A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics.

Real Estate Risk Management at BPI GA

Nova SBE Consulting Project

Afonso Amoedo Casqueiro Alves da Silva

Catarina Vilar Correia Caldeira de Albuquerque

João Manuel Guerreiro Castelo Ramos

Sofia Marques da Silva Jesus

Tiago dos Santos Botas Moita

Work project carried out under the supervision of:

Professor Melissa Porras Prado

04-01-2021

Real Estate Risk Management at BPI GA

Abstract: This paper determines the fundamental drivers that impact the CRE asset class, based on the analysis of a Portuguese Real Estate open-end fund. We developed a tailored risk management approach that considers both macro and micro risks – market and asset-specific, respectively. The material micro drivers analysed are vacancy, tenant, asset concentration, liquidity and ESG (environmental, social and governance factors). The results support the previous drivers' relevance on CRE capitalization rates and demonstrate the significant benefits inherent to adding Real Estate Investment Trusts to the portfolio.

Keywords: Commercial Real Estate; Risk Management; Macro Risks; Micro Risks; Fundamental Drivers; Capitalization Rates; REITs; ESG.

This work used infrastructure and resources funded by Fundação para a Ciência e Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Acknowledgements

Throughout the writing of this thesis, we have received a great deal of support and assistance.

First of all, we would like to express our sincere gratitude to the *Nova School of Business and Economics* for letting us be part of this incredible consulting project. Developing a thesis in this format allowed us to apply the technical skills we have been developing during the course of our Master's in Finance, as well as to work with a prominent Portuguese Asset Manager.

Secondly, we are deeply grateful for Professor Melissa Prado, PhD, for her continuous guidance and patience during the running of this project. She encouraged us to be practical and take risks while never losing sight of the importance of good academic support. We are equally appreciative that she had taken some time to discuss ideas and enrich our study.

Furthermore, appreciation is due to *BPI Gestão de Ativos* for providing us with a stimulating work environment and being incredibly collaborative. In particular, we believe two persons from *BPI Gestão de Ativos* deserve a special word of gratitude. One of them is Jorge Sousa Teixeira, CFA, whose insight and knowledge into the subject matter steered us through this research. Likewise, his friendship and great sense of humour allowed us to feel integrated and motivated to complete our work successfully. The other person is Marta Vieira da Silva, MSc, who offered valuable comments and suggestions and provided us with the essential tools to develop our research accurately.

Finally, we would like to thank our families and friends for the love and positive energy in always supporting our dreams and academic accomplishments. We apologize for the times we were grumpier than usual, but your incredible understanding and encouragement were essential. They are the foundation we needed during our thesis's compilation, and without them, none of this would be possible.

Table of Contents

1 Introduction

Alternative investments have seen a rapid growth since the mid-1990s due to an increased interest by institutions and high-net-worth individuals seeking either absolute returns, relative returns or higher diversification. According to DTZ Research, the most significant share of global assets under management (AuM) in alternative investments belongs to Commercial Real Estate investments (Fisher and MacGregor 2020). Nonetheless, even though Commercial Real Estate has long been an important asset class, its growing position was rattled by the 2007 global financial crisis. The recession has revealed that these assets, as other alternative investments, are not free of risk – with the diversification benefits vanishing as correlations among various assets increased dramatically. As a result, it is of utmost importance to understand which drivers are behind the Commercial Real Estate industry, identifying its key risk indicators and how they should be monitored and mitigated.

The current research is part of a consulting project developed in collaboration with the Portuguese Asset Management company *BPI Gestão de Activos (BPI GA),* where we aimed to identify both macro and micro fundamental drivers that affect Commercial Real Estate funds. Therefore, we developed a detailed risk assessment and suggested several risk-management processes and tools for future implementation, applied to *Imofomento's* portfolio – an open-end Commercial Real Estate fund managed by BPI GA. Through a well-established econometric model, we analysed whether Real Estate performance is sensitive to different economic variables. However, this analysis covers the macro risk component solely, requiring a further assessment of specific material risks. From the previous, we analysed tenant, vacancy, asset concentration, liquidity and ESG (environmental, social and governance). The current research also suggests some strategies to mitigate the risks affecting the client's portfolio. More precisely, we propose adopting an equity-based investment in Real Estate investment trusts

(REITs) through public markets, which seeks to maximise the risk-adjusted financial return, while not compromising the fund's investment style in core strategies. Moreover, we recommended an action plan for future implementation that aligns its risk management processes with the United Nations Principles for Responsible Investment (UNPRI) assessment's score maximisation.

2 Asset Class Characterization

Real Estate is a type of "real property" that includes the land, all its natural components, and everything permanently attached to it, such as human-made buildings and site improvements, below and above the ground. According to the RICS Valuation Professional Group (2019), a title of interest represents the Real Estate ownership over one of the main categories of Real Estate: residential, commercial, industrial, raw land and particular use.

While a big slice of Real Estate is residential, commercial properties – such as shopping centres, offices, hotels and educational buildings – are a critical component in institutional investors' portfolios, owned to generate income. In 2018, according to Property Funds Research, institutionally owned global Real Estate property represented US$ 3.48 trillion. Investors increasingly perceive Real Estate as an alternative to fixed income and equities, with potential for competitive long-term returns and lower volatility, due to its unique characteristics that lessen cash flow's exposure to economic shocks.

Moreover, investing in Real Estate helps investors achieving steady profits driven by income generation and capital appreciation. It also guarantees inflation protection if rents adjust for inflation, and diversification benefits from less-than-perfect correlation with traditional asset classes (Fisher and MacGregor 2020). Therefore, to better understand this asset class's underlying characteristics, we performed a more in-depth analysis based on the CFA Institute's readings for its Level 1 exam.

2.1 Asset Characteristics

The Real Estate asset class has some unique characteristics: heterogeneity, fixed location, illiquidity, indivisibility (being a high unit value), high transaction costs, depreciation, debt dependence and price determination. Heterogeneity arises since two properties are never wholly

identical, differing in size, location, age, type of construction, quality, tenant, leasing arrangements, among others. The illiquidity comes from its fixed location, allied with its high unit value, exposure to government regulations, and local factors, thus requiring a substantial amount of time to sell the asset at a fair market price.

Moreover, Real Estate is associated with high transaction costs and active day-to-day management. Buying and selling immovable property is often expensive and time-consuming, given that it requires appraisers, attorneys and architects, and debt capital financing in some cases. As a result, the prices of Real Estate are vulnerable to debt capital costs and supply. Real Estate valuation is lower when debt capital is scarce or interest rates are high, versus a scenario where debt capital is readily available, or interest rates are low. Lastly, the price determination is a difficult task to be made due to the heterogeneity and the limited frequency of sales. Those who possess superior experience and expertise in determining assets' prices can have an advantage in a less competitive market.

2.2 Alternatives for Real Estate Exposure

There are different forms to get exposure to Real Estate, classified within a four-quadrant matrix divided into equity or debt investment, in public or private markets. This thesis focuses on the equity-based investments made through private and public markets (debt investments are further explained in Appendix 2.1). The former implies investing in shares with Real Estate as the underlying investment – such as Real Estate Investment Trusts (REITs) – getting exposure to the asset class without owning the asset itself. In private equity, Real Estate investments comprehend private assets invested in the property market, implying the control (either direct or indirect) of private investors' properties. Private equity investors may create pooled vehicles arranged by intermediaries, such as joint ventures, Real Estate limited partnerships or indirect

ownership via a Real Estate fund. To buy assets when interest rates dropped, private equity Real Estate funds became common in the 1990s amid declining property prices.

REITs invest in various Real Estate segments, having a well-diversified portfolio generally professionally managed, producing a stable income stream and being a highly liquid investment (publicly traded like stocks). Moreover, these trusts are required to transfer most of the taxable profits to investors as dividends. There are three types of REITs worth highlighting, namely the publicly traded ones, listed on a national securities exchange, the non-traded REITs (less liquid yet not subject to market fluctuations) and the privately traded REITs (in the United States of America are not registered with the Securities and Exchange Commission and do not trade on national securities exchanges).

2.3 The Market for CRE Investment Funds

Various investment product vehicles are available to Commercial Real Estate investors, such as Real Estate mutual funds, listed property companies or non-listed funds. We can divide the latter into two types: closed-end funds and open-end funds. Closed-end funds raise money at creation with an initial issue of a defined number of shares, and after that, no more shares are issued. Existing investors have to liquidate by selling to new investors, with the number of outstanding shares always remaining the same, with supply and demand determining the share's overall price. Its fixed share characteristic results in closed-end funds selling at rates above or below the current net asset value per share. Contrarily, open-end funds exchange at its current net asset value per share, and investors do not pay a premium or discount, given that the new shares are issued at a value equal to the NAV of the fund. Besides, there is no limit to how many shares can be sold by an open-end fund.

2.4 The Variety of RE Funds

Real Estate funds can adopt three main strategies for their investments: core strategies, value-added strategies and opportunistic investment strategies. This section focuses on the former, as we developed this thesis for a Portuguese Real Estate fund with a core profile (the remaining strategies are explained in Appendix 2.2). Investments in core Real Estate funds are considered the least volatile, since they mostly focus on large core markets for stabilized, fully leased, secure investments. Such funds typically have a conservative investment profile, with a portfolio of properties with high credit tenants, long-term contracts and Class A buildings in desirable locations, often well-preserved on behalf of the current owner, requiring minor changes or adjustments. Thus, Real Estate investments adopting a core strategy do not typically undergo a substantial valuation appreciation, but rather have a steady and reliable cash flow with reasonably low risk. Therefore, management improvements are limited. Such characteristics suit investors pursuing capital accumulation over a long-term horizon. Investors tend to consider them favourable assets based on their risk profile, relative to other retail investment options such as corporate bonds and publicly traded equities.

2.5 Contract Type and Revenue Structure

There are different types of contracts used in Commercial Real Estate, such as the Single Net Lease (N), the Double Net Lease (NN) and the Triple Net Lease (NNN). In the Single Net Lease – the less common lease type – the tenant agrees to pay property taxes in addition to rent. At the same time, the owner is liable to pay the remaining administrative costs incurred in property maintenance. Furthermore, the Double Net Leases (also known as Net-net or NN leases) are highly common in Commercial Real Estate where the tenant pays the rent, property taxes and insurance premiums. At the same time, all repair expenses remain the responsibility of the landlord. Due to the tenant's extra costs, the base rent charged for space itself is usually smaller.

Lastly, the Triple Net Rent absolves the landlord from significant risk, thus assuring a specific revenue stream with no costs involved. In addition to leasing, property taxes, and insurance premiums, the tenant must also cover the expenses of building upkeep and repairs; thus, there is a reduced base rent charged by the landlord.

3 Company Overview

3.1 BPI GA

At the beginning of September 2020, BPI GA was placed as the third major Portuguese mutual fund management firm, with over €2.5 billion worth of assets under management, which represents a domestic market share of 23.67 percent. At the same time, concerning the Real Estate Fund Industry, the overall market registered an upward trend in 2020, in terms of assets under management. As for BPI GA, at the beginning of September of the same year, the firm was managing €542 million worth of assets and had a domestic market share of 6.68 percent. Therefore, BPI GA was the fifth largest player within the Real Estate Fund Portuguese Industry. However, when narrowing the industry by only considering Open Real Estate Funds, BPI GA maintained its third position, as it did in 2019 and 2018 (Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios 2020).

Regarding the Real Estate Funds which BPI GA manages, there are three funds that require a specific focus and detailed description. First of all, there is the *Imofomento* fund, which is an open-ended Real Estate fund. Secondly, there is *Josiba Florestal* fund, which is a special closed-end Real Estate fund, and lastly there is the Pension Fund, which the portfolio is composed by equities, bonds, and Real Estate. Each one of them presents very distinct characteristics, but for the purpose of this thesis only the first fund will be considered.

Regarding responsible investment practices within the Real Estate sector, BPI GA did not have enduring responsible investment policies neither integrated ESG factors in the overall decision-making process. The company is developing a strong Socially Responsible Investment (SRI) area, with adequate policies and procedures in place mostly directed towards equities and fixed income. Yet, the goal is to expand the SRI scope in order to reach the Real Estate asset class. It shall be noted that BPI GA reported to the UNPRI (United Nations' Principles of Responsible

Investing) in 2019 without filling the requirements for the Real Estate, thus maximizing such score is one of the major concerns considering the 2020 Report.

3.2 Imofomento Fund

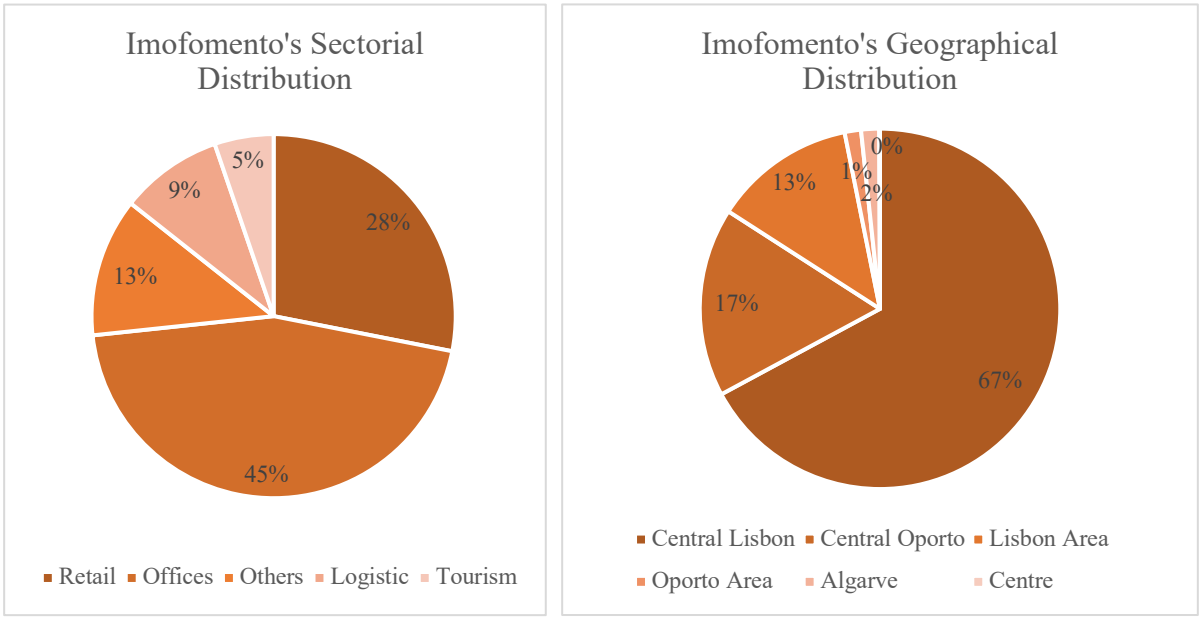
Imofomento's Profile

The *Imofomento* Fund is a diversified, core, open-ended Real Estate fund, consisting mostly of stabilized, income-producing, Commercial Real Estate. As it is considered a core fund, its investment objective is to provide investors, in the medium and long-term spectrum, with attractive returns, while not incurring significant risk levels. To achieve this goal, the fund seeks capital appreciation through diversified investments in Real Estate, both in property type and geographically, and by prioritizing stable rents among possible tenants. The fund has provided semi-annual cash flow distributions, accepts contributions with a minimum value of €500, and needs to meet redemptions both on a daily (Class A) and semi-annually (Class B) basis.

In terms of compliance, there are a few rules which, according to CMVM and the Portuguese Legislation, the fund must comply with, namely: (1) the value of the Real Estate assets cannot represent less than 66.67% of the fund's NAV; (2) the value of the rented Real Estate must be at least 10% of the fund's value; (3) the limit for the investment in contributions/units is 25% of the fund's value; (4) the number of units should be at least 25% of the overall units in the market; the value of a single building or another Real Estate instrument cannot surpass 20% of the fund's value; (5) the value of properties outside Europe but still within the OECD must not be higher than 25% of the fund's value; (6) the NAV of the fund after 12 months must be at least €5 million; (7) the fund's leverage level must not surpass 25% of the fund's value; (8) the value of properties rented to a single entity must not be above 20% of the fund's value; (9) shares in Real Estate companies must not be above 25% of the fund's value.

Imofomento's Composition

Concerning the fund's sectoral concentration, offices represent the major weight given the total value of properties. Additionally, offices combined with retail correspond to around 70% of the Real Estate portfolio, even though it also considers tourism and logistics, among others (figure 1). As for the geographical distribution, as shown in figure 2, the fund's properties are mostly concentrated in Lisbon Centre (67%) and Porto Centre (17%). Indeed, this can be said to be the fund's management team's more relevant spots, since these areas represent the most profitable investments and comprehend the most reliable tenants, compared to the rest of the country.



Figures 1 and 2 - Sectorial and Geographical distribution of Imofomento's portfolio, for 2020.

The tenant concentration is also a significant risk to consider. To guarantee the fund's profitability and maintaining its low-risk profile, *Imofomento*'s properties are leased to tenants who demonstrate healthy economic activity and financial capacity to comply with the different conditions specified on the respective contracts. Among other tenants, as of the end of September, the top five are *EDP Distribuição - Energia S.A., Modelo Continente*

Hipermercados S.A., Logic Logistica Integrada S.A., O Parque Ensino de Crianças S.A., and *Vila Avenida Hotel S.A.*

Imofomento's Performance

By the end of 2019, *Imofomento* represented 15% of market share among the domestic open-ended Real Estate funds. Most recently, by the end of September 2020, the fund reported a value of €512.95 million, with €314.54 million worth of Real Estate holdings and €198.41 million in liquid assets such as cash and Government Bonds. The fund's liquidity has been a concerning issue as the European interest rates have been negative for the past years. Consequently, the fund's returns may not expose the investors entirely to direct Real Estate returns, which are expected to be higher than the ones reported. The 1-year, 3-year, 5-year and 10-year gross returns of *Imofomento* are, respectively, 2.29%, 3.67%, 3.08%, and 2.38%. These are still impressive returns when compared to the volatility of the fund for the same horizons. For instance, the 1-year, 3-year, 5-year and 10-year volatility are, respectively, 0.99%, 1.20%, 1.06%, and 1.26%. Therefore, the risk-adjusted returns are attractive to investors who do not seek extremely volatile investments.

Compared to the *Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios* (APFIPP) open-ended fund index, *Imofomento* has performed relatively better over the years – as represented in Appendix 3.1 – even between 2008 and 2011 when the country was severely affected by the Global Financial Crisis. This is mostly because *Imofomento* is a core fund and does not make risky investments neither relies on tenants with high default probabilities. Nonetheless, the Covid-19 crisis had quite an impact on *Imofomento*'s returns, as since May until September 2020 the index has outperformed the fund. The healthcare crises affected the fund's returns, as the vacancy rates increased compared to the previous year – because in March 2020 a vital tenant, EDP, moved out of Edifício Niña – and several tenants requested the delay of rent payments, hence decreasing the monthly income.

By the end of September 2020, the vacancy rate was 10.13% higher than the 6.96% observed in the same month in 2019. As shown in Appendix 3.2, the vacancy rate has been following a downturn trend with a slight increase in 2020.

4 Market and Industry Overview

This section comprehends an analysis of the Commercial Real Estate market, in which the CRE fund's industry operates, with an emphasis in the Portuguese case. The overview starts with a market analysis prior to the pandemic. We perform a more in-depth view of the different CRE sub-segments for Lisbon and Porto and the key stakeholders' assessments. This is followed by an industry analysis assessing performance, size and gearing features. We then compare performance with several Portuguese macro-economic variables. The chapter concludes by evaluating the impact of Covid-19 in the sector.

4.1 The Market

4.1.1 Overall Look

The Portuguese Real Estate market has been following a strong upward trend since 2012, mostly driven by the low interest rates verified in the country and a significant improvement in economic figures and good financing conditions for all economic sectors. There has been a notorious growth in external demand for investors who seek to diversify their portfolios. For such purposes, Commercial Real Estate has been a clear target for generating consistent long-term yields. Commercial rental yields often outperform housing ones, plus tax benefits and inflation-hedging purposes, being a secure asset during both high and low cycles.

Moreover, this market entered 2020 in a healthy shape. In 2019, Portugal's commercial property sales exceeded €3.5 billion, a new record mostly driven by the office and retail sectors. It also invested around €1.5 billion in land for development and assets for renovation (Athena Advisers 2020). Additionally, according to the INE (2020) the Commercial Property Price Index (CPPI), which measures the price developments of the commercial properties transacted in Portugal, displays a continuously growing trend for transaction prices. Yet, the previous verifies a

decreasing growth rate since 2018. As shown in Appendix 4.1, prime yields for the different CRE segments have followed a slightly decreasing trend. Overall, we should highlight that in 2019, according to JLL, the number of new investments overpassed €400 million, mostly targeting student residencies and co-living spaces. Moreover, the touristic sector's strong demand in *Costa Alentejana* and *Algarve,* and the higher rents from new office buildings, led to a scenario where the demand surpasses the supply (JLL 2019).

4.1.2 Lisbon and Porto in Detail

Focusing on the two main Portuguese markets, Lisbon and Porto, we performed a more in-depth analysis for the different CRE sub-segments, namely offices, retail and industrials. This analysis is based on a Savills research made in the first quarter of 2020, which does not include any significant Covid-19 impact since the Real Estate sector verified a slowdown only at the end of March.

Offices

According to this research, Lisbon offices summed up to 44,671 sqm in total market take-up, representing a 6.5% increase compared to the first quarter of 2018. The most relevant areas for Commercial Real Estate activity are the Prime Central Business District (CBD) and the CBD, which compromises the most central part of Lisbon, as well as the *Parque das Nações*. The former two are the best-performing ones (Appendix 4.2 shows the different areas for Lisbon and Porto). Rents have been increasing for the past years, reaching a monthly average of €23/sqm in the Prime CBD, as shown in Appendix 4.3. Also, vacancy rates averaged 5.42%. Even though the Western Corridor still faces a high rate, the entire market is following a downward trend that converges to zero, meaning that it is reaching a saturation point. Moreover, it is worth mentioning that the growing number of start-ups increases the demand for coworking spaces.

On the other hand, the demand for office buildings in Porto has been slightly falling. Yet, between 2019 and 2020 the take-up was of 19,123 sqm, representing a change in this paradigm. Even though with a lower magnitude compared to Lisbon, many multinationals see Porto as a business destination, targeting the city when expanding to the Portuguese market. Thus, the demand is still high, reinforced by the new projects' increasing quality, leading to the rise in prime monthly rents. In the first quarter of 2020, office prime rents ranged between €12.5/sqm and €18/sqm (shown in Appendix 4.4).

Retail

Regarding the retail sector, high street retail continued to expand in the main touristic areas of Lisbon and Porto. There has been a predominance in new spaces for the food and beverage sector, mainly driven by the positive consumption spending trend. Prime rents have been rising steadily in the high street segment, reaching a monthly amount of €160/sqm in Lisbon, and €70/sqm in Porto. Shopping centres in both main cities show a more stable rent value, which only grew from €85 to €100/sqm (monthly).

Logistics

At last, the Logistics and Industrials segment suffer from a lack of supply. Spaces with more than 10,000 sqm are particularly scarce, leading to an overall increase in market prices. The trend for e-commerce increases the need for sufficient spaces nearer city centres. Also, the increase in sustainability, energy efficiency and interconnection with other platforms and means of transport, differentiates a new type of demand. The sector summed a take-up of 80,000 sqm in the first quarter of 2020 (16% concerning new occupations and 84% for renegotiation of contracts). In the same period, the prime yield was 6.25%, and the main logistics centres can be found in *Carregado, Alverca, Loures*, in the Western Corridor, in *Prior Velho, Montijo* and *Palmela*.

4.1.3 Key Stakeholders

The key stakeholders involved in the Commercial Real Estate industry are divided into internal and external ones (Caputo 2013). Based on literature, examples of internal stakeholders are the customers (tenants), shareholders, workers, financial sponsors, suppliers (mostly sellers), the project team, and support teams and organizations (such as appraisers). External stakeholders are, among others, Real Estate asset owners (competitors), political and organizations, local communities, local and national authorities and environmentalists. Therefore, this section comprehends an analysis of both competition and appraisal experts.

Global Competitors

In general terms, the professionally managed global industry of Real Estate funds comprised around €3.2 trillion in 2019 (INREV 2020). Moreover, as of 2019, European Real Estate investors made up over one third in the top 100 ranked by AuM (Statista 2019), much driven by the German market. The top three European listed Real Estate funds worth mentioning are Allianz, *Bayerisch Versorgungskammer* and *MEAG Munich ERGO*, summing US$ 88.41 billion of AuM (the data regarding the leading Real Estate investment managers in Europe as of 2018 by AuM was retrieved from Statista). The German *Allianz* was the top investor with over US$ 72 billion in AuM, followed by *APG* of the Netherlands summing over US$ 48 billion in AuM, and the French *Axa*, with over US$ 36 billion in AuM. Furthermore, when looking at the non-listed market, the top three Real Estate managers of 2019 were Blackstone, PGIM and Brookfield, in tandem with the overall top ten AuM chart (INREV 2019).

Portuguese Competitors

The most important asset management firms operating in the market for Portuguese non-listed Commercial Real Estate funds are the following (ranked by market share): *Interfundos* (13.20%), Square Asset Management (10.40%), *Norfin* (10.10%), *Fundger* (5.20%) and BPI

GA (5.00%) – summarized in Appendix 4.5. Among the previous, only *Norfin* does not manage open-end funds. Thus, we analyzed the top open-end funds managed by the players mentioned above, concerning their AuM, returns, participation unit price, volatility, sharpe ratio and investment style (summarized in Appendix 4.6[1])

Firstly, *AF Portfólio Imobiliário* managed by *Interfundos* sums € 261.72 million of AuM and an annual return of 3.43%. The fund seeks geographical dispersion in the national space (Appendix 4.7), predominantly in urban areas, favouring Real Estate acquisition for leasing. The latter are mostly directed for office services, retail and industrials.

Secondly, *CA Património Crescente* is managed by Square Asset Management, summing € 817 million of AuM and facing a 4.07% annual return. The favourable results associated with low volatility levels conferred the fund with national and international recognition. It was awarded for the tenth consecutive time by MSCI with the "Best Balanced Real Estate Portfolio", as well as with the "Best Open Real Estate Investment Fund" by APFIPP three times so far. The fund mostly invests in shopping centres (31.2%), office spaces (24.1%), retail (15%) and warehouses (12.9%) (shown in Appendix 4.8).

Thirdly, *Fundimo* is a fund managed by *Fundger*, with € 608 million of AuM and 6.03% annual returns. This fund is similar to *Imofomento* in terms of segment distribution, with a 55% amount allocated to office spaces, 18% to industrial areas, 18% to retail and the remaining 10% assigned to other segments (Appendix 4.9).

Lastly, Vip Real Estate Fund is managed by Silvip, with an annual return of 3.85% and holding approximately € 308 million worth of assets, with 54% of the portfolio invested on offices, as shown in Appendix 4.10.

[1] The market data was retrieved from Fund's People (2019 market data) and the information from each fund and corresponding asset manager was obtained through their websites.

Appraisers

An appraisal expert is a crucial Real Estate stakeholder, since the industry relies on the constant valuation of its physical assets for financial reporting purposes, tax reporting, transaction support, or support over a litigation procedure. In Portugal, rules[2] are set by the securities regulator CMVM (*Comissão do Mercado de Valores Mobiliários*), which makes the final decision over the valuer's ability to engage in valuation activity. The decision considers the binding opinion of the Bank of Portugal and the ASF (*Autoridade de Supervisão de Seguros e Fundos de Pensões*). In 2020, according to the CMVM, there were a total of 1670 valuers comprising both individuals (around 87%) and firms.

There is a growing importance of combining professional, technical and performance standards allied with transparency, consistency and the ability to interpret market dynamics and trends, such as the ever-increasing relevance of sustainability. Thus, valuers look for implementation guides and follow international standards for ethics and measurement. In Portugal, there is a total of 116 RICS-qualified valuers that comply with a well-established system of regulations, positioning them as the leading providers of IVS-compliant valuations (Royal Institution of Chartered Surveyors 2020).

According to the CMVM regulation nº 1/2017, valuers are required to report their activity results – namely the number of valuations performed, the global value of assets subject to valuation and the total revenue obtained from the valuation services. As a result, according to the Circular Letter released by CMVM on May 2020, a total of €87.8 billion in assets belonging to entities of the Portuguese financial system were subject to valuations (a total of 222 thousand

[2] Valuers must comply with article 2º of DL nº 153/2015 of 14th September in order to engage in a valuation procedure of assets belonging to entities of the Portuguese financial system.

valuations[3]). In 2018, the revenues from valuation practices amounted to €23.5 million, facing a decrease of around 4% compared to 2017.

Regarding the market environment in 2018, 41 valuers registered as professional appraising firms had around 83% of market share, representing 181 thousand assets with €72.5 billion in value. Besides, the major appraising firms in Portugal generated €18.9 million. Regarding the clients requesting valuations, 84% were credit entities and 12% were entities responsible for the Collective Investment Organization management – corresponding to 68% and 26% of the global value subject to valuation, respectively. According to the CMCV (2020), most evaluations performed were located in the Portuguese most popular Real Estate regions, namely Lisbon, Porto and Algarve. Lastly, 80% of the assets subject to valuation were residential, corresponding to 47% of the total value subject to valuation.

4.2 The Industry

This section overviews the Portuguese CRE non-listed funds' industry by assessing their performance, size, and gearing, being the previous two considered fund characteristics. The analysis was made for fifteen years, from 2004 to 2019, providing a clear picture of this market's behaviour. APFIPP non-listed fund indexes were the data used for the analysis on non-listed funds. One should note that APFIPP has indexes for closed-end, open-end and mixed funds[4]. Yet, concerning fund characteristics, we make a distinction between open-end and closed-end funds (only in 2018 and 2019).

[3] Data released in the Circular Letter refers to 2018, given that valuers' reported data for the year 2019 is not yet available.
[4] By 2019, the index closed-end funds incorporated 182 members with a total NAV of around €5,959 million, the index for open-end funds had 12 members and a NAV of around €3,807 million, and the aggregate index of both closed-end and open-end funds alongside other smaller types such as F.I.I.A.H's, FUNGEPI and Forest Funds, summed 210 funds with a NAV of around €10,511 million.

4.2.1 Performance

We measured Performance based on APFIPP-MSCI time-series indexes with monthly data. The previous were annualized by creating an index with December 2003 as the base. Accounting for the fifteen years under analysis, open-end non-listed funds had the best performance, with higher returns and lower volatility (Appendix 4.11). This performance derives from the higher flexibility that characterizes this vehicle structure, allowing for better time investment opportunities. Besides their high flexibility levels, open-end funds traditionally tend to have an investment style in core properties that have a higher degree of liquidity and usually diversify better their portfolios. The core investment style results in a lower negative impact in returns during times of crisis, such as the subprime crisis of 2007-2009 and the European debt crisis of 2012, which created a period of negative returns until 2016 across the three indices.

Overall, from 2004 to 2019, the APFIPP open-end funds presented an average annualized return of 1.56% and a standard deviation of 2.92%. Closed-end funds were highly penalized by the two crises, facing a lower average annualized return (-0.80%) and higher volatility (4.05%). The aggregate index of APFIPP-MSCI had an average annualized return of 1.04% and a standard deviation of 2.92%.

4.2.2 Fund Characteristics: Size and Gearing

The Size of Portuguese non-listed funds (average fund size) is a function of the historical NAV (net asset value) of the APFIPP index divided by the total number of funds – described in Appendix 4.12. Analyzing the inputs, we verified a steep growth in both NAV and number of funds until the end of the subprime crisis, with the NAV doubling from around €6,000 million to €12,000 million, between 2003 and 2009. This growth was driven by the rapid development of new funds, particularly closed-end funds, during the period known as a booming market for

the Real Estate fund industry (non-listed funds increased from 51 in 2003 to 261 in 2010). The market was highly competitive until the European debt crisis arrived in 2012. Consequently, a market consolidation was observed, with some funds closing operations. The total NAV stabilized around €10,500 million, between 2012 and 2019. As a result of the inputs' development, we observed a gradual reduction in average fund size, from €115 million in 2003 to €50 million in 2006, remaining stable around the previous value until 2019.

In 2018 and 2019, we performed a distinction between open-end and closed-end funds. Open-end funds were, on average, nine times larger than closed-end funds. In 2019, there were 12 open-end funds which summed to €3,807 million in NAV, resulting in an average fund size of around €317 million. Closed-end funds were much smaller, while representing an overwhelming percentage of the overall market (182 players). Their average size is around €33 million, similar to the one verified for the combined APFIPP index. By being larger, open-end funds can seize better opportunities and invest in prime locations, a characteristic of their typical core investment style. Additionally, size provides the benefits of economies of scale and the ability to acquire more considerable numbers of assets, generating diversification benefits that allow for higher returns and better protection in times of crisis.

We also analyzed the Gearing of Portuguese non-listed funds, which is defined as the level of a fund's debt as a percentage of its NAV, being a proxy for fund leverage. The impact of gearing on performance verified an asymmetric effect, depending on whether the period considered is one that comprehends gains or a crisis (Appendix 4.13). When considering the segmentation performed in 2018 and 2019, we observed that €1,068 million debt is incurred by closed-end funds, resulting in a Gearing level of 17.93%. In contrast, open-end funds faced around €36 million in loans and much higher liquidity levels (around €358 million), resulting in a Gearing of only 0.96%. Moreover, the performance verified in each vehicle structure reinforces the Gearing's impact on returns, since closed-end funds face higher Gearing levels and lower

returns during the two periods of crisis. Open-end funds, which are relatively healthier in financial terms, displayed enough liquidity to cover the loans incurred.

4.2.3 Impact of the Portuguese Economy

In this section, we crossed the Portuguese macroeconomic factors with industry performance. The variables addressed are motivated by the academic literature exposed in Chapter 5.2.1 and comprise the following: real GDP growth, inflation growth (CPI) and inflation surprise, 10-year Portuguese real interest rate growth, money supply real growth, stock market excess return, the unemployment rate[5] and industry performance (measured through the APFIPP indexes' returns[6]).

The Portuguese economy has been growing steadily in recent years, facing a 2.53% and 2.29% real GDP growth rate in 2018 and 2019, respectively. The latter, together with a 0.2% government surplus budget in 2019, created a positive environment that contributes to the low volatility and relatively high returns of around 3% of the Portuguese non-listed funds. Real GDP growth demonstrates a positive correlation with non-listed funds' performance (Appendix 4.14 plots real GDP growth against the APFIPP index return). Intuitively, as real GDP grows, firms expand their production levels and the demand for space increases, pressuring rents upwards. This factor is specific to the Real Estate industry since construction is time-consuming. Therefore, supply levels are unable to rapidly adjust to steep and upward movements in demand, increasing the rent's level of the existing buildings. As a consequence of higher rents, demand increases and more investors aim to own high return generating assets, which increases both asset prices and fund returns.

[5] The data is obtained from different sources, namely the Federal Reserve Economic Database for real GDP growth, money supply real growth and 10-year Portuguese interest rate growth. We used BPstat to obtain inflation and Bloomberg to get inflation surprise and stock market excess return. Lastly, the unemployment rate comes from the Ameco database.

[6] Considering the sample period of 15 years (from 2004 to 2019) and using annualized indexes with December 2003 as the base year, in order to uniformize the data with different release frequencies.

Inflation (growth rate of the Consumer Price Index, CPI) has been decreasing in the last three years, reaching values near 0%. The European Commission forecasted inflation to become extremely close to the previous amount in 2020, while growing to 1.2% in 2021. Inflation has a positive correlation with the returns of non-listed funds since Real Estate assets are traditionally perceived as safe investments, being able to hedge inflation (Appendix 4.15 plots inflation against the APFIPP index return). Various Real Estate properties generate a rental revenue indexed to inflation growth, and therefore owners can gain from the movements in the CPI index.

Further assessing the topic of inflation, unexpected (or surprise) inflation has been negative in the Portuguese market. This implies that actual inflation was lower than expected, according to Bloomberg, in the last two years. Compared to inflation growth, this variable has the opposite effect on returns since investors ideally wish to hedge against both expected and unexpected movements of inflation (Appendix 4.16). The higher the inflation surprise, the lower will be the expected inflation relative to the actual inflation, and the lower will be the allocation towards Real Estate funds based on expected inflation, given that the anticipated inflation hedging attractiveness of this asset class is lower.

Another significant macro variable worth analysing is the 10-year interest rate growth. In recent years, interest rates have verified a decreasing trend, much similar to the European panorama where the European Central Bank (ECB) has been cutting rates down. This variable negatively correlates with the annual returns of non-listed funds because a higher cost of capital negatively impacts Real Estate valuations, difficult the access to capital and pressures Real Estate yields (Appendix 4.17). As interest rates increase, Real Estate investors require higher yields to compensate for the more attractive investment opportunities in fixed income. As investors might be unable to catch up with the high fixed income yields, they give up on their Real Estate investments, influencing negatively returns.

Money supply (M1) has been increasing steadily throughout the years, with a sharper increase driven by the pandemic scenario. Money supply's real growth has a positive correlation with non-listed funds' performance when the former is lagged, due to fact that a higher supply of money implies easier access to capital, decreasing interest rates (Appendix 4.18). This enables investors to use leverage at a lower cost, which increases the demand for Real Estate assets. The macro variable positively impacts APFIPP returns, even though this impact takes time to materialize.

The unemployment rate has maintained its strong downward trend, facing a 6.5% level in 2019, a notorious recovery since the peak of the European debt crisis in 2012. This indicator reflects the state of the economy and is negatively correlated with non-listed fund's returns (Appendix 4.19). A growing unemployment rate is a product of the deterioration of several macroeconomic factors, resulting in lower production, with Real Estate asset prices and fund returns decreasing.

