 €*
24 *cash & cash equivalents*	*32.495.059 €*	*27.787.819 €*	*34.784.453 €*	*37.977.493 €*	*45.441.851 €*	*47.463.568 €*	*65.443.421 €*
25 *deferrals & accruals*	*3.204.031 €*	*781.003 €*	*761.202 €*	*1.023.744 €*	*1.250.530 €*	*1.204.069 €*	*1.377.261 €*
26 *non-interest bearing liabilities*	*133.523.746 €*	*231.936.798 €*	*234.879.636 €*	*261.346.880 €*	*255.584.544 €*	*249.256.555 €*	*249.579.272 €*
27 Net working capital [22+23+24+25-26]	**- 67.688.824 €**	**- 62.099.720 €**	**- 62.726.245 €**	**- 76.213.370 €**	**- 80.532.700 €**	**- 87.679.504 €**	**- 72.799.859 €**
28 Invested Capital [21+27]	**324.723.332 €**	**324.964.606 €**	**332.462.284 €**	**327.566.575 €**	**328.439.915 €**	**328.633.516 €**	**333.076.083 €**
29 Adjustments:	**99.033.807 €**	**107.171.163 €**	**123.079.120 €**	**144.907.013 €**	**148.944.827 €**	**145.404.809 €**	**156.191.277 €**
cumulative provisions	6.552.059 €	8.931.013 €	10.829.516 €	12.663.869 €	14.139.715 €	14.453.809 €	14.773.905 €
investment subsidies	92.481.748 €	98.240.150 €	112.249.604 €	132.243.144 €	134.805.112 €	130.951.000 €	141.417.372 €
30 Adjusted Invested Capital [29+30]	**423.757.139 €**	**432.135.769 €**	**455.541.404 €**	**472.473.588 €**	**477.384.742 €**	**474.038.325 €**	**489.267.360 €**

Financial Perspective	2010	2011	2012	2013	2014	2015	2016
31 *patrimony*	*342.383.960 €*	*342.383.960 €*	*342.504.172 €*	*341.283.960 €*	*341.283.960 €*	*341.283.960 €*	*341.283.960 €*
32 *reserves& adjust. in capital parts*	*1.107.361 €*	*1.973.278 €*	*2.775.315 €*	*3.255.793 €*	*3.273.347 €*	*3.282.252 €*	*4.351.471 €*
33 *retained earnings*	*- 19.101.849 €*	*- 21.196.443 €*	*- 15.654.941 €*	*- 22.578.562 €*	*- 22.762.721 €*	*- 22.470.083 €*	*- 18.521.947 €*
34 Equity [31+32+33]	**324.389.472 €**	**323.160.795 €**	**329.624.546 €**	**321.961.191 €**	**321.794.586 €**	**322.096.128 €**	**327.113.483 €**
35 Minority interests	**- €**	**727.113 €**	**1.015.336 €**	**3.166.206 €**	**3.201.937 €**	**3.290.801 €**	**3.301.117 €**
36 provisions	*333.860 €*	*333.860 €*	*333.860 €*	*333.860 €*	*425.888 €*	*362.451 €*	*333.860 €*
37 long term debt	*- €*	*8.392 €*	*804.935 €*	*1.607.626 €*	*1.663.156 €*	*1.628.933 €*	*567.864 €*
38 Non-current liabilities [36+37]	**333.860 €**	**342.252 €**	**1.138.795 €**	**1.941.486 €**	**2.089.044 €**	**1.991.384 €**	**901.723 €**
39 short-term debt & leases	*- €*	*734.446 €*	*683.606 €*	*497.692 €*	*1.354.348 €*	*1.255.202 €*	*1.759.759 €*
40 Current liabilities [39]	**- €**	**734.446 €**	**683.606 €**	**497.692 €**	**1.354.348 €**	**1.255.202 €**	**1.759.759 €**
41 Invested Capital [34+35+38+40]	**324.723.332 €**	**324.964.606 €**	**332.462.284 €**	**327.566.575 €**	**328.439.915 €**	**328.633.516 €**	**333.076.083 €**
42 Adjustments:	**99.033.807 €**	**107.171.163 €**	**123.079.120 €**	**144.907.013 €**	**148.944.827 €**	**145.404.809 €**	**156.191.277 €**
cumulative provisions	6.552.059 €	8.931.013 €	10.829.516 €	12.663.869 €	14.139.715 €	14.453.809 €	14.773.905 €
investment subsidies	92.481.748 €	98.240.150 €	112.249.604 €	132.243.144 €	134.805.112 €	130.951.000 €	141.417.372 €
43 Adjusted Invested Capital [42+43]	**423.757.139 €**	**432.135.769 €**	**455.541.404 €**	**472.473.588 €**	**477.384.742 €**	**474.038.325 €**	**489.267.360 €**

Source: own elaboration with data from Universidade de Coimbra (2011b:79–80; 2012a:88–89; 2013a:73–74; 2014b:78–79; 2015g:90–91; 2016a:104–105)

4.1.4. Cost of capital calculation

4.1.4.1. Cost of public capital 'approach'

Table 9 – Cost of public capital - Portugal 2011-2016

	2011	2012	2013	2014	2015	2016
44 Risk-free rate (Rf)	1,24%	0,18%	0,18%	0,02%	-0,25%	-0,62%
45 Country default spread [46-45]	10,98%	8,23%	3,73%	1,16%	0,54%	1,08%
46 Portugal sovereign bonds yield (2 years)	12,22%	8,41%	3,91%	1,19%	0,29%	0,46%
47 Cost of equity (Ke) [44+45=46]	**12,22%**	**8,41%**	**3,91%**	**1,19%**	**0,29%**	**0,46%**

Source: own elaboration with data from (Banco de Portugal 2017; European Central Bank 2017)

4.1.4.2. WACC with CAPM approach

Table 10 – Market risk premium (market-based estimation)

	Market Based estimates	2011	2012	2013	2014	2015	2016
48	*Portugal sovereign bonds yield (2 years)*	*12,22%*	*8,41%*	*3,91%*	*1,19%*	*0,29%*	*0,46%*
49	*Risk-free rate (Rf)*	*1,24%*	*0,18%*	*0,18%*	*0,02%*	*-0,25%*	*-0,62%*
50	Default spread [48-49]	10,98%	8,23%	3,73%	1,16%	0,54%	1,08%
51	*Standard deviation of equity market (Portugal)*	*23,65%*	*24,18%*	*20,95%*	*21,59%*	*21,51%*	*21,02%*
52	*Standard deviation of long-term sovereign bonds (Portugal)*	*42,06%*	*44,88%*	*39,99%*	*42,07%*	*53,74%*	*59,97%*
53	Relative volatility of equity [51/52]	0,56	0,54	0,52	0,51	0,40	0,35
54	**Country risk premium [50*53]**	**6,18%**	**4,43%**	**1,95%**	**0,60%**	**0,22%**	**0,38%**
55	**Risk premium for mature equity markets**	**6,00%**	**5,80%**	**5,00%**	**5,75%**	**6,25%**	**5,69%**
56	**Equity risk premium (R_m) [54+55]**	**12,18%**	**10,23%**	**6,95%**	**6,35%**	**6,47%**	**6,07%**
57	**Market risk premium (R_m-R_f) [56-49]**	**10,94%**	**10,06%**	**6,77%**	**6,32%**	**6,72%**	**6,69%**

Source: own elaboration with data from (Banco de Portugal 2017; Damodaran 2017a; European Central Bank 2017)

Table 11 – Market risk premium (rating/risk-based estimation)

	Rating/Risk score based estimates	2011	2012	2013	2014	2015	2016
50b	Rating-based default spread	2,75%	3,25%	3,60%	2,50%	2,80%	2,89%
54b	**Country risk premium [50b*53]**	**4,13%**	**6,39%**	**5,40%**	**3,75%**	**3,92%**	**3,55%**
55	**Risk premium for mature equity markets**	**6,00%**	**5,80%**	**5,00%**	**5,75%**	**6,25%**	**5,69%**
56b	**Equity risk premium (R_m) [54b+55]**	**10,13%**	**12,19%**	**10,40%**	**9,50%**	**10,17%**	**9,24%**
57b	**Market risk premium (R_m-R_f) [56b-49]**	**8,89%**	**12,01%**	**10,22%**	**9,48%**	**10,42%**	**9,86%**

Source: own elaboration with data from (Banco de Portugal 2017; Damodaran 2017a; European Central Bank 2017)

The default spread could, alternatively, be estimated using a hurdle rate associated with the country rating (table 11).

As can be observed by comparing the country risk premium in table 10 and table 11, this last approach may not be the most appropriate in periods of financial instability or crisis, as ratings could be distorted, in time or value, from real market values. Also, Fernandez *et al.* (2016), with a survey study determined the market risk premium for various countries in the 2011 to 2016 period, where for Portugal was determined an average rate of 6,5%, 7,2%, 6,1%, 8,5%, 5,7%, and 7,9%, respectively. Comparing those values is considered that the market risk premium calculated in table 10 is the best suitable approach.

Table 12 – Industry beta – education sector (Europe)

	Industry Beta	2011	2012	2013	2014	2015	2016
58	Average unlevered beta (Education - Europe)	0,19	0,13	0,40	0,82	0,02	0,06
59	Average levered beta (Education - Europe)	0,19	0,13	0,41	1,06	0,02	0,13
	Sample dimension (entities)	6	5	7	6	3	9

Source: own elaboration with data from Damodaran (2017b; 2017c).

Table 12, retrieve the levered and unlevered betas for education industry sector in Europe region. Although the restrict number of entities in Damodaran data, the main critics of the use of this education industry beta, is related to its composition, where almost of the sample entities are not HEI (Damodaran 2017d), which could raise the reasonableness of its use in this context.

Table 13 – Fundamental beta (based on UC individual accounts)

	Accounting Beta (fudamental method)	2011	2012	2013	2014	2015	2016
60	**Business sensitiviness to market conditions [58]**	**0,19**	**0,13**	**0,40**	**0,82**	**0,02**	**0,06**
61	% Δ in operating profit (adjusted)	-316.507	-4.395.515	-441.355	99.901	2.085.475	1.965.584
62	% Δ in operating income (adjusted)	-14.959.734	-12.372.742	10.893.960	752.632	2.567.716	2.736.523
63	**Opertating leverage [61/62]**	**0,02**	**0,36**	**-0,04**	**0,13**	**0,81**	**0,72**
64	Levered Beta [60+63]	0,21	0,48	0,36	0,95	0,84	0,78
65	Debt/Equity	0,00	0,00	0,00	0,00	0,00	0,00
66	(1-tax rate)	1,00	1,00	1,00	1,00	1,00	1,00
67	Unlevered Beta [64/(*1*+65*66)]	0,21	0,48	0,36	0,95	0,84	0,78

Source: own elaboration with data from Universidade de Coimbra (2011a; 2012b; 2013b; 2014a; 2015f; 2016b)

Table 14 – Fundamental beta (based on UC consolidated accounts)

	Accounting Beta (fudamental method)	2011	2012	2013	2014	2015	2016
60	**Business sensitiviness to market conditions [58]**	**0,19**	**0,13**	**0,40**	**0,82**	**0,02**	**0,06**
61	% Δ in operating profit (adjusted)	-2.636.921	-4.073.797	660.419	68.485	2.155.214	1.645.216
62	% Δ in operating income (adjusted)	-8.532.704	-12.229.772	13.551.554	5.241.150	1.417.385	781.407
63	**Opertating leverage [61/62]**	**0,31**	**0,33**	**0,05**	**0,01**	**1,52**	**2,11**
64	Levered Beta [60+63]	0,50	0,46	0,45	0,83	1,54	2,16
65	Debt/Equity	0,00%	0,23%	0,45%	0,65%	0,94%	0,90%
66	(1-tax rate)	1,00	1,00	1,00	1,00	1,00	1,00
67	Unlevered Beta [64/(*1*+65*66)]	0,50	0,46	0,44	0,82	1,53	2,14

Source: own elaboration with data from Universidade de Coimbra (2011b; 2012a; 2013a; 2014b; 2015g; 2016a)

The use of variations in profits and incomes as a proxy of the operational leverage, induces to a higher level of year-to-year variability in the beta calculation, as can be observed in tables 13 and 14, which is not compatible with the perception of the stability of the public HEI. When applied to other Portuguese HEI were observed, in the study time horizon, an amplitude of values in the [-5,16 ; 6,61] interval, confirming the instability in beta values.Therefore, can be concluded that this approach may not be appropriate to determine the beta value.