The stock market is represented in this analysis by the stock market's excess returns, calculated by subtracting the Portuguese MSCI index return by the Portuguese three-month risk-free interest rate (Lisbon's interbank offer rate). The excess return of this index has been positive from 2015 until 2019, except for 2018, when a 10% negative excess return was verified mostly attributed to geopolitical risks. This variable has a mild positive correlation with non-listed funds' returns, showing the impact of Portuguese equity market’s gains in other asset classes (Appendix 4.20).

4.2.4 Five Forces Shaping the Industry

To complement the CRE industry assessment, this chapter studies the paper developed by Michael Porter that defines five different forces shaping the industry (summarized in Appendix 4.21). The analysis applies Porter's strategic model to the non-listed funds' Portuguese Commercial Real Estate industry and for direct Real Estate exposure. It distinguishes between

factors that affect the fund (for instance, new entrants, substitutes and competitors) and others linked to the subjacent asset class (such as suppliers and buyers).

Overall, entry barriers for all CRE players tend to be high since Real Estate investments are connected with high entry and transaction costs, while being illiquid and time-consuming to be traded. The previous implies that small players face difficulties thriving in this market. Moreover, suppliers' bargaining power is seen from two perspectives: suppliers of existing buildings and providers of external services (such as cleaning services and security companies, and the ones related to constructions). Among the previous, suppliers of existing buildings have moderately high bargaining power, since CRE buildings don not trade frequently. The remaining suppliers have a low negotiating power.

The bargaining power of buyers tends to be moderately low, given the Portuguese market's current excess demand. Besides, the threat of substitutes may be increasing, since the Covid-19 pandemic is changing the status-quo of CRE. Alternative solutions are rising, such as REITs that enable investors to get indirect exposure market. Lastly, the rivalry between existing significant competitors in the CRE fund's industry is fierce, composed by similar market shares in a fragmented market.

4.3 The Impact of Covid-19

At the beginning of 2020, low interest rates and low unemployment levels allowed Commercial Real Estate investors and asset owners to benefit from a favourable and profitable economic environment. However, the Covid-19 pandemic affected the overall economy, and new trends have been emerging in the industry. According to JP Morgan's head of Commercial Real Estate, there is a prominent concern among investors and tenants. The latter is caused by the notorious decrease in the overall activity levels when compared to 2019 and the uncertainty regarding the possibility of future stronger economic downturns. The investment in global Commercial Real

Estate summed $109 billion in the second quarter of 2020, an abrupt 57% reduction compared to its homologous period in 2019 – and the lowest since 2012. More precisely, in the second quarter, Americas reported significant negative growth of 69% in Real Estate investments, with APAC countries registering the second-largest decline of 46%, and the EMEA facing a 38% drop.

The performance of the Portuguese economy was impacted by the global pandemic, consequently affecting the Portuguese property market. Yet, the latter faces an optimistic shape, due to a sustained demand for properties. Lisbon is one of the few world cities where prime property prices are expected to rise throughout the following months, caused by a constant demand from international investors. The analysis of pandemic impact in the Portuguese Commercial Real Estate industry is based on a study produced by Cushman & Wakefield (2020), that indicated a total of €1,670 million worth of investments registered in the first quarter – a record amount that represents a 50% increase when compared to the homologous period. The high performance was mainly attributed to the sale of 50% of the *Sierra Prime* joint venture between *Sonae Sierra* and *APG,* to *Allianz Real Estate* and *Elo,* for approximately €800 million. However, a sharper decline of 88% was verified in the second quarter, when the pandemic's economic consequences became more notorious.

Overall, the Commercial Real Estate industry's performance in the first half of 2020 was mostly influenced by the retail sector, representing 56% of the total amount invested. The sale of *Finsolutia's* PREOF portfolio to *Cerberus* (€150-170 million) and the acquisition of Natura Towers by *Cofidis* (€46 million) were the main transactions, retail was followed by office (21%) and hotel (18%) sectors, which are expected to be the two most affected sectors. Furthermore, the total investment volume is expected to sum € 2,500 million at the end of the year, a 20% drop compared to 2019. The previous highlights that the high activity levels at the beginning of the year were insufficient to compensate the enormous economic decline.

Focusing on the office sector, its performance was quite distinct for the two main Portuguese areas of Greater Lisbon and Greater Porto. In Greater Lisbon, the conclusion of some large-scale transactions undertaken during the pre-pandemic period, essentially between January and March 2020, smoothed the decrease in the Real Estate investment volume. Yet, it was insufficient to avoid the poor sector's performance. During the period of high transactions, 84,400 sqm were traded[7] – a statistical record within the office sector performance – much driven by the Prime CBD (26% of the total area traded). In Greater Porto, the transactions held and concluded before the pandemic were broad enough to prevent a decrease in performance compared to the previous year. The investment volume in the first half of 2020 was 38% higher[8] than the one verified in the homologous period.

Regarding the retail and logistics sectors, the former verified a 64% decline in transactions in the first half of 2020, while facing a significant 82% downturn in the second quarter (compared to the same period in 2019). Concerning the logistics sector, the first half of 2020 was also characterized by a marginal decline in demand compared to the previous year. The previous corresponds to a 9%[9] decrease in the sector's investment volume. Nonetheless, the present shortfall in the availability of quality properties should be covered by new projects, among which the *Lisbon North Logistics Network* of *Merlin Properties* stands out with a total area of 225,000 sqm.

All in all, even though the pandemic is largely affecting the global Real Estate investment activity, Portugal is one of the least affected markets due to its specific features that fascinate a significant number of international investors. Still, we expect that a full recovery will require some time to materialize.

[7] Representing a total of 57 transactions and an average area traded per transaction of 1,480 sqm.
[8] The percentage corresponds to 28,400 sqm traded in Porto during Q1 2010, summing to a total of 24 transactions and an average area traded per transaction of 1,180 sqm.
[9] Between January and June of 2020 64,400 sqm of logistics Real Estate assets were transacted.

5 Literature Review

The term "factor" is commonly used to any characteristic that is proved to be essential to explain either risk or returns. Even though academic researchers have found significant factors that explain returns, they may not earn a premium in the long run (Bender, et al. 2013). Several academic researchers and investors in all the financial field have attempted to build factor models with significant explanatory power to measure risk premiums of both bonds and stocks. The most coherent frameworks are the Capital Asset Pricing Model (CAPM), which became a modern financial theory in the 1960's by Treynor (1961), Sharpe (1964), Lintner (1965) and Mossin (1966); the Arbitrage pricing theory (APT) developed by Ross (1976), which is a theory that considers the expected return of a financial asset can be computed as a function of different macroeconomic factors or theoretical market indexes (Bender, et al. 2013); the Fama and French three factor model (FF3M), and, finally, in 1997, Mark Carhart proposed adding an extra factor to the FF3M: momentum factor, and the model was known as the Fama-French-Carhart Factor Model (FFCM) (Bodie , Kane and Marcus 2013).

Asset managers usually rely on factor models for investment decisions as there is quite strong evidence those factors are statistically significant. Therefore, it creates a special interest in investigating whether factor models can also be relied upon when considering alternative asset classes, such as Real Estate.

5.1 Macro Factor Models for Real Estate

5.1.1 Macroeconomic Risk

Regarding equities, as mentioned before, there are some well-known macro factors from academic research such as value, low size, momentum, low volatility, among others. Nonetheless, factor analysis has also been a useful model in Real Estate research to identify

factors that explain Real Estate risk and returns, investment decisions, and risk management (Gupta, et al. 2018). Economic models give some understanding of the fundamentals behind prices, mainly demand indicators and supply limitations. Macroeconomic drivers are essential as Real Estate investments tend to have a long-term perspective. Indeed, most academic studies focus on macroeconomic factors as macro risk measures at which most Commercial Real Estate securities are exposed. Even though there is no clear consensus on which macro factors are indeed relevant, some researchers defend similar conclusions.

Delfim and Hoesli (2016), who studied the European non-listed Real Estate funds, built a panel data with returns from French, Italian, English, and Dutch funds and analysed how the following variables affected their performance: real GDP growth, inflation, unexpected inflation, interest rates (10-year Treasury Bond), credit spread, money supply and the stock market excess return, among other specific portfolio variables such as gearing, size, and age. The model's explanatory power was strong, with an adjusted R squared of 63.8%, demonstrating that these variables influence European non-listed funds' returns. Likewise, Matysiak and Fuerst (2013) built a dataset with panel configuration, aiming to capture the relation between non-listed Real Estate funds' performance and market movements. The results indicate that factors like real GDP, interest rates and stocks are important drivers. Also, the authors state that usually Real Estate funds do not account for high levels of diversification. Thus, the fund's micro risk adds to the overall volatility.

Additionally, Hoskins et al.'s article (2004) aimed to identify patterns between macroeconomic indicators and Commercial Real Estate indexes performance in major economies such as American, English, Canadian and Australian ones. The authors chose some key-leading macroeconomic indicators: real GDP growth, unemployment rate, inflation, exchange rates with USD, interest rates and stock market performance. The article concluded the Commercial

Real Estate indexes returns align with these factors, even though the relation might have taken longer to show in some cases.

Furthermore, Devaney et al. (2017) studied the transaction activity variation between Commercial Real Estate markets as a proxy for market liquidity. More precisely, the authors examine over 38 economies in Europe and Asia-Pacific from 2000 to 2014 and developed a framework by estimating a fixed effect panel model. The independent variable was the turnover rates, and the vector of dependent variables included the investment in property stock, the GDP *per capita*, vacancy rate, bond yield spread, net inward FDI, change in the current account balance as a percentage of GDP, property rights index, and a dummy variable for the period of the Global Financial Crisis (2008-2010). The results showed that all variables were statistically significant.

However, Gupta and Tiwari (2016) found that in an emerging market like India, market risks as interest rate movements, rental movement, and occupier demand were not considered significant elements of risk. Nonetheless, according to Li and Chen (2015), who investigated the correlation between Commercial Real Estate returns and macroeconomic variables in China, concluded that money supply, employment rate, long-term interest rates, inflation, and GDP growth had relatively high levels of correlation.

Overall, leading research on Real Estate and macroeconomic variables conclude on some consistent fundamental drivers throughout the study years. Some studies link direct Real Estate to listed Real Estate and prove that the latter should be incorporated in models to predict future direct Real Estate returns, considering that such indicator should be lagged (Ling and Naranjo 2015) (Gyourko and Keim 1992). The previous conclusions are quite relevant for non-listed Real Estate funds as they are highly dependent on the performance of the underlying properties.

5.2 Micro Factors – Portfolio Level Variables

Even though macroeconomic factors proved to be statistically significant Real Estate performance indicators, they cannot fully explain it. For instance, Delfim and Hoesli (2016) model has an adjusted R squared of 63.8%. Hence, one should consider more micro factors of Real Estate funds' underlying assets as Real Estate returns' significant performance drivers.

5.2.1 Tenant Risk

Real Estate returns are highly dependent on the income-producing part of the investment, meaning that rents received enhance the attractiveness of having direct Real Estate holdings. Therefore, leased properties face the risk that tenants may not meet their obligations as expected, and late payments can generate cash flow problems for property owners. However, the scenario can be aggravated if the tenant declares bankruptcy and is forced out of the space (Grenadier 1996). Consequently, the property owner faces an unexpected shortfall in lease income along with additional costs of finding a new tenant to occupy the space.

Moreover, tenant concentration represents another risk to Real Estate investors (Blundell, Fairchild and Goodchild 2005). If the portfolio is highly concentrated in a certain or a small group of tenants, its returns are deeply dependent on those tenants' performance and creditworthiness. There is no proven compensatory association between tenant concentration and higher returns, but quite the opposite because of possible significant losses (Blundell, Fairchild and Goodchild 2005). Also, there is a relation between the tenants' credit quality and the inherent default risk in the rent payment. Reliable tenants could be considered as the ones who have investment-grade bonds. Usually, the higher the credit risk, the higher is the asked yield for a particular bond due to the risk premium. Hence, in the Real Estate case, riskier tenants should pay a rental premium. In most cases, a collateral warranty is required for tenants

with a poor credit quality as a way of owners protecting themselves in case of default (Grenadier 1996).

Several well-established models can measure companies' credit risk, such as the Merton's Model, Moody's-KMV EDF, and Credit Metrics. Also, credit rating agencies such as Moody's, S&P or Fitch may have a rating for specific tenants, which could be used as a way to measure credit risk. However, these models require data that might not be available for small/mid-cap private companies. Nonetheless, as an income-producing investment, Real Estate cash flows depend on the tenants' capacity to pay in order to meet its future obligations according to the lease terms (Short, et al. 2003). Thus, the previous is a risk that must be monitored closely.

5.2.2 Vacancy Risk

Real Estate investors look forward to owning and most often actively managing income-producing properties in different sectors, such as offices, shopping malls, parking lots, among others. When considering income-producing properties, it is crucial to consider three risks: vacancy risk, tenants' default, and the risk of renting the property out again or selling it after the contract expires (Giannotti and Mattarocci 2009). The authors also support the idea that vacancy rates depend on the building's owners' requested rent and potential tenants' commitment to pay. Furthermore, there is a belief that the vacancy rate equilibrium in the medium/long-term mainly relies on the number of available properties on the market, which offer similar traits, and on the tenants' capacity to pay the required rent (McDonald 2000). Moreover, as an income-producing investment, the cash flows depend on the tenants' ability to meet its future obligations according to the lease terms (Short, et al. 2003).

According to the empirical methodology involved in the research made by Sivitanides et al. (2003), the office market fundamentals are the vacancies and market rents, which long-term historical trends explain the behaviour of privately held property net operating income (NOI)

and property values (P). The ratio of the property's NOI over value (P) corresponds to the capitalization rate (C). The strong behavioural relation observed between the two previously mentioned market fundamentals are the research's main findings. As vacancy rates decrease, real office rent increases, added to the fact that there is a high degree of inertia in market adjustments and a pronounced mean-reverting behaviour.

According to Giannotti and Mattarocci (2009) and Short et al. (2003) the vacancy rates and consequent level of occupancy in Real Estate properties depend mainly on the rent asked by the property owner and the tenant's capacity to pay it throughout the full contract's lifetime. This means that the vacancy rate and consequent risk derives directly from the tenant's rating and respective probability (risk) of being unable to correctly pay the rental's total amount during the contract's full period. According to the same studies referred above, property's owners face a high chance of not being fully paid by the tenant when accepting low rated tenants regarding their financial sustainability capacity. Typically, when such situations occur, tenants start to delay their rental payments until they have enough financial resources. This means that the property owner will not receive the full annual amount of rent in each year of the rental contract but just a portion of it.

When negotiating a new contract for a period with an already existing tenant, it is crucial to carefully analyse if, according to historical tenant payments' records, this tenant is financially capable of supporting the full rental's value for the total period of the contract. If the property owner concludes that the historical records indicate that it is a considerable risk to extend this tenant's contract due to its lack of financial capacity (high level of tenant risk) to pay the full rental amount for the entire contract lifetime, then the hypothesis of finding a new and wealthier tenant for that building might be preferable (Giannotti and Mattarocci 2009). Nevertheless, until a more financially stable tenant is found, the building will stay vacant and not producing any income. In this case, this vacancy rate might represent a valuable opportunity if in the end a

better tenant is found and the property's owner can receive the building's full rental amount throughout the entire contract's period, which would not happen with the first tenant. On the other hand, if a wealthier or more financially stable tenant is not found, the owner will lose the rental's amount. Even if not the full amount, it represents the value that the owner could have received during the search time if he/she had initially accepted the already existed tenant. All in all, the valuation of this option to wait to search for new and wealthier tenants must be made before terminating the relation with the existing tenant.

As reported by Oppenheimer (2002), Discounted Cash Flow (DCF) models have been criticised mainly for using risky discount rates and subjective cash flows estimates. Moreover, it states that this type of valuation model doesn't include specific valuations of implicit options embedded in Real Estate capital projects. To overcome this issue, Oppenheimer (2002) recommends using real options pricing models when analysing Real Estate projects or decision moments. Nevertheless, since Real Estate presents a vast and significant subjectivity factor in every single valuation model that might be considered to use, the former paper suggests a complementary sensitivity analysis when performing such a study. The user can clearly understand the model's inputs' effects in the final output.

Considering the issue previously addressed, a Real Estate option pricing model should be used to understand if the option to wait is valuable or not. Consequently, this would increase a particular building's vacancy rate until finding a more financially stable tenant, instead of extending the existing tenant's contract right away. However, having a percentage of vacant space for a certain period may present itself as an opportunity for the property owner to find a more reliable tenant.

This academically based reasoning aims to determine whether a specific building's vacancy rate is always a signal of poor performance (consequently a risk) or if the vacant building owner is taking advantage of a valuable option/opportunity to improve its returns.

5.2.3 Asset Concentration Risk

Firstly, according to an informal survey applied to some UK property investment managers that aimed to seek their views on the factors that contribute for the riskiness of a property portfolio, excessive concentration on specific property types is one of the three primary sources of concentration risk (Adair and Hutchison 2005). This type of asset concentration risk measures the percentage of a fund's capital value allocated to each property type (offices, industry, retail, etc.) and evaluates how dependent the fund's value is on one specific property type.

Secondly, and still based on the previous survey, the over-concentration on large value assets is also a significant risk factor that needs to be managed in order to control for the volatility of fund's returns. Moreover, based on a study over risk management on a Real Estate portfolio, size concentration risk measures the percentage of fund's capital value that is bound up in the fund's five biggest assets (Blundell, Fairchild and Goodchild 2005). The higher is the size concentration, the more vulnerable the fund becomes to events affecting those properties. Also, concentration on large assets seems to have no significant correlation with higher returns – verifying a 0.10 correlation with the 10-Year Returns – therefore not compensating for the additional risk of not having a diversified portfolio in terms of assets size.

Lastly, location concentration is an important metric to consider when analysing Real Estate investment opportunities inside a fund's portfolio. Location concentration risk measures the percentage of each fund's capital value invested in the ten most essential locations to each fund (Blundell, Fairchild and Goodchild 2005). However, contrary to the size factor, the location concentration is mildly correlated with returns – 0.18 correlation with the 10-Year Returns – suggesting that there is some pay off for location concentration within a Real Estate portfolio. Furthermore, a portfolio may be exposed to various location concentration risks. On the one hand, flooding is related to the risk of a specific location. However, it should not only be

associated with proximity to rivers or the sea, given the increasing threat of localised flooding due to extreme rainfall situations occurred in the last decade, which is expected to aggravate in the future (Pottinger and Tanton 2014). Thus, the flooding risk factor should be included when analysing a particular geography's Real Estate investment opportunity. On the other hand, as pointed out in a study on economic seismic risk for buildings, the seismic risk is a factor taken into account during the real-estate decision process (Porter, Beck and Shaikhutdinov 2004). Therefore, the authors stress the importance of considering this factor when assessing a particular portfolio's overall concentration risk exposure.

5.2.4 Liquidity Risk

As previously mentioned when describing the asset class, Real Estate is deemed to have relatively low liquidity, thus high liquidity risk. The previous derived from the considerable value a single Real Estate investment requires and the time and cost it takes to sell the underlying property for the current value. On the one hand, liquidity can convert a specific asset into cash reasonably quickly while not incurring a significant price discount or principal loss. In the Real Estate case, investors are improbable to agree to immediate purchase of a property, unless there is a discount on the price. On the other hand, illiquidity incorporates both a long time to turn the asset into cash and also the risk that the selling price may diverge from the owner's perceived fair price (Fisher and MacGregor 2020).

In Real Estate funds, liquidity takes an even more critical role, relating to the amount of cash detained as a percentage of the fund's total value (Tira and Marcato 2010). As Ling and Naranjo (2002) mentioned, cash does not provide any return increase to the fund's performance. However, it is still advantageous to keep the fund flexible and prepared to deal with negative flows from fund redemptions. Indeed, the Real Estate funds are vulnerable to liquidity shocks as in severe liquidity crises asset managers may be forced to sell properties at a significant

discount in order to meet their obligations to investors, which may take months or even a year to finalise the selling process (Tira and Marcato 2010).

Measuring liquidity risk in private Real Estate markets has been studied by some scholars. For instance, liquidity risk could be measured by the volatility in asset returns over the (uncertain) time to sale (time-on-market) (Cheng, Lin and Liu 2010). Otherwise, the liquidity proxy for Commercial Real Estate could be the difference between an index imputed seller reservation prices and the estimate of the buyer's reservation prices level (Fisher, Geltner and Pollakowski 2007). Nonetheless, these suggested mechanisms require high-frequency data, which may be hard to obtain in countries that are not so developed in terms of research. Thus, some other processes may be applied in order to evaluate the liquidity risk in Real Estate.

The Association of the Luxembourg Fund Industry (ALFI) (2018) developed liquidity stress testing guidelines for Real Estate funds. Specifically, regarding open-ended Real Estate funds, one should stress different redemption scenarios, for instance considering the largest investor redeeming, the type of investor redemption, the redemptions based on historical experience or even a redemption of a fixed percentage. Moreover, in terms of asset liquidity, they suggest evaluating which properties should be sold first through a liquidity score. Finally, as one of the primary sources of liquidity are the monthly rents received from the Real Estate investments as mentioned by Bannier et al. (2007) rental growth should serve as a measure of the fund's liquidity level and should be monitored closely.

Property Liquidity Score

During liquidity crises, Real Estate funds are usually forced to sell properties in order to pay the investors' redemptions. As a result, funds must evaluate which properties on their portfolio would be easily sold in the market. There are some crucial determinants of Real Estate transaction frequency to consider when building a property liquidity score.

For instance, Fisher et al. (2004) developed a probit model with the goal to determine the probability of a property being sold. The authors found that this probability would be a function of three leading groups of factors: market conditions, property characteristics, and ownership characteristics. Considering the former, economic growth and prosperity are expected to be positively correlated with the likelihood of a property being sold. Also, government intervention takes a crucial role in influencing the transaction frequency, for example, by reducing tax benefits. The authors also analyse the motivation behind the owner's willingness to sell as well as the difference between buyers' and sellers' reservation prices. Lastly, within the property characteristics, factors such as property condition, age, location, property type, and occupancy are extremely relevant variables as they influence mostly the buying part of the deal.

Furthermore, Klimczak (2010) analyses the determinants of Real Estate investments, stressing that it is essential to understand the factors buyers value the most to evaluate which property could be sold faster in the market. Therefore, from a profitability point of view, investors are also concerned about the capitalization rate and the return on the investment, as well as the income from the Real Estate.

5.2.5 Valuation Risk

Differentiating Price and Value

Valuation risk is a major topic in fund management that influences investment decisions. Firstly, there are two concepts worth clarifying – the price and the value of an asset. On the one hand, the price is the outcome of a negotiation process, resulting from the purchase and sale transactions that occur regularly in the Real Estate industry. Understanding the fair price requires accurate information related to the particular asset, mostly obtained through intermediaries with professional investment expertise and specialist knowledge, giving rise to asymmetries in information regarding asset quality and fund manager behaviour (Morgan

2002). On the other hand, value is the judgement of the appraisal expert concerning an estimated amount based on fundamental premises – which are the basis of value – that are appropriate to the purpose of the valuation, resulting in the ultimate appraisal expert's opinion of value (RICS Valuation Professional Group 2019). In other words, the value of an asset results from an appraisal process which depends both on several criteria established by the regulated appraisal expert and on the particular Real Estate property subject to a valuation engagement.

Quantifying Risk: Capitalization Rate

The capitalization rate reflects the risks perceived by the market participants when a purchase occurs. The capitalization rate choice is either made through a statistical or analogical procedure, with the latter being the most common (Manganelli, Morano and Tajani 2014). The analogical procedure is usually a comparison between the capitalization rate of investments made in similar properties, concerning both the investment risk and duration. The assumed cap rate is then adjusted up or down under the possible differences in investment risk.

However, the low transaction volume verified in the public domain and the imperfections of the Real Estate and capital markets result in various challenges when estimating risk-adjusted discount rates for valuations through historical data (Weber, Siebenmorgen and Weber 2005), restricting the analysis of pricing and performance measured through the analogical procedure. The previous exposes the need for a refined pricing model that can fully reflect both complex characteristics of each specific asset's Real Estate market and attributes that most influence the capitalization rate.

Valuation Methods: General Overview

The valuation of a property is an estimation process of the market value of a Real Estate asset, which can be performed through a variety of approaches, with the most common ones being the comparable sales, the cost approach and the income approach, which are defined by Fisher

and MacGregor (2020).The comparable sales approach involves determining an approximate value for the asset-based on recent sales of comparable properties. Then, valuators adjust for differences in key characteristics, including the condition of the property, age, location and size, also contemplating price changes in the market between sales dates. Moreover, the cost approach evaluates the property's replacement cost, therefore considering estimating the market value of land and costs associated with the construction, such as labour, architectural and engineering costs, among others. The adjustments allow valuators to reach the building's final replacement cost in new conditions by considering the existing building's location and condition.

Lastly, the income approach targets income-producing properties, subdivided into two different methods: direct capitalization and discounted cash flow. The former estimates a property's value using the net operating income (NOI) – the income of the property net of operating expenses such as property taxes, insurance, maintenance, utilities and repairs – divided by the capitalization rate (cap rate) – the discount rate less the growth rate. The estimated cap rate for a specific property depends on relevant information, such as general business conditions and property qualities. Oppositely, the discount cash flow method values an income-producing property through the present value of projected future cash flows, considering the resale value at the end of the total holding period, which is often estimated using the direct capitalization approach.

Valuation Risks Associated with the Income Approach

In property investments, exchanging capital at the current purchasing power for future benefits – namely income, capital growth or a combination of both – is a source of risk, due to the uncertainty of such benefits (Baum, Mackmin and Nunnington 2011). Hence, there are four relevant property risks worth mentioning when adopting the income approach. Firstly, there is the risk that expected rents might not be realised. Thus, the expected rental income is lower

than previously anticipated. Secondly, rental increases may not occur when expected, and properties might become suddenly vacant due to a crisis, requiring additional time to find new tenants, compromising rental growth. Thirdly, it can be the case when the expected capital value growth of the property is not realised, facing either a continuous fall or a lower increase than previously expected before being sold to another investor. Finally, the costs associated with property holding may be unexpectedly high, thus compromising investors' future benefits.

The DCF Income Approach in Detail

The explicit DCF method builds upon the well-established yield pricing model – an extension of previous works (Fisher 1930) (Gordon 1959) – which defines the capitalization rate through the following equation:

$$K = R_f + R_p - g \quad (1)$$

where K is the cap rate; R_f is the nominal risk-free rate; R_p is the risk premium; and g is the growth rate.

The model has two components: the risk-adjusted discount rate and growth, with some literature extending the model to include depreciation. The risk-adjusted discount rate comprehends the risk-free rate and the risk premium. The former is the redemption yield on government bonds matched to the investment life (Baum and Crosby 2008), representing the compensating return for an investor's time preference.

Moreover, the risk premium is disaggregated by Baum and Crosby (2008) into various components that include the Real Estate market, sector, location and specific asset characteristics. The authors divide the risk premium determinants into macro risks (market) and micro risks (asset-specific). On one side of the risk spectrum, the Real Estate market risk represents the sensitivity of cash flows to economic shocks and derives from macroeconomic

indicators. Therefore, portfolio diversification in terms of asset selection does not actively reduce market risk. The sector and location components are in the middle of the spectrum that divides the risk premium between macro and micro levels of influence. Investors should consider demand and supply factors at the market's sector and the location's economic structure to assess these two components' impact on market quality and on a liquid investment opportunity. Finally, the specific asset characteristics are the last component of risk premium, which Baum and Crosby (2008) further disaggregate into tenant risk, lease risk, location risk and building risk. These components are drawn at an individual property level and represent the specific investment's liquidity, are micro factors and can be reduced through diversification.

In addition to the risk-adjusted discount rate, cap rates reflect the expected future growth and the Real Estate depreciation. However, some scholars defend that factors underpinning growth and depreciation are already present across the risk scale and wrapped into the risk premium estimation, proposing that these elements' expectations are a function of the specific asset attributes. Therefore, the measurement of such attributes reflects investors' expectations in terms of growth and depreciation (Jackson and Orr 2011) (Crosby, Jackson and Orr 2016).

Crosby et al. (2016) set out a conceptual model unravelling the complexities within a Real Estate pricing model – summarised in Appendix 5.1 – which distributes its several components along a risk scale. The authors performed an empirical analysis using observed transactions in a significant global investment market, the office sector market in central London[10], and found that specific risks largely contribute towards the investment risk attached to an asset, as well as that tenant characteristics drive default and void risks. They also verified that the significant variables driving transaction cap rates were the risk-free rate, the type of Real Estate interest, the existence of residential and retail in the buildings, and the tenant's covenants strength. The

[10] The analysis explores 497 transactions in the central London office market over the period 2010 Q2 – 2012 Q3, before the 2016 UK Referendum on the EU membership.

authors were surprised by the low impact on cap rates of building quality, submarket location and weighted average term to lease expiry. Moreover, the investors' perceptions explained the previous findings concerning the central London market's safe-haven characteristics and the data collected to determine the building quality detailed in Appendix 5.2, a new initiative with a significant subjectivity[11].

Limitations

Several scholars stress the problem of estimating the appropriate cost of capital for Real Estate investments (Ibbotson and Siegel 1984) (Quan and Quigley 1991). In a perfect capital market, it would be best practice to derive a value of an asset from the capital market data and assume that the historical returns and their fluctuations reflect all risks considered relevant for valuation. In the case of the Real Estate industry, due to the high presence of asset-specific factors on performance (Esrig, Hudgins and Cerreta 2011), there is the need for an approach which assesses the Real Estate investments and the associated risk by predicting future uncertainty. This approach should account for cash flow volatilities – the asset's income risk – and the impact of insolvency risk on an asset's value.

The income approach is the most common practice in Real Estate appraisals (Pagourtzi, et al. 2003). However, traditional DCF valuations are subject to several problems when applied to the Real Estate industry, since income and insolvency risks are generally not well-reflected. The value of an asset calculated using the DCF method can deviate substantially from the market value obtained by the appraisal companies and official expert reports as well as the prices practised by the market, something that can be viewed as a purchase or sale signal. Only in perfectly efficient markets, with equal levels and quick adjustments of information, as well

[11] The CoStar building quality rating is a single categorical variable that represents the first opportunity to fully explore the pricing of Real Estate attributes. This rating measures the condition of the building based on its specification, architectural quality, energy performance, quality of maintenance and prominence of its location. The building quality grading data is a new initiative and is collected by observation.

as with investors' homogeneous expectations and access to properties, there is a match between market prices and DCF values. Nonetheless, academic research points out to conceptual frameworks that assess Real Estate investments based on modern stochastic DCF model, which incorporates the nature and extent of risks that are often asymmetric (Szumilo, et al. 2016). In practice, despite these issues, institutional investors still rely on traditional approaches for investment criteria.

5.2.6 ESG Risk

Socially Responsible Investing

Financial markets have adapted to Socially Responsible Investing (SRI) 's increasing popularity and the growing concerns regarding the Sustainable Development Goals (SDGs). The incorporation of non-financial considerations, nowadays described as SRI concerns, can be traced back to the 1950s and 1960s. Even though being more focused on specific social needs – such as affordable housing and equality – the SRI sphere has grown further. The SDGs stress the trend around sustainability. The United Nations established 17 Sustainable Development Goals that aim, according to the European Central Bank, to provide a worldwide policy for eradicating all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind. As a result of this popularity, there is a need to increase transparency and protect investors' value by adopting best practices. In fact, institutional investors are under increasing pressure from governments, regulators and other stakeholders, in order to contribute to a wide variety of goals concerning SRI (Brounen and Marcato 2018).

The Real Estate market plays an essential role in the SRI sphere. Large institutional investors have more than 8% of their assets invested in this asset class, and the trend is for this allocation to increase in the coming years, with public Real Estate firms allowing for a more liquid exposure to the sector (Brounen and Marcato 2018). Moreover, around 30% of total CO^2

emissions are originated from the sector, stressing its importance in the fight against global warming (Green Building Council 2019). Real Estate firms see their market value derived from the underlying Real Estate assets. The previous is directly linked to ESG decisions, therefore making an impact by achieving both UN and climate goals (Brounen and Marcato 2018). Moreover, the United Nations and the RICS (2018) stress that the buildings' demand is becoming more sustainable in their design and infrastructure quality, representing a more efficient land use. The benefits of considering ESG factors are attractive for future investors, buyers and tenants.

ESG Definition

Since the beginning of the 21st century, the world has seen significant growth in the number of companies measuring, engaging and reporting according to ESG standards – Environmental, Social and Governance. The PRI (2018) associated environmental factors with the natural environment and natural systems' quality and functioning. Social factors are related to the rights, well-being and interests of people and communities. Lastly, the PRI links companies and other investee entities' governance to the relation between a company's management, its board, its shareholders, and its other stakeholders.

Sustainable versus Responsible Investing

Sustainable and responsible investing are currently common concepts used in the finance industry, yet sometimes misunderstood. On the one hand, the Brundtland's Report established the most accepted definition for sustainable development as *"the development that meets the needs of the present without compromising future generations' ability to meet their own needs"* (World Commission on Environment and Development 1987). Consequently, sustainable investing is the ideology where investment decisions focus on the well-positioning of assets to future challenges, in order to be long-term sustainable while committing efforts towards solving

the current global sustainability challenges (Nordea 2020). Although many investors believe that most sustainable challenges are faced within a long-term horizon, short-term risks highlight companies' urgency to consider them in their investment decisions.

On the other hand, the PRI defines responsible investing as a process in which companies include ESG information in investment decision-making stewardship practices, to ensure that all factors – both financial and non-financial – are taken into account when assessing risk and return (PRI 2019). Several forces have been contributing towards the progress of responsible investing, namely the growing client's demand for greater transparency about the way their money is invested, the increasing recognition that ESG factors can affect risk and return, as well as the tighter regulation that considers ESG issues as a growing investor's fiduciary duty. One should note that responsible investing is a concept broader than sustainable investing, given that the former accounts for moral or ethical goals as a primary purpose, while the latter has the sole focus of improving financial performance (PRI 2018).

ESG Disclosure

The growing demand among investors for transparency and disclosure regarding ESG issues is driving a worldwide transformation in fiduciary responsibility and corporate governance. The number of public companies reporting ESG data grew from fewer than 20 in the 90s to 8,500 by 2014, a year where more than 1,400 institutional investors managing around 60 trillion USD in assets had signed the UNPRI, United Nations Principles for Responsible Investing (Kotsantonis, Pinney and Serafeim 2016). As a further sign of ESG data's institutionalisation, Bloomberg terminals integrated ESG data in 2010 with hundreds of rating agencies, including large data providers such as Thomson Reuters and Morgan Stanley Capital International (MSCI), vigorously increasing the diffusion of ESG information. In fact, there were 44 million hits to the ESG metrics in the Bloomberg database between form November 2010 to April 2011 (Eccles, Krzus and Serafeim 2011).

At the policy level, guidelines and suggestions on non-financial ESG disclosures are adopted to enhance sustainability subjects' business transparency. The European Union adopted the Non-Financial Reporting Directive in 2014, pressing listed companies, companies over 500 employees and public-interest companies to disclose information related with environmental, social and governmental aspects of their operations (European Union 2014). Following this mobilisation of policymakers and the growing importance of sustainable issues among investors, non-financial disclosure requirements are expected to be supplemented and expanded in order to boost transparency and longevity in financial and economic activity.

Strategies for Sustainable and Responsible Investing

In this section, we detail three strategies that aim to respond to the goal of becoming a sustainable and responsible investor: screening (an ex-ante to the investment decision), ESG integration (used mostly for ex-ante considerations, yet not exclusively) and active ownership (a post-investment strategy).

Strategy 1 – Screening Investing

Screening is one of several widely used strategies to implement a responsible investment policy across a manager's investment. According to the PRI (2020), screening is a tool that uses filters to determine which companies, sectors or industries are eligible to be included in a specific portfolio, based on investors' preferences, values or/and ethics. Three screening techniques worth mentioning are negative Screening, positive Screening and norms-based Screening, which are assessed through ESG quantitative and objective measurements (PRI 2018). Negative screening is an approach based on the direct exclusion of specific sectors, issuers or securities for poor ESG performance, or based on specific ESG criteria to avoid particular activities, such as alcohol and weapons. This approach frequently sets a materiality threshold based on the business's revenue exposure to avoid worst-in-class investments.

Moreover, positive screening is focused on investing based on a positive ESG performance, comprehending a continuous and active inclusion of companies based upon the ESG benefits of their products, services and processes – thus endorsing best-in-class against a peer group. Lastly, while some screens depend on the values of the investor, the norms-based screening is a specific strategy in which the underlying assets are screened against minimum standards of business practises based on international norms – such as UN treaties, Security Council sanctions, UN Global Compact, UN Human Rights Declaration and OECD guidelines. Norms-based screening is a sub-category of negative screening which excludes companies or securities that fail to meet internationally accepted norms.

Screening is a broad strategy that can incorporate ESG integration. As reported by a study made on ESG embracement level by institutional investors (CoreData Research 2019), most early-stage 'adopters' of responsible investment deploy a combination of screening and ESG integration into their investment decision-making. This process identifies a universe of assets with a particular set of attributes, which the fund manager believes contributes to outperform a specific pre-defined benchmark. Nevertheless, this technique also depends on the demand of specific clients, reflecting the values outlined in a mission statement. Finally, regulation might also be the reason why screening is increasingly being used since, in some countries, financial regulators prohibit investments in certain asset classes or in companies engaged in certain activities, which makes screening a mandatory technique. This point is also essential for investors to understand which companies are ahead of evolving regulatory expectations and standards.

Strategy 2 – ESG Integration

ESG integration, also referred to as "integrated analysis", is a strategy based on the use of quantitative and qualitative ESG information in the investment processes to enhance investment decision-making, thus being linked to business risks and opportunities. The strategy can be used

to inform at a macroeconomic, industrial and even portfolio analysis by considering ESG-related trends such as climate change, or even at the stock, issuer or investee level – relevant for active and passive investment strategies. Concerning active strategies, integrating ESG in equity investments includes assessing the impact on financial performance and respective metrics – by changing costs, revenues and business growth assumptions – and evaluating the effect on the issuer's creditworthiness for debt-related investments. Furthermore, for passive strategies, ESG integration is made by allocating a portion of the portfolio to ESG indexes, that represent ESG characteristics of its underlying companies. Overall, the main idea is that it is possible to integrate ESG issues whatever the investment philosophy is (PRI 2018).

Strategy 3 – Active Ownership: Voting and Engagement

Active ownership is the consistent exercise of shareholder rights, built upon two keyways that complement one another (PRI 2018), namely voting at board meetings and participating with investment firms in an active conversation – also known as engagement. In order to protect long-term investment capital and increase long-term profitability, involved shareholders raise environmental, social or corporate governance issues with the business they participate. Dimson et al. (2015) stress the success of active ownership by examining engagements made with US public corporations during the period between 1999 and 2009, finding an abnormal average return in the company's stocks of plus 1.8%, during the year following the initial engagement. The previous is divided in returns of plus 4.4% for successful commitments and facing no change in returns for failed commitments, highlighting that companies are seeing changes in financial performance, sustainability performance, productivity and governance, through successful collaborations.

Active ownership is particularly important in Real Estate investments, benefiting economically and socially all parties involved, through an efficient use of resources and improvements in social issues. A report developed by the UNEP FI Property Working Group (2009) exemplifies

owner-tenant engagement strategies employed by large Real Estate funds – listed and non-listed – and well-known managers, from all across the world. For instance, Land Securities (UK) adopted Sustainable Leasing with free energy audits and related services; GTP (Australia) required retail customers to have green leases and to use an ecological footprint calculator; Hermes (UK) performed tenant surveys, shared ESG related data with the client, developed carbon-reducing programmes; also, CB Richard Ellis (US) implemented the Planet Building Programme, which educates tenants on various aspects related to sustainability practices. Among many others, these examples clearly indicate the trend towards sustainable tenant engagements in the Real Estate asset class.

Strategy 4 – Impact Investing

The Global Impact Investment Network (2019) defines impactful investments as the ones made with the intention to generate positive, measurable social and environmental impact alongside a financial return. The market for impact investing has been providing enough resources and capital to address the world's most critical challenges in sectors such as renewable energy and sustainable agriculture, conservation. In fact, impact investing challenges the long-held view that social and environmental concerns should be only addressed in very sporadic moments through donations or isolated projects, and that market investments should solely focus on achieving financial returns. To overcome this old-fashioned perspective, impact investing offers viable and diverse opportunities for achieving good financial returns, while contributing to social and environmental solutions. A survey performed by the GIIN (2020) emphasises that portfolio performance strongly meets or even exceeds investors' expectations for both social and environmental impact and financial return. Moreover, it is worth mentioning that the mission-aligned investment strategy and thematic investing – when its impact is quantitively measured – are fundamental practical drivers of this investment philosophy (Bérubé, Gai and Tétrault 2015).

ESG and Financial Performance

The quest for a significant relation between ESG ratings and financial performance is a popular topic among researchers – and a relatively complex interlink. On the one hand, ESG criteria are responsible, in the short-run, for reducing the investment universe significantly, lowering the benefits from diversification and augmenting the risk for ESG frontrunners, to which the additional costs from ESG screening are added (Brounen and Marcato 2018). On the other hand, when considering longer investment horizons, the benefits of ESG integration gain relevance.

Derwall et al. (2011) considered a sample of US stocks (1992-2008) and MSCI KLD[12] metrics to distinguish ESG leaders and exposed that firms with low ESG scores outperformed those with high scores in the short-run, but the authors could not find such relation in the long-run. Furthermore, an exhaustive paper that combines the findings of 2200 original ESG-related papers – a substantially large data set – concludes that around 90% of the studies find a non-negative relation between corporate financial performance and ESG, with the majority reporting positive findings (Friede, Busch and Bassen 2015). Lastly, the empirical result from a paper produced on the impact of ESG certification in Malaysian listed firms with Bloomberg ratings (2005-2018) highlights the value-added for firms displaying an ESG certification, by facing a lower cost of capital, while their associated Tobin's Q increases considerably (Wong, et al. 2020). To sum, all findings point towards the long-term benefits that surpass short-term costs for investors that account for the SRI trend in their investment decisions, capturing the value improving ESG factors.

For Real Estate, the analysis of benefits and costs should be even more focused in the long-term, since changes in ESG factors can be priced instantaneously in the capital markets, whilst real effects are likely to be lagged (Cajias, et al. 2014). Caijas et al. (2014) investigated the link

[12] The MSCI KLD 400 Social Index is a market-cap-weighted index concerning SRI. Source: MSCI.

between social, environmental and financial performance of Real Estate, using a sample of publicly traded US Real Estate companies and considering the MSCI database's ratings. The results stress the impact of ESG concerns and indicate a positive relation between ESG rating and Tobin's Q, showing that good ESG ratings impact positively market values, but concerns on ESG issues have more substantial effects than strengths, linked to lower returns and lower market values. Moreover, a study conducted on the Australian REITs' market (2007-2016) links high corporate social responsibility ratings to risk mitigation (Westermann, Niblock and Kortt 2019).

The existence of a green premium in valuations and rents is another vital research question among various studies. Fuerst and McAllister (2008) draw their conclusions upon the CoStar database of US Commercial Real Estate assets and determined that certified buildings have a rental premium when compared to buildings in the same metropolitan region. In fact, the authors found that the higher the rate in terms of environmental impact, the higher the rental premium (Fuerst and McAllister 2008). Likewise, a study conducted in the UK Real Estate office market found that environmental labels are related to price premiums compared to non-labelled offices, using the quality indicator BREEAM (Fuerst and Wetering 2015).

Material ESG Factors in Real Estate

The SASB materiality map is a widely used tool that allows investors to filter the ESG and financially material sustainable information. In other words, material issues are the ones who will have a reasonable impact on financials and operating performance, thus being the important ones to be considered by investors in their decisions. In fact, concerning the Real Estate asset class, the SASB considers energy and water management to be material factors, as well as product design and lifecycle management, the physical impacts of climate change and business ethics. Moreover, regarding engineering and construction services, the SASB considers the ecological impacts of performed interventions, product quality and safety, employee health and

safety, product design and life cycle management, as well as business ethics, to be material sources of risk exposure.

A report developed on ESG factor materiality for private Real Estate portfolios concluded that environment is the most measurable, as well as the most dominant ESG dimension, triggering the need to account for energy efficiency, water efficiency, waste efficiency and greenhouse gas emissions, when considering relevant ESG dimensions for this asset class (Allianz Global Investors 2015). To the previous, one can also add the choice of materials, impact on biodiversity, proximity to public transportation and accessibility (UN Global Compact & RICS 2018). Following the EU directives, the energy performance certificate (EPC) of buildings is a mandatory measuring tool, containing measurements on water efficiency, proximity to public transportation and indoor environmental quality. The LEED (Leadership in Energy and Environmental Design, US), BREEAM (Building Research Establishment Environmental Assessment Methodology, UK) and NABERS (National Australian Built Environment Rating System, Australia) are widely used examples of EPCs.

The social component of Real Estate affects all stakeholders involved in the sector. Aspects such as child labour, labour standards, human rights and controversial weapons are ranked as the most critical social issues among alternative investors in Europe (Mercer Capital Partners 2015). Following the same line of thought, Allianz (2015) enforces measuring the CAPEX used to provide a building with the necessary installations for it to become accessible for handicapped, as well as for security, healthiness and safety purposes. Moreover, the United Nations and the RICS (2018) highlight the importance of establishing a good relationship with tenants, in order to improve their retention, therefore reducing vacancy rates and void periods.

The concept of governance in Real Estate funds is linked to its internal organisation, as well as to external managers, external services' providers and tenants. According to the UNPRI, compromises the firm's managing standards, including bribery and corruption levels, as well as

the selection and monitorisation of third-party external managers, external services providers and tenants, through ESG contract clauses and leases. Corruption tends to be more relevant in countries where the institutional gaps are more notorious, with decision-making processes less transparent, but are not limited to them (UN Global Compact & RICS 2018). According to the United Nations**,** the global cost of corruption and mismanagement corresponds to 0.05 of the total world GDP, highlighting the need to address this risk. Moreover, transparency in the Real Estate market implies openness and organisation around a regulatory framework that can enforce rules, regulations and property rights, be exempt from corruption practices, and ensure a clear availability of information.

The UN Global Compact, together with the RICS, developed an approach to ESG that considers the three phases of the Real Estate life cycle, namely development, use and recovery, and considers the most significant factors for each of them. Focusing on the development phase, it comprehends the land's acquisition, planning, approvals, and construction while responding to the local communities' needs. The critical material ESG risks, which apply to overall improvements and significant renovations, are human rights, the environmental impact of the development, whether direct or indirect, in the ecosystems, biodiversity and local communities, transparency and corruption and the quality of the construction.

The construction quality is crucial when planning for developments or the need for future interventions since it represents a short-term to long-term risk for the property user (for instance, higher energy and water bills) and a long-term risk for the society. The mitigation and adaptation strategies for climate change are also relevant, comprehending location, infrastructure and safety systems. In fact, brownfield developments, such as improvements and renovations, should be preferred to greenfield developments.

5.3 Real Estate Investment Trusts

As previously defined, Real Estate Investment Trusts (REITs) are companies that own and operate income-producing Real Estate. They own several types of Commercial Real Estate: offices, warehouses, hospitals, hotels, shopping centres, among others. This type of investment vehicle has gained popularity among investors as an alternative of publicly traded stocks as REITs have provided considerable higher dividend yields (Block 2011).

There is a common topic regarding REITs, which is whether they behave more like equities or direct Real Estate. Ang (2014) analysed the direct Real Estate returns provided by National Council of Real Estate Investment Fiduciaries (NCREIF), the REITs' returns by using the FTSE NAREIT All Equity returns, and lastly, the S&P500 returns for equities, at a quarterly frequency. The author concluded that direct Real Estate was poorly correlated with REITs (15%), while REITs were highly correlated with equities (63%). Nonetheless, as the holding period increases, so does the correlation between REITs and direct Real Estate, while the correlation with equities starts decreasing. Moreover, Stevenson (2000) has proposed constructing hedged indexes of indirect Real Estate vehicles as a proxy for the direct Real Estate market. The main idea to create such indexes is to cut the effect of the stock market on indirect securities in order to obtain more representative returns of direct Real Estate.

Furthermore, literature has studied the inclusion of REITs in multi-asset portfolios intensively. Indeed, several studies have sought to provide evidence that allocating capital in REITs in a multi-asset portfolio can provide higher returns, as well as risk reduction due to its diversification benefit (Moss and Baum 2013). Yet, these conclusions do not assume a combination of both REITs and direct holdings, because the result may be somewhat different.

MacKinnon and Zaman (2009) concluded that when REITs and direct Real Estate holdings are put together in a portfolio, REITs have a minor, if any, role in the optimal portfolio allocation.

Likewise, Stevenson (2001) concluded that when considering an optimal direct Real Estate portfolio as the base of Real Estate allocation, adding REITs to the portfolio does not improve the performance appreciably.

Nonetheless, Kennedy and Baum (2012) conducted the same analysis using a sub-optimal and poorly diversified direct Real Estate portfolio. They found that adding REITs to the portfolio its performance starts improving. The National Association of Real Estate Investment Trusts (2011) examined the advantages of blending both private and listed Real Estate investments. The previous concluded that by blending the optimal portfolio, with a 70:30 allocation respectively, risk-adjusted returns substantially improve when compared to only investing in private vehicles. Moss and Farrelly (2014) conducted the same analysis for a 70:30 blend of UK unlisted Real Estate funds and global listed Real Estate funds, respectively, considering the period between 1998-2013.

Moreover, the previous authors performed a portfolio split of 70:25:5 between unlisted Real Estate, global listed Real Estate and cash, respectively. They concluded that by adding global listed Real Estate resulted in return's improvement of over 19% for the whole period. Similarly, Lee (2014) studied whether including REITs in a blended Real Estate portfolio would produce better risk-adjusted returns. The previous author found that including REITs indeed enhanced the portfolio's sharpe ratio. However, Lee (2014) advocated that REITs in a blended portfolio are the primary source of risk, and the portfolio manager should keep track of its performance.

More recently, Ametefe et al. (2018) examined the repercussions of open-ended Real Estate funds holding different types of liquid assets in their portfolios along with the existing direct Real Estate holdings. In this study, the authors test different combinations of capital allocation in Real Estate and liquidity components of each portfolio, for instance: 90:10, 80:20, 70:30 and a pure replication of direct Real Estate investments with 100% liquid assets. According to Ametefe, managers of open-ended Real Estate funds use mainly cash and at times listed Real

Estate securities in order to improve the liquid characteristics of the portfolio. Yet, each of these has some drawbacks. The use of cash to endorse the liquidity of the portfolio can cause substantial drags. In contrast, the use of listed Real Estate results in higher tracking errors than direct Real Estate benchmarks and may not provide investors with property-like returns.

Nonetheless, Ametefe et al. (2018) concluded that, for each combination of capital allocation, the use of a range of liquid assets as a liquidity buffer results in smaller tracking errors than those obtained using cash-only. Besides, due to the significant volatility and drawdown of listed Real Estate as a stand-alone asset, the direct-listed Real Estate portfolio did not perform so well, even though most studies proved that this combination should improve returns.

6 Macroeconomic Risk – Systematic Factors

Academic literature points to Real Estate performance being a function of macro and micro factors. This performance can be explained through the exposure to systemic risk factors, such as macroeconomic ones, as well as to idiosyncratic risk factors, namely micro traits that are asset specific and play a role in influencing risk perceptions. In this chapter, we will analyze the macro variables that drive Real Estate performance through a well-established econometric model at a global scale and through a model connected with Delfim and Hoesli's research (2016) in order to better understand the Portuguese Real Estate market.

6.1 CRE Prices – A Cross-Country Analysis

Variations in Commercial Real Estate prices have significant implications for Real Estate funds, specifically affecting investment strategies and risk management. Therefore, it is crucial to identify which systematic variables impact the respective prices to predict Commercial Real Estate price variations. The model examines five countries worldwide from 2006 to 2015 to capture a multi-country perspective of price variations. We developed a conceptual framework that aims to study the potential determinants of annual price variations of Commercial Real Estate in those countries, and then estimate the correspondent coefficients.

Data

This paper studies the fundamental macroeconomic factors that, according to the literature review, are proven to be significant in explaining price variations of Commercial Real Estate. Regarding the dependent variable, we gathered data of Commercial Real Estate price variations for the following countries: United States of America, Australia, Brazil, Denmark, and Euro Area (19 countries). We retrieved information from the *Federal Bank of Saint Louis Economic Database* for the first three countries and the *Bank of International Settlements* for the other

two economies quarterly. The independent variables included in the model are real GDP growth, inflation, 10-year interest rate growth, stock excess return, unemployment, money supply growth and a dummy variable for the Global Financial Crisis. We obtained the quarterly data for these variables from the *Federal Bank of Saint Louis Economic Database* between the 1st quarter of 2006 and the 4th quarter of 2015.

The real GDP growth (*GDP*) represents the percentage change from a year ago of the real Gross Domestic Product of each country considered (Hoskins, Higgins e Cardew 2004), (Matysiak e Fuerst 2013), (Delfim e Hoesli 2016). Inflation (*CPI*) is the annual change of the Consumer Price Index for all items in a given country. The inflation measure is based on Delfim and Hoesli (2016) and, consequently, the model does not account for anticipated or expected inflation. The 10-year interest rate growth (*10Y*) is the annual change of the 10-year Government Bond rate (Delfim and Hoesli 2016). Furthermore, the stock excess return (*STOCK*) represents the annual capital gains of the equity index of a given country[13] minus the risk-free, which is assumed to be the 10-year interest rate. Contrary to other macroeconomic variables, we obtained the data regarding interest rates and the stock market from *Bloomberg's* terminal. Then, unemployment growth (*UNEM*) represents the annual change of the unemployment rate at the quarter-end rate (Hoskins, Higgins and Cardew 2004) (Li and Chen 2015). The money supply growth (*M3*) reflects the broadest monetary aggregate's annual percentage change (Delfim and Hoesli 2016). Finally, the Global Financial Crisis dummy (*dgfc*) equals one if the year considered is between 2008 and 2010, and zero otherwise (Delfim e Hoesli 2016) (Devaney, McAllister and Nanda 2017). We present the descriptive statistics in Appendix 6.1.

[13] Delfim and Hoesli's (2016) model compute the stock market variable by subtracting the MSCI stock market return, ex Real Estate stocks, by the risk-free rate. However, due to the lack of public data regarding the MSCI stock market returns, we used the equity index for each country/economic area as a proxy, which are described in Appendix 6.2.

Econometric Model

Drawing upon well-established econometric models, the purpose of this model is to test the influence of a series of possible determinants for Commercial Real Estate prices variations. We used the fixed-effects (FE) regression, which is represented in the following formula:

$$CREP_{it} = \alpha + \beta X_{it} + \delta_i + \mu_{it} \quad (2)$$

Where $CREP_{it}$ is the annual Commercial Real Estate Price change of country *i* in quarter *t* and X_{it} is the vector of national macroeconomic attributes of country *i* in quarter *t*. In this model, we divided the error term into two components. The δ_i represents the stable country-specific characteristics which are usually unobservable and often related to the covariates. In other words, it represents the unobserved effects capturing time-constant individual heterogeneity. The second component, μ_{it} is the idiosyncratic error that differs across subjects and time.

The fixed-effects (FE) regression is used instead of the pooled ordinary least squares (POLS) because the FE estimator captures the country-specific effect under weaker assumptions. The consistency of POLS estimated depends on the exogeneity of time-constant individual heterogeneity and idiosyncratic error. The estimation does not make a distinction between the two components of the error, which is replaced by the composite error term $v_{it} = \delta_i + \mu_{it}$. Thus, for the estimates to consistent $E(X'_{it}, v_{it}) = 0$. The consistency also requires that the idiosyncratic errors be exogenous. While this assumption is often reasonable, the first one is not and, if violated, the estimates are considered biased and inconsistent. On the other hand, the FE only requires the assumption of no unit-specific heterogeneity, meaning that just the strict exogeneity assumption is enough for the FE estimator consistency[14] (Best and Wolf 2014)

[14] The assumption that $E(X'_{it}, \delta_i) = 0$ is no longer necessary.

The following equation specifies the model in more detail, capturing the main macroeconomic variables affecting Commercial Real Estate prices variations:

$$CREP_{it} = \alpha_0 + \beta_1 GDP_{it} + \beta_2 CPI_{it} + \beta_3 10Y_{it} + \beta_4 STOCK_{it} + \beta_5 UNEM_{it} + \beta_6 M3_{it} + \beta_6 dgfc + \delta_i + \mu_{it} \quad (3)$$

However, to develop a robust model, we conducted a unit-root test for each variable to test whether the variables were stationary or not. As a result, using the Levin-Lin-Chu unit-root test for all variables, it was possible to reject the null hypothesis[15] with 95% confidence. Also, we found the UNEM variable is correlated with the GDP factor (a correlation equal to -73%); thus, the unemployment variable was dropped from the model.

Findings

We present the econometric model results for Commercial Real Estate annual price changes in the following table. Model 1 coefficients are the POLS regression estimates, while Model 2 and 3 present the results of the FE regression with robust standards errors, with the difference that the latter includes the dummy variable for the Global Financial Crisis years while the other does not. Model 3 has the highest explanatory power with a relatively good R^2 of approximately 25%. Yet, it is evident that there remains a significant unexplained variation.

[15] The null hypothesis states that the variable contains unit roots, which means it is an unpredictable variable. By rejecting the null hypothesis one can say, with 95% confidence that the variable is stationary (statistical properties do not change over time).

	Period 2006-2015		
	Model 1 Coefficients	Model 2 Coefficients	Model 3 Coefficients
GDP	1.15 ***	1.59 **	1.44 ***
	(0.27)	(0.48)	(0.28)
CPI	0.42	0.78	0.77 *
	(0.37)	(0.41)	(0.36)
STOCK	0.07 ***	0.06 **	0.06 **
	(0.02)	(0.02)	(0.02)
M3	0.24 **	0.27 *	0.31 **
	(0.11)	(0.13)	(0.10)
10Y	0.03	0.03	0.03
	(0.02)	(0.03)	(0.03)
dgfc	-3.06 **	-	-2.85
	(1.31)	-	(3.15)
Intercept	-1.05	-3.94	-3.10
	(1.31)	(2.10)	(1.47)
Country Fixed Effects	NO	YES	YES
R-sq:	23.25%	23.12%	24.89%
Number of observations	200	200	200
Groups	5	5	5

Notes: Robust standard errors are computed are reported within
***p < 0.01; **p <0 .05; *p < 0.1;

Table 1 - The results of the econometric models for Commercial Real Estate annual price changes.

The conclusions extracted from the previous table are consistent with the literature (Delfim and Hoesli 2016). A positive relationship between real GDP growth and the price change in Commercial Real Estate was already expected. Indeed, the real GDP growth is significant and positive, suggesting that a 1% increase in real GDP growth translates into an annual price change of Commercial Real Estate of 1.44%, *ceteris paribus*. The intuition behind this result is that, as previously mentioned in Chapter 4 – Market and Industry Overview –, if firms expand production activity and output, and consequently the demand for space increases, given a fixed supply, there is an increasing pressure on rents. Accordingly, and because of construction prices and delays, the supply cannot adjust rapidly, rents will increase and so will Commercial Real Estate prices.

Regarding inflation growth, the relation is significant and positive once again, suggesting that when inflation increases, so do the Commercial Real Estate prices. Intuitively, this result makes sense since rents are deeply affected by inflation, meaning that when inflation rate increase so do rents. As a result, Commercial Real Estate price increase. By interpreting the coefficient, one could state that a 1% increase in the inflation growth leads to an annual price change of Commercial Real Estate by 0.77%, *ceteris paribus.* Therefore, with 90% confidence, we find that Commercial Real Estate does present inflation hedging characteristics.

The relation between the stock market and Commercial Real Estate price variations is significant and positive. This finding is consistent with Quan and Titman (1997) who conclude that on an international/aggregate analysis, the relation between Real Estate prices and stock returns is strong and positive. Therefore, a 1% increase in the stock market excess return translates into an annual price change of Commercial Real Estate of 0.06%, *ceteris paribus.* We also find that the money supply growth (M3) and Commercial Real Estate price variations relation is significant and positive, which is economically intuitive as it reflects the easier access to credit which should lead to higher demand and consequently higher Real Estate prices. A 1% increase in the M3 growth translates into an annual price change of Commercial Real Estate of 0.31%, *ceteris paribus.*

Furthermore, concerning the 10-year interest rate growth, we conclude that the variable is not statistically significant, so we do not draw any conclusions. Also, the *dgfc* variable does not capture any additional negative impact that is not already apprehended in the other macroeconomic variables. However, these variables should be kept as the R^2 is higher when they are considered.

6.2 CRE Funds' and Direct Properties' Returns – Model

Literature showed that European non-listed funds' performance reacts significantly to macroeconomic factors and to fund specific characteristics. The lack of data on the Portuguese Real Estate non-listed funds' market imposes a challenge when inferring macroeconomic factors' relevance on returns through traditional econometric models. To overcome this problem, we adopted a practitioner approach suggested by the client based on the study performed by Delfim and Hoesli (2016), which considers a vast database of the most important European Real Estate markets and finds evidence on the relevance of several macroeconomic factors. Our approach comprehends a model, whose outcome is the total annual excess return derived from Delfim and Hoesli's research applied to the Portuguese market, which is then compared to actual market data obtained from APFIPP.

Data

While the Delfim and Hoesli (2016) research analyses three types of Real Estate exposures, namely listed, non-listed funds and direct Real Estate, the following analysis disregards the former due to their low presence in the Portuguese market. Moreover, as Delfim and Hoesli (2016) consider data from the most important European Real Estate markets[16], we will adapt their model to the Portuguese market. There are three data categories: fund's performance, macroeconomic data and numerical data on non-listed fund's characteristics (Size and Gearing). In our model, the former comprises the returns from the APFIPP-MSCI indexes for open-end and closed-end funds, between 2004 and 2019, studied through the construction of an annualised index with December 2003 as the base year. Moreover, for the particular case of

[16] The study uses data from the United Kingdom, France, Germany, Italy, and the Netherlands. The final sample for non-listed funds contains 1285 fund-year observations provided by the European Association for Investors in non-listed Real Estate vehicles, while the direct Real Estate is provided by MSCI-IPD data at index level and contains a sample of 414 index-year observations.

analysing the client's Real Estate fund and pension fund's returns, we applied the latter approach to *Imofomento* and BPI Pension Fund, generating two indexes with the annualised total returns.

Furthermore, we considered two numerical variables, Size and Gearing, to characterise Portuguese non-listed funds, using the historical Net Asset Value (NAV) of the aggregate APFIPP index. We also considered a segmentation for closed and open-end funds for the year of 2018 and 2019 – thoroughly analysed in Chapter 4.2.2. Size is the average fund size, a function of the number of existing funds, and Gearing is the level of each fund's debt as a percentage of its NAV.

The model also incorporates several macroeconomic variables considered significant by Delfim and Hoesli (2016), which display a strong relation with both non-listed funds and direct Real Estate returns in the European market. More precisely, we used the following variables: Inflation growth (CPI), Inflation Surprise (which accounts for the Expected Inflation variable), Money Supply Real growth (M1), 10-year Real Interest Rate growth, Real GDP growth and Stock Market excess returns (MSCI's Portugal Index returns discounted by 3-month Risk-Free rate), Money Supply Real growth, the 10-year Real Interest Rate growth and the 3-month Risk-Free rate were provided by the *Federal Reserve Economic Database* with a monthly frequency. Real GDP growth comes from the same source but with a quarterly frequency, implying that the yearly returns had October as the reference month. Inflation growth was provided by *BPstat*, while both Expected Inflation and MSCI's Portugal Index returns extracted from *Bloomberg*.

The methodology for modelling the macro data with different frequencies and release months, encompassed the creation of indexes according to their frequency, then obtaining the yearly returns as of December to achieve the same time frame as the APFIPP indexes – as we previously analysed in Chapter 4.2.1.

Model

We based our model in Delfim and Hoesli's (2016) study on the European Real Estate market[17], adapted to the Portuguese market, considering Portuguese macroeconomic variables and the characteristics of its non-listed funds (Size and Gearing). The model's outcome is the Portuguese Real Estate excess returns of non-listed funds exposure (open- and closed-end) and direct Real Estate exposure. It is essential to highlight that the model's excess returns derive from the sum of the product of each variable's coefficient from Delfim and Hoesli's (2016) research (numerical and macroeconomic) and the respective Portuguese data.

This model's primary goal is to compare the results obtained from the adaptation of the author's results with the Portuguese market's actual excess return, given by the APFIPP indexes (discounted by the risk-free rate of Euribor 12 month). Furthermore, we compared those results with the client's funds' performance for *Imofomento* and BPI Pension fund. In other words, this model allows to determine the level of correlation between the two time-series that would explain the relevance of macroeconomic risk factors and fund characteristics, in the particular case of the Portuguese market. Following Delfim and Hoesli's conclusions, the returns of non-listed funds react to changes in macroeconomic risks in a similar way to direct Real Estate. Thus, findings on the returns obtained through direct Real Estate exposure can be inferred, considering the same significant macro variables as the authors indicate in their study.

We adjusted the model to consider the research's dummy variables[18] that allow for an adaptation to the characteristics of the Portuguese market and the client's funds. The adaptations range the vehicle structure, country, subperiod, sector and investment style (Appendix 6.3 details the

[17] The cross-sectional dimension of Delfim and Hoesli's research with access to data of 200 funds enables the reach of a good explanatory power with an adjusted R-squared of 63.8% in the case of non-listed funds and 65.5% for direct Real Estate.

[18] The Delfim and Hoesli (2016) research considers categorical variables, namely country variables, sector, investment style, vehicle structure and subperiod, with reference levels that are then controlled by summing the coefficients obtained in a different category of the reference.

rationale behind the dummy variables). Moreover, the model considers the numerical variables of Gearing and Size to assess fund characteristics' impact in the excess return of non-listed funds. However, there is an exception for direct Real Estate exposure, where the numerical variables and the open-end dummy do not apply.

As for the macroeconomic variables, we used the ones with a significance level in Delfim and Hoesli's research of at least 5%. Therefore, non-listed funds exposure considers Real GDP growth, Inflation growth, Inflation Surprise, Real Interest Rate growth, Money Supply Real growth and Stock Market excess return. In contrast, direct Real Estate exposure considers all the previous variables with the exception of Inflation Surprise and Stock Market excess return.

Furthermore, we developed two models which differ in the lags applied to the macro variables. In the first model, Real GDP growth is the only variable being one quarter lagged. In the second model, all variables are lagged one quarter, except for Interest Rate growth and Stock Market excess returns, allowing to conclude on the impact of lagged macroeconomic variables.

Findings

The following models allow to determine the significance of macroeconomic variables on the Portuguese Real Estate non-listed funds' returns and the exposure to direct Real Estate.

Findings Part 1 – Results from the First Model

According to the first model (no lags), we verified the strongest correlation for non-listed funds exposure with the actual excess annual returns of APFIPP closed-end funds – presented in Appendix 6.4. In other words, the correlation is the highest between our model with the reference for closed-end funds (an adaptation of Delfim and Hoesli's research) and the actual excess returns obtained by APFIPP closed-end funds index during the sample period. The result was a 0.5881 correlation, a moderate positive relation that confirms the macroeconomic variables' relevance in closed-end Portuguese non-listed funds' returns. According to the second

model, the correlation results were weaker (with the reference for vehicle structure to consider open-end funds). The previous is verified for the total annual excess returns of the open-end funds and for the aggregate APFIPP indexes with the excess returns, obtaining a correlation with the model of 0.4313 and 0.5186, respectively.

We also tested the model at a fund level, using *Imofomento* and BPI Pension Fund. We concluded that the previous two are more correlated with the reference model which expresses the excess returns of closed-end funds (does not consider the dummy for open-end funds during the subprime crisis). The correlation of *BPI* Pension Fund with the model is of 0.4870, while *Imofomento's* is of 0.4432. The fact that *Imofomento* was not better correlated with our model when considering the open-end dummy suggests that it did not benefit from the characteristics of flexibility and Size that enabled European open-end non-listed funds to avoid such heavy drops during the period of the subprime crisis.

To assess direct Real Estate exposure, the model does not consider fund characteristics and drops some non-significant macroeconomic variables. In this case, we observed a stronger correlation of the model with all the APFIPP indexes. This was most notorious for closed-end funds, where the model's correlation with total actual excess annual returns of closed-end funds provided by APFIPP is of 0.6507 (Appendix 6.5 shows the results for the first model concerning direct Real Estate exposure). For *Imofomento,* we performed an adjustment by subtracting the impact of liquidity on the fund's returns, in order to obtain a proxy for the returns of its direct Real Estate investment component. For the case of *Imofomento*, even after the adjustment, there was a decrease in the correlation strength with the model when considering direct Real Estate exposure.

Findings Part 2 – Results from the Second Model

The second model comprises an alternative analysis that explores the macroeconomic variables when lagged in time by one quarter. Besides the previously lagged variable (real GDP growth) we applied a one-quarter lag to other variables that showed a sluggishly characteristic, such as inflation and money supply, to observe if we could obtain a better fitted value.

The result was weaker for the non-listed funds' exposure than the first model, while for direct Real Estate exposure results improved, as shown in Appendix 6.6. The correlation of the model's total excess returns when considering direct Real Estate exposure with the actual excess annual returns of APFIPP closed-end funds presents a strong positive relation of 0.7554. The client's Pension Fund also improved its correlation to 0.5512 in the second model with a correlation pointing towards a moderate positive relation that suggests the predictability power of some macroeconomic variables, such as Real GDP growth, Inflation growth, 10-year Portuguese Real Interest Rate growth and Real Money Supply growth on the returns of the Real Estate investments of the fund.

Findings Part 3 – Further Remarks

The results suggest that the Portuguese non-listed fund's performance (given by the APFIPP indexes) is better correlated with the model for the direct Real Estate exposure, that only considers macroeconomic variables applied to direct Real Estate investments (excludes Stock Market excess returns, Inflation Surprise and fund's characteristics). We believe that Portuguese fund characteristics' irrelevance can explain these results since Portuguese funds are insignificant in Size and face much lower Gearing levels than their European counterparts. As for macroeconomic variables, the result suggests the lower impact that Portuguese equity returns have on Real Estate performance. The previous also indicate the lack of significance that Portuguese investors attribute to expected inflation, with Real Estate performance verifying

a lack of reaction to Inflation Surprise. It is also important to mention that the coefficients of the macroeconomic variables obtained for direct Real Estate investments and non-listed funds differ from Delfim and Hoesli's (2016) research, even though keeping the same sign. Real GDP growth, inflation, and money supply decrease their absolute impact on the excess returns of direct Real Estate exposure relative to non-listed funds. In contrast, the 10-year real interest rate growth increases its negative impact, which might explain the results mentioned before.

Key Takeaways

This model was helpful to understand that the Portuguese non-listed funds' performance reacts similarly to the macroeconomic factors that drive the major Real Estate European markets. The positive correlation of 0.5881 between the model and APFIPP closed-end funds excess returns highlights the previous conclusion. However, Portuguese closed-end funds actual excess returns presented an even higher correlation of 0.6507 with the model that considers direct Real Estate exposure.

The fact that direct Real Estate exposure better explains Portuguese non-listed funds emphasises the reduced impact on Portuguese funds' performance of fund characteristics variables and some macroeconomic factors such as Inflation Surprise and Stock market excess returns. Even though these variables significantly contribute to major European markets' non-listed funds' excess returns, we recommend that BPI GA focus their risk monitoring only on the core macroeconomic factors that retain significance in the European direct Real Estate market.

Additionally, we verified a more robust correlation result of 0.7554 between the model and the actual excess return of APFIPP closed-end index when considering the direct Real Estate exposure through the alternative model with lagged macroeconomic variables. Therefore, BPI

GA can monitor in advance those macroeconomic variables that have a predictable impact on Real Estate investments' performance.

Regarding the client's funds understudy, *Imofomento* presented a weaker correlation than APFIPP indexes with the models, given that micro factors contributed significantly to its excess return. The results suggest that the Portuguese market's aggregate excess returns can be explained mainly by macro variables. At the same time, individual funds are also partly explained by micro levels of influence. Nevertheless, BPI Pension fund demonstrated a higher degree of reaction to the model, especially when considering the alternative one with lagged macroeconomic variables, presenting a 0.5512 correlation.

6.3 Conclusions from the Macroeconomic Models

The econometric model based on a FE approach concludes that macroeconomic variables such as real GDP growth, inflation, money supply (M3), and the stock market excess returns are statistically relevant explaining Commercial Real Estate prices. Likewise, the model applied for the Portuguese market concludes that the direct Real Estate exposure was the one that better explained the Portuguese non-listed funds' returns. Therefore, we consider real GDP growth, inflation, money supply growth and the 10-year interest rates growth as significant variables.

It is possible to infer a common list of macroeconomic factors that drive Commercial Real Estate price variations and non-listed funds' performance. These are real GDP growth, inflation, and money supply. Nonetheless, even though we concluded that, with the FE regression, the 10-year interest rate growth is not significant in explaining the Commercial Real Estate price variations, BPI GA should keep track of this variable as Delfim and Hoesli (2016) proved it is statistically significant for non-listed funds, which is the case of *Imofomento*.

All in all, it is highly recommended that BPI GA monitors the performance of such variables closely to foresee the performance of the Portuguese Real Estate market, which we expected to

impact both *Imofomento* and BPI Pension Fund. Furthermore, even though these factors can represent the macro risk around Real Estate, they do not entirely explain the performance of Real Estate returns. Thus, it is crucial to supervise micro risks associated with investments within the Real Estate asset class.

7 Tenant Risk

Finding reliable tenants usually translates into minimizing the loss and maximizing the income produced by renting the underlying properties. However, by investing in Real Estate, the property owner is always exposed to the risk of one or more tenants defaulting. In order to reduce the loss in cases of default, the property owner can request, in the contract signed by the two parties, collateral or warranty to the tenant. Due to the importance of this risk on the overall direct Real Estate investment, it is crucial to monitor and evaluate which tenants are expected to default closely and the loss incurred in that scenario.

As of September 2020, *Imofomento*'s portfolio accounted for 41 properties and around 83 tenants. Even though the fund has a considerable number of tenants, there is clear evidence that the portfolio is highly concentrated on the top fifteen tenants. More precisely, the top fifteen tenants represent over 81% of the total rents *Imofomento* receives per month. Even when reducing the top tenants to the top five, they represent around 57% of the total rents – Appendix 7.1 states this current scenario.

As Blundell et al. (2005) stated, there is no evidence of compensatory returns due to tenant concentration. This is because if one major tenant defaults, then the fund incurs a significant loss. Defaulting may be represented by the tenant declaring bankruptcy or delaying rent payments.