Table 15 – Hill and Stone beta (based on UC individual accounts)

	Accounting Beta (Hill and Stone method)	2011	2012	2013	2014	2015	2016
68	cov (ROI i , ROI m)	*n.d.*	*n.d.*	*n.d.*	0,00007	0,00005	0,00000
69	var ROI m	*n.d.*	*n.d.*	*n.d.*	0,00010	0,00009	0,00001
70	Operating beta (B_O) [68/69]	*n.d.*	*n.d.*	*n.d.*	0,63	0,52	0,09
71	1-tax rate	*n.d.*	*n.d.*	*n.d.*	1	1	1
72	cov (ROI_m , ROE_m)	*n.d.*	*n.d.*	*n.d.*	0,00017	0,00014	0,00001
73	var ROE_m	*n.d.*	*n.d.*	*n.d.*	0,00026	0,00023	0,00002
74	Sistematic equity risk (B_K) [72/73]	*n.d.*	*n.d.*	*n.d.*	0,62	0,61	0,47
75	**Risk composed levered beta (B_F) [(70/71)*74]**	*n.d.*	*n.d.*	*n.d.*	**0,39**	**0,32**	**0,04**
76	Debt/Equity	*n.d.*	*n.d.*	*n.d.*	0,00%	0,00%	0,00%
77	(1-tax rate)	*n.d.*	*n.d.*	*n.d.*	1,00	1,00	1,00
78	**Unlevered Beta [75/(1+76*77)]**	***n.d.***	***n.d.***	***n.d.***	**0,39**	**0,32**	**0,04**

Source: own elaboration with data from Annex II

Table 16 – Hill and Stone beta (based on UC consolidated accounts)

	Accounting Beta (Hill and Stone method)	2011	2012	2013	2014	2015	2016
68	cov (ROI i , ROI m)	*n.d.*	*n.d.*	*n.d.*	0,00006	0,00003	0,00000
69	var ROI m	*n.d.*	*n.d.*	*n.d.*	0,00010	0,00008	0,00000
70	Operating beta (Bo) [68/69]	*n.d.*	*n.d.*	*n.d.*	0,57	0,38	1,30
71	1-tax rate	*n.d.*	*n.d.*	*n.d.*	1	1	1
72	cov (ROI m , ROE m)	*n.d.*	*n.d.*	*n.d.*	0,00018	0,00016	0,00001
73	var ROE m	*n.d.*	*n.d.*	*n.d.*	0,00035	0,00031	0,00004
74	Sistematic equity risk (Bk) [72/73]	*n.d.*	*n.d.*	*n.d.*	0,52	0,52	0,22
75	**Risk composed levered beta (Br) [(70/71)*74]**	*n.d.*	*n.d.*	*n.d.*	**0,30**	**0,20**	**0,29**
76	Debt/Equity (market average)	*n.d.*	*n.d.*	*n.d.*	0,66%	0,60%	0,47%
77	(1-tax rate)	*n.d.*	*n.d.*	*n.d.*	1,00	1,00	1,00
78	**Unlevered Beta [75/(1+76*77)]**	***n.d.***	***n.d.***	***n.d.***	**0,30**	**0,19**	**0,29**

Source: own elaboration with data from Annex II

As referred before, because financial statements prior to 2010 were almost unavailable to obtain, it determined the use of the last five years in the beta calculation, and hence, made unfeasible to obtain values for the 2011 to 2013 period. Also, although the Hill and Stone method with five years' time horizon, retrieved stable values to University of Coimbra (tables 15 and 16), when applied to other Portuguese HEI were observed an amplitude of values in the [0,19 ; 2,17] interval (Annex II), which invalidates its use in the CAPM calculation.

Therefore, considering the assumptions referred before, the cost of equity of the University of Coimbra for individual and consolidated, given by the CAPM approach, can be observed in table 17 and 18, respectively.

Table 17 – University of Coimbra cost of equity (based on individual accounts)

	2011	2012	2013	2014	2015	2016
79 Risk-free rate (R_f) [44]	1,24%	0,18%	0,18%	0,02%	-0,25%	-0,62%
80 Beta (β) [58]	0,19	0,13	0,40	0,82	0,02	0,06
81 Market-risk premium (R_m-R_f) [57]	10,94%	10,06%	6,77%	6,32%	6,72%	6,69%
82 Cost of equity (Ke) [79+80*81]	**3,31%**	**1,48%**	**2,87%**	**5,19%**	**-0,09%**	**-0,23%**

Source: own elaboration

Table 18 – University of Coimbra cost of equity (based on consolidated accounts)

	2011	2012	2013	2014	2015	2016
79 Risk-free rate (Rf) [44]	1,24%	0,18%	0,18%	0,02%	-0,25%	-0,62%
80 Beta (β) [58]	0,19	0,13	0,40	0,82	0,02	0,06
81 Market-risk premium (Rm-Rf) [57]	10,94%	10,06%	6,77%	6,32%	6,72%	6,69%
82 Cost of equity (Ke) [79+80*81]	**3,31%**	**1,48%**	**2,87%**	**5,19%**	**-0,09%**	**-0,23%**

Source: own elaboration

The cost of debt of the University of Coimbra is only observable at the consolidated accounts level (table 19). As the UC consolidated financial reports do not disclose the contracted rates of the loan contracts, it can only be represented by average marginal values.

Table 19 – University of Coimbra cost of debt (based on consolidated accounts)

	2011	2012	2013	2014	2015	2016
83 Weighted average interest rate of debt	0,00%	7,22%	7,05%	4,65%	3,75%	2,69%
84 Cost of debt (Kd)	**0,00%**	**7,22%**	**7,05%**	**4,65%**	**3,75%**	**2,69%**

Source: own elaboration

Finally, the WACC values for the University of Coimbra, individual and consolidated, can be observed in table 20 and 21, respectively.

Table 20 – University of Coimbra WACC (based on individual accounts)

	2011	2012	2013	2014	2015	2016
85 Equity (E)	299.752.563 €	305.542.549 €	296.382.638 €	295.374.262 €	294.737.480 €	298.535.600 €
86 Preferred stocks (Ps)	- €	- €	- €	- €	- €	- €
87 Debt (D)	- €	- €	- €	- €	- €	- €
88 % of equity [85/(85+86+87)]	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%
89 % of preferred stocks [86/(85+86+87)]	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
90 % of debt [87/(85+86+87)]	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
91 Cost of equity (Ke) [82]	3,31%	1,48%	2,87%	5,19%	-0,09%	-0,23%
92 Cost of preferred stocks (Kps)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
93 Cost of debt (Kd) [84]	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
94 WACC [(88*91)+(89*92)+(90*93)]	**3,31%**	**1,48%**	**2,87%**	**5,19%**	**-0,09%**	**-0,23%**

Source: own elaboration

Table 21 – University of Coimbra WACC (based on consolidated accounts)

	2011	2012	2013	2014	2015	2016
85 Equity (E)	323.160.795 €	329.624.546 €	321.961.191 €	321.794.586 €	322.096.128 €	327.113.483 €
86 Preferred stocks (Ps)	- €	- €	- €	- €	- €	- €
87 Debt (D)	- €	742.838,00 €	1.488.541,11 €	2.105.318,46 €	3.017.504,57 €	2.884.134,72 €
88 % of equity [85/(85+86+87)]	100,00%	99,78%	99,54%	99,35%	99,07%	99,13%
89 % of preferred stocks [86/(85+86+87)]	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
90 % of debt [87/(85+86+87)]	0,00%	0,22%	0,46%	0,65%	0,93%	0,87%
91 Cost of equity (Ke) [82]	3,31%	1,48%	2,87%	5,19%	-0,09%	-0,23%
92 Cost of preferred stocks (Kps)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
93 Cost of debt (Kd) [84]	0,00%	7,22%	7,05%	4,65%	3,75%	2,69%
94 WACC [(88*91)+(89*92)+(90*93)]	**3,31%**	**1,50%**	**2,89%**	**5,18%**	**-0,05%**	**-0,21%**

Source: own elaboration

4.1.5. EVA® results

4.1.5.1. EVA® results – cost public capital 'approach'

Considering the cost of public capital 'approach', the Economic Value Added (EVA®) of University of Coimbra, for the years 2013 to 2016, is presented in tables 22 and 23, considering its individual or consolidated accounts, respectively.

Table 22 – University of Coimbra EVA® (based on individual accounts and CPC)

	2013	2014	2015	2016
95 Adjusted EBIT [16]	154.881 €	254.781 €	2.340.256 €	4.305.840 €
96 [1 - tax rate]	1	1	1	1
97 NOPAT [95*96]	**154.881 €**	**254.781 €**	**2.340.256 €**	**4.305.840 €**
98 Cost of Capital [47]	3,91%	1,19%	0,29%	0,46%
99 Adjusted Invested Capital (n-1) [30]	394.678.179 €	391.953.636 €	394.841.589 €	400.217.567 €
100 Capital Charge [98*99]	**15.438.495 €**	**4.647.917 €**	**1.158.202 €**	**1.820.990 €**
101 EVA® [97-100]	**- 15.283.614 €**	**- 4.393.136 €**	**1.182.054 €**	**2.484.851 €**
103 Return On Investment [(97/99]	0,04%	0,07%	0,59%	1,08%
104 EVA® Spread [103-98]	**-3,87%**	**-1,12%**	**0,30%**	**0,62%**
105 Cost of capital BEP rate	**0,04%**	**0,07%**	**0,59%**	**1,08%**

Source: own elaboration

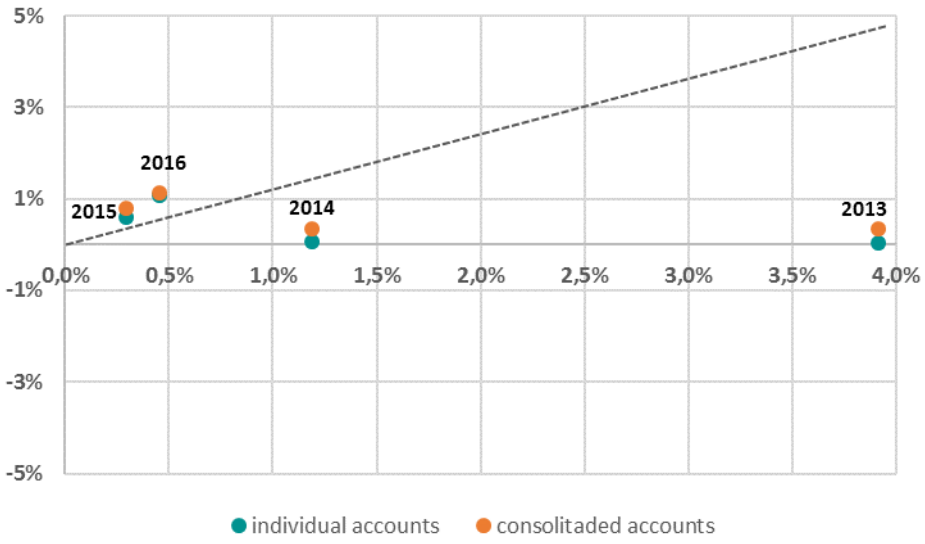
Table 23 – University of Coimbra EVA® (based on consolidated accounts and CPC)

	2013	2014	2015	2016
95 Adjusted EBIT [16]	1.526.236 €	1.594.721 €	3.749.935 €	5.395.151 €
96 [1 - tax rate]	1	1	1	1
97 NOPAT [95*96]	**1.526.236 €**	**1.594.721 €**	**3.749.935 €**	**5.395.151 €**
98 Cost of Capital [47]	3,91%	1,19%	0,29%	0,46%
99 Adjusted Invested Capital (n-1) [30]	455.541.404 €	472.473.588 €	477.384.742 €	474.038.325 €
100 Capital Charge [98*99]	**17.819.261 €**	**5.602.749 €**	**1.400.329 €**	**2.156.874 €**
101 EVA® [97-100]	**- 16.293.025 €**	**- 4.008.029 €**	**2.349.607 €**	**3.238.277 €**
103 Return On Investment [(97/99]	0,34%	0,34%	0,79%	1,14%
104 EVA® Spread [103-98]	**-3,58%**	**-0,85%**	**0,49%**	**0,68%**
105 Cost of capital BEP rate	**0,34%**	**0,34%**	**0,79%**	**1,14%**

Source: own elaboration

Analyzing the variables of University of Coimbra, considering the university individual or consolidated accounts in tables 22 and 23, is observable, a continuous increasing pattern of year-to-year created value, where EVA® value turned to positive in 2015 and 2016. The UC data from the EVA® matrix (graphic 2), evidence a path towards value creation, where UC moved from quadrant II (cost of capital > return on invested capital) to quadrant I (value creation position) in the study time horizon.

Graphic 2 – EVA®matrix – UC values in the 2013-2016 period (CPC approach)



Source: own elaboration

The EBIT is positive in the study time horizon, and it is observable a constant increase, both regarding the individual accounts and consolidated accounts. Although the UC presented positive returns in all periods, they were not sufficient to cover the cost of capital, in 2013 and 2014, and hence, create financial value.

The invested capital level maintained relatively stable during the analysis period, where values oscillated between a minimum of 394,68M€ and a maximum of 400,22M€, corresponding to a positive return on investment (ROI) amplitude between 0,04% to 1,28% at the individual accounts level. If considered the consolidated accounts, the invested capital varied from 455,54M€ to 474,04M€, while ROI was also positive between 0,34% to 1,14%. A first hypothesis is to consider that the UC investment capital amount could be

excessive facing the created value, but there are similar levels and behaviour of investment capital and EVA® values in other Portuguese HEI (Annex VII). Consequently, it can be inferred that the trade-off between the invested capital level and cost of capital could be the decisive variable that influences the created value in UC.

The cost of capital oscillated between 0,29% in minimum and 3,91% in maximum, considering the selected approach. In order to obtain a neutral EVA® value in the analysis period, at individual and consolidated accounts, the UC cost of capital break-even-point is an average rate of 0,44% and 0,65%, respectively.

4.1.5.2. EVA® results – WACC approach

Considering the WACC approach in the cost of capital estimation, the Economic Value Added (EVA®) of University of Coimbra, for the years 2013 to 2016 is presented in tables 24 and 25, considering its individual or consolidated accounts, respectively.

Table 24 – University of Coimbra EVA® (based on individual accounts and WACC)

		2013	2014	2015	2016
95	Adjusted EBIT [16]	154.881 €	254.781 €	2.340.256 €	4.305.840 €
96	[1 - tax rate]	1	1	1	1
97	**NOPAT [95*96]**	**154.881 €**	**254.781 €**	**2.340.256 €**	**4.305.840 €**
98	Cost of Capital [94]	2,87%	5,19%	-0,09%	-0,23%
99	Adjusted Invested Capital (n-1) [30]	394.678.179 €	391.953.636 €	394.841.589 €	400.217.567 €
100	**Capital Charge [98*99]**	**11.346.956 €**	**20.331.957 €**	**- 341.327 €**	**- 922.537 €**
101	**EVA® [97-100]**	**- 11.192.075 €**	**- 20.077.176 €**	**2.681.583 €**	**5.228.378 €**
103	Return On Investment [(97/99]	0,04%	0,07%	0,59%	1,08%
104	**EVA® Spread [103-98]**	**-2,84%**	**-5,12%**	**0,68%**	**1,31%**
105	**Cost of capital BEP rate**	**0,04%**	**0,07%**	**0,59%**	**1,08%**

Source: own elaboration

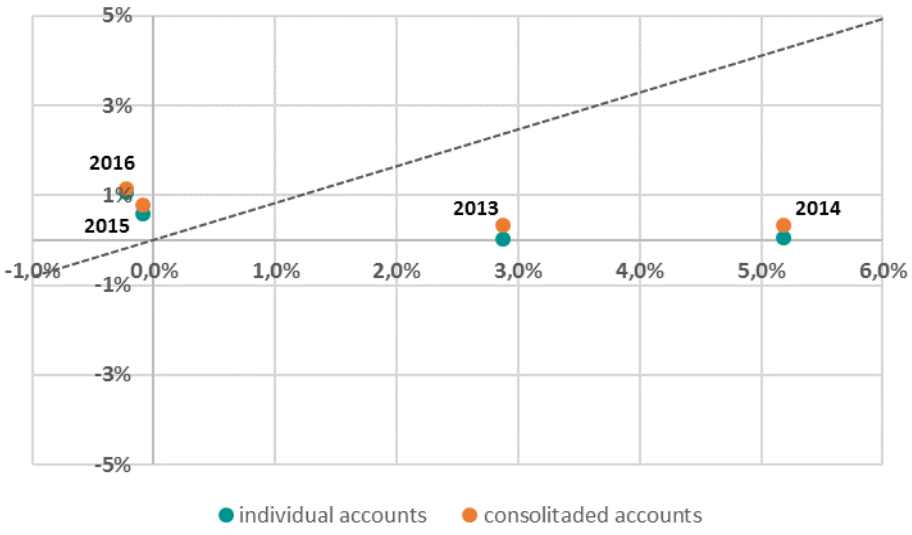
Table 25 – University of Coimbra EVA® (based on consolidated accounts and WACC)

		2013	2014	2015	2016
95	Adjusted EBIT [16]	1.526.236 €	1.594.721 €	3.749.935 €	5.395.151 €
96	[1 - tax rate]	1	1	1	1
97	**NOPAT [95*96]**	**1.526.236 €**	**1.594.721 €**	**3.749.935 €**	**5.395.151 €**
98	Cost of Capital [94]	2,89%	5,18%	-0,05%	-0,21%
99	Adjusted Invested Capital (n-1) [30]	455.541.404 €	472.473.588 €	477.384.742 €	474.038.325 €
100	**Capital Charge [98*99]**	**13.184.324 €**	**24.492.428 €**	**- 242.691 €**	**- 971.864 €**
101	**EVA® [97-100]**	**- 11.658.089 €**	**- 22.897.707 €**	**3.992.626 €**	**6.367.016 €**
103	Return On Investment [(97/99]	0,34%	0,34%	0,79%	1,14%
104	**EVA® Spread [103-98]**	**-2,56%**	**-4,85%**	**0,84%**	**1,34%**
105	**Cost of capital BEP rate**	**0,34%**	**0,34%**	**0,79%**	**1,14%**

Source: own elaboration

In this approach, the EVA® values for University of Coimbra in tables 24 and 25, in the 2013-2016 period, is relatively similar to the previous approach. It is also observable a continuous increasing pattern of year-to-year created value, where EVA® value turned to positive in 2015 and 2016. The UC data from the EVA® matrix (graphic 3), also evidence a path towards value creation, where in the study time horizon, UC moved from quadrant II to quadrant I.

Graphic 3 – EVA®matrix – UC values in the 2013/2016 period (WACC approach)



Source: own elaboration

The main difference between these two approaches is the cost of capital. Thru the WACC approach, there is, on average, a higher cost of capital rate. While in the first approach the cost of capital is influenced by the country default spread, in the WACC approach it is also influenced, by a higher risk level derived from the relative volatility of equity, the risk premium for mature equity markets and beta value, validating the perception referred in the literature review.

4.1.5.3. Key EVA® drivers in University of Coimbra

The table 26 resume the correlation, and therefore, the relation between EVA® and the UC performance variables in financial, education, research, and resources dimensions.

Table 26 – University of Coimbra dimensional performance indicators

Dimension	EVA®	Financial					Education				Research				Resources		
Year/Measure	EVA®	ROI	ROA	ROE	BUD	TYR	CUR	STD	GSR	RKG	PRJ	PAT	PUB	SIR	NTR	DTP	DIV
2013	-16.293.025	0,3%	0,0%	0,0%	181.435.544	3.193.039	258	24.054	18,6%		519	99	9.432	91,3%	1.586	73,8%	48,4%
2014	-4.008.029	0,3%	-0,1%	-0,1%	185.984.586	7.464.358	249	22.741	19,0%	45,5%	402	116	10.704	92,3%	1.536	73,9%	47,3%
2015	2.349.607	0,8%	0,4%	0,8%	186.421.300	2.021.716	250	22.114	18,8%	49,3%	339	130	12.143	92,5%	1.648	72,8%	45,7%
2016	3.238.277	1,1%	0,7%	1,3%	194.592.730	17.979.854	242	21.662	19,8%	51,9%	292	156	14.463	92,5%	1.702	72,1%	47,4%
Average	**-3.678.293**	**0,6%**	**0,3%**	**0,5%**	**187.108.540**	**7.664.742**	**250**	**22.643**	**19,1%**	**48,9%**	**388**	**125**	**11.686**	**92,2%**	**1.618**	**73,2%**	**47,2%**
Correlation EVA®/measure		***78,7%***	***76,3%***	***76,3%***	***80,8%***	***47,8%***	***-88,1%***	***-99,0%***	***65,3%***	***95,4%***	***-98,5%***	***88,4%***	***87,0%***	***97,7%***	***61,0%***	***-76,8%***	***-75,2%***

Dimension	EVA®	Financial					Education				Research				Resources		
Year/Measure	Δ EVA®	Δ ROI	Δ ROA	Δ ROE	Δ BUD	Δ CHR	Δ CUR	Δ STD	Δ GSR	Δ RKG	Δ PRJ	Δ PAT	Δ PUB	Δ SIR	Δ NTR	Δ DTP	Δ DIV
2013																	
2014	0,7540	0,0074	-143,7121	-142,5850	0,0251	1,3377	-0,0349	-0,0546	0,0242		-0,2254	0,1717	0,1349	0,0106	-0,0315	0,0014	-0,0218
2015	1,5862	1,3273	8,6864	8,5986	0,0023	-0,7292	0,0040	-0,0276	-0,0134	0,0835	-0,1567	0,1207	0,1344	0,0017	0,0729	-0,0149	-0,0332
2016	0,3782	0,4489	0,6688	0,6568	0,0438	7,8934	-0,0320	-0,0204	0,0550	0,0527	-0,1386	0,2000	0,1911	0,0003	0,0328	-0,0096	0,0365
Average	**0,9061**	**0,5945**	**-44,7856**	**-44,4432**	**0,0238**	**2,8340**	**-0,0210**	**-0,0342**	**0,0219**	**0,0681**	**-0,1736**	**0,1641**	**0,1535**	**0,0042**	**0,0247**	**-0,0077**	**-0,0062**
Correlation EVA®/measure		***80,0%***	***25,9%***	***25,9%***	***-98,7%***	***-87,4%***	***93,0%***	***1,5%***	***-98,8%***	***100,0%***	***1,6%***	***-99,9%***	***-74,4%***	***-9,3%***	***56,9%***	***-51,3%***	***-83,3%***

Legend:

EVA®	Economic Value Added
ROI	Retun On Investment
ROA	Return On Assets
ROE	Return On Equity
BUD	Budget
TYR	Treasury result (budgetary result)
CUR	Number of courses
STD	Number of ctudents
GSR	Graduates/students ratio
PRJ	Number of research projects
PAT	Number of patents
PUB	Number of publications (Web of Science - last 5 years)
SIR	Relative inverse position in Scimago Institutions Rankings
NTR	Number of teatchers and researchers
DTP	Percentage of doctorates
DIV	Level of funding diversification (government funding/total income)
RKG	Relative inverse position in Center for World University Rankings (CWUR)

Source: own elaboration with data from table 23 and Universidade de Coimbra (Universidade de Coimbra 2013b; Universidade de Coimbra 2013a; Universidade de Coimbra 2014a; Universidade de Coimbra 2014b; Universidade de Coimbra 2015f; Universidade de Coimbra 2015g; 2016b; Universidade de Coimbra 2016a; Center for World University Rankings 2017; Scimago Institutions Rankings 2017)

From the analysis of table 26, in the financial dimension is observable a strong correlation (80,8%) between EVA® and budgeting, from where can be inferred that the dimension of the financial capacity is determinant. Also, ROI has a significant (78,7%) correlation, which is natural as ROI is a component of the EVA® calculation. ROA and ROE also have significant correlations, and therefore the operational and equity efficiency is also related with EVA® results. The treasury results, evidence a moderate correlation, and therefore it suggests that an increase in treasury surplus does not, necessarily, generate financial value. It could make sense as treasury surplus increase the invested capital, and hence, the capital charge. Changes in EVA® are, naturally, more correlated with ROI than the other measures. The budget and treasury results evidence a strong negative correlation, which can be inferred that increases in budget and cash results, will decrease the EVA® results.

The educational dimension reveals a very robust correlation (95,4%) with the relative inverse position in Center for World University Rankings (RKG), from where can be inferred that the third-party quality recognition of the university has a positive impact on EVA® results. Also, it is observable a very strong negative correlation with the number of students (-99,9%) and number of courses (-88,1%), indicating that EVA® in UC increases when the number of students and courses decreases, where, from this perspective, concentration increases the value creation efficiency.