7.1 Probability of Default

As mentioned in the literature review, there are a few well-established models that measure credit risk. Nevertheless, in the specific case of *Imofomento*, most tenants are private companies which do not disclose any data about their financial performance. Also, because they are mostly small and mid-cap companies, debt instruments data such as bonds, is not available. Thus, there

is little public information that limits more complex models to evaluate default probability. To overcome this problem, BPI GA relies on Informa D&B, a company that offers data and know-how about the corporate segment, more precisely for small and medium-size firms in Portugal and Spain. The company provides a credit risk valuation of *Imofomento*'s tenants by presenting two main scores: the delinquency score, which determines the probability that the tenant may delay its payments in the next 12 months to, at least, one of its creditors; and the failure score, which determines the probability the tenant will go out of business in the next 12 months. However, these scores provide only a number within a specific range and not the likelihood of default.

Nonetheless, there is an opportunity to expand the tenant risk evaluation. Consequently, we developed jointly with BPI's risk management team, a table that matches the Failure Score provided by Informa D&B and the ratings from S&P, presented in Appendix 7.2. Furthermore, rating agencies provide information regarding the probability of default for each rating in a transition matrix. The following table summarises the One-year Global Corporate Average Transition Rates from 1981 to 2018 (Global Credit Data 2019).

(%)

From/to	AAA	AA	A	BBB	BB	B	CCC/C	D	NR
AAA	86.99	9.12	0.53	0.05	0.08	0.03	0.05	0.00	3.15
AA	0.50	87.06	7.85	0.49	0.05	0.06	0.02	0.02	3.94
A	0.03	1.69	88.17	5.16	0.29	0.12	0.02	0.06	4.48
BBB	0.01	0.09	3.42	85.44	3.62	0.46	0.11	0.17	6.10
BB	0.01	0.03	0.14	4.83	77.50	6.65	0.55	0.65	9.67
B	0.00	0.02	0.08	0.17	4.93	74.53	4.42	3.44	12.41
CCC/C	0.00	0.00	0.11	0.20	0.59	13.21	43.51	26.89	15.50

Table 2 - One-year Global Corporate Average Transition Rates for 1981-2018 (source: S&P).

Each entry represents the probability of migrating from the row-class to the column-class. For example, one year from now, a BBB-rated obligor will have the following rating: BBB with 85.44% probability; BB with 3.62% probability; etc.; and defaulted with 0.17% probability. The NR column corresponds to the likelihood of the firm not being rated in the following year.

To obtain an n-period transition matrix, given a single-period square transition[19] - available in Appendix 7.3. – matrix *P*, the n-period transition matrix, $P^{(n)}$ is the n-th power of *P*:

$$P^{(n)} = P^n \tag{4}$$

Therefore, it is possible to calculate the probability of default for *n* periods given the transition matrix. The longer the horizon, the higher the probability of default, as verified in the following table.

Year/Ratings	AAA	AA	A	BBB	BB	B	CCC/C	D
P(0,1)	0.00%	0.02%	0.06%	0.18%	0.72%	3.93%	31.82%	100.00%
P(0,2)	0.02%	0.06%	0.14%	0.44%	1.83%	8.92%	48.82%	100.00%
P(0,3)	0.05%	0.10%	0.25%	0.76%	3.26%	14.08%	58.36%	100.00%
P(0,4)	0.10%	0.16%	0.37%	1.15%	4.95%	19.04%	64.09%	100.00%
P(0,5)	0.15%	0.23%	0.53%	1.61%	6.82%	23.64%	67.83%	100.00%
P(0,6)	0.21%	0.31%	0.70%	2.14%	8.81%	27.86%	70.49%	100.00%
P(0,7)	0.27%	0.41%	0.91%	2.73%	10.87%	31.69%	72.53%	100.00%
P(0,8)	0.35%	0.52%	1.14%	3.38%	12.96%	35.17%	74.20%	100.00%
P(0,9)	0.43%	0.65%	1.41%	4.08%	15.06%	38.33%	75.62%	100.00%
P(0,10)	0.52%	0.80%	1.71%	4.83%	17.14%	41.22%	76.86%	100.00%

Table 3 - Computed probabilities of default for ten periods

As mentioned before, *Imofomento* is highly dependent on the performance of its top 15 tenants. We applied the previous methodology, and the results can be found in Appendix 7.4. Except for *Logic Logistica Integrada S.A*, which has a rating of CCC/C, and *Vila Avenida Hotel SA, Banco BPI SA,* and *Entreposto VM, SA*, which have no data available on the D&B platform, the other 11 tenants show an investment-grade rating. This means that the probability of them defaulting ranges between 0% to 1%. More precisely, we computed the PD of the portfolio using the following formula:

[19] To obtain the square transition matrix we eliminated the *NR* column and normalizing each transition frequency and then added a row a row – called *Default* - at the end with zeros in each entry except the last one which is equal to 100% (assuming default is an absorbing state).

$$PD_{portfolio} = \sum_{i=1}^{n} w_i \times PD_i \quad (5)$$

Where w_i is the weight of tenant i on the portfolio of tenants– computed by dividing the rent per month of tenant i by the sum of the rents per month of the tenants, and PD_i is the probability of default of tenant i. Therefore, considering the 12 tenants with available data, the portfolio's PD is 2.35%.

7.2 Key Take-Aways

All in all, the most relevant tenants are quite reliable with stable financial performance. For instance, in 2019, the tenants who kept on defaulting and delaying their payments represented a small percentage of *Imofomento*'s rents. However, due to the Covid-19 healthcare crisis, specific sectors were severely affected, which compromised their ability to meet their obligations. This is the case of hotels, restaurants, and other retail stores who asked to delay the payment.

8 Vacancy Risk

The expected rental cash flows for Real Estate investments depend on the tenants' capacity and willingness to afford that cost during the lease contract's lifetime (Short, et al. 2003). Nonetheless, as rents are only received for non-vacant properties, Real Estate investors aim to maximize occupancy rates. Vacant spaces represent a cost by not generating the investment's potential cash flows. Typically, high vacancy rates are an indirect consequence of economic downturns, with tenants facing a higher probability of defaulting on their payments. As stated by Giannotti and Mattarocci (2009), the cash flow of a Real Estate investment depends not only on the vacancy rate but also on the tenants' commitment and capacity to pay the required rent. Even if a property is fully occupied, the owner may not receive the contracted rents entirely.

Conceptually, a negative relation exists between vacancy rate and the total rents received by the fund. Hence, we obtained a -20.1% correlation between *Imofomento*'s vacancy rate and total rental growth (between 2015 to 2020). Even though rental growth depends on various factors (such as inflation and tenant's defaulting on their payments), we consider that high vacancies impact negatively the fund through lower rents. Thus, *Imofomento*'s managers should monitor the non-vacant properties and respective tenants, as well as attempt to decrease the fund's overall vacancy rate.

8.1 Vacancy in Imofomento's portfolio

In order to evaluate whether *Imofomento's* vacancy rate was effective, we conducted a peer analysis. We considered *Fundimo* and *CA Património Crescente* that verified a vacancy rate in 2019 of 6% and 7%, respectively (Jornal de Negócios 2020). In the same period, *Imofomento* registered a similar vacancy rate of 6.64%. Nonetheless, in September 2020, the vacancy rate was a significantly higher (10.1%) due to the vacancy of *Edificio Niña* – one of the most

valuable *Imofomento*'s properties previously rented to *EDP* until the beginning of the current year, when its lease contract expired and was not renovated.

From an historical perspective, *Imofomento*'s vacancy has been following a downward trend since January 2017, as shown in appendix 8.1. Yet, this rate increased in each month of 2020. To better understand the vacancy rate behaviour, we conducted a deep dive analysis on the fund's most critical properties and concluded that the buildings with the highest vacancy rate are *Coimbra* (Retail), *Quinta Grande* (Offices) and *Edificio Galiza* (Offices) – all being 100% vacant. Concerning the first two properties, BPI GA has not been successful in finding new tenants and should evaluate whether a potential sale would be beneficial.

There are several *Imofomento*'s buildings with a high punctual vacancy rate. *Edifício Monsanto* and *Edificio Sagres* reported, as of September 2020, a vacancy rate of 77.3% and 89.57%, respectively. Contrarily to what was mentioned for *Coimbra, Quinta Grande* and *Edificio Galiza*, these are attractive buildings already returning income from its non-vacant portions. Hence, we consider that the best approach to tackle vacancy in the two buildings is to find new tenants rather than selling. Next, we analyse vacancy with the previous characteristics, allowing the client to efficiently understand in what partially vacant properties can returns still be optimised without having to divest completely from those vacant spaces.

In order to determine the most urging properties to tackle in terms of vacancy, we computed the correspondent vacancy rates and yields for 2019 (since 2020 was an atypical year) – the top 5 properties with the highest vacancy rates are shown Appendix 8.2 (excluding *Coimbra*, *Quinta Grande and Edificio Galiza*) and the respective yields in Appendix 8.3. Moreover, we evaluated which properties generate the lowest relative returns. Thus, the fund's management team should focus its efforts on *Edificio Monsanto* and *Edificio Parque Oceano* since those are the ones with the lowest rental yields within the top five highest vacancy level's buildings –

1.70% and 2.41%, respectively. Solving vacancy for these two properties allows for BPI GA to simultaneously counter the highest vacancy levels and improve the fund's performance.

8.2 Strategies to Mitigate Vacancy Risk

To overcome its current vacancy exposures, BPI GA can implement some specific strategies in *Imofomento*'s portfolio. The following analysis identifies four feasible solutions and exemplifies where these could be applied.

Firstly, we consider that a building's vacancy rate may be tackled by aligning the client's asked rents with the ones currently asked for comparable properties with similar location. This strategy allows to reach a vacancy rate closer to the client's target (Shilling, Sirmarns and Corgel 1987). The previous could be effectively implemented in *Edifício Peninsula* – a shopping centre that operates in the premium retail sector with a 22% vacancy rate verified for almost nine years. By operating in the premium segment, it targets tenants recognised as premium brands, with the asked rents being considerably higher compared to non-premium shopping centres. *Edifício Peninsula* faces strong competition from the nearby *Shopping Cidade do Porto* – a shopping centre that does not operate solely in the premium segment, including more affordable retail brands and office spaces, thus attracting more diversified tenants. *Edificio Peninsula* should align its rental pricing strategy to the one practiced by this close competitor, attracting tenants that do not operate in the premium retail segment.

Secondly, the implementation of a renovations-based strategy allows for improving the oldest building's features. We expect that modern features attract a larger number of tenants, decreasing vacancy rates (Bollo 2019), as tenants are increasingly demanding more efficient solutions and the inclusion of smart buildings' features. This strategy could be efficiently implemented in *Edificio Galiza*, an offices' property currently fully vacant. The property was

built 50 years ago, verifying a less modern construction quality compared to more recently properties from the same segment.

A property's vacancy rate also depends on a building's specificities. A specific property is a Real Estate asset physically designed for a particular tenant's activities. To illustrate, *Estádio Bessa* is a football stadium constructed to undertake sporting events. Due to its specific characteristics, the range of tenants who might be interested in renting this property is not vast. Moreover, this asset's physical conditions are not easily adapted for supporting other professional activity without incurring in large construction costs. We recommend that BPI GA adopts a strategy of continuous engagement with the property's current tenant.

Finally, *Imofomento* may consider selling the properties which have been vacant for large periods. Nevertheless, the sale should be carefully evaluated in order to avoid selling below the property's fair value due to current unfavourable market conditions. As this strategy increases *Imofomento*'s liquidity, we advise managers for investing the new capital in more profitable properties or to invest in alternative solutions. The latter include a REITs' investment strategy, diversifying the fund's risk exposure and increasing total returns – a strategy further explained in Chapter 13.

8.3 Vacancy as a Valuable Opportunity

Considering the previous analysis, we concluded that having vacancy has a negative effect on the potential cash flows from Real Estate investments. The common belief is that property owners should minimise the vacancy rate to maximise the return and generate the most income possible to their investors. Nevertheless, one could only assume this proposition to be valid under the assumption that all tenants have a zero probability of default.

Typically, having vacant spaces means that the property is not returning any income for the investor. However, having a certain vacant space level may be an opportunity if the tenant(s) are financially unstable or keep defaulting/delaying the rental payment. The property owner can decide to leave a percentage of the space vacant to find a more reliable tenant willing to pay premium rent.

Therefore, we study whether having a part of the property vacant is considered a risk solely, or it could be seen as an opportunity. The answer to this question depends enormously on the likelihood of finding a more trustworthy tenant after ceasing the contract with the current one. This probability will depend mostly on the economic conditions and rental premium targeted by the property owner. To study this topic further, we use real options in Real Estate, which is presented in the following segments.

Real Options

As Oppenheimer (2002) states, the real options is a great framework to accurately account for specific valuations of the implicit options embedded in Real Estate capital projects. Therefore, we present an accurate options model and apply it to one of *Imofomento*'s properties: *Edifício Península.*

The option we use is related to the option to wait. In other words, it is the option of, after ceasing the contract of a specific unstable tenant, leaving that occupied fraction of the building vacant for one year to find a better tenant who is willing to pay, or not, a premium. If the option's value is positive, then we conclude having a particular vacancy may be valuable. Otherwise, the property owner should keep the current tenant and extend its contract.

In order to compute the option's value, we considered three possible scenarios of action at the moment of renegotiating the lease contract, which we present in Appendix 8.4. *Scenario 1* represents the case where the fund's management team decides to remain with the current tenant

and extend the contract for another eight years[20]. By keeping the same tenant, the fund is exposed to the tenant's financial stability and the capacity to pay the contracted rent. If, for instance, the tenant usually defaults or delays the payment for three months, then the property owner will receive the rental correspondent to nine out of twelve months in that year. We assume that the tenant will keep defaulting/delaying the three-month rent for the following eight years.

Scenario 2 considers the case where the fund's managers decide to cease the contract with the current tenant and wait for one year to find a better tenant willing to pay a certain premium. We assume that the fund indeed finds a tenant with a better credit rating and stable financial performance who will pay entirely the rent contracted with the previous tenant plus a requested premium.

Scenario 3 represents the case where the fund decides to cease the contract with the existing tenant and leaves the space vacant for a year in order to find a better tenant. However, in this scenario, the fund considers only a stable tenant willing to pay the rent at a discount. To compute the value of the option, we establish some assumptions:

a) The average horizon of a Real Estate's lease agreement is 8 years.

b) After one year of searching for a new tenant, the fund's managers have to decide which tenant they will assign to the vacant property.

c) In order to compare all scenarios, the same time period of eight years must be held.

By applying this real options model, *Imofomento's* managers will analyse the option's value to extend or cease the contract with the current and wait a year to find a new one. Yet, the model requires some inputs in order to compute a final result, which is presented in Appendix 8.5.

[20] The average of *Imofomento* current lease contract's duration is 8 years.

Detailed Computations

To clearly understand how the model works, we present the detailed computations we performed to get the option's value. Firstly, we calculate the level of annual rents for each of the possible described scenarios. Based on the user's inputs, we achieve the rental for each scenario during the next eight years through the following formulas:

$$\boldsymbol{Expected\ Yearly\ Rent_{Scenario\ 1}} = (12 - DM) \times \frac{Annual\ Rent}{12} \quad (6)$$

$$\boldsymbol{Expected\ Yearly\ Rent_{Scenario\ 2}} = Annual\ Rent \times (1 + premium) \quad (7)$$

$$\boldsymbol{Expected\ Yearly\ Rent_{Scenario\ 3}} = Annual\ Rent \times (1 - premium) \quad (8)$$

Where *DM* represents the number of months the tenant has defaulted or delayed the rental payment, the *Annual Rent* (AR) is equal to the annual rent assuming no default[21], and the *premium* is the premium rate the property owner requires or expects.

These variables are inputs that *Imofomento's* management team must be defined considering the tenant and building under analysis. Additionally, we adjust the expected yearly rent for each scenario based on the inflation rate. Specifically, we compute the final annual rent for each year following calculations:

$$\boldsymbol{Expected\ Annual\ Rent_{Scenario\ i}} = EYR_{Scenario\ i} \times (1 + IR)^n \quad (9)$$

Where i = 1, 2, 3, the $EYR_{Scenario\ i}$ is the Expected Yearly Rent for scenario i, IR is the current annual inflation rate, and n = 1, 2, …, 8.

It is fundamental to mention that in *Scenario 1* the fund will receive eight annual rental payments since it is extending the lease contract with the existing tenant, which guarantees that the property will be occupied throughout the entire lease contract lifetime (eight years). However, both in *Scenario 2* and *Scenario 3*, the fund will only receive seven annual rental

[21] $Annual\ Rent = Contracted\ Monthly\ Rent\ \times 12$.

payments since it is ceasing the contract with the current existing tenant and the respective property is assumed to stay vacant for one year while a better tenant is searched. This is the same as saying that *Scenario 1* will present a rental payment at Year 1, unlike *Scenario 2* and *Scenario 3* where rental payments will only start at Year 2.

Furthermore, we calculate the net present value (NPV) of each scenario by applying the following equation:

$$\boldsymbol{NPV_{No\ Option,t=0}} = \sum_{i=1}^{8} \frac{EYR_{Scenario\ 1,i}}{(1+R_f)^i} \tag{10}$$

Where R_f is the 10-year Portuguese Government yield[22]. Additionally, we also calculate the Net Present Value with the option. To do so, we computed the NPV for Scenario 2 and Scenario 3 by using the previous formula. We calculate the NPV with the option as:

$$\boldsymbol{NPV_{Option,t=0}} = \frac{P \times NPV_{Scenario\ 2,t=1} + (1-P) \times NPV_{Scenario\ 3,t=1}}{(1+Rf)} \tag{11}$$

Where P is the probability of finding a better tenant within one year that will pay an additional premium.

All in all, the final value of this option will come from the difference between the Net Present Value of the case with the option and the Net Present Value of the case with no option:

$$\boldsymbol{Option\ Value} = NPV_{Option} - NPV_{No\ Option} \tag{12}$$

The option's value will largely depend on three main variables: the probability of finding a better tenant within one year, the premium requested by the fund's management team and the number of months the current tenant is expected to default. Suppose the existing tenant presents an historical large delay in rental payments and the probability of finding a new and better

[22] We selected the 10 Year Portuguese Government Bond as the best proxy to the risk-free rate to use when discounting each rental payment to the present moment as its duration is quite similar to the average lease contract's duration within *Imofomento*'s properties.

tenant that pays a certain requested premium is large. In that case, the option will be valuable, and the vacancy rate during that following year will be seen as an opportunity to find a better tenant and improve the fund's returns.

As Oppenheimer (2002) defends, a complementary sensitivity analysis is crucial to overcome the significant subjectivity factor implicitly present in every Real Estate's valuation model. Therefore, we propose *Imofomento's* management team to conduct this sensitivity analysis with different probabilities and targeted premiums.

Real Options: The Case of Edifício Península

In order to demonstrate how this option can be valuable to the client in certain specific cases, we conducted the following analysis by using the particular *Imofomento*'s situation of *The Gentleman Square*. This is a tenant from *Edifício Península* that, according to the model presented in Chapter 7, carries a low rate in terms of tenant's risk (BB), which is confirmed by its constant delay and default in the full rental payments throughout previous years. We used the inputs taken from this tenant's case when conducting the option's analysis mentioned before, which we present in Appendix 8.6.

For *Edifício Península*, the value of the option is positive – €22,415.97 (Appendix 8.7) – under the assumptions we made for this example. However, in Appendix 8.8 we present a sensitivity analysis, which a matrix entry represents the value of the option for different levels of premium and probabilities. In this case, no matter what premium is requested, for any probability equal or higher than 40%, the option is valuable.

As one might expect, this option's value primarily depends on the current tenant's capacity to pay the rent. The more stable is the current tenant in paying its contracted rent, the less valuable will be the option. For instance, if the current tenant presented in this example has some monthly rental payments delayed of one (Appendix 8.9) instead of three (Appendix 8.8), then

the option value will only be positive in less possible scenarios since the current tenant has an already good rating in terms of paying its respective rent on time. In this case, the probability of finding a better tenant is lower, and then the option has a negative value: -€4,403.32 (Appendix 8.9). Hence, if the option has a negative value, it is worth remaining with the same tenant and rolling the contract.

Key Takeaways

To sum up, this tool allows the client to have a clearer view of whether the lease contract of an existing tenant should be extended or not at the moment that it expires. By imputing the variables previously mentioned, the client can evaluate whether the option to find a better tenant is truly valuable or not. Suppose the green area in the sensitivity analysis increases throughout the time for a particular tenant. In that case, it means that the probability of taking some real value out of the option increases due to the positive value of the option in a larger group of possible situations (probability-premium relation).

We conclude that having a specific percentage of vacancy can be a valuable opportunity to *Imofomento*. Notwithstanding, due to the existing subjectivity of the Real Estate industry, we recommend *Imofomento*'s management team to use this model solely as an extra tool to decide whether to keep or exclude the existing tenant, always complemented by the fundamental knowledge of the skilled fund's managers that already have strong expertise

9 Asset Concentration Risk

As mentioned in the literature, too much investment concentration on a specific property type, geographical location or top valued assets might lead to poor performance results of any real state fund, and *Imofomento* is not an exception. Thus, this chapter analyses *Imofomento's* portfolio's actual exposure to three different types of asset concentration risk: sector, size and location. We also propose several risk management strategies to tackle them. For this analysis, which is made for 2020 and considering the yields of 2019[23], we only considered the total capital actually invested in properties of € 314.6 million. Moreover, we compared *Imofomento* with a close competitor – *Fundimo,* a core and open-ended Real Estate fund managed by *Caixa Gestão de Ativos*, with a similar value of assets under management (AuM).

9.1 Sector Concentration

In order to study the fund's exposure to sector concentration, we performed an analysis considering five main sectors, namely retail, office, logistics, tourism and others. As mentioned in Chapter 3, there is an explicit portfolio's concentration in the office sector of 45.22%, followed by the retail sector with a 28.09% concentration. Nevertheless, when assessing *Fundimo's* portfolio composition, a similar concentration was verified, with the latter investing 54% of its total AuM in the office sector. As inferred from the market analysis, the office space market has been booming in the past years. Thus, the sector tends to guarantee long-term and steady revenue streams through tenants that engage in long-term lease agreements – a high- and steady-income source for investors – which may justify the choice for both *Imofomento* and *Fundimo* to allocate a high percentage of their portfolios to the sector.

[23] The 2019 individual building's yields were considered and used in this analysis as these are assumed to better reflect the fund's reality in a regular economy's reality. Indeed, the respective yields from 2020 are largely affected by the current pandemic situation and do not reflect the normal performance's behaviour of the fund.

Moreover, the proportion of total AuM currently vacant in *Imofomento* sums up to 10.13%. The office sector is the one that mostly contributes to this percentage, where 13.57% of the sector's properties are vacant, stressing the importance of tackling this risk exposure with new tenants. Furthermore, to avoid the exposure to poor performance scenarios in the office market, a strategy focused on REITs investing may lead to a higher portfolio sector diversification and hedge the fund's performance against possible losses – a strategy further discussed in Chapter 13.

9.2 Size Concentration

The analysis of size concentration aims to assess whether a fund's returns are too dependent on a few specific assets. According to the literature, the approach to perform such analysis is focused on considering the top five most valued assets within the overall portfolio (listed in Appendix 9.1) and using them as the proxy to evaluate the size exposure. Currently, *Imofomento* faces a 50.18% value concentration in these five main properties. Furthermore, the top five buildings sum 5.64% of the fund's overall – a positive picture for the fund since it means that portfolio's largest investments are being well managed and returning an exceptional income value. More precisely, among the top five, *Edifício Península* and *Picoas Plaza* are the ones that currently face the highest vacancy rates, and therefore should be more closely monitored.

9.3 Geographical Concentration

General Location

In order to obtain a clear picture of *Imofomento*'s geographical concentration, we performed an analysis considering seven locations, namely *Central Lisbon, Central Porto, Lisbon Area* (which excludes *Central Lisbon* zones), *Porto Area* (which excludes *Central Porto* zones),

Algarve and *Centre*[24]. As mentioned under Chapter 3, it is possible to verify an intense concentration of *Imofomento* Real Estate's assets in Central Lisbon, namely of 67.13%, which is likely to be triggered by the high level of economic activity verified in this location. Moreover, when evaluating each location in terms of vacancy, we found that the *Lisbon Area* demonstrates the largest percentage of vacant assets, summing 27.33%, followed by *Central Porto* with 14.51% of vacancy within this location's assets. Therefore, managers should take a closer look at the previous two locations so that both investments can be optimised.

Seismic Location

This section comprehends a strategy for BPI GA to measure and overcome *Imofomento's* exposure to earthquake risk. Thus, seven different seismic regions are defined (explained in Appendix 9.2), to which a certain level of earthquake risk is assigned, from a scale from 0 to 3, being 3 the riskiest. The previous are based on a study presented by *Agência Portuguesa do Ambiente (2014)* and in the analysis of the historical earthquake occurrences in Portugal (Publico 2017). Overall, there is a clear concentration of properties in the regions of Lisbon, as well as in the riskiest parts of Lisbon (shown in Appendix 9.3), stressing the high exposure of the fund to earthquake risk. However, when analysing the portfolio's overall risk exposure – as shown in the following table – we verified an overall earthquake risk level of 2.1, which is a relatively risky score.

Finally, it is fundamental to analyse whether larger returns are compensating the portfolio's considerable risk exposure. Based on the following table one can conclude that the riskiest assets in seismic exposure are not getting an overall higher return when compared to lower-risk assets to compensate for the extra risk. Moreover, those riskiest assets represent 32.68% of the

[24] The 7 locations were determined in accordance with the client's previous geographical divisions.

overall portfolio's value, showing that a substantial share of the portfolio does not generate the needed returns to compensate for its risk.

	0	1	2	3
Return	0.00%	5.49%	5.06%	5.48%
% Value	0.07%	19.08%	48.12%	32.68%

Table 3 – Portfolio's exposure to each level of seismic risk (in % value of AuM) and the weighted average return (2019) for each level of seismic risk.

Flood Location

In order to analyse *Imofomento*'s portfolio exposure to flood risk, we considered nine different flood zones to which different levels of flood risk were assigned, based on research developed by (Agência Portuguesa do Ambiente 2014). The flood score ranges from 0 to 2, with 2 being the riskiest score (explained in Appendix 9.4). We found that *Grande Lisboa* is the flood location with the highest portfolio's weight (54.95%) – as shown in Appendix 9.5 – which is also a risky location in terms of flood occurrences despite being an area strong in economic activity.

There is significant exposure to this risk (shown in the following table), with 70.45% of the portfolio's assets located in the areas with the highest flood risk – an overall portfolio exposure of 1.44. Moreover, we concluded that the riskiest flood areas do not compensate *Imofomento* with higher returns, since the assets located in less risky locations are returning higher yields than those in riskiest locations, as shown in table 4. As the riskiest assets represent 70.45% of the overall portfolio's value, a big pie does not generate a fair amount of income in terms of risk-return trade-off.

	0	1	2
Return	5.15%	6.63%	5.26%
% Value	26.20%	3.35%	70.45%

Table 4 – Portfolio's exposure to each level of seismic risk (in % value of AuM)) and the weighted average return (2019) for each level of seismic risk.

Recommendations

The sub-chapters of the geographical concentration section – general, seismic and flood – lead to very similar recommendations. Firstly, the risk exposure may be diversified through REITs' investment, a topic further developed in Chapter 13. The underlying assets of these instruments are located in various areas, thus expanding *Imofomento*'s geographical coverage. Secondly, BPI GA can consider divesting in some of the assets located in the riskiest areas while investing the divested capital and/or the fund's excess liquidity in lower risk exposure areas.

However, as there is a tendency for the riskiest locations to face high economic activities and more stable returns, the client may not be willing to adopt the previous divestment recommendation. Alternatively, BPI GA should adopt a preventive strategy by continuously evaluating the building's physical conditions, in order to perform the necessary renovations and implement appropriate security policies – a topic further explained in Chapter 11 concerning ESG risk management.

10 Liquidity Risk

10.1 *Imofomento*'s Liquidity Profile

Real Estate funds are usually under the scrutiny of a structural vulnerability risk, which is explained by the fact that Real Estate funds offer daily liquidity, but the respective investments do not integrate such liquid assets. This raises the concern of balancing funds' liquidity with the expected number of redemptions in a certain period. For instance, during the 2008 Financial Crisis and when the Brexit decision was announced, UK property funds were deeply desperate for cash and, consequently, were forced to sell properties and catalyse steep drops in prices – Commercial Real Estate values fell more than a third (Williams and Evans 2017).

Imofomento's management team is well aware of these types of liquidity crunches. Thus, it ensures a sufficient liquidity level in the portfolio to meet its obligations to investors comfortably. We compared *Imofomento* to its peers, and the fund shows significantly different liquidity profiles. In terms of NAV, the major fund in the open-ended Real Estate market is CA *Património Crescente* - managed by Square AM - with over € 807.57 million of assets under management. Nonetheless, in terms of liquidity, the fund reported 9.82% of cash as a percentage of the NAV, much lower than *Imofomento*'s 40.59% result. However, *CA Património Crescente* is a value-added open-ended Real Estate fund, which means it has a different investment style from *Imofomento*, which may explain this huge difference. On the other hand, if one considers the second leading open-ended Real Estate fund, *Fundimo* - managed by *Caixa Gestão de Ativos* – which is also a core Real Estate fund, the liquidity profile is again surprisingly different, as of August 2020, *Fundimo* presented a result of 0.89%[25].

[25] CMVM requires that funds keep a liquidity ratio of 33.33% minimum. However, funds must keep proving to CMVM that they are working on meeting the requirements, as some deals take a long time to be finished and the inflows are not immediate. That is why CMVM may accept lower liquidity ratios for a certain period of time.

Therefore, it is possible to conclude that *Imofomento* takes liquidity as one of the industry's key risks. Yet, as Li and Naranjo (2002) mention, cash does not provide return increase, especially now that interest rates in Europe are negative. Hence, the issue is not the lack of liquidity but rather the excess of liquidity. Even though the Real Estate market has been growing, *BPI Gestão de Ativos* has not found investment opportunities adequate to the fund's investment style. This is because some investment opportunities offer high yields and, consequently, high-risk levels that do not fall in line with *Imofomento*'s risk profile.

10.2 Liquidity Stress

Even though *Imofomento* has presented relatively high liquidity ratios in the past three years, that has not always been the case, as shown in Appendix 10.1. When facing periods of low liquidity levels, the fund must be aware of possible scenarios it may face in the future. Consequently, *Imofomento* must test its performance under certain conditions, for instance, if the number of redemptions increases or the rental income decreases. Also, if the fund is forced to sell assets, it must evaluate which properties are more liquid and sold faster in the market. Therefore, the following sections will be focused on analysing situations in which the fund is under stress, as well as the evaluation of the liquidity profile of the *Imofomento*'s portfolio.

10.2.1 Liquidity Score

Considering a scenario of liquidity stress where the fund is forced to sell one or more properties to meet the respective redemptions, it is crucial to evaluate which building should be sold first. BPI's Risk Management team had previously constructed a liquidity score in order to solve this issue. Nonetheless, it needed improvement due to its lack of academic background and market analysis.

Therefore, we improved the score by defining the most important determinants of Real Estate transaction frequency. Fisher et al. (2014) prove that factors such as age, location, property type

and vacancy rate increase the probability of transaction of a specific building. On the other hand, Klimczak (2010) added that rental income is also an essential factor that buyer consider, which is proxied by the price per square meter since not all properties are fully occupied. Furthermore, when investing in Real Estate property owners expect stable cash flows, which is only possible if the tenant is reliable (Klimczak 2010). Therefore, we consider tenant risk to be a good proxy for the stability of future cash flows.

The weight attributed to each factor should reflect its importance on the final investment decision. Therefore, after we presented the model to the client, the latter determined the final weights following its investment preferences and experience.

Location (25%)

According to Fisher et al. (2014), as one of the property's relevant characteristics explaining property transaction frequency, the buildings' location held significant value. Furthermore, the CFA Institute (2018) highlights the importance of location as a critical factor in determining the property value. For instance, properties with the highest value per unit of space are in the best areas and have modern features and functionality.

In Portugal, there are two main metropolitan areas: Lisbon and Porto. Lisbon, Portugal's capital, and Porto, its second biggest city, are the main cities where employment, GDP per capita, prime rents, and investment opportunities are more significant (Cushman & Wakefield 2020). Furthermore, increasingly new international companies are settling part of their business in Portugal, particularly in Lisbon and Porto, a choice aided by the country's favourable conditions and quality of life. Companies such as BNP Paribas, UBER, Google, Microsoft, and many others already have offices in these two cities (JLL 2020).

Taking the office segment as the standard example, Portugal's average rents are higher in Lisbon and Porto, respectively. Specifically, one will consider a top 9 zones in terms of rent per square

meter per month being, from higher to lower, the Prime CBD, *Parque das Nações*, CBD, New Office Zone, Historic and Riverside Zone, *Porto Boavista*, Downtown, Western Corridor, *Matosinhos* – summarized in Appendix 10.2. It is possible to conclude that in city centres, both in Lisbon and Porto, the rents are higher than the city surroundings.

Also, in terms of demand per square meter, all zones in Lisbon, except the Historical Zone, had a higher demand compared to Porto's zones – represented in Appendix 10.3. Therefore, it is reasonable to assume the properties located in Lisbon's city centre are more liquid than properties located in Porto's city centre. From a score from 1-5, with 5 representing the highest liquidity level, in terms of location, the distribution would be 5 – Lisbon City Center; 4 – Porto City Center; 3 – Lisbon Surroundings; 2 – Porto Surroundings; 1 – Other.

One should consider that Tourism in Portugal has been growing significantly over the past years, particularly in Algarve. For instance, in 2019 the Trade Balance was positive (€ 817.9 M) due to the Service Segment performance (€ 17 483. 7 M) compared to the Goods Segment (- € 16 665.9 M) (PORDATA 2019). Therefore, if BPI GA is considering selling a hotel, Algarve should have a higher score in location.

Property Type (25%)

As CFA Institute (2018) states, the property types are important for institutional investors, mainly for diversification purposes, but also to create a portfolio with low risk, assuming the properties are in a good location and well leased, meaning that the tenants are reliable and responsible, the vacancy rate is low and are fiscally sound. Moreover, according to a report made by Cushman & Wakefield (2020), the investment volume in Portugal per sector between January and September 2020 was distributed the following way: Retail (46%), Offices (35%), Hotels (13%), Industrial (3%), and Alternatives (4%).

Hence, it is possible to conclude that the Retail segment followed by the Office segment are the ones with higher demand, in terms of investment volume, followed by Tourism/Hotels, and Industrial/Logistics, respectively. Thus, from a score from 1-5, with 5 representing the highest liquidity level, the distribution would be the following: 5 – Retail; 4 – Offices; 3 – Tourism/Hotels; 2 – Industrial/Logistics; 1 – Others.

Nonetheless, some properties operate in different segments simultaneously. Therefore, the segment attributed to each building is based on the value of each segment represented on the overall building. If that value was higher than 50% of the building's value as a whole, then the corresponding segment was assumed.

Age (10%)

A New York Times' article written by Kolomatsky (2017) proves that the age of a building indeed affects rents, as the age of the building increases the rents charged will decrease. This theory does not apply to historic merit buildings, as the rents may be higher than newer properties. Moreover, Fisher et al. (2004) find that as the age of a building increases, the property holder's likelihood to sell also increases. On the other hand, institutional investors prefer holding newer buildings, or the so-called "institutional-grade" properties. Thus, the older the building, the less liquid it is in the market as investors are looking for modern Real Estate. Nonetheless, as Kolomatsky (2017) mentions, there might be an exception for buildings that hold historical merit.

So, to hold a scale from 1-5, the distribution of years of age of each building in the *Imofomento*'s portfolio was conducted to obtain each quartile's value. The results are, in years, 5 – [0; 19]; 4 –]19;25]; 3 –]25;30]; 2 –]30;60]; 1 – Age > 60. It is important to notice that *Imofomento* holds historic properties, hence when deciding upon a sale, these buildings require a more exhaustive analysis. That is the case of *Palácio Condes Azevedo* and the buildings in the street of São José

161 until 167, built in the XII and XIII centuries, respectively. Furthermore, some properties have been reconstructed, expanded or even modulated. Therefore, the age component must reflect the changes undertaken of each building in terms of renovations. Thus, if a property was reconstructed in the past ten years, then it must have the highest score in this category.

Price per square meter (15%)

Property transactions incorporate the sales price, which directly affects the decision to buy or/and sell. As the CFA Institute (2018) mentions, the higher the value per unit of space the most interested would institutional investors be to acquire a property, particularly if it has a core property type (office, industrial and warehouse, retail, and apartments) due to its low risk.

Therefore, it is fair to assume the higher the price per square meter, the higher the demand for that property and the higher the income. We calculated the price per square meter by dividing the value of the building by its area. Thus, based on all properties in the portfolio, the quartiles and the minimum value were computed, and the results originated the following score reasoning: 1 – [€ 0; € 596.01]; 2 –]€ 596.01; € 953.42]; 3 –]€ 953.42; €1 726.43]; 4 –]€1 726.43; €3 068.22]; 5 – Price per square meter > €3 068.22.

Vacancy Rate (15%)

Fisher et al. (2004) proved that the building's occupancy is positively correlated with the probability of sale, which indicates that the buyer does not intend to incur an added risk of the leasing and absorption of space. Also, the CFA Institute (2018) emphasizes the importance of a low vacancy. If the property is occupied, then the rental income is stable (assuming no credit risk), and the buyer's reservation price may be higher if the building is at full occupancy.

Considering the European office market as a standard example, according to a research report developed by Savills (2020), the vacancy rate of the leading European cities in the second quarter of 2020 were as follow: London West End - 4.70%; Paris CBD - 1.52%; Dublin - 8.10%;

Milan - 10%; Frankfurt - 6.50%; Berlin - 1.20%; Munich - 2.30%; Hamburg - 3.40%; Madrid CBC – 8.35%; Barcelona – 4.57%; Budapest – 7.50%; Lisbon – 6.27%; Warsaw – 7.90%; Prague – 5.40%; Bucharest – 10.50%. By analysing the quartile distribution, it is possible to conclude that the first quartile corresponds to a vacancy rate of 3.99%. The second quartile corresponds to 6.37%, and the third and fourth quartile corresponds to 8.00% and 10.50%, respectively.