In the research dimension, the relative inverse position in Scimago Institutions Rankings (SIR) have a very strong correlation (97,7%), which suggests that the third-party recognition of research productivity and quality, at the current UC ranking level, have a positive impact in with EVA® results, but changes in the UC position do not, in fact, could have a small inverse effect. The number of patents (88,4%) and the number of publications (87,0%) evidence a strong correlation level, and therefore the research productivity also has an impact on the EVA® results, although results suggest that its variance is inverse to the EVA® change. The number of projects was, strangely, negatively correlated with EVA® results, indicating that a minor number of research projects induce a higher EVA® result. It could make sense as the execution of research projects, according to the current funding type of contracts, require a large amount of invested capital, namely at the treasury level,

which increases the capital charge, or, the obtained results could be purely circumstantial at the UC level.

In last, the resources dimension indicates a moderate correlation level (61,0%) with the number of teachers and researchers so that higher operational capacity can destroy value. The percentage of doctorates (DTP) is negatively strong correlated with EVA® results, suggesting that a decrease in DTP will also decrease the created value. Finally, the results indicate that EVA® increases when government funding increases (less diversification), and also, changes in EVA® in this dimension are more sensitive to the changes in funding diversification.

Therefore, the purpose of this analysis was to focus on the variables that could drive the improvement of the EVA® results, and therefore, create financial value. As been mainly a non-profit organization, the UC core aim is not to create value for its shareholders, but to the society. The acceptable levels of financial value destroyed or created on which the University should achieve were not objectively determined in its strategic plan, and hence, no assessment can be made. The answer to this question is not easy because there are no studies about the optimal level of financial performance, and namely the EVA® in the HEI sector, therefore, a first approach to assess the value creation in the UC is the benchmark analysis, which will be developed in the next section.

4.2. EVA® in the Portuguese public HEI sector

4.2.1.1. EVA® results – Portuguese public HEI sector

Table 27 – EVA® in Portuguese public HEI sector (individual accounts level)

EBIT (adjusted) [€]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	5.308.257	4.991.751	596.236	154.881	254.781	2.340.256	4.305.840
Universidade Aberta	1.267.776	642.160	-441.280	951.098	-384.446	87.898	246.395
Universidade de Aveiro	1.667.418	4.668.038	2.703.903	4.136.323	1.854.244	5.574.704	1.838.746
Universidade da Beira Interior	4.077.071	3.351.864	-30.578	-1.855.663	-1.077.245	-144.025	-669.258
Universidade da Madeira	1.539.550	312.681	583.447	468.695	-502.317		
Universidade do Minho		4.242.030	4.966.501	-1.489.674	-1.267.239	3.262.887	
Universidade do Porto	10.748.099	21.423.513	6.698.298	5.232.037	4.886.166	725.794	1.118.234
Total	**24.608.171**	**39.632.037**	**15.076.527**	**7.597.697**	**3.763.943**	**11.847.514**	**6.839.957**
Average	**4.101.362**	**5.661.720**	**2.153.790**	**1.085.385**	**537.706**	**1.974.586**	**1.367.991**

Invested capital (adjusted) [€]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	391.440.647	391.440.647	387.349.839	394.678.179	391.953.636	394.841.589	400.217.567
Universidade Aberta	10.964.948	10.979.711	10.306.101	14.089.861	10.846.784	12.497.087	12.621.807
Universidade de Aveiro	136.903.378	146.470.599	161.736.524	171.478.406	177.330.232	181.602.084	179.353.018
Universidade da Beira Interior	105.528.590	112.831.093	108.574.538	102.737.613	106.236.711	101.543.876	90.516.635
Universidade da Madeira	14.185.146	15.376.528	15.190.803	10.727.227	12.495.187		
Universidade do Minho	176.992.359	152.810.647	150.507.220	189.450.042	130.627.405	144.483.222	
Universidade do Porto	538.424.928	674.928.029	645.922.493	650.088.267	657.827.471	655.580.790	652.109.760
Total	**1.374.439.996**	**1.504.837.254**	**1.479.587.519**	**1.533.249.595**	**1.487.317.425**	**1.490.548.649**	**1.334.818.788**
Average	**196.348.571**	**214.976.751**	**211.369.646**	**219.035.656**	**212.473.918**	**248.424.775**	**266.963.758**

Cost of Capital [%]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra		0,12	0,08	0,04	0,01	0,00	0,00
Universidade Aberta		0,12	0,08	0,04	0,01	0,00	0,00
Universidade de Aveiro		0,12	0,08	0,04	0,01	0,00	0,00
Universidade da Beira Interior		0,12	0,08	0,04	0,01	0,00	0,00
Universidade da Madeira		0,12	0,08	0,04	0,01		
Universidade do Minho		0,12	0,08	0,04	0,01	0,00	
Universidade do Porto		0,12	0,08	0,04	0,01	0,00	0,00
Total		**0,86**	**0,59**	**0,27**	**0,08**	**0,02**	**0,02**
Average		**0,12**	**0,08**	**0,04**	**0,01**	**0,00**	**0,00**

EVA®	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra		-42.845.558	-32.310.874	-14.996.954	-4.425.444	1.190.525	2.509.311
Universidade Aberta		-697.848	-1.364.307	547.958	-551.529	56.081	189.533
Universidade de Aveiro		-12.062.696	-9.609.392	-2.190.271	-179.204	5.054.535	1.012.457
Universidade da Beira Interior		-9.544.609	-9.515.912	-6.102.737	-2.295.542	-455.653	-1.131.283
Universidade da Madeira		-1.420.862	-709.207	-125.518	-629.525		
Universidade do Minho		-17.387.911	-7.879.781	-7.377.015	-3.513.801	2.879.713	
Universidade do Porto		-44.376.500	-50.040.652	-20.034.298	-2.822.797	-1.203.833	-1.864.659
Total		**-128.335.984**	**-111.430.125**	**-50.278.835**	**-14.417.842**	**7.521.369**	**715.360**
Average		**-18.333.712**	**-15.918.589**	**-7.182.691**	**-2.059.692**	**1.253.561**	**143.072**

Source: own elaboration with data from (Universidade Aberta 2017; Universidade de Aveiro 2017; Universidade da Beira Interior 2017; Universidade de Évora 2017; ISCTE 2017; Universidade de Lisboa 2017; Universidade da Madeira 2017; Universidade do Minho 2017; Universidade Nova de Lisboa 2017; Universidade do Porto 2017; UTAD 2017)

Table 28 – EVA® in Portuguese public HEI sector (consolidated accounts level)

EBIT (adjusted) [€]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	7.576.535	4.939.614	865.817	1.526.236	1.594.721	3.749.935	5.395.151
Universidade Aberta	1.267.776	642.160	-441.280	951.098	-384.446	87.898	246.395
Universidade de Aveiro	1.284.308	4.537.696	3.110.538	3.733.764	1.882.753	5.385.564	2.009.157
Universidade da Beira Interior	4.273.310	3.179.254	-146.107	-1.792.215	-1.050.425	-125.720	-936.572
Universidade de Évora	4.099.296	4.603.798	-364.013	-4.022.368	-1.973.404	-1.867.880	
ISCTE			3.327.859	545.679	403.979	989.387	
Universidade de Lisboa				13.386.369	9.931.848	10.642.886	
Universidade da Madeira	1.539.550	312.681	583.447	468.695	-502.317		
Universidade do Minho	5.079.349	4.448.315	5.242.311	-1.142.591	-1.481.795	8.843.644	
Universidade Nova de Lisboa	3.081.982		4.061.119	1.078.753	1.003.355	-437.837	
Universidade do Porto	9.389.840	22.120.036	-1.097.328	6.345.563	6.099.144	723.763	
Universidade de Trás-os-Montes e Alto Douro	850.499	2.545.315	1.616.374	1.027.324	-696.065	1.736.872	
Total	**38.442.444**	**47.328.869**	**16.758.737**	**22.106.307**	**14.827.347**	**29.728.512**	**6.714.131**
Average	**3.844.244**	**5.258.763**	**1.523.522**	**1.842.192**	**1.235.612**	**2.702.592**	**1.678.533**

Invested capital (adjusted) [€]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	423.757.139	423.757.139	432.135.769	455.541.404	472.473.588	477.384.742	474.038.325
Universidade Aberta	10.964.948	10.979.711	10.306.101	14.089.861	10.846.784	12.497.087	12.621.807
Universidade de Aveiro	142.147.784	150.183.763	163.963.807	174.710.317	180.268.576	182.499.146	180.210.251
Universidade da Beira Interior	119.465.095	128.799.451	124.414.490	120.270.785	119.490.700	118.354.088	107.549.408
Universidade de Évora	92.052.903	109.431.634	98.627.971	102.768.431	101.598.792	102.098.611	
ISCTE			89.054.486	98.134.909	96.968.612	96.074.866	
Universidade de Lisboa				1.168.216.359	1.186.763.407	1.232.354.187	
Universidade da Madeira	14.185.146	15.376.528	15.190.803	10.727.227	12.495.187		
Universidade do Minho	177.259.811	174.333.881	177.606.141	221.440.256	218.713.297	241.209.040	
Universidade Nova de Lisboa	244.902.811		254.171.615	243.646.157	238.582.388	232.945.385	
Universidade do Porto	658.983.931	701.914.746	725.517.215	746.543.788	752.105.209	746.262.829	
Universidade de Trás-os-Montes e Alto Douro	28.095.701	38.410.194	40.330.654	52.967.162	51.159.235	52.616.343	
Total	**1.911.815.269**	**1.753.187.046**	**2.131.319.052**	**3.409.056.656**	**3.441.465.776**	**3.494.296.323**	**774.419.791**
Average	**191.181.527**	**194.798.561**	**193.756.277**	**284.088.055**	**286.788.815**	**317.663.302**	**193.604.948**

Cost of Capital [%]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra		0,12	0,08	0,04	0,01	0,00	0,00
Universidade Aberta		0,12	0,08	0,04	0,01	0,00	0,00
Universidade de Aveiro		0,12	0,08	0,04	0,01	0,00	0,00
Universidade da Beira Interior		0,12	0,08	0,04	0,01	0,00	0,00
Universidade de Évora		0,12	0,08	0,04	0,01	0,00	
ISCTE				0,04	0,01	0,00	
Universidade de Lisboa					0,01	0,00	
Universidade da Madeira		0,12	0,08	0,04	0,01	0,00	
Universidade do Minho		0,12	0,08	0,04	0,01	0,00	
Universidade Nova de Lisboa				0,04	0,01	0,00	
Universidade do Porto		0,12	0,08	0,04	0,01	0,00	
Universidade de Trás-os-Montes e Alto Douro		0,12	0,08	0,04	0,01	0,00	
Total		**1,10**	**0,76**	**0,43**	**0,14**	**0,04**	**0,02**
Average		**0,12**	**0,08**	**0,04**	**0,01**	**0,00**	**0,00**

EVA® [€]	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra		-46.847.040	-34.758.033	-15.377.475	-3.807.241	2.364.013	3.223.051
Universidade Aberta		-697.848	-1.364.307	547.958	-551.529	56.081	189.533
Universidade de Aveiro		-12.833.948	-9.514.910	-2.679.954	-189.020	4.856.776	1.178.786
Universidade da Beira Interior		-11.420.376	-10.973.848	-6.658.895	-2.476.636	-476.226	-1.475.083
Universidade de Évora		-6.645.834	-9.563.566	-7.880.366	-3.192.066	-2.165.903	
ISCTE			3.327.859	-2.937.835	-759.738	704.946	
Universidade de Lisboa					-3.921.251	7.161.713	
Universidade da Madeira		-1.420.862	-709.207	-125.518	-629.525	-36.653	
Universidade do Minho		-17.214.311	-9.413.357	-8.089.951	-4.107.707	8.202.085	
Universidade Nova de Lisboa				-8.863.593	-1.885.882	-1.137.679	
Universidade do Porto		-58.413.292	-60.104.961	-22.034.252	-2.753.621	-1.482.412	
Universidade de Trás-os-Montes e Alto Douro		-888.214	-1.612.643	-550.277	-1.324.167	1.586.805	
Total		**-156.381.724**	**-134.686.973**	**-74.650.159**	**-25.598.383**	**19.633.546**	**3.116.286**
Average		**-17.375.747**	**-13.468.697**	**-6.786.378**	**-2.133.199**	**1.636.129**	**779.072**

Source: own elaboration with data from (Universidade Aberta 2017; Universidade de Aveiro 2017; Universidade da Beira Interior 2017; Universidade de Évora 2017; ISCTE 2017; Universidade de Lisboa 2017; Universidade da Madeira 2017; Universidade do Minho 2017; Universidade Nova de Lisboa 2017; Universidade do Porto 2017; UTAD 2017)

Considering the benchmark values in table 27 and 28, and also the graphics in Annex III, the main conclusion that can be inferred is, although the distinct levels of EBIT and investment capital, they tend to follow a similar behavior or pattern during the study time horizon. The EBIT levels are more concentrated between entities, while the investment capital differs in the portion of the size of each entity, for example, determined by the number of students. Therefore, as the Portuguese public HEI sector tend to achieve positive EBIT's, their EVA® results are mainly influenced by the trade-off between the investment capital level and their cost of capital. The EVA® result tends to be negatively correlated with the cost of capital. Therefore it can be concluded that the cost of capital is the main determinant of EVA® result in the Portuguese HEI setting.