Nonetheless, *Imofomento* accounts for higher vacancy rates than the average of European cities. For instance, *Edifício Península* reported a vacancy rate of 22.21% by the end of September, while *Edifício Galiza* reported a vacancy rate of 100%. These two buildings should not have the same score in this category, and hence, from a scale from 1-5, with 5 representing the highest liquidity level, the allocation would be: 5 – [0%; 4.00%]; 4 -]4.00%; 8.00%]; 3 –]8.00%; 10.50%]; 2 –]10.50%; 30.00%]; 1 – Vacancy rate > 30.00% (which represents one-third of the building).

Tenant Risk (10%)

The tenant risk is one of the property's characteristics that affect a sale's likelihood (Klimczak 2010). This is because the buyer is concerned whether or not it has to add the risk of having a tenant low credit credibility. If the tenant defaults the owner loses its income and, in the chance of tenant solvency, the owner must find another tenant for occupying the space.

Based on the tenant risk evaluation, the tenants rating is based on the failure score attributed by Informa D&B. Therefore, following the same reasoning as before, the 1-5 scale would be: 5 – [AAA; AA]; 4 – [A; BBB]; 3 – [BB]; 2 – [B]; 1 – [CCC/C]. As one property may have more than one tenant, a weighted average of the failure score was conducted based on the property's value each tenant was occupying over the full value of a property occupied in that specific building.

Risk of Property Specificity

When a property lacks versatility, the likelihood of finding a tenant or even to sell may be negatively affected. As the CFA Institute (2018) mentions, specific properties are considered riskier, either based on its correlation with the business cycle, which is the case of hotels and their particular characteristics. This is the case of football stadiums, schools, among others. To capture this effect, we studied each building with the client to identify whether there was this property specificity risk or not. If the risk exists, then the liquidity score would drop by 1; otherwise, it will remain unchanged.

10.2.2 Results

Before analysing the liquidity score of all properties, it is crucial to consider some critical notes. Firstly, as mentioned before, each building segment was attributed based on the value per segment per building that was higher than half of the value of the whole property. Yet, there was one exception to be taken into account: *Edifício Península*, which was divided by 43% of the entire value in Retail, 23% in Offices, and 34% in Others (Parking), was considered in the Retail segment since it is the higher percentage and the client demanded so. Secondly, regarding the tenant risk, the building's failure score was calculated as a weighted average of the tenants' score based on the value of the fraction they were occupying over the value of the whole rented space in that property. However, the Informa D&B database does not provide information for all tenants. Thus, when the information was not available, the weights of all indicators were adjusted such that tenant risk would be dropped and the respective weight was distributed among the other variables.

If the score was between 4 and 5, then it is expected that the building could be sold within 6 to 10 months; if it was between 4-3, it is expected to be sold within 10 to 14 months. If between 3-2, the building is to be sold within 14 to 18 months, and if the score was lower than 2, then

the property is probable to be sold only after 18 months. We applied these timeframes based on the average time BPI GA takes to sell or buy a property.

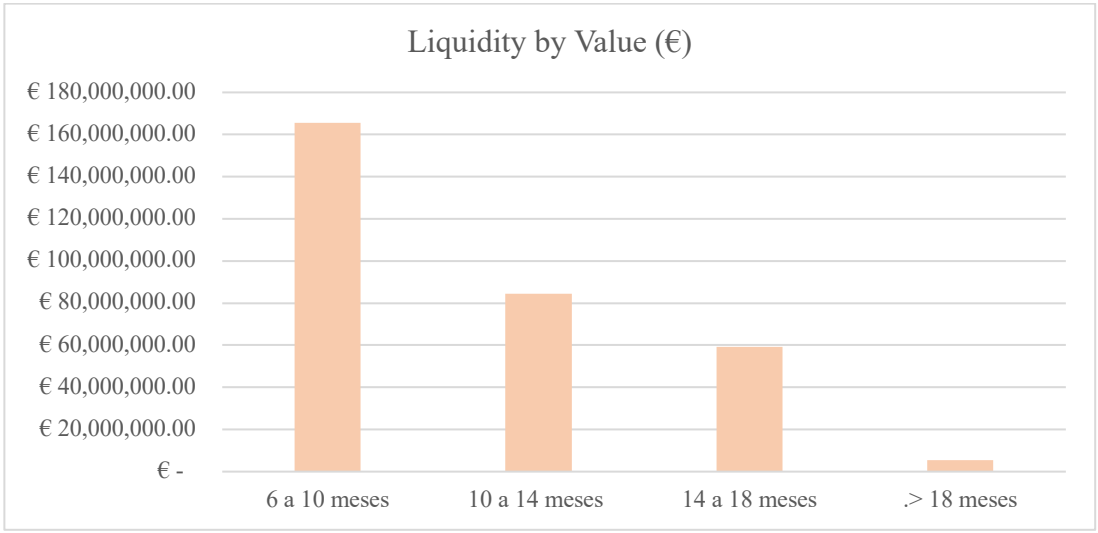


Figure 3 - Liquidity Score in terms of value.

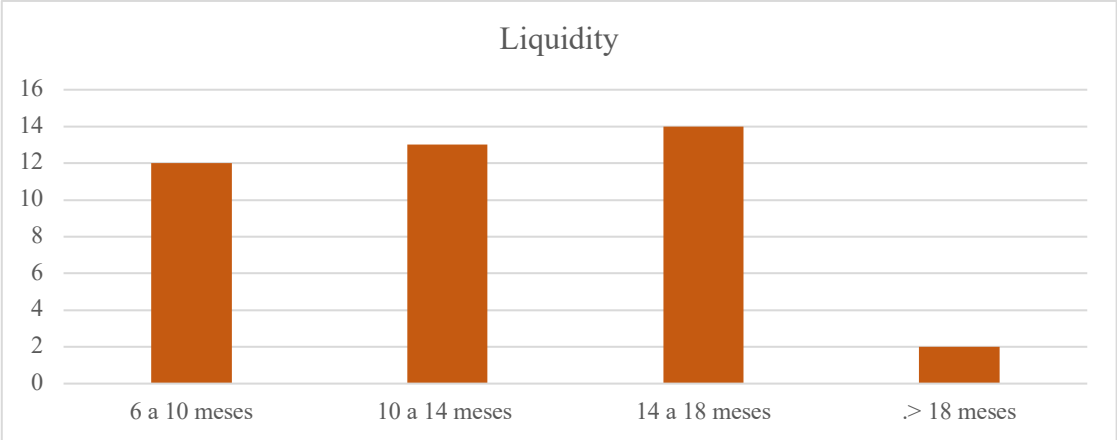


Figure 4 - Liquidity Score in terms of number of properties.

The results indicated that, in terms of value, BPI GA could receive around 52% (Figure 3) of the entire portfolio value within 6 to 10 months, yet, in terms of the number of properties, just 12 properties could be sold within that time on a total of 41 properties (Figure 4). Therefore, if liquidity stress and BPI is forced to sell properties, this model offers a proxy for which property could be sold faster without compromising the price. The portfolio overall is proven to be quite liquid within the Real Estate class. For instance, the top 10 properties – listed in Appendix 10.4

in terms of liquidity score represent 47% of the investment value in direct Real Estate, while the bottom 10 represent just 11% - listed in Appendix 10.5. This falls in line with the investment strategy of *Imofomento*, as it is a core fund with low volatility and the criteria to invest in direct Real Estate takes in consideration most if not all the factors used to compute the liquidity score.

10.2.3 Stress Tests

We believe the asset management team must stress specific scenarios to be prepared if one of those events happens. One of the most concerning scenarios is when a fund does not have enough liquidity to meet investors' redemptions (Association of the Luxembourg Fund Industry 2018). Notably, after the 2008 Global Financial Crisis, European regulators started to demand higher control on funds' liquidity side. As a result, we studied several situations based on the scenarios recommended by the Association of the Luxembourg Fund Industry (ALFI), the European Securities and Markets Authority (ESMA), and the Autorité des Marchés financiers (AMF), the French Financial Markets Regulator.

According to ESMA (2019), a liquidity shock could be either a redemption shock or the consequence of other types of shocks resulting from various scenarios. Nonetheless, in this analysis, we assume a simulation that focuses on a one-month horizon shock and consequent impact. The first approach is based on historical data of the fund. In other words, the scenarios considered are based on outflows observed in the past (ESMA, 2019). The Net flows in a percentage of NAV are defined by:

$$flows_t = \frac{Flows_{\ t}}{NAV_{t-1}} \tag{13}$$

Where $Flows_{\ t}$ represents the Net Flows at time *t* (equal to subscriptions minus redemptions) and NAV_{t-1} is the Net Asset Value at time *t-1*. We computed the historical Value at Risk (VaR) at 1% and at 5% using *Imofomento*'s data between January 2002 and September 2020. A potential pitfall of the VaR approach is that it discards any flows that are below the VaR. Hence,

we also computed the Expected Shortfall (ES) since it considers all the extreme events and weights them equally (ESMA, 2019). Also, we studied extreme cases alone, for instance, the worst loss in terms of Net Flow for 2005-2010; 2010-2015 and 2015-2020.

Then, we analysed redemption shocks based on different possible scenarios. Specifically, a fixed number of redemptions (ranging between 10% and 50%), redemption by the largest investor, and redemptions per investor type, which in the case of *Imofomento* are non-monetary financial institutions, resident individual investors, companies, and non-resident individual investors (AMF 2017) (ALFI 2018).

Moreover, we considered specific scenarios based on the asset side. The *Imofomento*'s portfolio has a significant portion of properties exposed to seismic risk, mainly in Lisbon and Algarve. Therefore, we computed the loss incurred following an earthquake or tsunami in those areas. It is important to notice that most of the portfolio properties have insurance that protects from natural disasters. Yet, if a scenario with this magnitude happens, it is possible that the insurance company may not be able to meet its obligations entirely; thus, it was assumed *Imofomento* only recovers 60% of the value[26]. Additionally, regarding the tenant risk and because *Imofomento*'s portfolio is also highly dependent on its top 15 tenants' performance, we analysed the scenario in which the top 5 and top 10 tenants defaulted.

Given the information available for September 2020, Appendix 10.6 resents all these scenarios and the respective expected losses. In case the loss surpasses the liquidity available, the fund will be forced to sell its assets. To do so, it should use the liquidity score as a complementary tool to evaluate which building(s) to sell. Overall, the fund is extremely well-prepared for the scenarios considered. This is mostly due to the high percentage of liquidity which *Imofomento*

[26] The rate we assume was discussed and accepted by the client based on their insurance agreements.

has registered over the past five years, which, on the one hand negatively impacts the fund's returns, on the other hand, offers security and stability for possible shocks.

11 ESG Risk

According to the Task Force on Climate-related Financial Disclosures (TCFD), one of the most significant risks organisations face today is climate change, which is perhaps the most misunderstood. As organisations do not perceive the long-term effects of climate change accurately, the associated risk is not correctly priced, leading to a general misallocation of capital. A proper Environmental, Social and Governance (ESG) risk management is critical for real estate investors due to this asset class' high portfolio presence and accounting for a buildings' environmental impact.

Therefore, this section defines an ESG risk management strategy tailored to BPI's profile through a process that identifies the material ESG Key Risk Indicators (KRIs). The previous is an action plan for the investment process and outlines a strategy to maximise the United Nations Principles for Responsible Investment (UNPRI) Real Estate score. This approach stems from the literature review on ESG matters. The authors concluded that the ESG impact on performance depends upon the trade-off between short-term costs versus long term benefits, requiring an even longer materiality horizon for real estate investors. Moreover, we based the strategy on the indications and frameworks developed by several international organisations[27]. Overall, the decisions that should be made today concerning sustainability and responsible investing tend to be postponed, as the lack of transparency in information makes investors unaware of market inefficiencies.

[27] This strategy follows the recommendations and standards of international organizations, namely the GRESB, SASB, GRI, Investor Network on Climate Risk (CERES – INCR), Institutional Investors Group on Climate Change (IIGCC), Investor Group on Climate Change (IGCC), Principles for Responsible Investment (PRI), Royal Institution of Chartered Surveyors (RICS), United Nations Environment Programme Finance Initiative (UNEP FI) and the UN Global Compact.

11.1 Material ESG KRIs for Commercial Real Estate

Environmental Factors

As mentioned in the literature, the environment is the most dominant ESG dimension and the easiest to be measured. Therefore, different KRIs related to infrastructure design and quality affects a building's ESG performance, such as the energy efficiency (that accounts for CO^2 emissions), the existence of a property certification label or scheme, and the percentage of renewable energy which are extracted from the energy certificates. Waste and water-efficient management are also important sources of risk exposure and their impact on biodiversity and land contamination. The geographical location of the building impacts its proximity to public transportations and affects the resilience to natural disasters, related to the risk of sea-level rise and floods, as well as earthquake. Finally, additional material environmental KRIs are light and noise pollution from the environmental impact of construction interventions.

Social Factors

The social component of ESG risk management ranges building features and stakeholders, namely tenants, buyers and sellers, and external providers[28]. Entities should be analysed for connections with child labour, compliance with labour standards, compliance with human rights and involvement with controversial weapons. Moreover, the building safety standards will be taken into account, associated with infrastructure quality and safety procedures (such as personal security, first aid kits and protocols and equipment designed for earthquakes, floods and fires) to ensure the well-being of the different stakeholders. Similarly, features that adapt buildings for handicapped contribute positively to a lower ESG risk exposure.

[28] In this section, the providers of external services mostly concern the workers related to the building, namely the ones associated with construction activities (developments, improvements and renovations), cleaning services and security personnel.

Governance Factors

Governance factors depend mostly on the organisational level of the fund and its managers. Important KRIs to be considered are the existence of an overall Property Investment Policy and a Responsible Property Investment Policy (RPI Policy). Moreover, to tackle transparency and corruption, the KRIs measured are the possibility of conflicts of interests, the separation of powers and impartiality among the different lines of defence in risk management, as well as scandals related to bribery, money laundering and corruption. Moreover, Governance factors include integrating ESG clauses in contracts, supervision by the investment committee on ESG integration and commitment to proper due diligence. The previous also target the compliance with international standards, availability of budget to improve ESG performance, considering ESG in pricing and measuring its impact on financial performance. Establishing comparisons with past ESG performance and aligning strategy with the Sustainable Development Goals (SDGs) are also essential governance aspects. Lastly, considering ESG in construction interventions, measuring its ecological impact, using certified labelled materials and considering green building certifications are important material KRIs.

11.2 The Approach to ESG Risk Management

According to the Principles for Responsible Investment (PRI), responsible investment implies incorporating ESG factors in investment decisions and active ownership. Hence, the ESG risk management's approach is an action plan – based on the CDC Group's framework[29] – that allows for integration through the investment cycle. It is a SMART plan – specific on the ESG risks/opportunities materially identified; measurable through scorings, benchmarks and

[29] The plan will be based on the guidelines provided by the CDC Group and in the international framework for implementing the Paris Agreement for real estate sustainable investments.

performance improvement; achievable and realistic; and time-delimited for different target dates – aiming to address long-term value-generating opportunities for real estate investors.

ESG risk management is an integral component of decision-making and monitoring ESG. It covers the four stages of the investment process (PRI 2020) – deal sourcing, investment decision, ownership and sale – associated with the three phases of the real estate life cycle – development, use and recovery (UN Global Compact & RICS 2018). The ESG risk management approach identifies the specific KRIs for each stage, uses pre-defined metrics to obtain ESG risk scores, compares them with internal targets much associated with past performance, attests SDG alignment, and delineates the mitigation strategies for ESG performance improvement. The previous is developed from an organisational perspective (mostly concerning governance practices) and from the point of view of the portfolio holdings.

Risk Management at the Organizational Level

The organisational ESG risk exposure depends on the previously identified material governance KRIs. We attributed ESG scores based on a set of pre-defined metrics, as shown in Appendix 11.1 – with a higher ESG score representing a lower risk exposure, and vice versa. The previous requires constant monitoring, targeted to the real estate team and the associated investment committee. For the KRIs with a non-positive score[30], the organisation should define mitigation strategies that allow for a lower exposure to material real estate governance risks, when effectively applied. To illustrate, the preliminary step for risk mitigation at the organisational level implies the development of a Responsible Real Estate Investment Policy that delineates the entire approach to ESG risk management. We developed a draft of the Responsible Investment Policy for the real estate asset class for BPI GA, as well as its complementary manual of procedures (Appendix 11.2).

[30] Each KRI is assessed through a "Yes" or "No" answer, corresponding to one or zero points, respectively.

Risk Management at the Portfolio Level

Pre-Investment Action Plan – Screening and Due Diligence

The pre-investment section ranges the first two stages of the investment process – deal-sourcing and investment decision. In the deal sourcing, the material KRIs for the specific property are measured through informative E, S and G screens, based upon a thorough process of due diligence[31]. The previous implies that managers complete the deal sourcing scoreboard presented in Appendixes 11.3 and 11.4 for each new investment opportunity, obtaining its final ESG score that should weight for the final investment decision. For the previous judgment, the client should recognise that a higher risk exposure impacts the property's financial performance negatively, thus having a higher probability of requiring the implementation of active ownership strategies or execution of interventions and renovations. The decision is then communicated to the investment committees responsible for its approval.

Post-Investment Action Plan – Monitoring and Mitigation

The post-investment action plan focuses on the last two stages of the investment process – ownership and sale – linked to the life-cycle phases of usage, development and recovery. To manage the exposure to ESG risk factors, we divided the action plan into monitoring and mitigation. While the former is conveyed through ESG scores and an SDG alignment strategy, mitigation is employed through developments, renovations and improvements, as well as voting and engagement, aiming to improve ESG performance. Finally, it is worth mentioning that the investment process ends with the asset sale**,** where the property's price should reflect the ESG risk exposure – the lowest corresponding to a price premium.

[31] Following the PRI's indications, information may include raw data (utility bills, building management system, existing environmental management system, engagement with tenants), third-party reports (energy audit reports, certification reports, surveyors' reports) and independent databases (geospatial databases, flood records).

Risk Monitoring – ESG Scores

Analogous to the pre-investment strategy, the action plan for monitoring the post-investment phase depends on assessing ESG scores. As shown in Appendixes 11.3 and 11.4, while the property level ESG KRIs are identical to the deal sourcing ones, we added new informative screens that assess the current tenant and the providers of external services. These final scores should be evaluated regularly and compared to previous ones, to determine the historical ESG performance of the asset being monitored. To improve a particular ESG score, it is necessary to employ the risk mitigation strategies explained next.

Risk Monitoring – SDG Alignment Strategy

The 2030 Agenda for Sustainable Development was established in 2015 by the UN among world leaders, comprehending 17 goals and 169 targets to "*to end poverty, fight inequality and tackle climate change".* As these goals are not independent of the finance industry and acknowledging that global frameworks depend heavily on scalability, the real estate industry can significantly contribute to meeting the 2030 agenda. Thus, this responsible investment strategy aims to set short- to medium-term SDG targets for the real estate asset class at BPI GA, aligning the company with this international framework. The approach[32] implies re-thinking material ESG risks and opportunities under the scope of business activities – in this case, Real Estate investments – to the extent of meeting the chosen SDG outcomes (Appendix 11.5 presents the targets SDGs, targets and indicators). The strategy to meet the priority SDG targets is shown in Appendix 11.6, divided between three implementation periods – until the end of 2020, 2023 or 2026 – and its progress should be monitored continuously.

[32] The SDG alignment strategy is based on the PRI's five-part framework for investing with SDG outcomes (PRI 2020), as well as on the strategy defined by the GRESB for SDG integration, answering the four main questions for the Real Estate Industry – What, Where, Why and How.

Overall, the timeframe until 2020 targets corruption practices at the organisational level, child labour scandals, and compliance with labour, health and safety standards, from the perspective of tenants and external services' providers. Until 2023, the SDG alignment strategy focuses on increasing recycling patterns among tenants and reducing water pollution caused by constructions, by not dumping hazardous chemicals. Lastly, until 2026 the management company should increase the portfolio's proportion of renewable and decrease CO^2 emissions, prioritising the acquisition and development of greener buildings, improving the current portfolio's assets and monitoring tenant's activities, mitigating this exposure through engagements when necessary. Moreover, the decrease in deaths caused by natural disasters is also a 2026's target, through the excellent quality of construction and materials, as well as by having the correct procedures and equipment in place.

Risk Mitigation - Developments, Renovations and Improvements

For buildings to become more sustainable, the planning and execution of developments, improvements and renovations should account for ESG factors. Nonetheless, it is essential to highlight that brownfield investments should be preferred to greenfield developments, as mentioned in the literature. Improving older buildings has a lower environmental impact than acquiring or developing new high-performance green buildings, even though being usually more complicated and sometimes more expensive.

Therefore, we developed a scoreboard to evaluate the ESG level of a specific construction intervention (shown in Appendix 11.7). The previous considers the impact of the intervention itself by assessing incidents with ecological impacts, light and noise pollution, waste management, health and safety of the workers, and the choice of materials with certified labels. Moreover, the score also accounts for the ESG outcome of the intervention, thus considering improvements in water management, for instance through automotive taps and new rainwater

harvesting features, as well as the installation of renewable energy technologies and the achievement of green building certifications.

Risk Mitigation - Voting and Engagement

The active ownership strategies of engagement (dialogue) and voting are vital for a successful sustainable management process of real estate portfolios, aiming to tackle different stakeholders. Consequently, their implementation contributes to building stronger long-term relationships and improving investment performance – both sustainable and financial. Tenants are crucial stakeholders to consider when addressing active ownership strategies, which tend to improve satisfaction, increase retention rates, reduce vacancy and void periods, and attract other quality tenants. Additionally, engagements can as well target the providers of external services.

This active ownership strategy aims to define and integrate a standard process for engagements in the real estate department's organisational governance at BPI GA – built upon GRESB guidelines (2015) – which implies identifying the source of ESG risk, planning, mobilising resources and capacity, implementing and monitoring. Then, following the PRI's recommendations, the management company can engage with tenants through regular meetings to address possible ESG concerns, implementing a system for tenants to share ESG data, develop a tenant newsletter that informs them about the latest ESG trends, distribute tenant satisfaction surveys, as well as implementing green leases or adding green clauses in the current contracts.

11.3 ESG Reporting – UNPRI Maximization Strategy

According to international standards, the disclosure of sustainability-related practices increases transparency and improves the assessment and pricing of ESG risks. The TCFD stresses the importance of disclosing clear, comparable and consistent information about the risks and opportunities presented by climate change. Therefore, this section details a strategy for BPI GA

to disclose ESG-related information for real estate investments according to the UNPRI framework. The approach to maximise the associated score started with analysing the requirements and assessing its grade as of September 2020 – estimated to be around 20%.

The ESG risk management strategy is tailored to the UNPRI, integrating its requirements into the various action plans. Therefore, we developed the score maximisation tactic by defining targets for each question, as well as the strategies to meet them, aiming to be implemented along three time periods – December 2020, 2023 and 2026[33] – as shown in Appendixes 11.8 and 11.9. A successful implementation of the maximisation strategy allows for the real estate asset class at BPI GA to obtain the UNPRI scores of 55%, 88% and 97%, for the reporting years of 2021, 2023 and 2026, respectively.

[33] The activities of a certain reporting year are only reported in March of the following year, based on the UNPRI guidelines. This means, for instance, that the measures implemented until December 2023 will be reported in March 2024.

12 Valuation – Explicit Capitalization Rates Model

The valuation of a property is an estimation process of the market value of a Real Estate asset. As mentioned in the literature, property investors are exposed to several risks when appraisal experts perform valuations (or appraisals). To incorporate those risks into the valuation process, it is relevant to reflect again upon the variables that have the most significant impact in estimating the final value, which for the income approach are the income, operating expenses and capitalization rate.

Therefore, this section specifies a valuation model that aims to determine the investment value of a property by determining the explicit cap rates while fixing the income and operating expenses variables. The word "explicit" describes the process of disaggregating the cap rate into its different components, instead of considering it to be equivalent to the rate of return of investments made on similar properties. The model intents to be an internal practical tool that allows BPI GA to determine the worth of its properties in advance, therefore supporting the investment decisions of buy, sell or hold. The model also contributes to lower exposure to the uncertainty derived from experts' valuations performed on BPI GA's Real Estate assets.

12.1 Valuation in *Imofomento*'s Portfolio

The valuation model is tailor-made for *Imofomento's* portfolio, which assets are appraised by Portuguese appraisal experts under the Portuguese law[34]. *Imofomento's* properties should be appraised bi-annually[35] by two valuers, requiring a third one when the results from the previous two differ by more than 20%. We performed a study to analyse the valuer more often requested

[34] A valuer respects the requirements expressed in article 2º of DL nº 153/2015 of 14th September. Besides the qualification requirements, the valuer needs to act with integrity, independence and objectivity. Incompatibilities are specified in article 19º of DL nº 153/2015 of 14th September.

[35] The frequency of property appraisals is specified in the article 144º of the *Regime Geral dos Organismos de Investimento Coletivo*, which states that open-end funds should have a minimum frequency equal to the number of redemption periods.

in the last five years, which verified that *PVW*, *Urbanflow* and *Garen* were the three appraising expert firms with most fractions appraised (Appendix 12.1 shows the totality of *Imofomento's* appraisal experts). Besides, as *Garen* is the one with the highest presence in 2019 and 2020[36], we studied its valuation criteria and interviewed one of its experts to support the model's considerations. The income approach is the preferred appraising method at BPI GA, and according to the analysis of several valuation reports[37], the one most often used by appraisal experts.

12.2 The Model

The explicit capitalization rates valuation model aims to determine the investment value of a property based on the income capitalization approach. The model assumes that an asset's growth level is stable, therefore not requiring a forecasting period, and considering a terminal value – which is the basis of value when applying the income capitalization method. The investment value of property differs from its market value, the former implies a subjective assessment that reflects the owner's market perceptions, contrasting with the objective analysis performed by appraisal experts mentioned in the literature.

Thus, the model aims to find the explicit capitalization rate by disaggregating its formula into different components – nominal risk-free rate, risk premium and growth – as described in the literature. Among the previous three, the most challenging element to be determined is the risk premium, while we assumed that the risk-free rate is equivalent to the 10-year Portuguese government bonds and growth is an implicit component of the risk premium. To determine the risk premium, it is necessary to address its different determinants, divided between systematic – macro/market – and unsystematic – micro/asset-specific. More precisely, the model

[36] Garen appraised 1033 fractions of *Imofomento*'s portfolio in June 2020 (Appendix 12.2 shows the nº of fractions appraised by Garen since 2016).
[37] Valuation reports are developed in accordance with the requirements of article 20º of DL nº 153/2015 of 14th September.

incorporates the macroeconomic risk component, the sector and location components, and the asset-specific ones – tenant, vacancy and building (Baum and Crosby 2008). We applied the model to a total of 33 *Imofomento's* properties in 2020 and will compare the results with the actual cap rates. The term “actual cap rates” describes the capitalization rate that measures the investment's true value based on supply and demand free market forces. We derived the actual cap rates by dividing the Net Operating Income (NOI) of each property by its market value – assuming that all properties are fully rent and that the market value is the average of the two appraisal experts' opinion of value.

Macroeconomic Component

The macroeconomic component of the risk premium considers the statistically significant variables found in Chapter 6 – Macroeconomic Risk – Systematic Factors –, which include real GDP growth, inflation, real interest rate, and money supply. We created a score that attributes a certain risk premium to each macroeconomic variable. The findings presented in Chapter 6 are the base for the weight attributed to each macro variable, with real GDP having the higher weight, resulting on an average risk premium for the Real Estate market produced by macroeconomic factors of 1.30% in September 2019 and of 2.15% in September 2020.

Sector and Location Components

The model assumes the sector and location components as the ones with the most significant influence on the risk premium. We aligned this consideration with *Garen's* practices, which attributes an average risk premium of around 1.5% for the sector and of 1.3% for the location when appraising office buildings inserted in prime locations. Then, we scored the two risk factors based on the methodology constructed in Chapter 10 – Liquidity Risk – with premiums attributed to each level of risk exposure. The results obtained through the actual cap rate analysis of *Imofomento's* properties highlight that locations and sectors with higher liquidity

levels benefit from lower risk premiums. Yet, we found an exception for the Tourism properties that have an income source dependent on both fixed and variable components, with the variable part being almost null in 2020 due to the pandemic situation. Thus, leading to an actual cap rate much lower than expected based on the asset's liquidity. Altogether, taking into account the Liquidity Score and the importance given by appraisal experts over location and sector, we assumed, on average a location and sector risk premiums of 1.60% and 1.64%, respectively.

Tenant, Vacancy and Building Components

The influence of the tenant, vacancy and building factors in the risk premium considers the liquidity score built in Chapter 10 that defines high liquid properties as being low in vacancy levels, with strong tenants and few years of construction. Among the previous three asset-specific components, the literature points towards a more substantial influence on cap rates from tenant covenants, while building risk is the least significant. Furthermore, it is possible to verify the direction of the relationship between each micro/asset-specific risk and the actual cap rates by plotting the properties by the micro risk score related to their level of liquidity determined in Chapter 10 – Liquidity Risk – against the correspondent actual cap rate. Based on the previous two considerations, the average risk premium assumed for tenant risk, vacancy risk, and building risk was of 0.74%, 0.64% and 0.3%, respectively.

Concerning vacancy risk, as portrayed in Appendix 12.3, lower vacancy levels – which imply lower vacancy risk – correspond on average to lower actual cap rates. As a matter of fact, for vacancy levels higher than 30.01% (liquidity risk score level 1, which is the riskiest, representing the lowest liquidity level), the average actual cap rate is of 7.19%, while vacancy levels between 0% and 4% (risk score level 5, which is the least risky) verify an average actual capitalization rate of 5.88%.

Moreover, the tenant score reflects the risk of having a tenant with low credibility, implying that low tenant scores – more tenant risk involved, therefore less liquidity – verify higher risk premiums and result in higher capitalization rates. Tenants' scores are based on the failure score of *Informa D&B* and capture the most severe scenarios of default. The trendline is slightly negative for the properties studied if we exclude the tourism sector since this sector faces a low liquidity tenant score and low actual cap rates. The relation between tenant risk and actual cap rates is presented in Appendix 12.4, exposing that the average cap rate of properties with a high probability of default – most risky, with a level 1 score – is 6.42%, while for low default probabilities – liquidity risk score level 5 – cap rates are on average 6.04%.

Furthermore, the building risk – mostly influenced by the age factor – was found to affect cap rates, with the lower risk being associated with lower yields, as plotted in Appendix 12.5. The previous relation was only verified when disregarding the tourism sub-sector and the properties located in Lisbon and Porto's city centres. In fact, the results demonstrate that the age factor is less significant when properties' location is in the city centre, which is a location where many buildings have a high historical value and most often suffered reconstructions or renovations, not bearing the same negative impact of age in their actual cap rates as buildings outside the city centre.

12.3 Conclusions

The approach suggested for managing valuation risk at BPI GA comprises a model that defines each property's explicit capitalization rates, thus determining its investment value. The explicit cap rates were constructed in accordance with literature findings, by summing up the risk-free rate, the systematic risk of the Real Estate market, and all the unsystematic risks attributed to every single property understudy – with different levels of risk exposure and scores representing the liquidity of the investment, resulting on different premiums charged. Appendix 12.6 shows

the model's final results, allowing for a comparison between average explicit cap rates and average actual cap rates in September 2020. To allow for relevant conclusions, we grouped properties by sector, as well as by their location within each sector, with the results indicating an average explicit cap rate of 6.49%, while the average actual cap rate is of 6.31%. Furthermore, the same model was applied to September 2019, considering 30 properties, as shown in Appendix 12.7. The results present an overall average explicit cap rate of 5.71%, while the average actual cap rate is 6.02%.

The model results point towards a close approximation between the explicit and actual cap rate values for most properties, emphasising that the different components considered in the model – macroeconomic, sector, location, tenant, vacancy and building – are accurate drivers for the cap rates. However, we found an exception for properties inserted in the tourism segment mostly driven by their rent structure and the particular situation faced during 2020, implying that this sector requires a more in-depth analysis. Moreover, it is worth stressing that a slight change in cap rates correspond to a significant inverse variation in property values estimations. Therefore, the investment value obtained from the explicit capitalization rate might vary substantially from the market value obtained from actual cap rates.

To conclude, when using this model one cannot forget that actual valuations always imply a certain subjectivity level since valuers assess a property's value based on their beliefs and experience. Therefore, the explicit cap rates model aims to determine an investment value which is the most similar to the experts' results, based upon the different conclusions reached throughout the thesis, and adding *Garen's* valuation criteria to further improve results. However, when developing the model, we found that there are some risks not yet fully priced in the market, such as ESG and asset concentration risks. In fact, Commercial Real Estate markets are gradually adapting to a range of issues encompassing ESG factors, which include some environmental hazards such as seismic and flooding risk, energy efficiency, climate and

matters of legislation, management and fiscal considerations. According to the RICS (2019), valuers should reflect markets and be aware of sustainability features, and their implications on property values in the short and long-term, which implies a continuously seek to enhance their knowledge as markets change. Therefore, when being aware of its limitations, this valuation model can be a useful tool for investors, by signalling a valuable purchase or sale before the market prices the property's corresponding risk exposure.

13 REITs

13.1 Direct and Indirect Real Estate Investments

Both direct Real Estate and REITs investments involve buildings and land that produce cash flows. Hence, one would believe that the returns of the two approaches are highly correlated. Indeed, direct and indirect physical holdings of Real Estate must be affected by similar fundamentals; thus, returns should follow the same pattern. To evaluate this issue, we considered different scenarios when computing the correlation between the *STOXX Europe 600* (equities), *FTSE EPRA NAREIT Developed Europe Index* (European REITs index), and the *Commercial Real Estate Index* (provided by the ECB).

We used price variations from the beginning of 2000 until the second quarter of 2020 at a quarterly frequency for this analysis. The following table shows the correlation between direct Real Estate, REITs, and equities. Considering one quarter as the holding period (HP), the correlation between REITs and equities' price variations is exceptionally high, at 78%, while the correlation between REITs and direct Real Estate is low, at 9.5%. Hence, REITs resemble equities more than they resemble direct Real Estate. This conclusion falls in line with Ang's (2014) findings, who conducted the same analysis for the USA market. The author found that direct Real Estate was poorly correlated with REITs (15%), while REITs were highly correlated with equities (63%).

	CRE Index	*SXXP Index*	*EPRA Index*
CRE Index	1		
SXXP Index	0.117	1	
EPRA Index	0.095	0.781	1

Table 5 – Correlation between direct Real Estate, REITs and equities.

Nonetheless, the correlation between direct Real Estate and REITs increases as the holding period increases. This relation is represented in Appendix 13.1, which considers different horizons. For instance, after 12 quarters, the correlation rises to 34%, continuing an upward trend as the horizon increases. After 20 quarters, the correlation tappers around 42%, which is a very similar result to Ang (2014), who reported a correlation of 43% for the North American market. Furthermore, it is crucial to note that the correlation between REITs and equities is still substantial but decreases as the horizon increases. For example, after 20 quarters the correlations is 67%, lower than the 78% verified with the one-quarter horizon.

All in all, it is possible to conclude that REITs' prices move, in the long run, along with direct Real Estate prices. This is an exciting finding for BPI GA as the investment in REITs does not fall entirely outside the investment strategy of *Imofomento*, assuming that price variations work as a good proxy for the behaviour of returns. However, REITs are still much more liquid assets than direct Real Estate investments and usually more volatile. The following chapters explore the inclusion of REITs within the *Imofomento*'s portfolio.

13.2 *Imofomento*'s Portfolio with REITs

There are different reasons for suggesting the inclusion of REITs in *Imofomento*'s portfolio. The fund invests only in the Portuguese market and, due to its investment profile, the portfolio is intentionally concentrated in Lisbon, as well as in the office segment – a location with attractive investment opportunities and a segment with an impressive risk-return trade-off. Furthermore, the fund's liquidity has been increasing in recent years, affecting returns negatively due to the negative European interest rates and the lack of suitable Real Estate investment opportunities in Portugal. Therefore, to tackle this issue, we explore four investment strategies with European REITs, based on the literature previously performed on this topic, which would expose *Imofomento* to other European markets, segments, and more attractive

returns, while still following its investment strategy. The four strategies are the 70:30, 70:25:5, *Hedge* and *No Hedge*, with the last two being sub-divided into variance minimisation and tangency portfolios.

The listed Real Estate (REITs) component of the portfolio we consider is the *BNP Paribas Easy FTSE EPRA/NAREIT Developed Europe UCITS ETF*, a proxy for the European REITs market. The ETF seeks to fully replicate the FTSE EPRA Nareit Developed Europe index's performance – designed to track the European listed Real Estate companies' performance – by investing in the same companies as the index with a maximum tracking error of 1%. The period we considered is between September 2015 and December 2019[38], using monthly data. During the period analysed the ETF reported an average annualised return of 52.6% and an annualised standard deviation of 35.98%, a result much influenced by a frequent dividend distribution.

Each strategy suggests different capital allocations, and the final recommendations are given by comparing the results obtained from such allocations with the ones verified by the fund while accounting for its specific investment characteristics. During this period, the annualised average return of *Imofomento* was 3.42%, with an annualised standard deviation of 2.37% and a sharpe ratio of 1.61 (considering the 3M EURIBOR as the risk-free rate). The returns calculated in this chapter do not incorporate potential fees.