As HEI are focused in budgetary (treasury) results, the cost of capital is not considered in their activities, and its impact on investment levels is not at all appraised, which affects the financial value enhancement, and hence, there is not a genuinely strategic dimension of value creation.

4.2.1.2. Key EVA® drivers in Portuguese HEI sector

This section, pretend to infer which are main key drivers of value creation in the HEI sector and, in particular, if the type of regime has an impact in the HEI created value. For this purpose, was conducted multivariate regression, considering the OLS method and robust standard errors, with the models defined in the research design section.

From the regression results from model I, present in table 29, it can be observed that the operational efficiency, measured by ROA, is a very significant explanatory variable of the EVA® results.

The research productivity and quality, given by the relative inverse position in SIR, and size, are significant in the explanation of the HEI EVA® results. While a higher SIR can induce value generation, a higher size affects negatively the created value, where large HEI tend to present a minor created value.

About the type of regime, the study clearly suggests that created value between the foundational regime and the public law regime do not differ significantly. Therefore the foundational regime cannot improve the Portuguese HEI value generation, on the contrary, it destroys value.

From the empirical results obtained in model I, it can be concluded that, although was found some evidence about the drivers that could explain the created value by HEI and the model is statistically significant, given by the determination coefficient (R^2) it can only explain 37,0% of the EVA® results.

Table 29 – Model I multivariate regression results

Model 1: OLS, using observations 1-32 (n = 19)

Missing or incomplete observations dropped: 13
Dependent variable: EVA
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−2.40524e+08	1.16434e+08	−2.0658	0.0579	*
Size	−1.00371e+07	5.51556e+06	−1.8198	0.0902	*
Foundation	−4.0163e+06	3.86996e+06	−1.0378	0.3170	
SIR	2.6351e+08	1.27737e+08	2.0629	0.0582	*
ROA	2.37931e+08	7.42165e+07	3.2059	0.0063	***

Mean dependent var	−2655744	S.D. dependent var	7418770
Sum squared resid	6.24e+14	S.E. of regression	6675017
R-squared	0.370354	Adjusted R-squared	0.190455
F(4, 14)	4.532124	P-value(F)	0.014765
Log-likelihood	−322.6225	Akaike criterion	655.2449
Schwarz criterion	659.9671	Hannan-Quinn	656.0441

Source: own elaboration (with GRETL software)

Table 30 – Model II multivariate regression results

Model 2: OLS, using observations 1-32 (n = 19)
Missing or incomplete observations dropped: 13
Dependent variable: EVApc
Heteroskedasticity-robust standard errors, variant HC1

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	−141387	60442.6	−2.3392	0.0347	**
Size	−4791.74	2460.46	−1.9475	0.0718	*
Foundation	−971.459	1283.02	−0.7572	0.4615	
SIR	153827	65781.5	2.3385	0.0347	**
ROA	181234	42114	4.3034	0.0007	***

Mean dependent var	−1198.607	S.D. dependent var	4030.584
Sum squared resid	1.42e+08	S.E. of regression	3185.498
R-squared	0.514181	Adjusted R-squared	0.375376
F(4, 14)	8.031609	P-value(F)	0.001394
Log-likelihood	−177.3196	Akaike criterion	364.6392
Schwarz criterion	369.3614	Hannan-Quinn	365.4384

Source: own elaboration (with GRETL software)

The model II differ from model I by considering the EVA® *per capita* in order to mitigate the size effects on absolute EVA® results values.

Observing the results present in table 30, it can be inferred the same conclusions observed in model I, although with higher significance levels associated with the variables. Also, the model has a more robust statistical significance, where can explain 51,4% of the Portuguese sample HEI value creation.

However, with the present study, it is assumed that the difficulty in obtaining publicly available information of the Portuguese HEI resulted in an unbalanced sample with reduced time horizon. The reduced number of observations has an impact on the obtained results. Therefore, the present conclusions care for confirmation in an extended time horizon and with a balanced improved measures panel.

Conclusions

The HEI sector, not only in Portugal but worldwide, is facing a dynamic and turbulent environment driven by the economic crisis, the demographic and social changes in student population, the decline in public funding and global competition. Higher Education is shifting now from a public service to a market-drive-one, and a value-driven approach is starting to appear in these entities, namely present in HEI strategic plans. These value creation measures are primarily based on scorecard systems or composite indexes that rely on budgetary and traditional ratio measures, which are unable to evaluate the value-based performance. In this context, the EVA® methodology has been referred in the literature as a privileged performance metric for the measurement of value generation and integration in the corporate strategical decision process.

The present work pretended to extend the use of EVA® as a financial performance measure in the public HEI context. For this purpose, the EVA® method was initially applied to the public HEI sector using the case study methodology in the University of Coimbra, considering its individual and consolidated accounts levels and two different approaches to the cost of capital, in the 2011 to 2016 period.

The results evidenced an increasing of EVA®, and therefore, value creation in the analysis period. Considering the variables that are related and can improve the EVA® at the University of Coimbra was conducted a statistical study. The study evidence a strong correlation between EVA® and distinct measures of financial, education, research, and resources dimensions. In the financial perspective the size of financial capacity and efficiency, given by ROI, ROA, and ROE, is determinant in EVA® results, although treasury surplus could not necessarily generate added value. In the educational perspective, the results suggest that the quality given by the position in rankings can induce value generation, while the size, given by the number of courses and alumni, has a negative correlation. In the research perspective, productivity and quality have a positive impact on

EVA® results. Finally, in the resources perspective, the results suggest that EVA® tends to increase when government funding increases, therefore, in the UC perspective, funding diversification is correlated with a lower value creation.

Thereafter, the empirical analysis was extended to the Portuguese public HEI sector, considering the cost of public capital approach. The results also evidenced similar conclusions. As Portuguese HEI tend to present positive adjusted EBIT and invested capital evolution, the main determinant of EVA® evolution in the Portuguese HEI sector is the cost of capital, which is negatively correlated with the HEI EVA® results. The cost of equity calculated by the financial approach was lower than in CAPM approach, as this last one incorporates a higher risk level given by the market risk premium, which in public entities its application could be objectionable. The cost of capital at the individual accounts level was, naturally, lower than in consolidated accounts level, as this last one incorporates debt from the group entities. As HEI are focused on budgetary and treasury results, the impact of the cost of capital in investment levels is not at all appraised, and hence, it can be concluded that there is not a genuinely strategic dimension of value creation.

Corroborating the claim that EVA® is suitable to measure and explain the value creation in HEI sector was conducted a statistical study. Thru a multivariate regression over two distinct models was pretended to infer about the main performance drivers that could improve the HEI value generation.

The results evidenced that operational efficiency, given by ROA, is a very significant explanatory variable of the EVA® in Portuguese HEI sector. By considering the EVA® per capita in order to mitigate the size effects on absolute EVA® results, the research productivity and quality, measured by the relative inverse position in SIR, is also significant to the value creation. Finally, the study suggest that large HEI tend to generate less value than medium and small HEI, and also, that created value between the foundational regime and the public law regime do not differ significantly, whereas the negative coeficient of the foundational regime dummy variable, points to a potential value destruction in HEI based

on the foundational regime, points to a value destruction in HEI based on the foundational regime. Although was found some evidence about the drivers that could explain the created value by HEI, the model significancy was moderate, as the model can only explain 51,4% of the HEI value generation.

The financial instability due to the international and Portuguese financial crisis limited the study by inhibiting the formation of stable long-term series of cost of capital, and therefore, conducted to the exclusion of the years 2011 and 2012 in the study time horizon.

The study was also limited by the lack of available publicly, financial and non-financial, information in the Portuguese public HEI, namely from years prior to 2011. This fact resulted in an unbalanced benchmark sample panel, which affected comparability and the feasibility of the statistical study. Although the sample of included entities is relatively representative, it is not the population of the HEI sector in Portugal.

Also, the EVA® calculation process was affected, since proposed adjustments were not fully applied, as the required information was publicly unavailable. The new Portuguese GAAP framework for public entities (SNC-AP), which will be implemented from the 2018 economic year, entails a new paradox regarding the application NOPAT and investment capital, and therefore the proposed EVA® adjustments, although the present study considered both perspectives in the literature review.

Considering these limitations, the results of the study should be regarded with restraint, requiring further future research.

In order to validate or refute the obtained results, the present research should be extended in relation to a broad sample and time horizon. Also, the diversity of HEI indicators that could explain the value creation measured through the EVA® approach should be explored with further available data.

Furthermore, for future research, as the cost of capital is one of the main EVA® determinants, is suggested to deepen the thematic of the cost of public capital, in particular, the definition of a model to hybrid entities with government funding (non-profit) activities and open economy (for-profit) activities. Finally, the new Portuguese GAAP framework for public entities (SNC-AP) that will be applied from 2018 result in an opportunity to explore its impact in the public-sector value creation.

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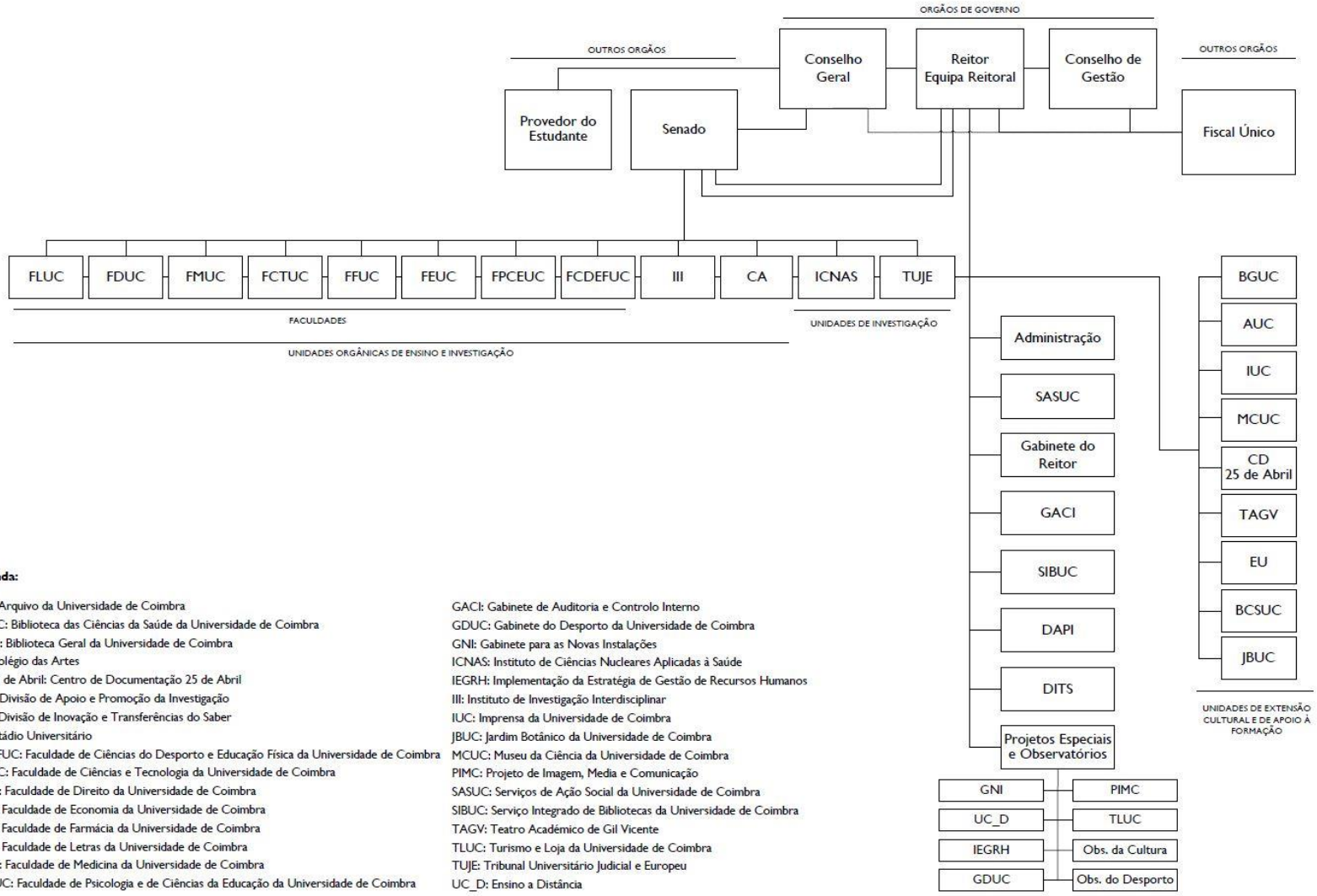
Annex I