[38] We considered this period because before 2015 the liquidity share of the overall *Imofomento*'s portfolio was not precisely accurate and sufficient to realistically use part of it to invest in other alternative classes - REITs. Liquidity (cash) availability is crucial for every Real Estate fund to cover unexpected withdrawals from investors, having in mind that Real Estate assets are not as liquid as it should be in order to protect from these situations. Also, we did not consider 2020 due to its particular and uncommon pandemic situation that consumed every single security's returns, which would incorrectly influence the results of this analysis.

13.2.1 Strategy 70:30

The National Association of Real Estate Investment Trusts (2011) proved that portfolios with a 70:30 capital allocation – 70% invested in private Real Estate and 30% in listed Real Estate – provide higher risk-adjusted returns than just considering direct Real Estate. When implementing these capital allocations within *Imofomento*'s portfolio, we arrive at the same conclusion. The annualised return is 19.71% and the annualised standard deviation is 10.20%, resulting on a sharpe ratio of 1.97. As the volatility is much higher than what BPI GA Real Estate team is willing to accept, we do not recommend this strategy to the client, even though it proves to be extremely attractive.

13.2.2 Strategy 70:25:5

Moss and Farrelly (2014) present a slightly different capital allocation than the previous strategy, suggesting one must split the portfolio following a 70:25:5 capital allocation. This means investing 70% in unlisted direct Real Estate, 25% in listed Real Estate (REITs) and 5% cash. We expect that including cash in the portfolio will decrease the volatility compared to the previous strategy. The results indicate that the risk-adjusted returns indeed improve, with an annualised return of 17.07% and an annualised standard deviation of 8.48%, indicating a sharpe ratio of 2.06. This also meets Lee's (2014) conclusions that including REITs in a blended portfolio would improve risk-adjusted returns. However, 5% invested in cash does not satisfy the client's requirements to securely meet investors' redemptions.

13.2.3 No Hedge Strategies – Minimum Variance and Maximum Sharpe

The stock market and REITs are positively correlated, and the listed Real Estate securities performance is deeply affected by equities' behaviour. The strategy's name is based on the fact that these portfolios are not hedged against the stock market. We constructed two portfolios:

the minimum variance – applying the Markowitz Mean-Variance Portfolio Theory (Marling and Emanuelsson 2012) – and the tangency portfolio - maximising the sharpe ratio. Nonetheless, while developing these portfolios, we also considered some restrictions imposed for Portuguese non-listed open-ended Real Estate funds, which are presented in Appendix 13.2, and assumed no short-selling was possible. The goal is to find the optimal capital allocation for direct Real Estate (using data from *Imofomento*), cash, and REITs (*BNP Paribas Easy FTSE EPRA/NAREIT Developed Europe UCITS ETF)*.

To minimise the portfolio variance, we applied the following formula:

$$\sigma^2_{portfolio} = w_A^2\,\sigma_A^2 + w_B^2\,\sigma_B^2 + w_C^2\,\sigma_C^2 + 2w_A w_B \rho_{AB}\sigma_A\sigma_B + 2w_A w_C \rho_{AC}\sigma_A\sigma_C + 2w_B w_C \rho_{BC}\sigma_B\sigma_C \quad (14)$$

Where w_i is the weight of asset *i*, the σ_i^2 is the variance of asset *i,* and the ρ_{ij} is the correlation coefficient between assets *i* and *j*. We conclude that the optimal capital allocation is investing 64% in direct Real Estate, 33.33% in cash and 2.67% in REITs (Appendix 13.3). Consequently, the annualised return and standard deviation are 4.9% and 2.29%, respectively, resulting on a sharpe ratio of 2.31. This investment strategy is much more appropriate to *Imofomento*.

On the other hand, we also studied the tangency portfolio's case (maximum sharpe ratio). By following this strategy, we expected to obtain a higher standard deviation as well as a higher return compared to the previous strategy. Under these conditions, the optimal capital allocation is to invest 60.60% in direct Real Estate, 33.33% in cash and 6.07% in listed Real Estate (Appendix 13.3). The return increases to 6.50%, yet the standard deviation rises less than expected (2.61%). This results on a sharpe ratio of 2.64, higher than the minimum the variance strategy.

While the minimum variance approach presents a lower annualised volatility, the tangency portfolio approach presents a slightly higher annualised volatility. Yet, in both cases, the level

of volatility is similar to the current risk profile of *Imofomento* (Level 2, according to CMVM). All in all, both portfolios are very attractive and the choice between the two depends solely on the client's risk-return preferences.

13.2.4 Hedge Strategies – Minimum Variance and Maximum Sharpe

This strategy analyses the potential diversification opportunities arising from investments in Real Estate hedged indexes. REITs are highly exposed to the stock market due to its daily trading feature, which ends up exposing this asset class to a higher level of risk. Hence, we applied Stevenson's (2000) framework to construct a hedged index based on the STOXX Europe 600. The main goal is to eliminate the effect of the stock market from the listed Real Estate security, and consequently, get closer to the actual returns of direct Real Estate. Therefore, we adjusted the original indirect security for the influence of their respective equity markets through the following regression:

$$r_t^p = \alpha + \beta r_t^e + \mu_t \quad (15)$$

Where r_t^p is the unhedged index – *BNP Paribas Easy FTSE EPRA/NAREIT Developed Europe UCITS ETF* – total return, the r_t^e is the respective equity index – STOXX Europe 600 – total return, α is the intercept and β is the estimated beta coefficient. We then retrieved the hedged Real Estate index as:

$$r_t^{hp} = r_t^p - \beta r_t^e \quad (16)$$

Where r_t^{hp} is the hedged index. Since the relationship between indirect Real Estate securities and the stock market may not be stable throughout time, we applied the strategy defined by Stevenson (2000), computing a forty-eight-month rolling beta[39].

Following the same approach as the No Hedge, we constructed the same two portfolios – minimum variance and tangency portfolio – based on the same constrains. However, the securities included in this strategy are direct Real Estate, cash, and the Real Estate hedged index. Because this approach implies selling the STOXX Europe 600, we assumed transaction costs of 0.4%, which is the value indicated by Morning Star (2020) for this security.

By minimising the portfolio's variance strategies, the optimal capital allocation is investing 63.36% in direct Real Estate, 33.33% in cash and 3.31% in the hedged index (Appendix 13.4). As a result, the annualised return is 4.96%, and the annualised standard deviation is 2.20%, which implies a sharpe ratio of 2.44. Furthermore, by computing the tangency portfolio, the optimal capital allocation is to invest 61.01% in direct Real Estate, 33.33% in cash and 5.66% in the hedged index (Appendix 13.4). The respective annualised return is 5.90%, annualised standard deviation of 2.54%, and a sharpe ratio of 2.48.

It is worth noticing that both strategies face a slightly lower variance than in the *No Hedge* strategy. This was already expected since hedging the REITs index against its implicit volatility derived from the stock market. Therefore, the client should consider both options, as they allow for a better risk-return trade-off.

[39] We computed 51 betas, through an OLS regression for each 48-month period. Overall, we achieved an average beta of 83.89% for the period analysed, which clearly demonstrates the positive correlation between REITs and the stock market.

13.3 Testing the *Hedge* and *No Hedge* Strategies

In order to further inform the client on the two recommended strategies – the *No Hedge* and the *Hedge* – we performed a new analysis, aiming to understand what would have been the performance of *Imofomento* if the asset management team had invested in REITs since 2015. Thus, given the strategies described before, we assumed the capital invested in REITs equal to the capital allocation computed on each optimal portfolio. That percentage invested in REITs would be discounted from the fund's liquidity and the percentage invested in direct Real Estate would remain the actual value verified for the period between 2015 and 2019. We show the results in Appendix 13.5.

For instance, when considering the *No Hedge* strategy tangency portfolio, if the asset management team had invested 6.07% in *BNP Paribas Easy FTSE EPRA/NAREIT Developed Europe UCITS ETF*, the fund's annualised return and info sharpe would have been of 6.64% and 2.52, respectively – both substantially better than the actual results of 3.42% and 1.45. In fact, all these strategies would have produced higher returns and better risk-return levels than the ones they did and are highly recommended to be analysed by the client.

To conclude, there is clear evidence that including REITs in *Imofomento*'s portfolio will lead to a better overall performance. This diversification solution will be useful to deliver more attractive returns to investors. Still, it will also decrease the portfolio's exposure to some specific risks that were already mentioned, such as liquidity and asset concentration risk.

14 The Knowledge Initiative

This thesis addresses the fundamental drivers of Real Estate returns, from a risk management perspective, determined based on the literature. We adapted the academic support to the Portuguese market and the client itself. Moreover, the literature pointed towards risks that are not yet fully priced in the market, such as ESG risk. Therefore, there was a further need to confirm whether different stakeholders understood the ESG factors involved in Commercial Real Estate investments and included them in valuations. To address the previous needs, we developed three surveys targeting three main stakeholders: (1) Real Estate department, (2) tenants and (3) appraisers. This chapter summarises the main results.

Appraisers' Survey

The goal of this survey was to understand the appraisal process in Portugal further, and the main drivers considered by the experts. From a sample of twenty appraisers, there was a 50% adherence. We divided the survey into three main sections, that tackled the most commonly used appraisal methods, the macroeconomic variables considered to be the most relevant, and the level of knowledge and integration on ESG matters. We found that the majority (80%) of the appraisers use the yield method (the income capitalisation method), as shown in Appendix 14.1.

Moreover, the macroeconomic variables worth highlighting are the economic cycles and the long-term interest rates considered by all appraisers – and the unemployment rate, real GDP growth, inflation rate, monetary policy by the central banks – even though with a lower representativity. Concerning ESG, half of the appraisers recognise that the topic has been impacting valuations more substantially in recent years. A major 90% of appraisers that answered the survey considered these topics when performing an appraisal, such as energy efficiency (obtained from the energy certificates) or even going deeper in other ESG issues, as

shown in Appendix 14.2. In fact, 70% of the appraisers stated they included a premium for green buildings, and 80% said the same for smart buildings (Appendixes 14.3 and 14.4, respectively)

Tenants' Survey

Commercial Real Estate investments' success depends on quality tenants, stressing the need to understand the considerations that drive the demand side, emphasising ESG awareness and integration. There was only a 10% response ratio for this survey, yet the results we got are relevant. Firstly, the top three ESG factors considered by tenants when choosing a renting property were the building's energetic efficiency (e.g. the use of LED lamps), the good conditions and safety of workers, and lastly the proximity to public transports.

It was also reported a 61,1% rate of property exclusions in the selection process due to poor ESG character (Appendix 14.5), and that 44% of tenants are willing to have a lease agreement that tackles social or government environmental characteristics as this conclusion reflects in Appendix 14.6. Surprisingly, 61,1% disclosed that they had little knowledge or were not familiar with the ESG topic (Appendix 14.7), yet considering ESG factors in their decisions, such as installing LEDs and improving workers' conditions. The previous answers indicate that tenant's value ESG factors, yet not possessing a wide knowledge on this topic. Lastly, 61,1% of the respondents were willing to pay a rental premium for buildings with better ESG characteristics or a more sustainable location, as shown in Appendix 14.8.

Real Estate and Risk Department's Survey

The survey targeted the Real Estate and Risk departments to assess the current practices and knowledge on Real Estate risk management, again focused on ESG factors, and obtained 60% response ratio. Firstly, 83,3% affirmative answers for considering that the current investment procedures for decision-making and monitoring follow an appropriate framework, as

demonstrated in Appendix 14.9. Moreover, when assessing the important factors for risk management, all respondents consider vacancy risk as a crucial one, but tenant, valuation and liquidity were also considered.

Focusing on the ESG topic, 83,3% responded either being vaguely familiar or extremely familiar (Appendix 14.10), yet not using this information in the investment process meaning. Also, 66,6% answered that they did not assess material ESG risks and opportunities when making investment decisions (Appendix 14.11), and the majority answered not tracking the information concerning the ESG impact in the company's financial performance and ESG performance for Real Estate assets.

However, it is worth noticing that even though not considering including ESG factors in investment decisions, it was possible to conclude that many employees do so unconsciously. They consider aspects that are pro-ESG, yet without realising that the previous is the effect of ESG factors. Concerning the UNPRI reporting framework, 66,6% said they were unaware of these requirements, while no one had seen its last update released in November 2020, as shown in Appendix 14.12.

This survey was composed of two other sections, that tackle BPI's alignment with its tenants and appraisers. Regarding, tenants BPI's employees believe that tenants account for ESG factors such as energy efficiency, good and safe conditions for workers and proximity to transports – coincident with the tenants' answers. Moreover, 33,3% of the team members that answered the survey thought tenants were willing to pay a premium for more ESG-friendly buildings or to have their location updated to a more sustainable one. Simultaneously, the remaining did not believe this was something valued by the tenants – which contrasts with the tenant's survey that verified a much higher percentage of affirmative answers. Concerning the alignment with appraisers, BPI's team believed GDP growth, economic cycles, interest rates and inflation were

the macroeconomic factors mostly considered in valuations, as well as that ESG impacts appraisal – which goes in line with the appraisers.

Conclusions

Overall, the surveys allowed us to extract some important conclusions that support, in addition to the literature, the choice of the fundamental drivers for Commercial Real Estate and the approach to risk management. Concerning the appraisers, a preference for the yield method is verified, as well as for certain macroeconomic and ESG factors. Tenants also considered the previous as relevant, with the possibility of excluding properties based on their poor ESG characteristics, added to the option of paying a premium for buildings more ESG-friendly. Lastly, the Real Estate and risk teams believe they have the appropriate systems for risk management in place, yet not being familiar nor considering ESG factors when assessing their investments, added to a poor understanding of the UNPRI requirements for this asset class. Nonetheless, it is critical to notice that the company has several interests aligned with tenants and appraisers – two significant Commercial Real Estate industry stakeholders.

15 Conclusions

This paper seeks to investigate Commercial Real Estate drivers while developing a risk management approach that integrates macro and micro factors, tailored to BPI GA's *Imofomento* Real Estate fund. The main goal was to deliver a robust assessment of the portfolio's materially relevant risks and to develop measurement and monitoring tools to manage them. Furthermore, a client's central requirement was the maximisation of the UNPRI's Real Estate score. Therefore, we developed an action plan that tackles ESG risk management aligned with the previous requirements.

Regarding the macro risk components, we found that real GDP growth, inflation, money supply growth and the 10-year interest rates growth were significant factors in explaining Commercial Real Estate price variations. Nonetheless, the models' R squared indicates that these factors do not entirely explain Commercial Real Estate performance. Through an extensive literature review, market research and survey assessment, we identified several material micro risk factors and incorporated them on the risk assessment framework. The micro risks found relevant are tenant, vacancy, liquidity, asset concentration and ESG.

By performing an in-depth analysis of both macro and micro drivers, we built a concise valuation model that predicts the near future capitalization rates. The model aims to minimise the real appraisers' valuation process's subjectivity and offer a more material perspective of risk premiums. Nonetheless, we recommend further research on this topic, to define holistic weights for each risk premium and measure the non-currently priced risk attributes, namely seismic, flood and ESG risks. Furthermore, we developed a dashboard on Power BI and a database on Access that allows the client for a more interactive and descriptive tool to monitor the material risks identified (described in Appendix 15.1 and Appendix 15.2, respectively).

Many researchers have analysed whether adding listed Real Estate increases risk-adjusted returns on a direct Real Estate portfolio. This paper also explores the inclusion of Real Estate Investment Trusts (REITs) within *Imofomento's* portfolio, finding an optimal mix between liquidity, publicly-traded Real Estate securities and direct Real Estate for different investment strategies. Results indicate that, for the period considered, REITs improve risk-adjusted returns. The capital allocated to those assets is relatively low as listed Real Estate securities tend to be very volatile. Lastly, Commercial Real Estate transactions occur in private and illiquid markets – with low transparency and data availability. However, the sector's fast growth implies that more transparent channels of information must be made available to develop a better and more universal understanding of its underlying risks.

16 References

Allianz Global Investors. 2015. “ESG in Real Estate.”

Adair, Alastair, and Norman Hutchison. 2005. “The Reporting of Risk in Real Estate Appraisal Property Risk.” *Journal of Property Investment & Finance* 23 (3): 254-268.

Agência Portuguesa do Ambiente . 2014. “Avaliação Nacional de Risco.”

Allianz Global Investors. 2015. *ESG in Real Estate.* Market Analysis, Munich: Allianz GI Global Solutions.

Amel-Zadeh, Amir, and George Serafeim. 2017. “Why and How Investors Use ESG Information: Evidence from a Global Survey.”

Ametefe, Frank Kwakutse, Steven Devaney, and Simon Andrew Stevenson. 2018. “Optimal composition of hybrid/blended real estate portfolios.” *Journal of Property Investment* 37 (1): 20-41.

Ang, Andrew. 2014. “Chapter 11: Real Assets.” In *Asset Management - A Systematic Appraoch for Factor Investing*, 374-380. New York: Oxford University Press.

Associação Portuguesa de Fundos de Investimento, Pensões e Patrimónios. 2020. *Volumes Sob Gestão – Sociedades Gestoras.* Accessed September 14, 2020. http://www.apfipp.pt/report.aspx?itemcode=Volumes_SGFIM_PUB_PT.rpt&calendar=no&type=FIM.

Association of the Luxembourg Fund Industry. 2018. “Association of the Luxembourg Fund Industry.” 16 May. Accessed 10 06, 2020. https://members.alfi.lu/publications/AlfiPublications/Liquidity-Stress-Testing-Considerations-for-Real-Estate-Funds.pdf.

Association, PRI. 2018. “PRI Reporting Framework: Main Definitions.”

Athena Advisers. 2020. *Portugal Commercial Property Investment.* London: Athena Advisers.

Autorité des Marchés Financiers. 2017. “The Use of Stress Tests as Part of Risk Management: Guide for asset management companies.”

Baele, Lieven , Geert Bekaert, and Koen Inghelbrecht. 2010. “The Determinants of Stock and Bond Return Comovements.” *The Review of Financial Studies* 23 (6): 2374–2428.

Bannier, Christina E., Falko Fecht, and Marcel Tyrell. 2007. “Open-end real estate funds in Germany – genesis and crisis.” *Discussion Paper Series 2: Banking and Financial Studies, Deutsche Bundesbank.*

Baum, Andrew, and Neil Crosby. 2008. *Property Investment Appraisal.* New Jersey: John Wiley & Sons.

Baum, Andrew, David Mackmin, and Nick Nunnington. 2011. *The Income Approach To Property Valuation.* Abingdon: Routledge.

Bender, Jennifer, Remy Briand, Dimitris Melas, and Raman Subramanian. 2013. *Foundations of Factor Investing.* MSCI.

Bérubé, Vincent, Sacha Gai, and Jonathan Tétrault. 2015. *From indexes to insights: the rise of thematic investing.* 1 December. Accessed October 24, 2020. https://www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/from-indexes-to-insights-the-rise-of-thematic-investing.

Best, Henning, and Christof Wolf. 2014. *The SAGE Handbook of Regression Analysis and Causal Inference.* 1st. London: SAGE Publications Ltd.

Bizoumi, Tania, Socrates Lazaridis, and Natassa Stamou. 2019. “Innovation in Stock Exchanges: Driving ESG Disclosure and Performance.” *Journal of Applied Corporate Finance* 72-79.

Black, Fischer , Michael Jensen, and Myron Scholes. 1972. “The Capital Asset Pricing Model: Some Empirical Tests.” In *Studies in the Theory of Capital Markets*, edited by Michael C. Jensen, 79-124. New York: Praeger Publishers Inc.

Block, Ralph L. 2011. “REITs: What They Are and How They Work.” In *Investing in REITs - Real Estate Investment Trusts*, edited by Bloomberg Press, 3-10. Hoboken, New Jersey: John Willey & Sons, Inc.

Blundell, Gerald F., Simon Fairchild, and Robin N. Goodchild. 2005. “Managing Portfolio Risk in Real Estate.” *Journal of Property Research* 22 (3): 115-136.

Bodie , Zvi, Alex Kane, and Alan Marcus. 2013. “Equilibrium in Capital Markets.” In *Investments*, 293-342. New York: McGraw-Hill Education.

Bollo, Christina Suzanne. 2019. “Reducing apartment vacancy duration: lessons from affordable housing.” *Property Management* 37 (3): 450-466.

Bouveret, Antoine. 2017. “Liquidity Stress Tests for Investment Funds: A Practical Guide.” *IMF Working Paper.*

Brounen, Dirk, and Gianluca Marcato. 2018. “Sustainable Insights in Public Real Estate Performance: ESG Scores and Effects in REIT Markets.”

Cajias, Marcelo, Franz Fuerst, Patrick McAllister, and Nanda Anupam. 2014. “Do Responsible Real Estate Companies Outperform Their Peers?” *International Journal of Strategic Property Management* 18 (1): 11-27.

Caputo, Andrea. 2013. “Systemic Stakeholders’ Management for Real Estate Development Projects.” *Global Business and Management Research: An International Journal* 66-82.

Carhart, Mark M. 1997. “On Persistence in Mutual Fund Performance.” *Journal of Finance* 52: 57-82.

CBRE. 2020. *EMEA Real Estate.* CBRE.

CBRE. 2019. *Portugal Property Perspective.* CBRE.

CFA Institute. 2018. *Alternative Investments and Portfolio Management.* Wiley.

—. 2020. *CFA Program Curriculum. Level I.* Charlottesville, VA: John Wiley and Sons.

Cheng, Ping, Zhenguo Lin, and Yingchun Liu. 2010. “Illiquidity, transaction cost, and optimal holding period for real estate: Theory and application.” *Journal of Housing Economics* 19 (2): 109-118.

Chun, Gregory H., Brian A. Ciochetti, and James Shilling. 2000. “Pension Plan Real Estate Investment in an Asset-Liability Framework.” *Real Estate Economics* 28 (3): 467-491.

Comissão do Mercado de Valores Mobiliários. 2020. 3 December. https://web3.cmvm.pt/sdi/peritos/peritos.cfm.

Comissão do Mercado de Valores Mobiliários. 2020. *Circular Anual Peritos Avaliadores De Imóveis / 2020.* Lisbon: CMVM.

Connor, Gregory, and Robert Korajczyk. 2010. “Factor Models in Portfolio and Asset.” In *Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques*, edited by John Guerard, 401-418. Springer.

CoreData Research. 2019. “ESG embracement from Instituitional investors .”

Crosby, Neil, Cath Jackson, and Allison Orr. 2016. “Refining the Real Estate Pricing Model.” *Journal of Property Research* 33 (4): 332-358.

Cushman & Wakefield. 2020. “Markebeat Portugal Office Q2 2020.” New York.

—. 2020. “Portugal Insights.” September. Accessed October 15, 2020. https://www.cushmanwakefield.com/pt-pt/portugal/insights.

Delfim, Jean Christophe, and Martin Hoesli. 2016. “Risk Factors of European Non-Listed Real Estate.” *Journal of Property Research* 33 (3): 190–213.

Derwall, Jeroen, Kees Koedijk, and Jenke Ter Horst. 2011. “At tale of values-driven and profit-seeking social investors.” *Journal of Banking and Finance* 35 (8): 2137-2147.

Devaney, Steven, Pat McAllister, and Anupam Nanda. 2017. “Determinants of transaction activity in commercial real estate markets: evidence from European and Asia-Pacific countries.” *Journal of Property Research* 34 (1): 251-268.

Dimson, Elroy, Oğuz Karakaş, and Xi Li. 2015. *Active Ownership.* Fox School of Business .

Eccles, Robert G., Michael P. Krzus, and George Serafeim. 2011. “Market Interest in Nonfinancial Information.” *Journal of Applied Corporate Finance* 113-127.

Esrig, Dave, Michael C Hudgins, and Luigi Cerreta. 2011. “Revisiting the Impact of Large Assets on Real Estate Portfolio Returns.” *The Journal of Portfolio Management* 35 (5): 125-136.

European Securities and Markets Authority. 2019. “Stress Simulation for Investment Funds.” *ESMA Economic Report.*

European Union. 2014. “Directive 2014/95/EU.”

Fama , Eugene , and Kenneth French. 1992. “The Cross-Section of Expected Stock Returns.” *The Journal of Finance* 47 (2): 427-465.

Fisher, Irving. 1930. *The Theory of Interest, as determined by Impatience to Spend Income and Opportunity to Invest it.* New York: Macmillan.

Fisher, Jeff, David Geltner, and Henry Pollakowski. 2007. “A quarterly transactions-based index (TBI) of institutional real estate investment performance and movements in supply and demand.” *The Journal of Real Estate Finance and Economics* 34: 5-33.

Fisher, Jeffrey D., and Bryan D. MacGregor. 2020. “Reading 39: Alternative Investments.” In *CFA Program Curriculum 2020 Level II: Volume 6*, 1-74. New Jersey: John Wiley and Sons.

Fisher, Jeffrey, Dean Gatzlaff, David Geltner, and Donald Haurin. 2004. “An Analysis of the Determinants of Transaction Frequency of Institutional Commercial Real Estate Investment Property.” *Real Estate Economics* 32 (2): 239–264.

Fisher, Jeffrey, Dean Gatzlaff, David Geltner, and Donald Haurin. 2003. “Controlling for the impact of variable liquidity in commercial real estate price indices.” *Real Estate Economics* 31 (2): 269–303.

Friede, Gunnar, Timo Busch, and Alexander Bassen. 2015. “ESG and financial performance: aggregated evidence from more than 2000 empirical studies.” *Journal of Sustainable Finance & Investment* 5 (4): 210-233.

Fuerst, Franz, and Jorn van de Wetering. 2015. “How does environmental efficiency impact on the rents of commercial offices in the UK.” *Journal of Property Research* 193-216.

Fuerst, Franz, and Patrick McAllister. 2008. *Green Noise or Green Value? Measuring the Price Effects of Environmental Certification in Commercial Buildings.* Henley Business School.

Georgiev, Georgi, Bhaswar Gupta, and Thomas Kunkel. 2003. “Benefits of Real Estate Investment.” *The Journal of Portfolio Management Special Real Estate Issue* 29 (5): 28-33.

Giannotti, Claudio, and Gianluca Mattarocci. 2009. “How to evaluate risk for Italian real estate funds.” *Journal of European Real Estate Research* 2 (2): 132-150.

GIIN. 2020. “Annual Impact Investor Survey.”

GIIN. 2019. “What is impact investing.”

Global Credit Data. 2019. “PD Benchmarking Report 2019.” 19 December. Accessed November 10, 2020. https://www.globalcreditdata.org/library/pd-benchmarking-report-2019.

Gordon, M J. 1959. “Dividends, Earnings and Stock Prices.” *The Review of Economics and Statistics* 41 (2): 99-105.

Green Building Council. 2019. “New report: the building and construction sector can reach net zero carbon emissions by 2050.” https://www.worldgbc.org/news-media/WorldGBC-embodied-carbon-report-published.

Grenadier, Steven R. 1996. “Leasing and credit risk.” *Journal of Financial Economics* 42: 33-364.

Gupta, Ashish , Graeme Newell, Deepak Bajaj, and Satya Mandal. 2018. “Identifying the Risk Factors in Indian Non-Listed.” *Journal of Property Investment and Finance* 36 (5): 429-453.

Gupta, Ashish, and Piyush Tiwari. 2016. “Investment Risk Scoring Model for Commercial Properties in India.” *Journal of Property Investment & Finance* 34 (2): 156 - 171.

Gyourko, Joseph, and Donald Keim. 1992. “What Does the Stock Market Tell Us About Real Estate Returns?” *Real Estate Economics* 20 (3): 457-485.

Hair, Joseph, William Black, Barry Babin, and Rolph Anderson . 2015. “Principal Components and Common Factor Analysis .” In *Multivariate Data Analysis*, 16-18. Noida: Pearson.

Hoskins, Nicholas, David Higgins, and Richard Cardew. 2004. “Macroeconomic Variables and Real Estate Returns: An International Comparison.” *The Appraisal Journal* 72 (2): 163 - 170.

Houweling, Patrick, and Jeroen van Zundert. 2017. “Factor Investing in the Corporate Bond Market.” *Financial Analysts Journal* 2 (73): 100-115.

Ibbotson, Roger G, and Laurence B Siegel. 1984. “Real estate returns: A comparison with other investments.” *Journal of the American Real Estate & Urban Economics Association* 12 (3): 219-242.

Ilmanen, Antti , Rory Byrne, Heinz Gunasekera, and Robert Minikin. 2004. “Which Risks Have Been Best Rewarded?” *Journal of Portfolio Management* 30 (2): 53-57.

INREV. 2020. “Global asset managers achieve record €3 trillion of real estate AUM.” *INREV.* https://www.inrev.org/news/press/global-asset-managers-achieve-record-eu3-trillion-real-estate-aum.

Jackson, Cath, and Allison Orr. 2011. “Real estate stock selection and attribute preferences.” *Journal of Property Research* 28 (4): 317-339.

JDM Associates. 2017. “Stakeholder Engagement – the Why, Who, What, & How?” *GRESB.*

Jianping Mei, Ahyee Lee. 1994. “Is There a Real Estate Factor Premium?” *Journal of Real Estate Finance and Economics.*

JLL. 2019. *Market 360 S1 2019.* Lisbon: JLL.

JLL. 2020. *Market 360º 2019 S1.* Lisbon: JLL.

—. 2020. “Research EMEA: Portugal.” Accessed September 15, 2020. https://www.jll.pt/content/dam/jll-com/documents/pdf/research/emea/portugal/en/jll-pt-investing-in-the-rental-market-2020.pdf.

Jornal de Negócios. 2020. *Imobiliário: navegar à bolina.* Accessed November 12, 2020. https://www.jornaldenegocios.pt/mais/analises-deco/detalhe/imobiliario-navegar-a-bolina.

Jostova, Gergana, Stanislava Nikolova, Alexander Philipov, and Christof Stahel. 2013. “Momentum in Corporate Bond Returns.” *The Review of Financial Studies* 26 (7): 1649–1693.

Just, Tobias. 2017. “Understanding German Real Estate Markets.” *Springer International Publishing Switzerland 2017* (Library of Congress Control Number: 2016954195) 496.

Kennedy, Paul J., and Andrew Ellis Baum. 2012. “Aligning Asset Allocation and Real Estate Investment: Some Lessons from the Last Cycle.” *Henley Business School Working Paper.*

Klimczak, Karol. 2010. “Determinants of Real Estate Investment.” *Economics and Sociology* 3 (2): 58-66.

Kolomatsky, Michael. 2017. *Does a Building’s Age Affect the Rent?* Accessed October 16, 2020. https://www.nytimes.com/2017/08/18/realestate/does-a-buildings-age-affect-the-rent.html.

Kotsantonis, Sakis, Chris Pinney, and George Serafeim. 2016. “ESG Integration in Investment Management: Myths and Realities.”

Kotsantonis, Sakis, Chris Pinney, and George Serafeim. 2016. “ESG Integration in Investment Management: Myths and Realities.”

Laboratório Nacional de Engenheiria Civil. 2012. “Regiões de maior risco sismico em Portugal Continental.”

Lee, Stephen. 2014. “The Contribution Risk of REITs in the Blended Public and Private Real Estate Portfolio.” *Real Estate Finance* 30 (5): 50-55.

Li, Juan, and Xuemi Chen. 2015. “Analysis of China’s Real Estate Prices and Macroeconomy Based on Evolutionary Co-spectral Method.” *Journal of Industrial Engineering and Management* 8 (2): 598-614.

Ling, David, and Andy Naranjo. 2015. “Returns and Information Transmission Dynamics in Public and Private Real Estate Markets.” *Real Estate Economics* 43 (1): 163-208.

Ling, David, and Andy Naranjo. 2002. “Commercial Real Estate return performance: a cross-country analysis.” *Journal of Real Estate Finance and Economics* 24 (2): 119-142.

Ludvigson, Sydney, and Serena Ng. 2009. “Macro Factors in Bond Risk Premia.” *The Review of Financial Studies* 22 (12): 5027–5067.

MacKinnon, Gregory H., and Ashraf Al Zaman. 2009. “Real estate for the long term: the effect of return predictability on long-horizon allocations.” *Real Estate Economics* 37 (1): 117-153.

MAGG. 2017. “Sismo. As 8 zonas mais perigosas em Lisboa se acontecer uma catástrofe.”

Manganelli, Benedetto, Pierluigi Morano, and Francesco Tajani. 2014. “Risk assessment in estimating the capitalization rate.” *WSEAS Transactions on Business and Economics* 11 (1): 199-208.

Marling, Hannes, and Sara Emanuelsson. 2012. “The Markowitz Portfolio Theory.”

Matysiak , George , and Franz Fuerst. 2013. “Analysing the Performance of Nonlisted Real Estate Funds: a Panel Data Analysis.” *Applied Economics* 45 (14): 1777–1788.

McDonald, J.F. 2000. “Rent, vacancy and equilibrium in real estate markets.” *Journal of Real Estate Practice and Education* 3 (1): 55-69.

Mercer Capital Partners. 2015. “AI survey: Global Insights on ESG in Alternative Investing.”

Miller, Clara, and Toni Johnson. 2015. “Mission-Aligned Investing: More complex than it seems.”

Morgan, Donald P. 2002. “Rating Banks: Risk and Uncertainty in an Opaque Industry.” *The American Economic Review* 92 (4): 874-888.

Moss, Alex, and Andrew Baum. 2013. “The use of listed real estate securities in asset management.” *EPRA Research.*

Moss, Alex, and Kieran Farrelly. 2014. *The performance implications of adding global listed real estate to an unlisted real estate portfolio: A case study for UK Defined Contribution funds.* European Public Real Estate Association.

Nareit. 2019. “U.S. REIT Industry Equity Market Cap.”

National Association of Real Estate Investment Trusts. 2011. *REITs, Private Equity Real Estate and the Blended Portfolio Advantage.* Accessed September 22, 2020. http://papers.org/newweb/documents/OptimizingRiskandReturninPensionFundRealEstate-MeredithDespins-NAREIT.pdf.

Nordea. 2020. “The Guide to Sustainable Investing.”

Oppenheimer, Pete H. 2002. “A critique of using real options pricing models in valuing real estate projects and contracts.” *Briefings in Real Estate Finance* 2 (3): 221-233.

Pagourtzi, Elli, Vassilis Assimakopoulos, Thomas Hatzichristos, and Nick French. 2003. “Real estate appraisal: A review of valuation methods.” *Journal of Property Investment and Finance* 21 (4): 383-401.

PORDATA. 2019. *Balança Comercial Portugal.* Accessed October 19, 2020. https://www.pordata.pt/Portugal/Balan%C3%A7a+comercial-2594.

Porter, Keith A., James L. Beck, and Rustem Shaikhutdinov. 2004. “Simplified Estimation of Economic Seismic Risk for Buildings.” *Earthquake Spectra* 20 (4): 1239-1263.

Pottinger, Gaye, and Anca Tanton. 2014. “Flooding and UK commercial property investment: what is the risk?” *Qualitative Research in Financial Markets* 6 (2): 1755-4179.

PRI. 2020. “An Introduction to Responsible Investing: Screening .”

PRI. 2018. “How ESG engagement creates value for investors and companies.”

PRI. 2018. “Main Definitions to PRI Reporting Framework.”

—. 2018. “PRI Reporting Framework: Main Definitions.” November. Accessed October 10, 2020. https://www.unpri.org/Uploads/i/m/n/maindefinitionstoprireportingframework_127272_949397.pdf.

PRI. 2018. “PRI Reporting Framework: Main Definitios.”

PRI. 2019. “What Is Responsible Investing?”

Prindiville, Ryan. 2020. *Four Commercial Real Estate Trends to Watch Post-COVID.*

Publico. 2017. “Mapa do passado dos sismos em Portugal esclarece riscos no futuro.”

Quan, Daniel C., and John M. Quigley. 1991. “Price formation and the appraisal function in real estate market.” *The Journal of Real Estate Finance and Economics* 4: 127–146.

Quan, Daniel, and Sheridan Titman. 1997. “Commercial Real Estate Prices and Stock Market Returns: An International Analysis.” *Financial Analysts Journal* 53 (3): 21-34.

RICS Valuation Professional Group. 2019. *RICS Valuation - Global Standards.* London: Royal Institution of Chartered Surveyors (RICS).

Royal Institution of Chartered Surveyors (RICS). 2019. *RICS Valuation - Global Standards.* London: Royal Institution of Chartered Surveyors (RICS).

Royal Institution of Chartered Surveyors. 2020. *RICS: Royal Institution of Chartered Surveyors.* 3 December. https://www.rics.org/uk/find-a-member/?firstName=&lastName=&town=&countryCode=PT#results.

Savills. 2019. *Portugal Real Estate Market Report.* Lisbon: Savills.

—. 2020. “Savills: Insight & Opinion.” 18 September. Accessed October 16, 2020. https://en.savills.pt/research_articles/254204/305216-0.

Shilling, James D., C. F. Sirmarns, and John B. Corgel. 1987. “Price Adjustment Process for Rental Office Space.” *Journal of Urban Economics* 22 (1): 90-100.

Short, Patricia, John Minnery, Elspeth Mead, Barbara Adkins, Andrew Peake, Debbie Fedrick, and Martin O'Flaherty. 2003. *Tenancy databases: risk minimization and outcomes.* Australian Housing and Urban Research Institute.

Sivitanides, Petros S., Raymond G. Torto, and William C. Wheaton. 2003. “Real Estate Market Fundamentals and Asset Pricing.” *The Journal of Portfolio Management Special Real Estate Issue* 29 (5): 45-53.

Sivitanides, Southard, Torto, and Wheaton. 2001. “The Determinants of Appraisal-Based Capitalization Rates.” *CBRE.*

Sivitanidou, Rena, and Petros Sivitanides. 1999. “Office Capitalization Rates: Real Estate and Capital Markets Influences.” *Journal of Real Estate Finance and Economics* 18 (3): 297-322.

Stephen, Lee, and Stevenson Simon. 2001. “The Case for REITs in the Mixed-Asset Portfolio in the Short and Long Run.” *Journal of Real Estate Portfolio Management* 11 (1): 55-80.

Stevenson, Simon. 2000. “International real estate diversification: Empirical tests using hedged indices.” *The Journal of Real Estate Research* 19 (2): 102-131.

Szumilo, Nikodem, Pascal Gantenbein, Werner Gleißner, and Thomas Wiegelmann. 2016. “Predicting uncertainty: the impact of risk measurement on value of real estate portfolios.” *Journal of Property Research* 33 (1): 1-17.

The SASB Foundation. 2018. *SASB Materiality Map.* Accessed November 26, 2020. https://materiality.sasb.org/.

Tira, Giovanni, and Gianluca Marcato. 2010. “Liquidity Pricing In Unlisted Real Estate Funds.” January. Accessed October 20, 2020. https://eres.architexturez.net/doc/oai-eres-id-eres2018-215.

UN Global Compact & RICS. 2018. “Advancing Responsible Business in Land, Construction and Real Estate Use and Investment – Making the Sustainable Development Goals a Reality.”

UNEP Finance Initiative Property Working Group. 2009. “Owner-Tenant Engagement in Responsible Property Investing.”

UNPRI. n.d. “An introduction to responsible investment: real estate.”

Weber, Elke U, Niklas Siebenmorgen, and Martin Weber. 2005. “Communicating asset risk: How name recognition and the format of historic volatility information affect risk perception and investment decisions.” *Risk Analysis* 25 (3): 597-609.

Westermann, Steffen, Scott J. Niblock, and Michael A. Kortt. 2019. “Does it pay to be responsible? Evidence on corporate social responsibility and the investment performance of Australian REITs.” *ASIA-PACIFIC JOURNAL OF ACCOUNTING & ECONOMICS.*

Williams, Aime, and Judith Evans. 2017. “Property funds’ liquidity crisis lives on for investors.” *Financial Times.*

Wong, Woei Chyuan, Jonathan A. Batten, Abd Halim Ahmad, Shamsul Bahrain Mohamed Arshad, Sabariah Nordin, and Azira Abdul Adzis. 2020. “Does ESG certification add firm value?” *Finance Research Letters.*

World Commission on Environment and Development. 1987. *The Brundtland report: Our common future.* Oxford, Oxford University Press.

17 Appendix

Appendix Chapter 2: Asset Class Characterization

Appendix 2.1 – Debt Real Estate Exposure.

There are private and public markets for debt-based investments in Real Estate, namely through construction lending and mortgages. Debt funds play a significant role in the industry by lending large sums to buyers and entrepreneurs. Furthermore, public debt can be represented by the securitization of commercial or residential mortgages - mortgage-backed securities (MBS) which are bond-like investments formed by a package of a diversified portfolio of mortgages.

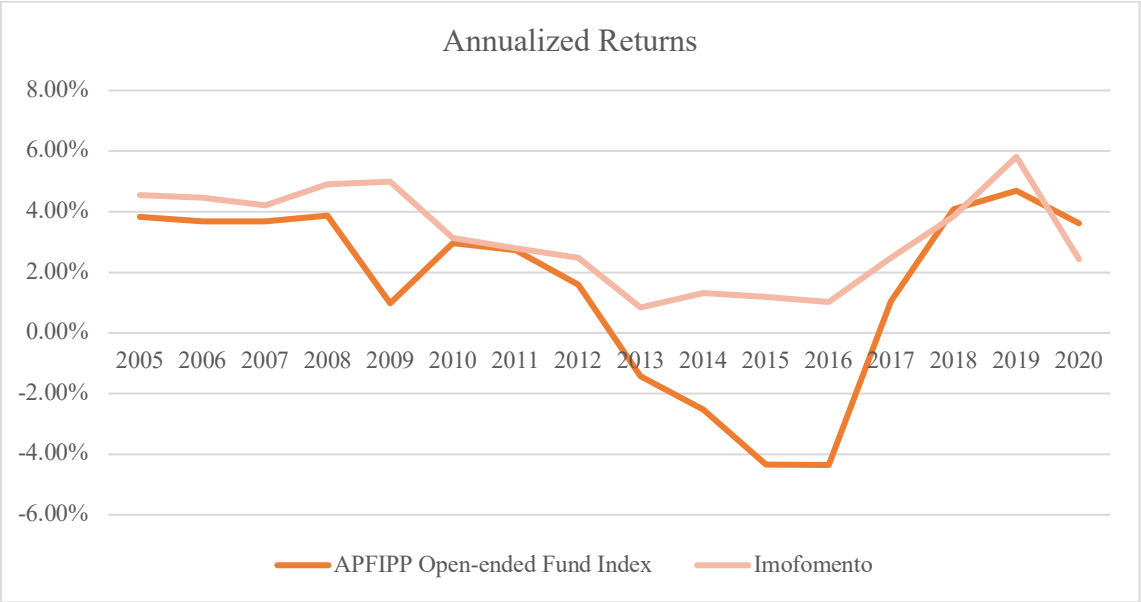
Appendix 2.2 – Real Estate funds: value-added and opportunistic.

The value-added strategy frequently seeks assets that aim to maximize their cash flow over time, through both changes and repositioning of the land. This strategy may include making physical modifications to the asset, thus seeking higher rents and increasing attempts to lease vacant space to quality tenants, enhancing land maintenance and customer loyalty, or minimizing operational expenses when feasible. When the property's net operating revenues increase, the aim is to sell the asset and gain market growth earnings. Efficient value-added strategies usually produce better financial returns for investors than core ventures due to asset inflation. These developments are more costly in terms of risk since properties do not run on maximum capacity at the acquisition time. It is not entirely rented, rented at lower market rents, and has not been adequately managed and properly maintained.

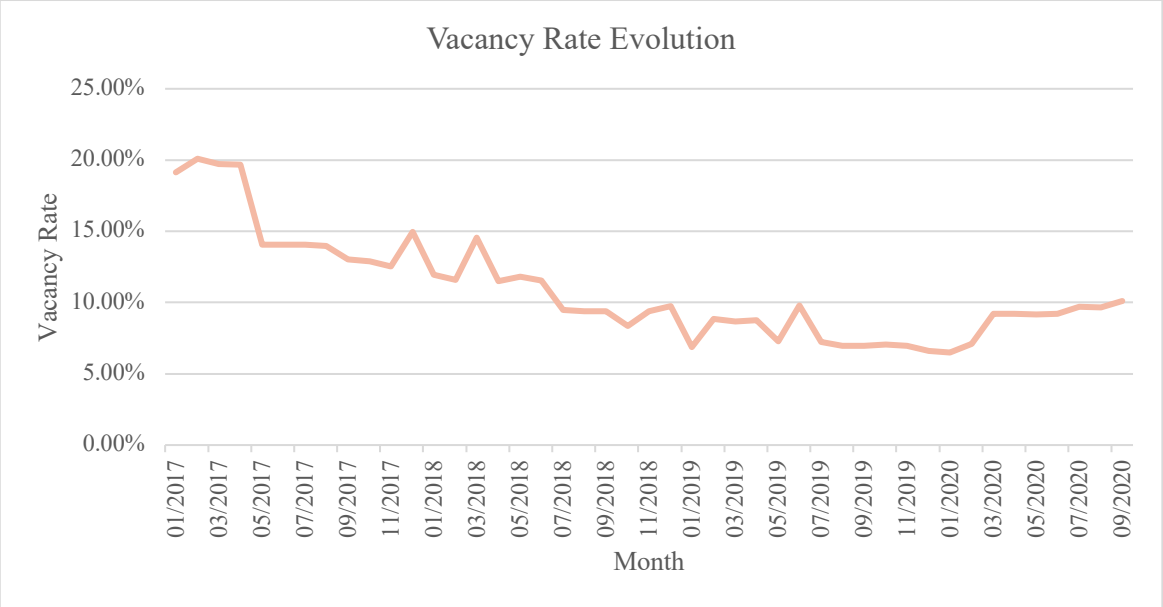
The opportunistic strategy follows the value-added approach, yet further extending the risk spectrum, entering the world of development and of niche markets that are riskier and tend to require essential rehabilitation, yet having the potential for high returns. When the investment strategy is successful, these ventures will deliver the highest returns but will face the most risk derived from their complicated management plans. Moreover, these assets have little to no cash flow in place at the time of acquisition or during the several development years, while being highly leveraged and exposed to market trends that might move against the investors.

Appendix Chapter 3: Company Overview

Appendix 3.1 – Annualized returns of the APFIIP open-end fund index and the *Imofomento* fund, between 2005 and 2020.



Appendix 3.2 – Evolution of *Imofomento*'s vacancy rate, between 2017 and 2020.

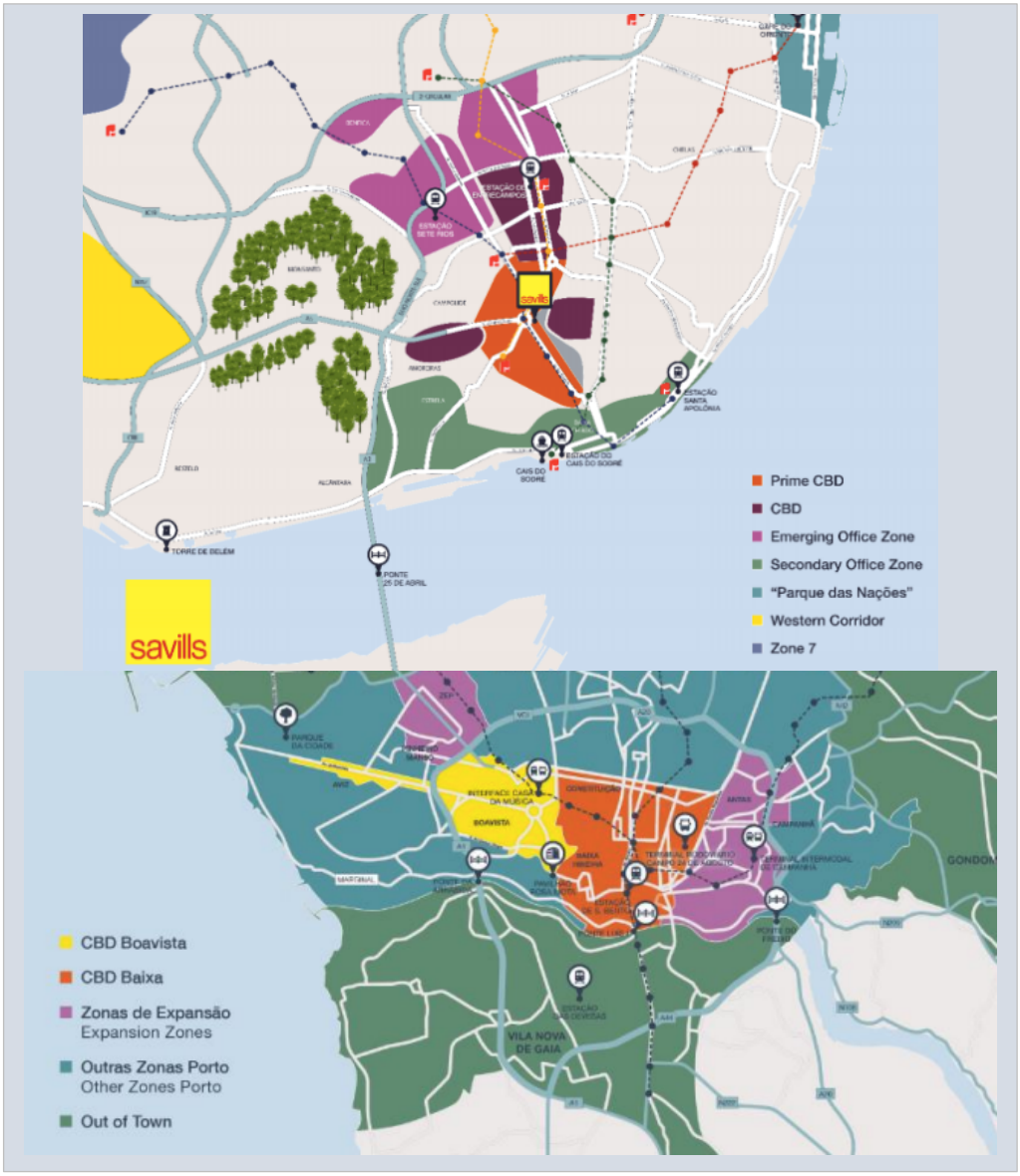


Appendix Chapter 4: Market and Industry Overview

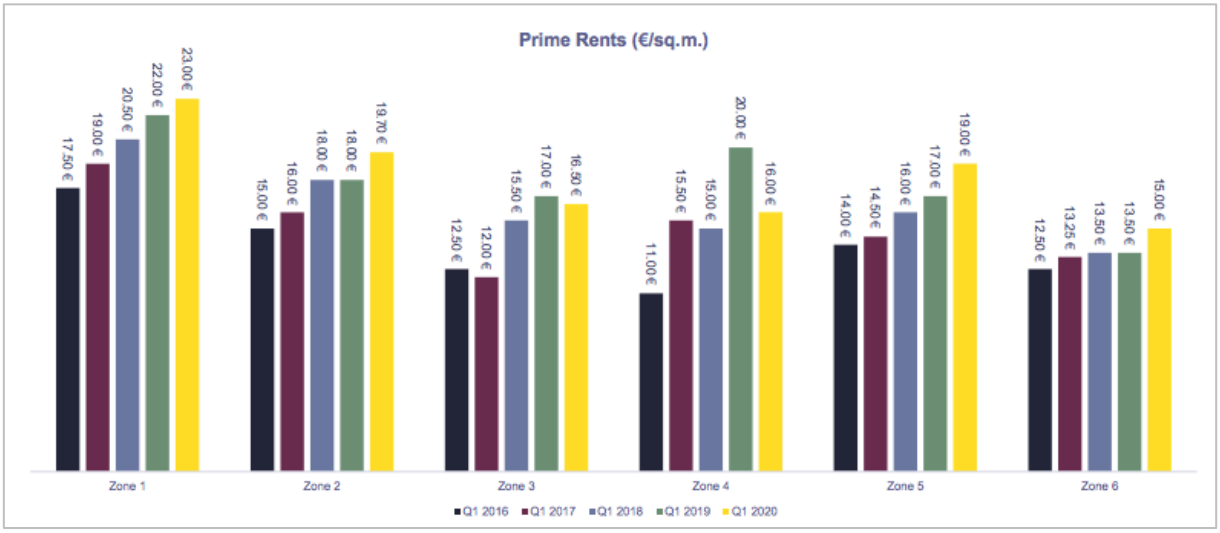
Appendix 4.1 – Prime yields for the different segments of CRE. Source: Savills, Q1 2020.

PRIME YIELD (%)	2016	2017	2018	2019	Q1 2020
Offices (Gross)	5.00	4.75	4.50	4.00	4.00
Shopping Centres (Net)	5.50	5.00	5.00	4.75	4.75
Retail Parks (Net)	7.25	6.75	6.75	6.50	6.50
High Street (Gross)	5.00	4.50	4.25	3.75	3.75
Industrial & Logistics (Gross)	7.00	7.00	6.50	6.25	6.25

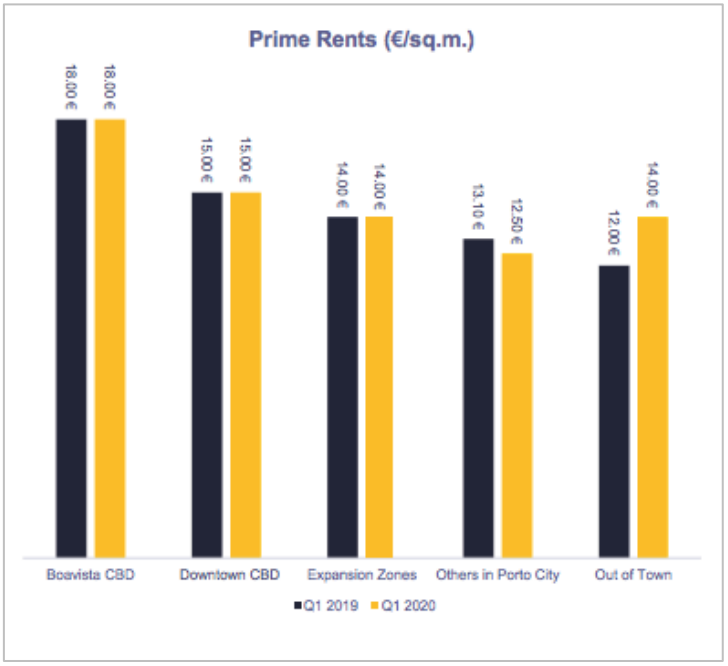
Appendix 4.2 **–** The different areas in Lisbon and Porto. Source: Savills, Q1 2020.



Appendix 4.3 **–** Prime rents in the Lisbon office market. Source: Savills, Q1 2020.



Appendix 4.4 **–** Prime rents in the Porto office market. Source: Savills, Q1 2020.



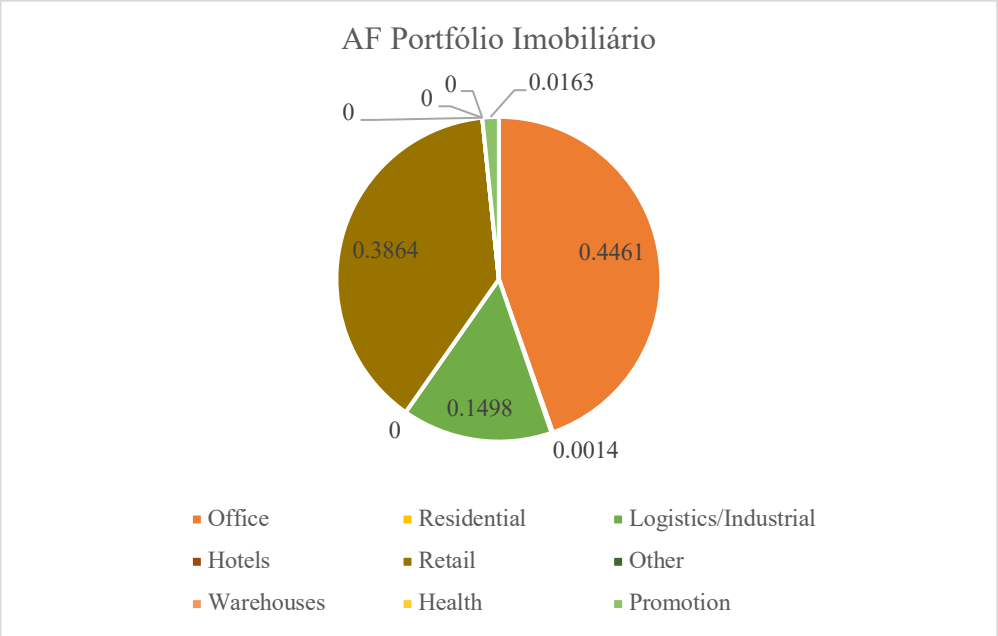
Appendix 4.5 – Summary of the major Portuguese players in the CRE non-listed open-end fund's market. The market data was retrieved from Fund's People (2019 market data) and the information from each fund and corresponding asset manager was obtained through their websites.

Management Firm	Market Share	Top Real Estate Fund
Interfundos	13.20%	AF Portfólio Imobiliário
Square Asset Management	10.40%	CA Património
Fundger	5.20%	Fundimo
BPI GA	5.00%	Imofomento
Silvip	4.40%	Vip

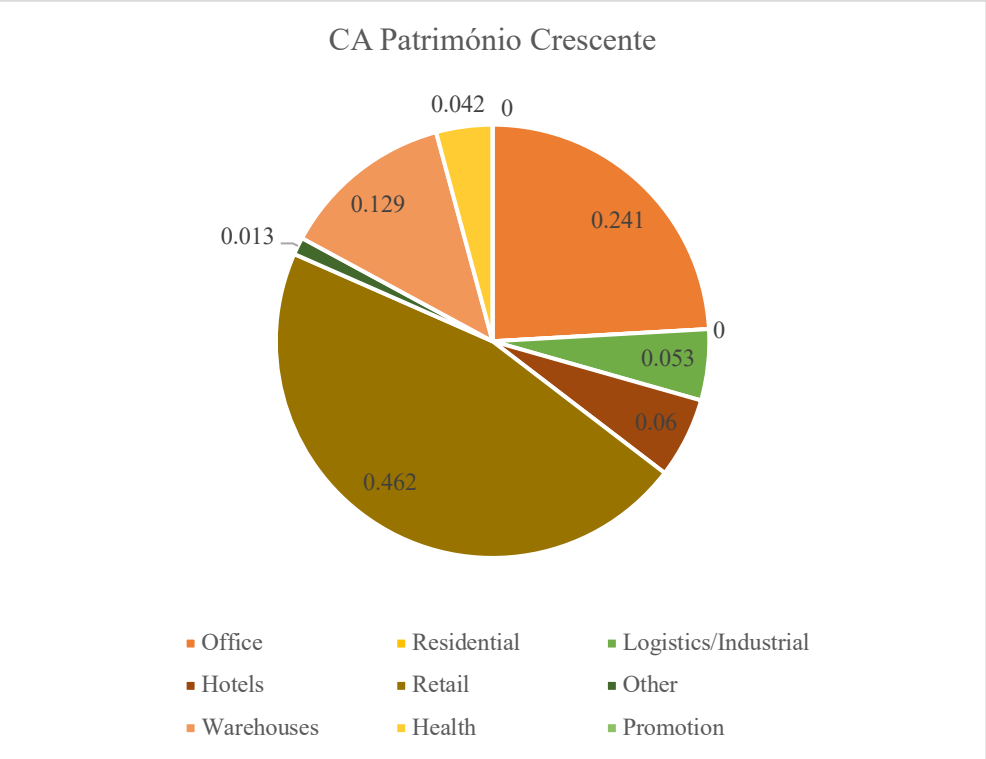
Appendix 4.6 – Summary of the top CRE non-listed open-end funds. The market data was retrieved from Fund's People (2019 market data) and the information from each fund and corresponding asset manager was obtained through their websites.

Real Estate Fund	AuM (million €)	Returns	UP Price	Volatility	Sharpe Ratio	Investment Type
AF Portfólio Imobiliário	261.72	3.43%	10.61 €	1.38%	3.09	Core/ Value added
CA Património	817.83	4,07%	18.14 €	0.61%	7.59	Core
Fundimo	608.60	6,03%	7.90 €	2.01%	1.99	Core
Imofomento	512.95	2.37%	5.92 €	1.35%	2.47	Core
Vip	308.84	3.85%	9.66 €	0.52%	7	Core/ Value added

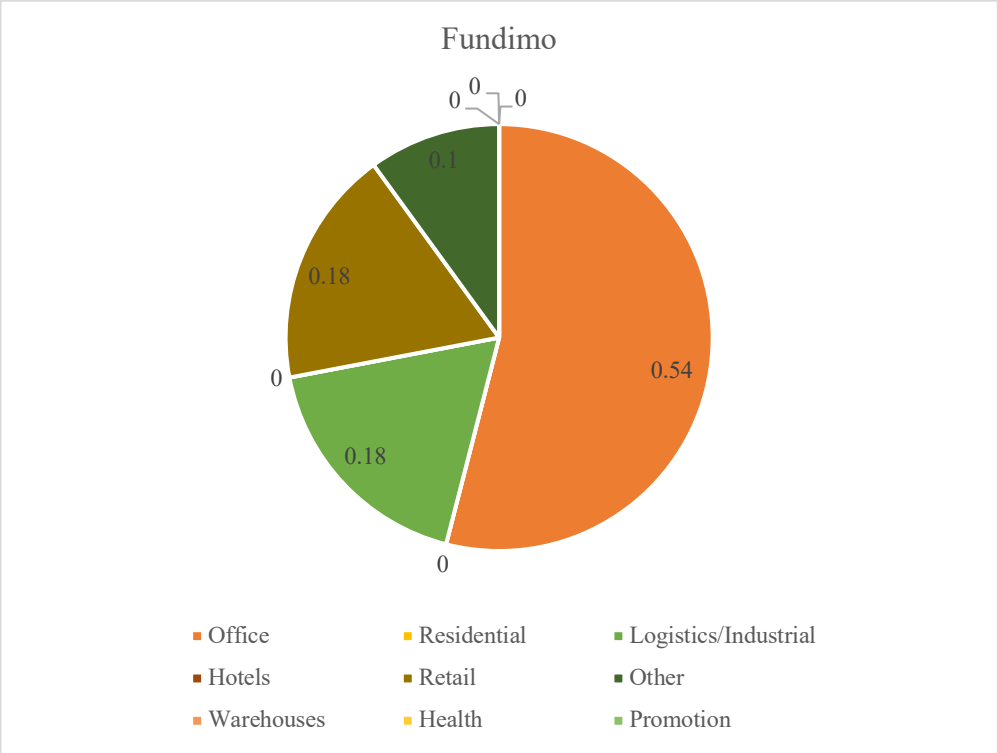
Appendix 4.7 – Segment distribution of *AF Portfólio Imobiliário*.



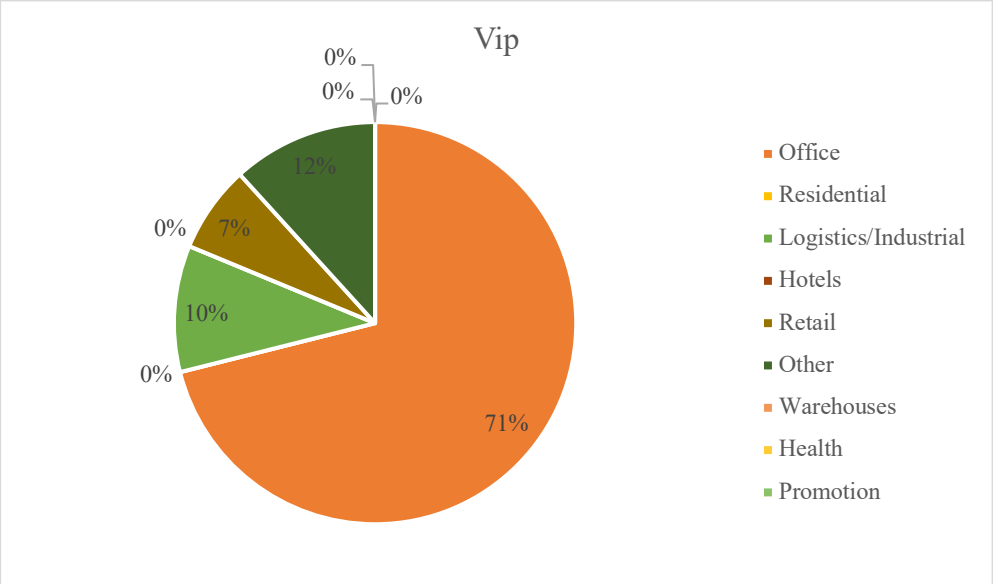
Appendix 4.8 – Segment distribution of *CA Património Crescente*.



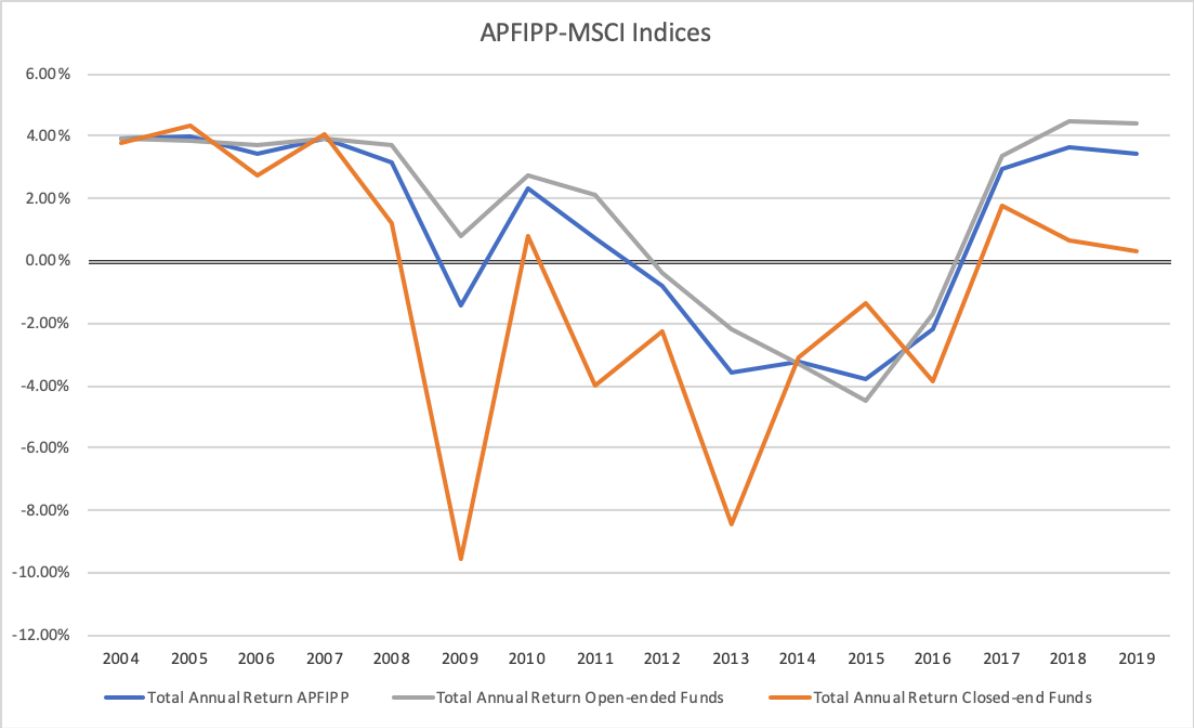
Appendix 4.9 – Segment distribution of *Fundimo*.



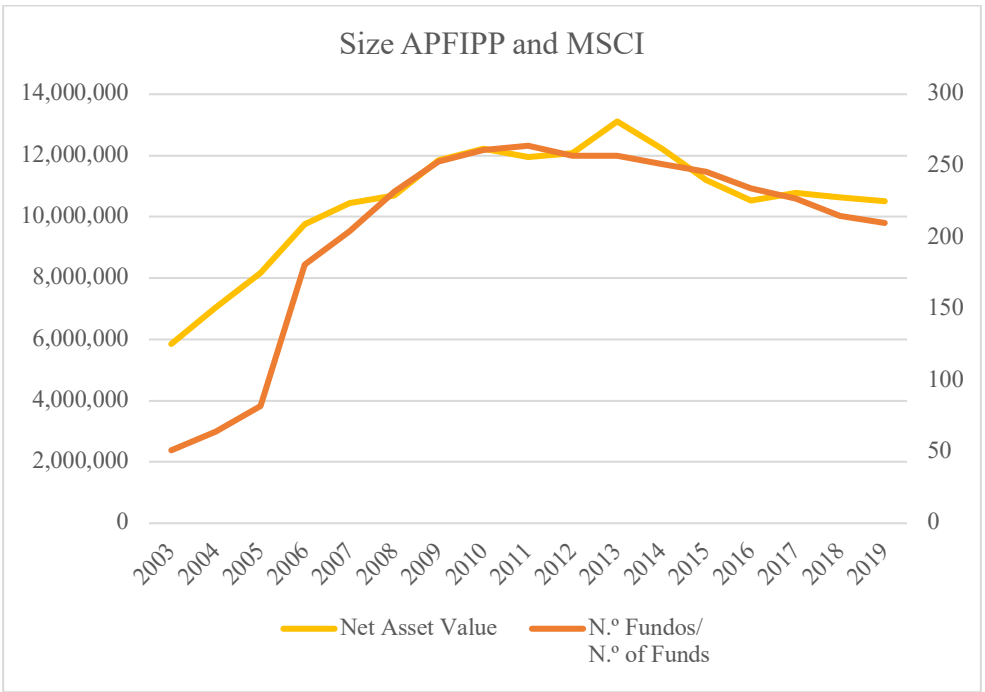
Appendix 4.10 – Segment distribution of Vip.

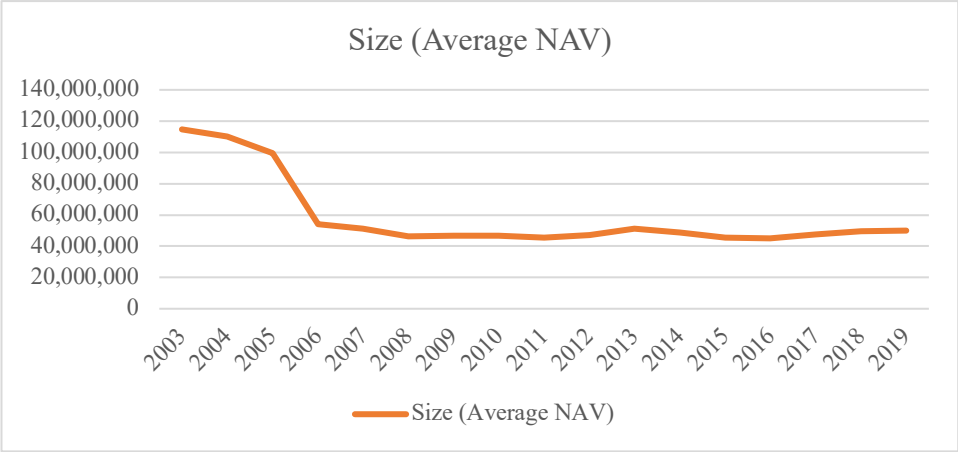


Appendix 4.11 **–** Graphical Representation of the performance of the APFIPP indexes.

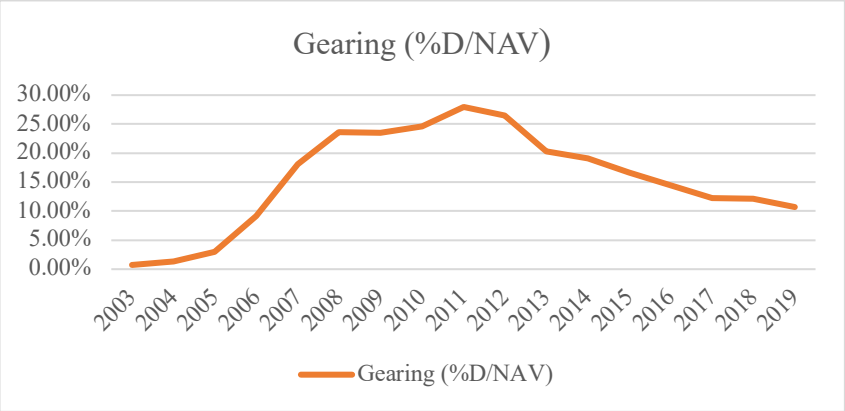


Appendix 4.12 **–** Graphical Representation of the historical average fund size of the APFIPP index, NAV and number of funds. The graph does not discriminate between closed-end, open-end and other fund types.

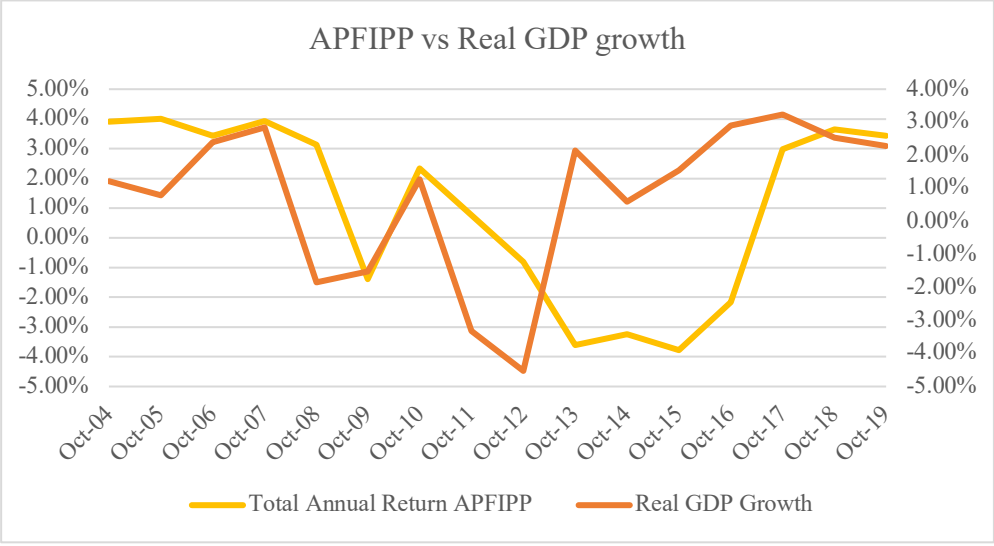




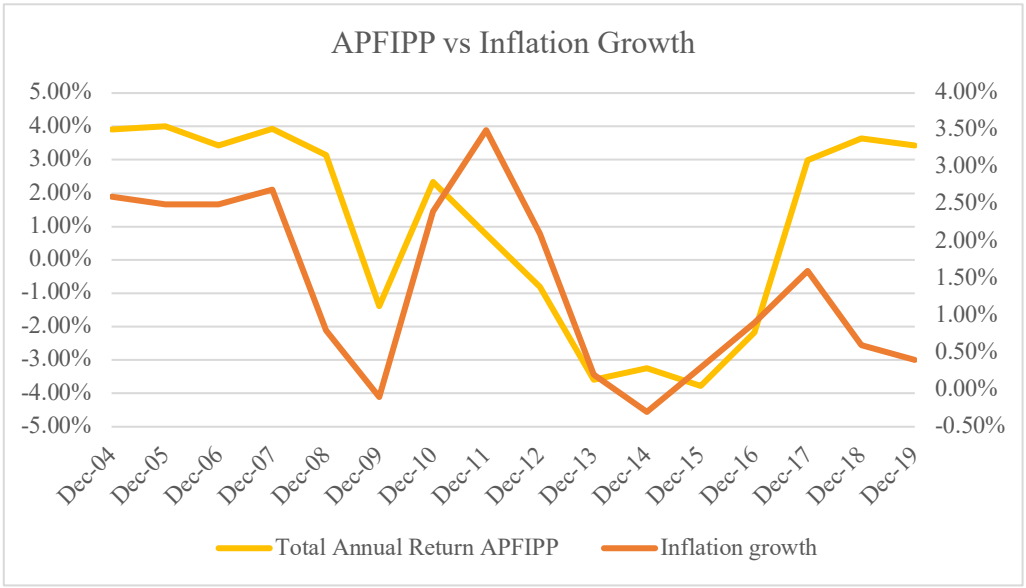
Appendix 4.13 **–** Graphical Representation of the Gearing of the APFIPP index.