University of Coimbra organizational structure

Source: (Universidade de Coimbra - Organograma 2017)

Organograma da Universidade de Coimbra

Revisão: 30
Data: 23-03-2017



Legenda:

AUC: Arquivo da Universidade de Coimbra
BCSUC: Biblioteca das Ciências da Saúde da Universidade de Coimbra
BGUC: Biblioteca Geral da Universidade de Coimbra
CA: Colégio das Artes
CD 25 de Abril: Centro de Documentação 25 de Abril
DAPI: Divisão de Apoio e Promoção da Investigação
DITS: Divisão de Inovação e Transferências do Saber
EU: Estádio Universitário
FCDEFUC: Faculdade de Ciências do Desporto e Educação Física da Universidade de Coimbra
FCTUC: Faculdade de Ciências e Tecnologia da Universidade de Coimbra
FDUC: Faculdade de Direito da Universidade de Coimbra
FEUC: Faculdade de Economia da Universidade de Coimbra
FFUC: Faculdade de Farmácia da Universidade de Coimbra
FLUC: Faculdade de Letras da Universidade de Coimbra
FMUC: Faculdade de Medicina da Universidade de Coimbra
FPCEUC: Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra
GACI: Gabinete de Auditoria e Controlo Interno
GDUC: Gabinete do Desporto da Universidade de Coimbra
GNI: Gabinete para as Novas Instalações
ICNAS: Instituto de Ciências Nucleares Aplicadas à Saúde
IEGRH: Implementação da Estratégia de Gestão de Recursos Humanos
III: Instituto de Investigação Interdisciplinar
IUC: Imprensa da Universidade de Coimbra
JBUC: Jardim Botânico da Universidade de Coimbra
MCUC: Museu da Ciência da Universidade de Coimbra
PIMC: Projeto de Imagem, Media e Comunicação
SASUC: Serviços de Ação Social da Universidade de Coimbra
SIBUC: Serviço Integrado de Bibliotecas da Universidade de Coimbra
TAGV: Teatro Académico de Gil Vicente
TLUC: Turismo e Loja da Universidade de Coimbra
TUJE: Tribunal Universitário Judicial e Europeu
UC_D: Ensino a Distância

Annex II

Beta calculation for University of Coimbra – Hill and Stone method | 2011-2016

Source: (Universidade Aberta 2017; Universidade de Aveiro 2017; Universidade da Beira Interior 2017; Universidade de Évora 2017; ISCTE 2017; Universidade de Lisboa 2017; Universidade da Madeira 2017; Universidade do Minho 2017; Universidade Nova de Lisboa 2017; Universidade do Porto 2017; UTAD 2017)

Accounting Beta - Hill and Stone Method [Individual Accounts]

EBIT (adjusted)	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	5.308.257	4.991.751	596.236	154.881	254.781	2.340.256	4.305.840
Universidade Aberta	1.267.776	642.160	-441.280	951.098	-384.446	87.898	246.395
Universidade de Aveiro	1.667.418	4.668.038	2.703.903	4.136.323	1.854.244	5.574.704	1.838.746
Universidade da Beira Interior	4.077.071	3.351.864	-30.578	-1.855.663	-1.077.245	-144.025	-669.258
Universidade da Madeira	1.539.550	312.681	583.447	468.695	-502.317		
Universidade do Minho		4.242.030	4.966.501	-1.489.674	-1.267.239	3.262.887	
Universidade do Porto	10.748.099	21.423.513	6.698.298	5.232.037	4.886.166	725.794	1.118.234
Total	**24.608.171**	**39.632.037**	**15.076.527**	**7.597.697**	**3.763.943**	**11.847.514**	**6.839.957**
Average	**4.101.362**	**5.661.720**	**2.153.790**	**1.085.385**	**537.706**	**1.974.586**	**1.367.991**

Invested capital (adjusted)	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	391.440.647	391.440.647	387.349.839	394.678.179	391.953.636	394.841.589	400.217.567
Universidade Aberta	10.964.948	10.979.711	10.306.101	14.089.861	10.846.784	12.497.087	12.621.807
Universidade de Aveiro	136.903.378	146.470.599	161.736.524	171.478.406	177.330.232	181.602.084	179.353.018
Universidade da Beira Interior	105.528.590	112.831.093	108.574.538	102.737.613	106.236.711	101.543.876	90.516.635
Universidade da Madeira	14.185.146	15.376.528	15.190.803	10.727.227	12.495.187		
Universidade do Minho		152.810.647	150.507.220	189.450.042	130.627.405	144.483.222	
Universidade do Porto	538.424.928	674.928.029	645.922.493	650.088.267	657.827.471	655.580.790	652.109.760
Total	**1.197.447.637**	**1.504.837.254**	**1.479.587.519**	**1.533.249.595**	**1.487.317.425**	**1.490.548.649**	**1.334.818.788**
Average	**199.574.606**	**214.976.751**	**211.369.646**	**219.035.656**	**212.473.918**	**248.424.775**	**266.963.758**

Net Income	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	3.300.570	2.403.491	-1.766.637	-654.972	-1.200.485	1.557.967	3.791.342
Universidade Aberta	-592.279	487.041	93.111	240.642	388	-94.612	229.544
Universidade de Aveiro	4.881.111	2.082.922	2.548.016	3.215.995	2.803.209	5.949.128	1.750.706
Universidade da Beira Interior	3.091.993	3.868.283	115.732	-1.737.842	-1.099.344	20.114	-886.822
Universidade da Madeira	1.476.800	286.328	394.683	-599.942	-638.560		
Universidade do Minho		3.250.059	1.366.410	-4.028.595	-4.815.606	1.722.926	
Universidade do Porto	9.617.167	23.394.387	5.788.485	4.025.409	5.489.952	2.034.654	876.464
Total	**21.775.361**	**35.772.512**	**8.539.800**	**460.694**	**539.554**	**11.190.177**	**5.761.235**
Average	**3.629.227**	**5.110.359**	**1.219.971**	**65.813**	**77.079**	**1.865.030**	**1.152.247**

Equity	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	301.923.756	301.923.756	299.752.563	305.542.549	296.382.638	295.374.262	294.737.480
Universidade Aberta	203.664	498.088	591.199	1.316.249	1.556.891	1.644.087	1.873.631
Universidade de Aveiro	38.960.977	34.070.650	42.352.395	45.571.734	48.399.867	54.351.479	56.148.793
Universidade da Beira Interior	29.628.380	26.335.929	29.740.696	26.133.911	25.053.227	25.073.341	24.198.820
Universidade da Madeira	11.376.346	11.948.744	12.344.362	9.828.927	9.190.366		
Universidade do Minho		98.529.509	99.789.826	85.476.372	77.204.900	78.880.266	
Universidade do Porto	467.509.256	491.779.227	498.486.792	494.680.221	499.645.577	502.144.904	502.794.206
Total	**849.602.380**	**965.085.903**	**983.057.832**	**968.549.963**	**957.433.467**	**957.468.339**	**879.752.930**
Average	**141.600.397**	**137.869.415**	**140.436.833**	**138.364.280**	**136.776.210**	**159.578.056**	**175.950.586**

ROI	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	1,36%	1,28%	0,15%	0,04%	0,07%	0,59%	1,08%
Universidade Aberta	11,56%	5,85%	-4,28%	6,75%	-3,54%	0,70%	1,95%
Universidade de Aveiro	1,22%	3,19%	1,67%	2,41%	1,05%	3,07%	1,03%
Universidade da Beira Interior	3,86%	2,97%	-0,03%	-1,81%	-1,01%	-0,14%	-0,74%
Universidade da Madeira	10,85%	2,03%	3,84%	4,37%	-4,02%		
Universidade do Minho		2,78%	3,30%	-0,79%	-0,97%	2,26%	
Universidade do Porto	2,00%	3,17%	1,04%	0,80%	0,74%	0,11%	0,17%
ROI i	**1,36%**	**1,28%**	**0,15%**	**0,04%**	**0,07%**	**0,59%**	**1,08%**
ROI m (weighted average by equity)	**2,06%**	**2,63%**	**1,02%**	**0,50%**	**0,25%**	**0,79%**	**0,51%**
ROI m (arithmetic average)	**5,14%**	**3,04%**	**0,81%**	**1,68%**	**-1,10%**	**1,10%**	**0,70%**
cov (ROI i , ROI m)					**0,00007**	**0,00005**	**0,00000**
var ROI m					**0,00010**	**0,00009**	**0,00001**
Sample representability	**40,00%**	**46,67%**	**46,67%**	**46,67%**	**46,67%**	**40,00%**	**33,33%**

ROE	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	1,09%	0,80%	-0,59%	-0,21%	-0,41%	0,53%	1,29%
Universidade Aberta	-290,81%	97,78%	15,75%	18,28%	0,02%	-5,75%	12,25%
Universidade de Aveiro	12,53%	6,11%	6,02%	7,06%	5,79%	10,95%	3,12%
Universidade da Beira Interior	10,44%	14,69%	0,39%	-6,65%	-4,39%	0,08%	-3,66%
Universidade da Madeira	12,98%	2,40%	3,20%	-6,10%	-6,95%		
Universidade do Minho		3,30%	1,37%	-4,71%	-6,24%	2,18%	
Universidade do Porto	2,06%	4,76%	1,16%	0,81%	1,10%	0,41%	0,17%
ROE i	**1,09%**	**0,80%**	**-0,59%**	**-0,21%**	**-0,41%**	**0,53%**	**1,29%**
ROE m (weighted average by equity)	**2,56%**	**3,71%**	**0,87%**	**0,05%**	**0,06%**	**1,17%**	**0,65%**
ROE m (arithmetic average)	**-41,95%**	**18,55%**	**3,90%**	**1,21%**	**-1,58%**	**1,40%**	**2,63%**
cov (ROE i , ROE m)					**0,00011**	**0,00007**	**0,00001**
var ROE m					**0,00026**	**0,00023**	**0,00002**
Sample representability	**40,00%**	**46,67%**	**46,67%**	**46,67%**	**46,67%**	**40,00%**	**33,33%**

Accounting Beta - Hill and Stone Method [Consolidated Accounts]

EBIT (adjusted)	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	7.576.535	4.939.614	865.817	1.526.236	1.594.721	3.749.935	5.395.151
Universidade Aberta	1.267.776	642.160	-441.280	951.098	-384.446	87.898	246.395
Universidade de Aveiro	1.284.308	4.537.696	3.110.538	3.733.764	1.882.753	5.385.564	2.009.157
Universidade da Beira Interior	4.273.310	3.179.254	-146.107	-1.792.215	-1.050.425	-125.720	-936.572
Universidade de Évora	4.099.296	4.603.798	-364.013	-4.022.368	-1.973.404	-1.867.880	
ISCTE			3.327.859	545.679	403.979	989.387	
Universidade de Lisboa				13.386.369	9.931.848	10.642.886	
Universidade da Madeira	1.539.550	312.681	583.447	468.695	-502.317		
Universidade do Minho	5.079.349	4.448.315	5.242.311	-1.142.591	-1.481.795	8.843.644	
Universidade Nova de Lisboa	3.081.982		4.061.119	1.078.753	1.003.355	-437.837	
Universidade do Porto	9.389.840	22.120.036	-1.097.328	6.345.563	6.099.144	723.763	
Universidade de Trás-os-Montes e Alto Douro	850.499	2.545.315	1.616.374	1.027.324	-696.065	1.736.872	
Total	**38.442.444**	**47.328.869**	**16.758.737**	**22.106.307**	**14.827.347**	**29.728.512**	**6.714.131**
Average	**3.844.244**	**5.258.763**	**1.523.522**	**1.842.192**	**1.235.612**	**2.702.592**	**1.678.533**

Invested capital (adjusted)	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	423.757.139	423.757.139	432.135.769	455.541.404	472.473.588	477.384.742	474.038.325
Universidade Aberta	10.964.948	10.979.711	10.306.101	14.089.861	10.846.784	12.497.087	12.621.807
Universidade de Aveiro	142.147.784	150.183.763	163.963.807	174.710.317	180.268.576	182.499.146	180.210.251
Universidade da Beira Interior	119.465.095	128.799.451	124.414.490	120.270.785	119.490.700	118.354.088	107.549.408
Universidade de Évora	92.052.903	109.431.634	98.627.971	102.768.431	101.598.792	102.098.611	
ISCTE			89.054.486	98.134.909	96.968.612	96.074.866	
Universidade de Lisboa				1.168.216.359	1.186.763.407	1.232.354.187	
Universidade da Madeira	14.185.146	15.376.528	15.190.803	10.727.227	12.495.187		
Universidade do Minho	177.259.811	174.333.881	177.606.141	221.440.256	218.713.297	241.209.040	
Universidade Nova de Lisboa	244.902.811		254.171.615	243.646.157	238.582.388	232.945.385	
Universidade do Porto	658.983.931	701.914.746	725.517.215	746.543.788	752.105.209	746.262.829	
Universidade de Trás-os-Montes e Alto Douro	28.095.701	38.410.194	40.330.654	52.967.162	51.159.235	52.616.343	
Total	**1.883.719.568**	**1.714.776.852**	**2.090.988.398**	**3.356.089.494**	**3.390.306.541**	**3.441.679.980**	**774.419.791**
Average	**209.302.174**	**214.347.107**	**209.098.840**	**305.099.045**	**308.209.686**	**344.167.998**	**193.604.948**

ROI	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	1,79%	1,17%	0,20%	0,34%	0,34%	0,79%	1,14%
Universidade Aberta	11,56%	5,85%	-4,28%	6,75%	-3,54%	0,70%	1,95%
Universidade de Aveiro	0,90%	3,02%	1,90%	2,14%	1,04%	2,95%	1,11%
Universidade da Beira Interior	3,58%	2,47%	-0,12%	-1,49%	-0,88%	-0,11%	-0,87%
Universidade de Évora	4,45%	4,21%	-0,37%	-3,91%	-1,94%	-1,83%	
ISCTE			3,74%	0,56%	0,42%	1,03%	
Universidade de Lisboa				1,15%	0,84%	0,86%	
Universidade da Madeira	10,85%	2,03%	3,84%	4,37%	-4,02%		
Universidade do Minho	2,87%	2,55%	2,95%	-0,52%	-0,68%	3,67%	
Universidade Nova de Lisboa	1,26%		1,60%	0,44%	0,42%	-0,19%	
Universidade do Porto	1,42%	3,15%	-0,15%	0,85%	0,81%	0,10%	
Universidade de Trás-os-Montes e Alto Douro	3,03%	6,63%	4,01%	1,94%	-1,36%	3,30%	
ROI i	**1,79%**	**1,17%**	**0,20%**	**0,34%**	**0,34%**	**0,79%**	**1,14%**
ROI m (weighted average by equity)	**2,01%**	**2,70%**	**0,79%**	**0,65%**	**0,43%**	**0,85%**	**0,87%**
ROI m (arithmetic average)	**4,17%**	**3,45%**	**1,21%**	**1,05%**	**-0,71%**	**1,02%**	**0,83%**
cov (ROI i , ROI m)					**0,00006**	**0,00003**	**0,00000**
var ROI m					**0,00010**	**0,00008**	**0,00000**
Sample representability	**66,67%**	**60,00%**	**73,33%**	**80,00%**	**80,00%**	**73,33%**	**26,67%**

Net Income	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	4.101.933	2.107.101	-2.043.722	-2.326	-333.835	2.539.043	4.272.173
Universidade Aberta	-592.279	487.041	93.111	240.642	388	-94.612	229.544
Universidade de Aveiro	1.843.395	4.797.235	2.953.987	2.794.339	2.793.742	5.773.509	1.770.244
Universidade da Beira Interior	4.210.498	3.073.390	155.882	-1.535.028	-1.072.973	38.225	-1.015.852
Universidade de Évora	3.595.279	4.515.989	-596.987	-4.820.507	-2.795.526	-3.016.005	
ISCTE			3.259.822	247.563	175.354	808.359	
Universidade de Lisboa				-1.053.813	-994.411	2.333.381	
Universidade da Madeira	1.476.800	286.328	394.683	-701.662	-638.560		
Universidade do Minho	3.693.177	3.074.502	1.258.476	-4.548.890	-5.012.679	1.841.920	
Universidade Nova de Lisboa	2.686.445		919.913	-1.974.947	677.804	-1.269.120	
Universidade do Porto	8.621.956	24.316.066	-1.968.276	4.223.937	4.283.836	2.101.931	
Universidade de Trás-os-Montes e Alto Douro	796.829	2.038.641	-108.416	-136.381	-1.480.457	996.461	
Total	**30.434.032**	**44.696.293**	**4.318.472**	**-7.267.072**	**-4.397.317**	**12.053.093**	**5.256.109**
Average	**3.043.403**	**4.966.255**	**392.588**	**-605.589**	**-366.443**	**1.095.736**	**1.314.027**

Equity	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	324.389.472	323.160.795	329.624.546	321.961.191	321.794.586	322.096.128	327.113.483
Universidade Aberta	203.664	498.088	591.199	1.316.249	1.556.891	1.644.087	1.873.631
Universidade de Aveiro	38.246.050	43.103.522	44.068.131	46.923.174	49.573.720	55.395.055	57.214.372
Universidade da Beira Interior	29.256.212	32.525.755	32.680.985	28.923.818	27.869.505	27.897.620	26.886.293
Universidade de Évora	63.252.983	83.102.236	82.553.888	76.837.961	74.279.054	72.846.900	
ISCTE			47.819.448	50.474.075	50.598.480	51.165.144	
Universidade de Lisboa				968.527.269	957.969.468	986.032.984	
Universidade da Madeira	11.376.346	11.948.744	12.344.362	9.828.927	9.190.366		
Universidade do Minho	100.246.945	103.412.133	104.962.226	90.118.663	85.243.304	86.925.501	
Universidade Nova de Lisboa	186.524.526		183.777.144	172.691.829	170.433.981	169.388.673	
Universidade do Porto	481.250.281	506.188.905	503.393.257	509.782.482	514.316.962	516.495.647	
Universidade de Trás-os-Montes e Alto Douro	15.708.689	26.458.081	25.166.208	31.874.058	30.760.994	32.074.374	
Total	**1.250.455.170**	**1.130.398.258**	**1.366.981.393**	**2.309.259.695**	**2.293.587.311**	**2.321.962.113**	**413.087.779**
Average	**125.045.517**	**125.599.806**	**124.271.036**	**192.438.308**	**191.132.276**	**211.087.465**	**103.271.945**

Debt	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	0	0	742.838	1.488.541	2.105.318	3.017.505	2.884.135
Universidade Aberta	0	0	0	0	0	0	0
Universidade de Aveiro	75.480	58.587	778.405	2.193.764	1.915.473	180.514	29.622
Universidade da Beira Interior	0	0	0	0	0	0	0
Universidade de Évora	1.172.585	1.087.549	1.039.551	982.199	931.969	880.705	
ISCTE			0	3.038.322	1.379.576	0	
Universidade de Lisboa				151.435	5.285	876.967	
Universidade da Madeira	0	0	0	0	0		
Universidade do Minho	0	0	0	0	0	0	
Universidade Nova de Lisboa	0		0	0	0	0	
Universidade do Porto	5.827.364	7.199.609	7.034.409	7.378.712	7.405.136	6.039.332	
Universidade de Trás-os-Montes e Alto Douro	0	0	0	0	0	0	
Total	**7.075.429**	**8.345.745**	**9.595.203**	**15.232.972**	**13.742.757**	**10.995.023**	**2.913.757**
Average	**707.543**	**927.305**	**872.291**	**1.269.414**	**1.145.230**	**999.548**	**728.439**

ROE	2010	2011	2012	2013	2014	2015	2016
Universidade de Coimbra	1,26%	0,65%	-0,62%	0,00%	-0,10%	0,79%	1,31%
Universidade Aberta	-290,81%	97,78%	15,75%	18,28%	0,02%	-5,75%	12,25%
Universidade de Aveiro	4,82%	11,13%	6,70%	5,96%	5,64%	10,42%	3,09%
Universidade da Beira Interior	14,39%	9,45%	0,48%	-5,31%	-3,85%	0,14%	-3,78%
Universidade de Évora	5,68%	5,43%	-0,72%	-6,27%	-3,76%	-4,14%	
ISCTE			6,82%	0,49%	0,35%	1,58%	
Universidade de Lisboa				-0,11%	-0,10%	0,24%	
Universidade da Madeira	12,98%	2,40%	3,20%	-7,14%	-6,95%		
Universidade do Minho	3,68%	2,97%	1,20%	-5,05%	-5,88%	2,12%	
Universidade Nova de Lisboa	1,44%		0,50%	-1,14%	0,40%	-0,75%	
Universidade do Porto	1,79%	4,80%	-0,39%	0,83%	0,83%	0,41%	
Universidade de Trás-os-Montes e Alto Douro	5,07%	7,71%	-0,43%	-0,43%	-4,81%	3,11%	
ROE $_i$	**1,26%**	**0,65%**	**-0,62%**	**0,00%**	**-0,10%**	**0,79%**	**1,31%**
ROE $_m$ (weighted average by equity)	**2,43%**	**3,95%**	**0,32%**	**-0,31%**	**-0,19%**	**0,52%**	**1,27%**
ROE $_m$ (arithmetic average)	**-23,97%**	**15,81%**	**2,95%**	**0,01%**	**-1,52%**	**0,74%**	**3,22%**
cov (ROE $_i$, ROE $_m$)					**0,00010**	**0,00005**	**0,00004**
var ROE $_m$					**0,00035**	**0,00031**	**0,00004**
Sample representability	**66,67%**	**60,00%**	**73,33%**	**80,00%**	**80,00%**	**73,33%**	**26,67%**

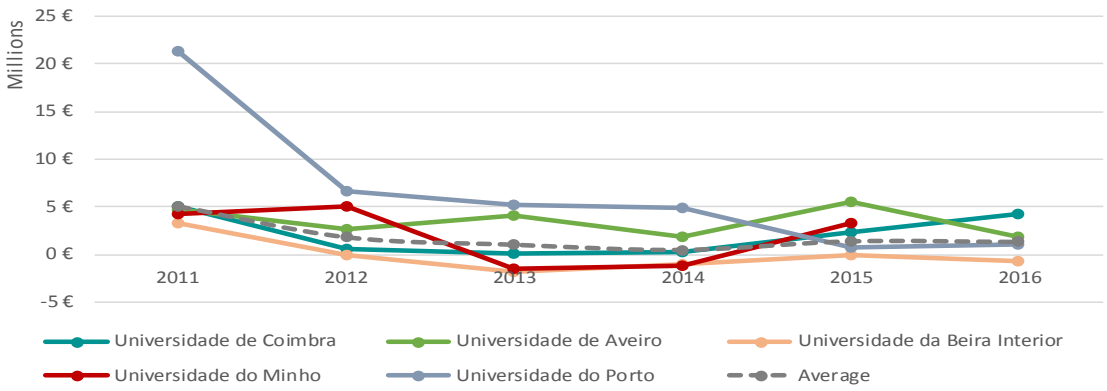
Annex III

EVA® benchmark graphics

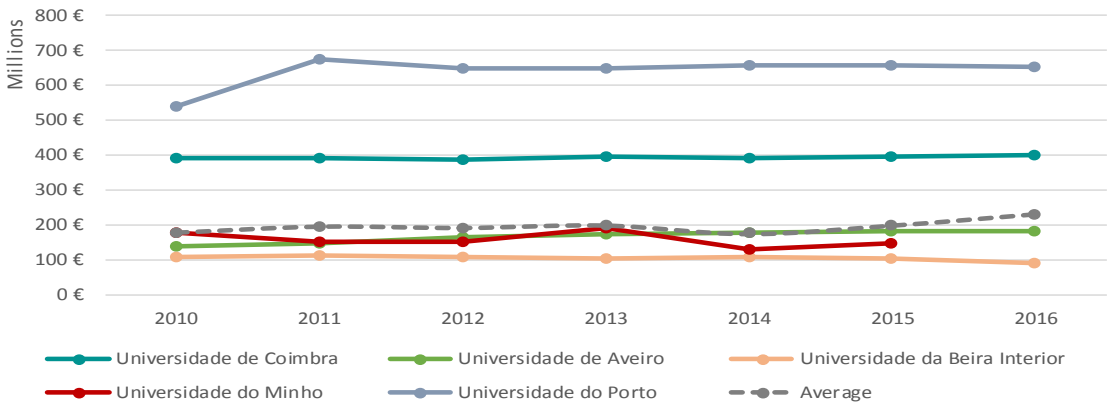
Source: tables 26 and 27

Individual accounts benchmark:

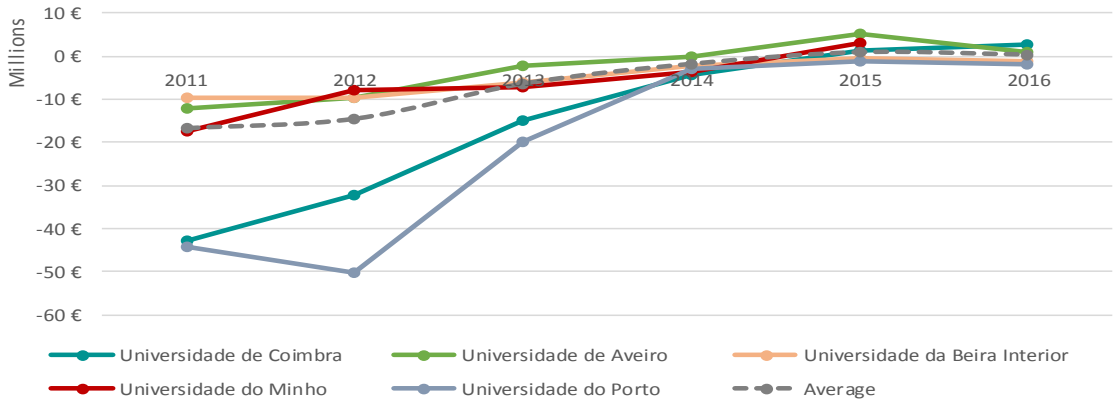
EBIT



Invested Capital

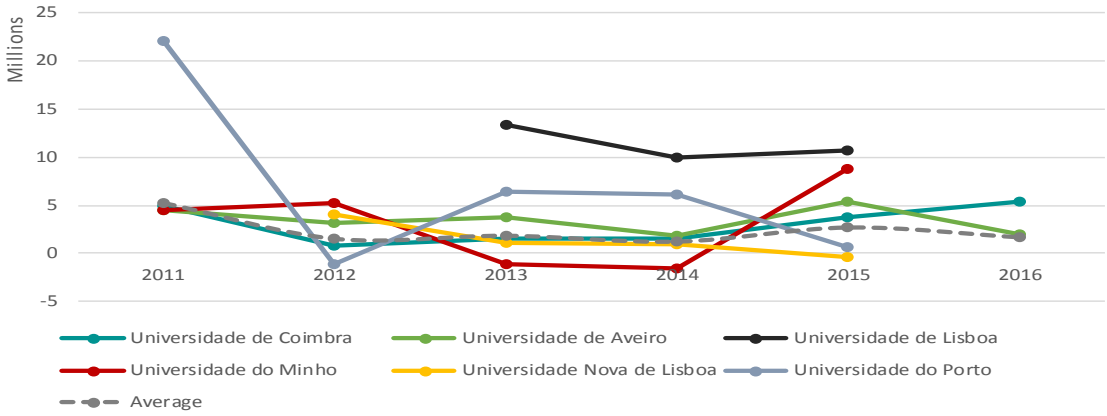


EVA®

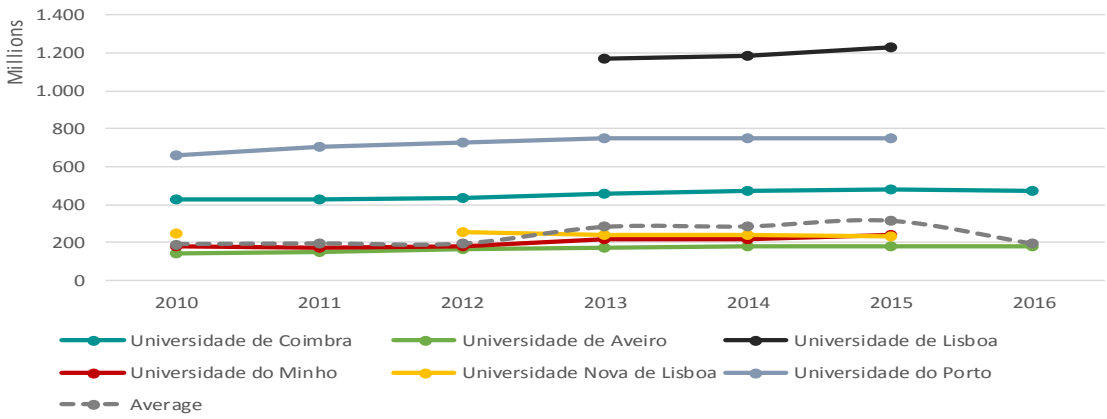


Consolidated accounts benchmark:

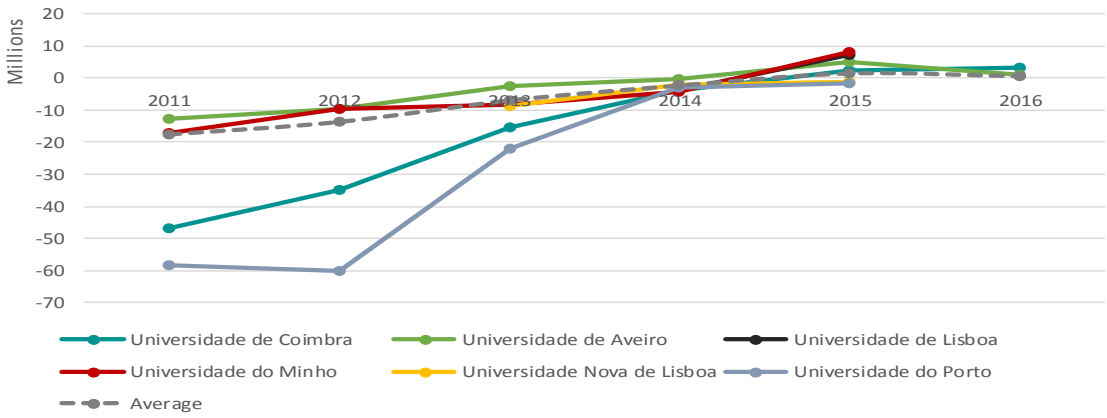
EBIT



Invested Capital



EVA®



Annex IV

Panel data for multivariate study

				EVA®	Financial					Education				Research				Strategic		
Institution	Size	Foundation	Year	EVA®	ROI	ROA	ROE	BUD	CHR	CUR	STD	CSR	RKG	PRJ	PAT	PUB	SIR	NTR	DTP	DIV
U. Coimbra	1	0	2013	-16.293.025	0,3%	0,0%	0,0%	181.435.544	3.193.039	258	24.260	18,4%		519	99	9.432	91,3%	1.586	73,8%	48,4%
U. Coimbra	1	0	2014	-4.008.029	0,3%	-0,1%	-0,1%	185.984.586	7.464.358	249	24.069	18,0%	45,5%	402	116	10.704	92,3%	1.536	73,9%	47,3%
U. Coimbra	1	0	2015	2.349.607	0,8%	0,4%	0,8%	186.421.300	2.021.716	250	24.817	16,7%	49,3%	339	130	12.143	92,5%	1.648	72,8%	45,7%
U. Coimbra	1	0	2016	3.238.277	1,1%	0,7%	1,3%	194.592.730	17.979.854	242	24.361	17,6%	51,9%	292	156	14.463	92,5%	1.702	72,1%	47,4%
U. Aberta	0	0	2013	547.958	6,8%	0,0%	18,3%	17.641.509	1.404.911	52	7.164	10,2%		41		264		150	84,7%	56,1%
U. Aberta	0	0	2014	-551.529	-3,5%	3,8%	0,0%	17.339.537	-987.538	51	6.561	10,9%		35		373		144	95,8%	64,9%
U. Aberta	0	0	2015	56.081	0,7%	-1,4%	-5,8%		234.427	48	6.400	9,1%		19		421		144	96,5%	61,7%
U. Aberta	0	0	2016	189.533	2,0%	3,5%	12,3%		-10.430											69,5%
U. Aveiro	0	1	2013	-2.679.954	2,1%	1,4%	6,0%	108.684.261	6.231.823							6.912	90,8%	986		45,2%
U. Aveiro	0	1	2014	-189.020	1,0%	1,4%	5,6%	104.817.258	-3.297.322				44,7%			7.583	91,8%	969		46,3%
U. Aveiro	0	1	2015	4.856.776	3,0%	2,9%	10,4%	104.695.932	-3.659.093				44,3%			8.600	92,0%	960		44,6%
U. Aveiro	0	1	2016	1.178.786	1,1%	0,9%	3,1%	99.728.831	3.099.266				41,5%			9.500	92,5%	1.024		47,4%
U. Beira Interior	0	0	2013	-6.658.895	-1,5%	-1,6%	-5,3%	36.231.609	-564.645								87,4%			55,5%
U. Beira Interior	0	0	2014	-2.476.636	-0,9%	-1,1%	-3,8%	36.133.046	-4.360.292								88,3%			54,8%
U. Beira Interior	0	0	2015	-476.226	-0,1%	0,0%	0,1%	37.774.615	2.560.924								88,9%			54,3%
U. Beira Interior	0	0	2016	-1.475.083	-0,9%	-1,0%	-3,8%	35.913.000	4.782.068								88,9%			56,9%
U. Lisboa	1	0	2013			-0,1%			3.358.392								95,1%			47,0%
U. Lisboa	1	0	2014	-3.921.251	0,8%	-0,1%	-0,1%	333.591.682	5.182.861	431	47.525	19,7%	72,2%		165		95,7%	3.713		51,6%
U. Lisboa	1	0	2015	7.161.713	0,9%	0,2%	0,2%	319.783.137	1.685.215	417	47.543	20,8%	74,3%		171		95,9%	3.737	82,7%	51,3%
U. Lisboa	1	0	2016										72,5%				96,1%			
U. Minho	0	1	2013	-8.089.951	-0,5%	-2,1%	-5,0%		-981.338		18.375	23,2%				1.425	90,9%	1.295	95,1%	47,4%
U. Minho	0	1	2014	-4.107.707	-0,7%	-2,3%	-5,9%		-4.780.966		18.330	22,9%	32,1%			1.736	91,8%	1.286	92,0%	44,6%
U. Minho	0	1	2015	8.202.085	3,7%	0,8%	2,1%		3.605.516		18.491	23,6%	37,1%			1.642	92,1%	1.240	92,0%	41,3%
U. Minho	0	1	2016										40,5%				93,1%			
U. Nova Lisboa	0	0	2013	-8.863.593	0,4%	-0,8%	-1,1%	147.407.032	5.143.788		19.501	22,0%				1.330	91,0%	1.646		47,9%
U. Nova Lisboa	0	0	2014	-1.885.882	0,4%	0,3%	0,4%	148.641.211	2.594.552		19.516	20,2%	36,8%			1.489	91,7%	1.591		47,7%
U. Nova Lisboa	0	0	2015	-1.137.679	-0,2%	-0,5%	-0,7%	152.221.099	2.750.217		19.867	21,5%	38,8%				92,3%	1.716		47,3%
U. Nova Lisboa	0	0	2016										41,9%				93,4%			
U. Porto	1	1	2013	-22.034.252	0,8%	0,5%	0,8%		21.635.128		32.488	22,2%		1.497	153	3.035	93,6%	3.572		43,6%
U. Porto	1	1	2014	-2.753.621	0,8%	0,6%	0,8%		8.582.426		31.686	31,8%	71,0%	1.479	169	3.538	94,6%	3.741		42,6%
U. Porto	1	1	2015	-1.482.412	0,1%	0,3%	0,4%		4.134.385		31.472	24,5%	69,2%	1.100	208	4.064	95,2%	3.594		41,6%
U. Porto	1	1	2016										66,9%				96,0%			