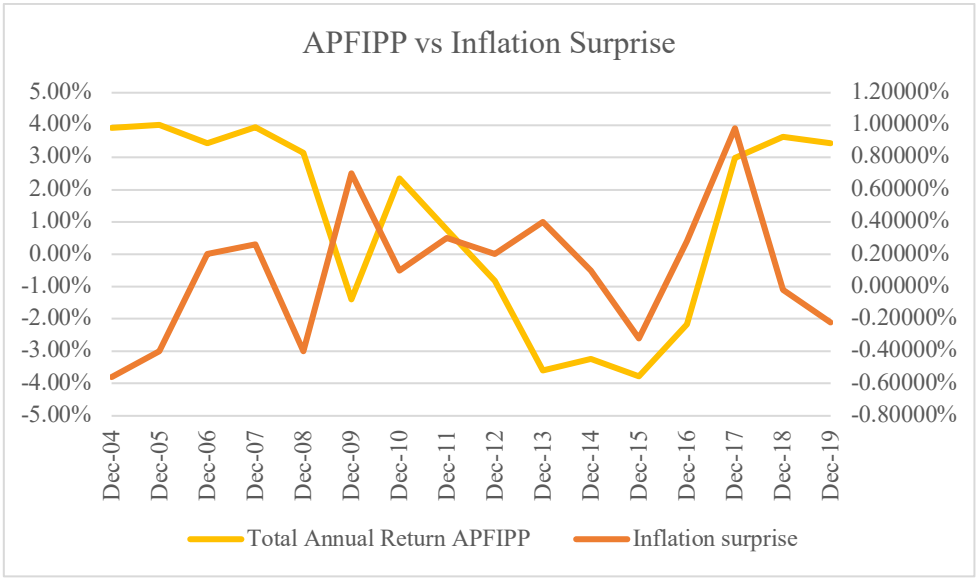
Appendix 4.14 **–** Graphical representation of GDP growth against the returns of non-listed Portuguese funds (APFIPP index).



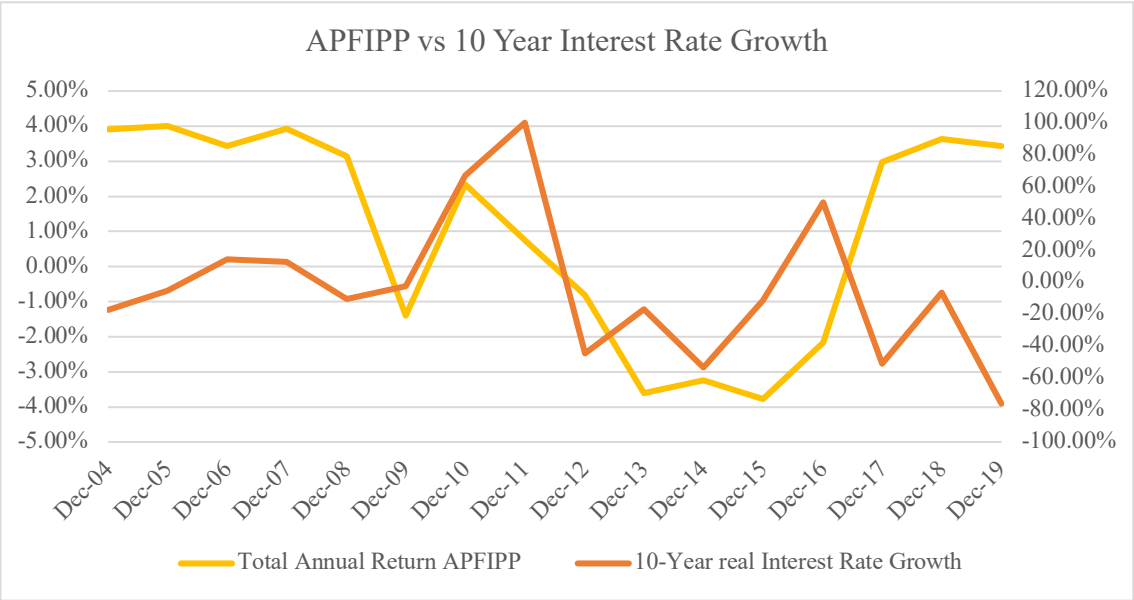
Appendix 4.15 – Graphical representation of inflation growth against the returns of non-listed Portuguese funds (APFIPP index).



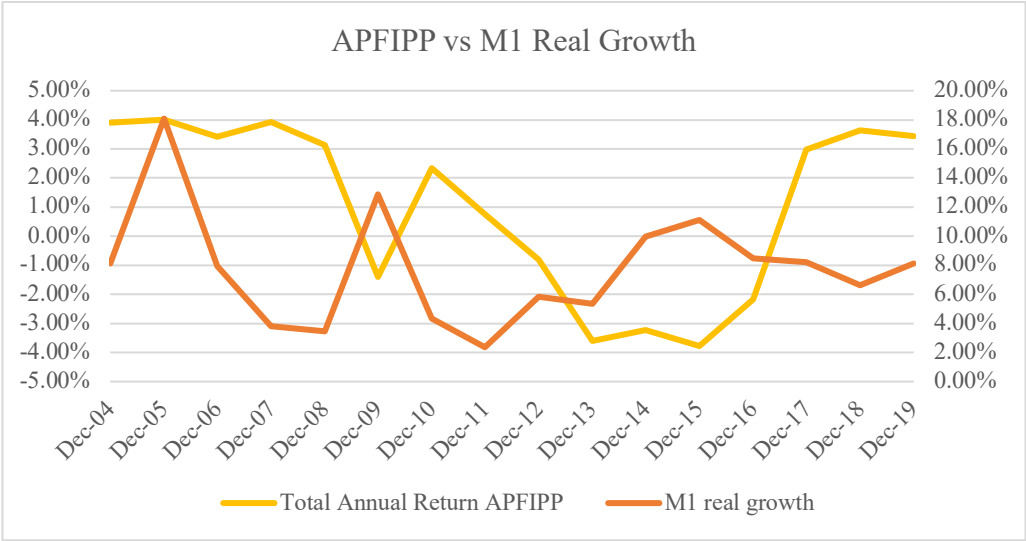
Appendix 4.16 – Graphical representation of inflation surprise against the returns of non-listed Portuguese funds (APFIPP index).



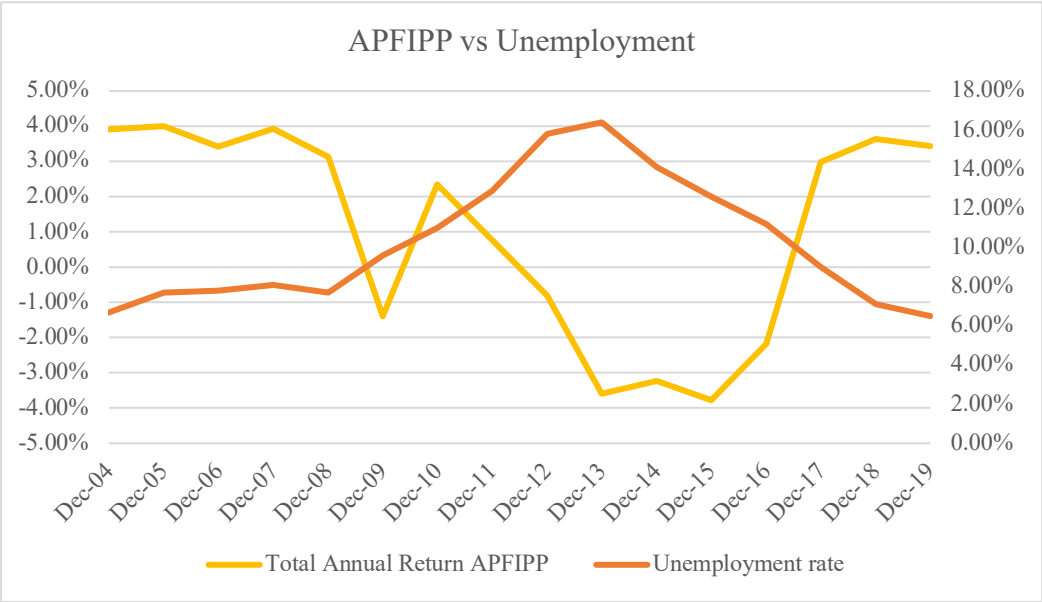
Appendix 4.17 – Graphical representation of interest rate growth against the returns of non-listed Portuguese funds (APFIPP index).



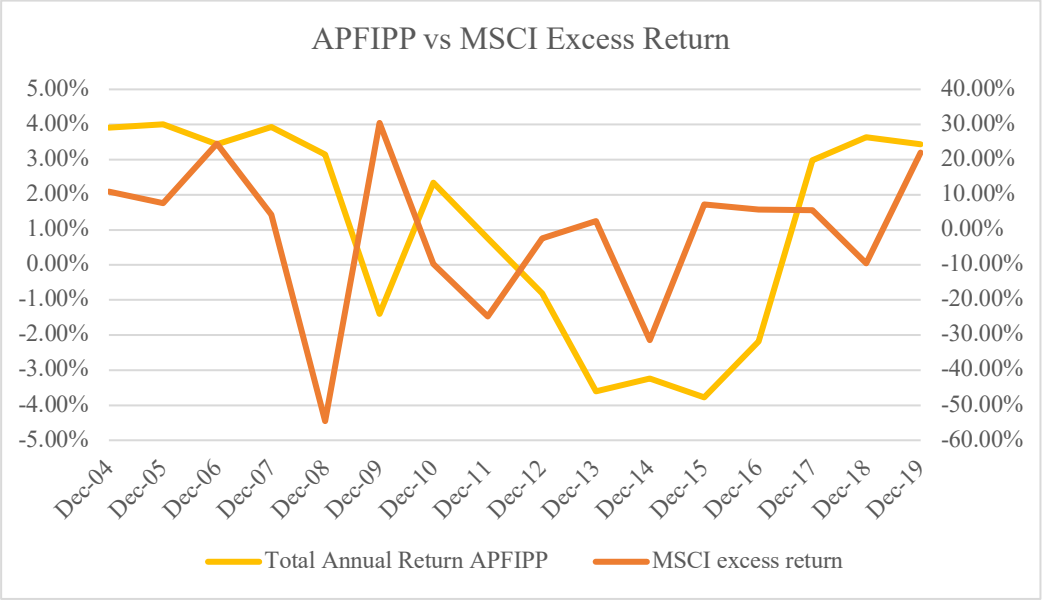
Appendix 4.18 – Graphical representation of money supply against the returns of non-listed Portuguese funds (APFIPP index).



Appendix 4.19 – Graphical representation of unemployment rate against the returns of non-listed Portuguese funds (APFIPP index).



Appendix 4.20 – Graphical representation of the excess return of the MSCI Portugal index against the returns of non-listed Portuguese funds (APFIPP index).



Appendix 4.21 – Porter's 5 Forces crossing the CRE Industry with the CRE Private Fund's Industry.

Porter's Force	**Level and Analysis**
Threat of New Entrants	*Moderately Low – CRE Fund's Industry* Due to high entry costs and high transaction costs. Buying a property requires a substantial initial investment, especially when compared to investments in the stock and bond markets. Yet, the rise in REITS is changing this landscape.
Bargaining Power of Suppliers	*Moderately High – CRE Industry* This force is not significant in terms of the suppliers of external services. However, suppliers of existing buildings have a moderately high bargaining power. BPI GA's Real Estate funds target the regions of Lisbon and Porto, where there are few offers that meet the fund's target goals, namely with an adequate risk-return profile and mostly compromising big buildings (currently the most important ones ranging from €8 million to €53 million). The two regions have seen a decrease in construction permits in recent years (INE, 2019), added to a business trend around these two major Portuguese cities which boosts the demand for an already saturated market.
Bargaining Power of Buyers	*Moderately Low – CRE Industry* Following the same reasoning behind the high bargaining power of suppliers, the bargaining power of buyers – in this case the tenants and actual buyers of CRE assets – will be low, due the high demand and the low supply verified.
Threat of Substitutes	*Moderate – CRE Fund's Industry* Threat of substitutes may be an increasing one, with COVID changing the status-quo of CRE. Investors may forecast a shrinkage in the CRE market caused by a decrease in office demand, but such could be offset by an increase in the logistics sub-sector. Moreover, alternative solutions which allow investors to get exposure to the CRE market are

	increasing and becoming more relevant, such as REITs and derivatives.
Rivalry from Existing Players	*High – CRE Fund's Industry* The rivalry between existing major competitors is fierce, since the market is fragmented and composed by different major players with similar market shares.

Appendix Chapter 5: Literature Review

Appendix 5.1 – Crosby et al. (2016) conceptual model for a Real Estate pricing.

Spatial Scale of Influence		Returns to Reflect	Drivers	Variables
Macro ↑	Investment and Capital Markets	RFR	Expected inflation, time preference	National level measures such as Treasury Bill rates, Gross Redemption Yields on government bonds, and actual and expected inflation rates.
	Real Estate Market	Risk and growth expectations	Performance and volatility of real estate relative to other assets	Macro-economic and industry estimates of income and capital returns and key drivers in asset markets at national, local and submarket levels.
	Sector		Market specific factors, economic/ catchment profile	
	Location			
	Stock/Asset		Tenant	Credit worthiness
			Lease	Multi/single-let, Review/user clause, Period to expiry/review
↓ Micro			Location	Micro location/ accessibility
			Building	Sustainability rating, Obsolescence

Appendix 5.2 **–** The data collected on the CoStar building quality rating for the central London office market, in the empirical analysis performed by Crosby et al. (2016).

Building Rating	***Definition***	***Percentage in Sample***
1 Star	A very poor quality building with no tenant and little prospect of attracting a tenant because it is in very poor condition with substantial physical and structural defects and does not offer viable accommodation.	0.0%
2 Star	An older building, typically more than 20 years old, with the majority of the accommodation cellular. Poor quality reception areas with no lifts or old, poorly maintained lifts and generally poor maintenance with physical or structural defects. Rents will be substantially lower than for 3 Star buildings and close to the lowest levels achieved locally.	1.2%
3 Star	This is an older building that offers basic open plan accommodation and has been partly renovated but the interior has not been completely refurbished. Plant and other servicing likely to be outdated and inferior with some functional limitations although still reasonably well maintained.	39.2%
4 Star	A modern building, completed or renovated in the last 10 years, which offers good quality modern open plan space which is well maintained and managed. Externally less architecturally impressive than a 5 Star building. Offers good quality open plan office accommodation with raised floors, some form of air cooling system and adequate passenger lifts but is of a more basic design than a five star building.	47.6%
5 Star	A landmark building, either new built or extensively renovated within the last 5 years; to provide top specification accommodation and typically have a BREEAM rating of VERY GOOD, EXCELLENT or OUTSTANDING. If the building is older then the interior will be completely reconstructed with only the historical façade or structural frame remaining, and maintained and managed to the highest standard. Commands rents at or close to the top achievable rents in the local market.	12.0%

Source: CoStar (2013)

Appendix Chapter 6: Systematic Risk – Macroeconomic

Appendix 6.1 – Descriptive statistics on the econometric model.

	Mean (%)	St. Dev (%)	Min (%)	1st Qu. (%)	Median (%)	3rd Qu. (%)	Max (%)
% Change CRE Prices							
USA	3.414	12.271	-29.725	1.598	6.591	12.351	15.685
Australia	0.065	0.123	-0.190	0.030	0.055	0.123	0.280
Brazil	7.927	4.034	-1.701	5.667	8.193	10.838	13.982
Denmark	4.363	16.252	-22.006	-10.073	1.967	15.340	40.768
Euro Area	1.278	4.813	-8.502	-1.050	1.601	2.670	9.778
USA							
Real GDP growth	1.590	1.847	-3.924	1.385	1.952	2.624	4.148
M3 growth	6.335	1.952	1.945	5.572	6.126	7.153	10.176
Inflation	1.967	1.496	-1.623	1.265	1.836	2.935	5.303
Stock excess return	5.041	19.022	-38.736	-3.134	8.377	16.627	39.930
10-Year IR growth	-3.852	25.266	-46.183	-19.017	-8.462	9.418	71.407
Australia							
Real GDP growth	2.771	0.879	1.418	2.116	2.645	3.212	4.941
M3 growth	2.446	11.590	-10.960	-6.317	1.429	6.666	35.766
Inflation	2.640	0.941	1.200	1.950	2.600	3.150	5.000
Stock excess return	-0.103	24.675	-56.828	-13.970	-0.038	11.763	71.995
10-Year IR growth	-4.868	18.406	-40.318	-21.298	-2.762	6.955	30.623
Brazil							
Real GDP growth	2.840	3.463	-5.476	0.222	3.302	5.364	9.270
M3 growth	15.674	4.038	7.717	12.409	16.693	17.721	22.973
Inflation	5.703	1.556	2.988	4.625	5.687	6.424	10.361
Stock excess return	-4.758	42.623	-66.621	-33.597	-15.069	14.357	128.517
10-Year IR growth	10.301	32.298	-32.803	-9.116	0.852	20.268	108.973
Denmark							
Real GDP growth	0.780	2.506	-6.168	-0.112	1.139	2.293	4.732
M3 growth	7.168	9.506	-17.752	1.869	9.713	13.315	19.770
Inflation	1.762	0.985	0.268	0.797	1.892	2.493	4.183
Stock excess return	10.872	25.488	-51.519	-1.004	18.409	27.463	64.398
10-Year IR growth	-9.288	31.575	-82.424	-30.596	-5.695	12.436	72.470
Euro Area							
Real GDP growth	0.832	2.330	-5.644	-0.408	1.532	2.324	3.799
M3 growth	4.539	4.124	-2.125	1.569	2.967	8.525	11.405
Inflation	1.685	1.114	-0.359	0.621	1.877	2.481	3.911
Stock excess return	-0.296	19.701	-47.738	-10.705	4.452	12.659	38.395
10-Year IR growth	-12.534	26.052	-83.306	-25.582	-7.252	9.570	30.655

Appendix 6.2 – Equity indexes used as a proxy for the stock market variable.

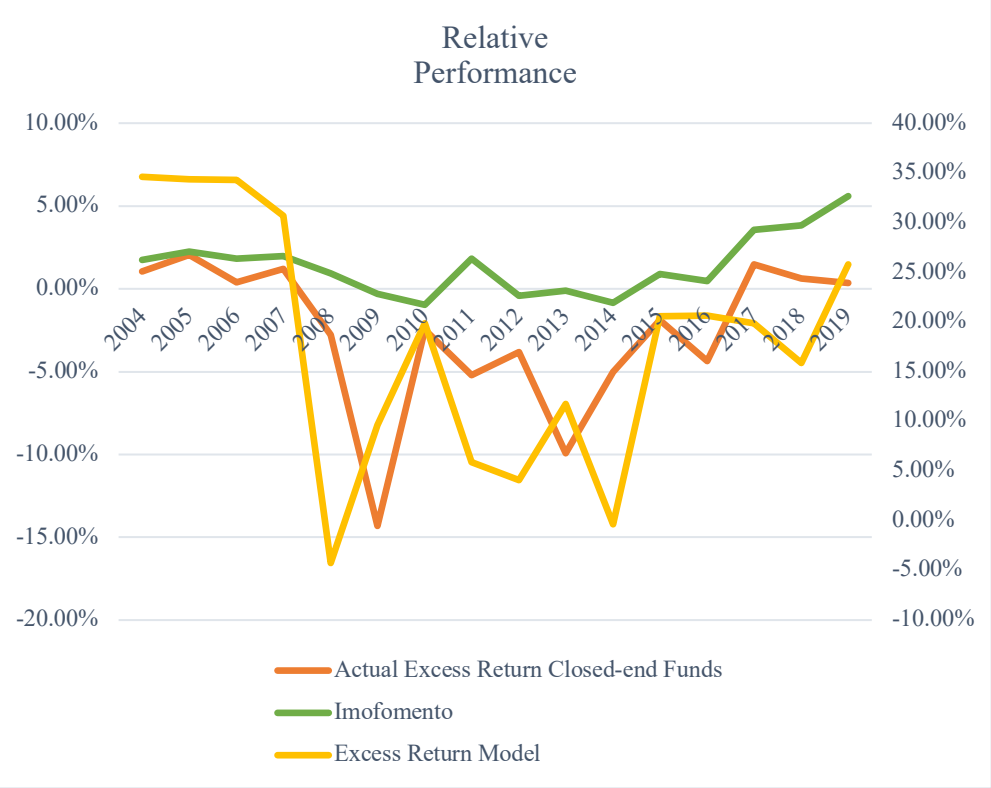
Equity Index	
USA	S&P 500
Australia	S&P/ASX 200
Brazil	Bovespa
Denmark	OMX Copenhagen 20
Euro Area	STOXX Europe 600

Appendix 6.3 **–** A detailed approach to the categorical variables when applying Delfim and Hoesli's study (2016) to the Portuguese market.

Categorical Variable (Delfim and Hoesli's study (2016) reference level	**Considerations in the Fitted-Values Model (dummy variables)**
Vehicle structure of non-listed funds (Closed-end funds)	Has a dummy for open-end funds, which will be applied during the subprime crisis period.
Country (United Kingdom)	UK is the reference, thus a dummy for Italy will be used due to the fact that it is the country most similar to Portugal (Southern Europe Region).
Subperiod (Pre-subprime crisis)	Faces a dummy for the subprime crisis.
Sector (Retail)	The reference level is retail, and from Delfim and Hoesli's research no significance was found across sectors for non-listed funds, so there was no need for adjustments to be made.
Investment style (Core)	No adjustments were made since the Core Style is the reference, and the majority of Portuguese funds, including *Imofomento*, are characterized by having a core investment style.

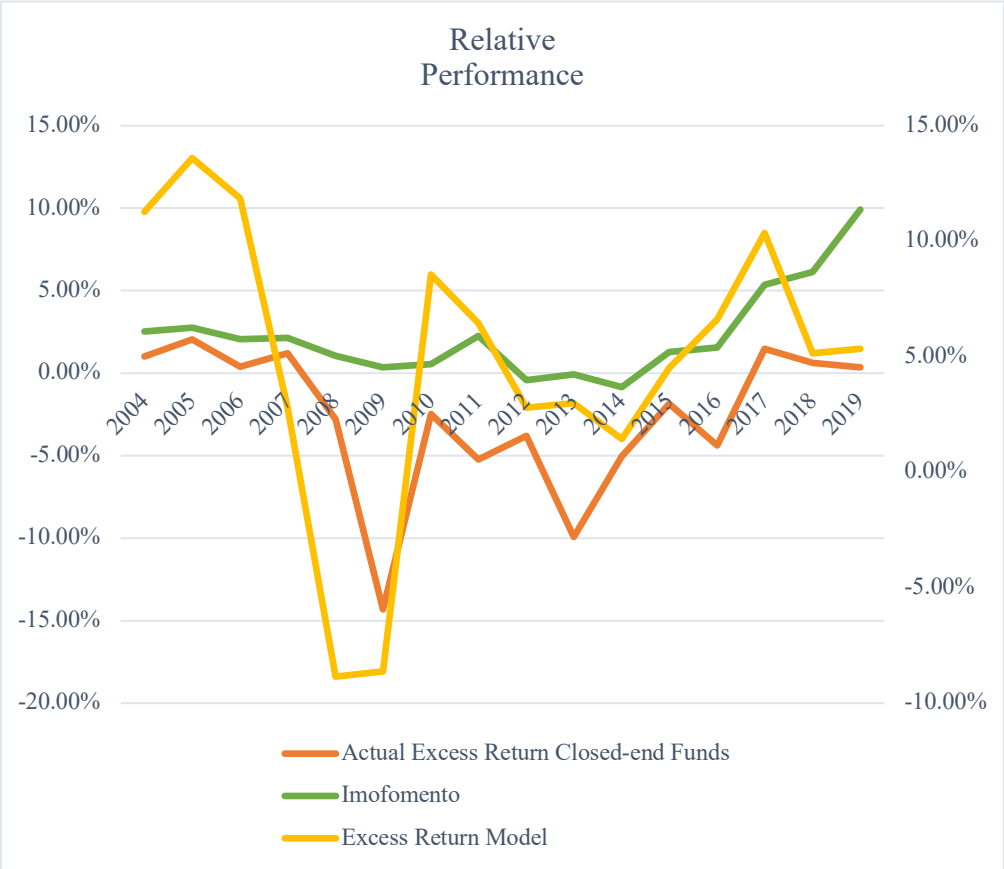
Appendix 6.4 **–** Results of the 1st Model concerning Real Estate non-listed Fund's returns. It shows the model results obtained from the engine constructed with all the input data (Portuguese macroeconomic variables, fund characteristics variables and the coefficients of Delfim and Hoesli (2016) research). The Fitted-Values Model named "Return D&H" is the excess total return, which is compared to the returns given by APFIPP discounted by the risk-free rate given by the Euribor 12 month.

CORREL Imofomento vs Fitted-Value Model	0.4432
CORREL APFIPP vs Fitted-Value Model	0.5881
CORREL BPI Pension Fund vs Fitted-Value Model	0.4870



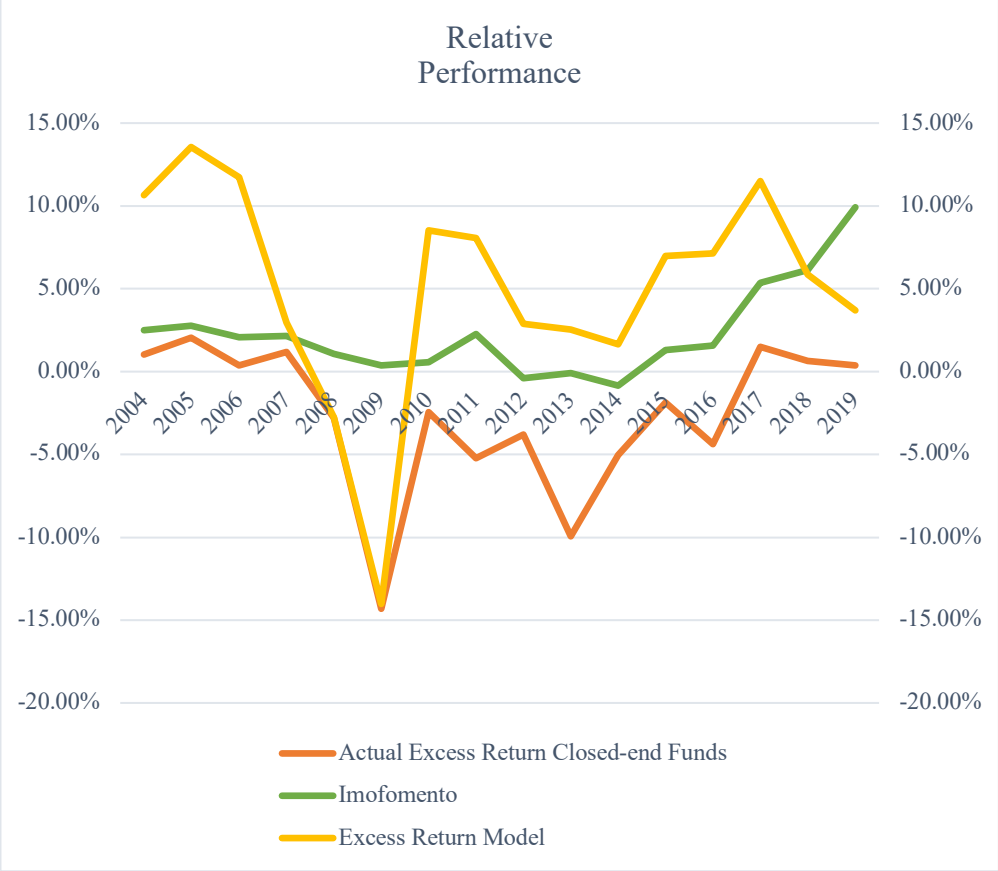
Appendix 6.5 – Results for the first model concerning Direct Real Estate Exposure.

CORREL Imofomento vs Fitted-Value Model	0.3098
CORREL APFIPP vs Fitted-Value Model	0.6507
CORREL BPI Pension Fund vs Fitted-Value Model	0.4207



Appendix 6.6 **–** Results of the 2nd Model concerning Direct Real Estate exposure. It shows the model results obtained from the engine constructed with all relevant macroeconomic data with the necessary lags and the coefficients of Delfim and Hoesli (2016) research. The Fitted-Values Model named "Return D&H" is the excess total return, which is compared to the returns given by APFIPP discounted by the risk-free rate given by the Euribor 12 month.

CORREL Imofomento vs Fitted-Value Model	0.2728
CORREL APFIPP vs Fitted-Value Model	0.7554
CORREL Pension Fund vs Fitted-Value Model	0.5512



Appendix Chapter 7 – Tenant Risk

Appendix 7.1 – *Imofomento* 's top 15 tenants regarding rents, ranked from highest to lowest rental prices.

Top 15	Tenant	Rent/month	Rent/year	% of Total Rents	Property
1	EDP DISTRIBUIÇÃO - ENERGIA SA	€ 338,059.54	€ 4,056,714.48	24.47%	Rua Camilo Castelo Branco 43
2	Modelo Continente Hipermercados SA	€ 249,969.50	€ 2,999,634.00	18.09%	Vasco da Gama
3	LOGIC LOGISTICA INTEGRADA S.A.	€ 72,500.00	€ 870,000.00	5.25%	Quinta da Arrogela
4	O Parque Ensino de Crianças S.A.	€ 68,474.09	€ 821,689.08	4.96%	O Parque (Restelo)
5	VILA AVENIDA HOTEL S.A.	€ 56,867.79	€ 682,413.48	4.12%	Av. Liberdade, 160
6	HP Health Clubs Portugal S.A	€ 41,088.50	€ 493,062.00	2.97%	Estádio Bessa
7	Servier Portugal-Especialid. Farmacêut.	€ 39,295.00	€ 471,540.00	2.84%	Ant. Aug. Aguiar
8	Saba Portugal - Parques de Estacionamento SA	€ 35,416.67	€ 425,000.04	2.56%	Picoas Plaza
9	Banco BPI SA	€ 35,391.96	€ 424,703.52	2.56%	Rua da Saudade
10	DHL EXPRESS PORTUGAL LDA	€ 34,390.50	€ 412,686.00	2.49%	Edifício Stern
11	Entreposto VM - SGPS, S.A.	€ 33,333.33	€ 399,999.96	2.41%	Entreposto Feijó
12	TELEPERFORMANCE PORTUGAL , S.A.	€ 31,364.73	€ 376,376.76	2.27%	Edifício Niña
13	DHL EXEL Supply Chain Portugal	€ 30,841.35	€ 370,096.20	2.23%	Armazém Vialonga
14	Pingo Doce Distribuição Alimantar S.A.	€ 29,892.91	€ 358,714.92	2.16%	Vale de Lobo
15	Perfumes & Companhia S.A.	€ 27,384.46	€ 328,613.52	1.98%	Mouzinho Silveira 11,15 e 19
TOTAL		**€ 1,124,270.33**	**€ 13,491,243.96**	**81.38%**	

Appendix 7.2 – Relation between the Failure Score provided by Informa D&B and the rating from S&P.

Min	Max	Rating
95.0	100	AAA
90.0	95.0	AA
80.0	90.0	A
70.0	80.0	BBB
55.0	70.0	BB
40.0	55.0	B
0.0	40.0	CCC/C

Appendix 7.3 – One-Year Square Transition Matrix. Source: S&P.

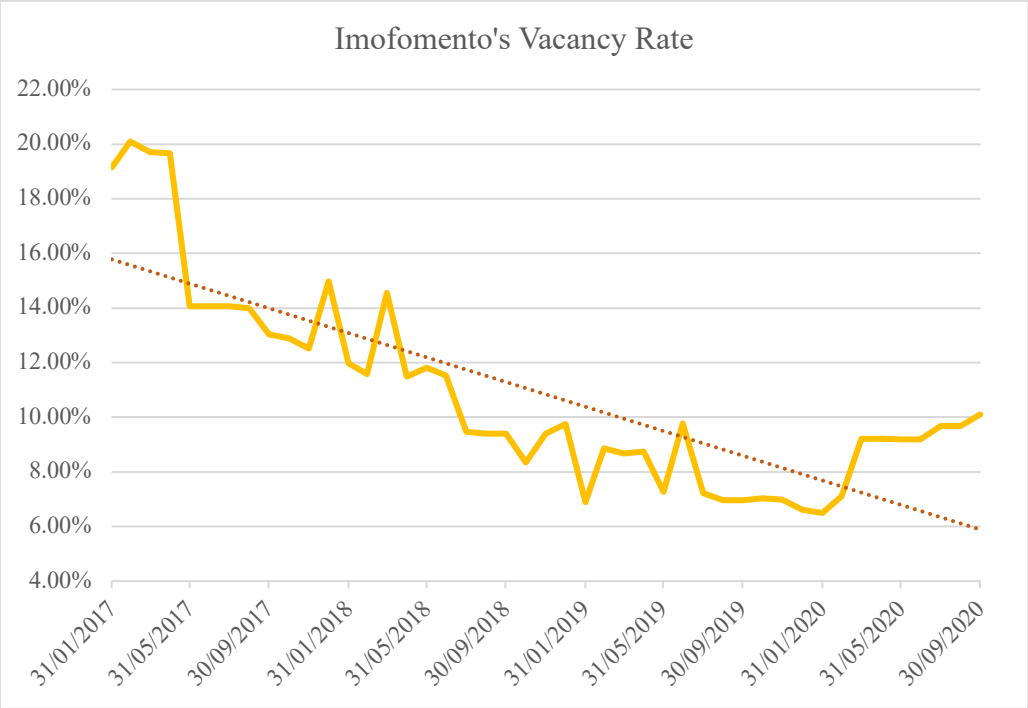
T = 1								
From/to	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**CCC/C**	**D**
AAA	89.82%	9.42%	0.55%	0.05%	0.08%	0.03%	0.05%	0.00%
AA	0.52%	90.64%	8.17%	0.51%	0.05%	0.06%	0.02%	0.02%
A	0.03%	1.77%	92.29%	5.40%	0.30%	0.13%	0.02%	0.06%
BBB	0.01%	0.10%	3.66%	91.56%	3.88%	0.49%	0.12%	0.18%
BB	0.01%	0.03%	0.15%	5.35%	85.77%	7.36%	0.61%	0.72%
B	0.00%	0.02%	0.09%	0.19%	5.63%	85.09%	5.05%	3.93%
CCC/C	0.00%	0.00%	0.13%	0.24%	0.70%	15.63%	51.49%	31.82%
D	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%

Appendix 7.4 – Failure Score, Rating and PD of the top 15 tenants on *Imofomento*'s portfolio.

Top 15	Tenant	Failure Score	Rating	Probability of Default
1	EDP DISTRIBUIÇÃO - ENERGIA SA	78	A	0.06%
2	Modelo Continente Hipermercados SA	78	A	0.06%
3	LOGIC LOGISTICA INTEGRADA S.A.	18	CCC/C	31.82%
4	O Parque Ensino de Crianças S.A.	98	AAA	0.00%
5	VILA AVENIDA HOTEL S.A.	-	-	-
6	HP Health Clubs Portugal S.A	78	A	0.06%
7	Servier Portugal-Especialid. Farmacêut.	100	AAA	0.00%
8	Saba Portugal - Parques de Estacionamento SA	100	AAA	0.00%
9	Banco BPI SA	-	-	-
10	DHL EXPRESS PORTUGAL LDA	78	A	0.06%
11	Entreposto VM - SGPS, S.A.	-	-	-
12	TELEPERFORMANCE PORTUGAL , S.A.	100	AAA	0.00%
13	DHL EXEL Supply Chain Portugal	86	AA	0.02%
14	Pingo Doce Distribuição Alimantar S.A.	78	A	0.06%
15	Perfumes & Companhia S.A.	100	AAA	0.00%

Appendix Chapter 8 – Vacancy Risk

Appendix 8.1 – Evolution of the overall *Imofomento*'s vacancy rate (2017-2020).



Appendix 8.2 – Top 5 *Imofomento*'s buildings in terms of vacancy rate, excluding the building totally vacant (2019).

Rank	Building	Vacancy Rate (%)
1	Edifício Monsanto	77.3%
2	Edifício Sagres	74.0%
3	Ed. Parque Oceano	67.7%
4	Edif. Eça de Queiroz	65.3%
5	Edifício Stern	58.2%

Appendix 8.3 – Ascending ranking of rental yields from the Top 5 *Imofomento*'s buildings with highest vacancy rates, excluding the ones totally vacant (2019).

Rank	Building	Yield (%)
1	Edifício Monsanto	1.70%
2	Ed. Parque Oceano	2.41%
3	Edifício Sagres	2.55%
4	Edif. Eça de Queiroz	2.76%
5	Edifício Stern	3.63%

Appendix 8.4 – Rental payments under different scenarios (15 years of rental contract)

Year	1	2	3	...	7	8
Scenario 1	x	x	x		x	x
Scenario 2	-	y + Premium	y + Premium		y + Premium	y + Premium
Scenario 3	-	y - Premium	y - Premium		y - Premium	y - Premium

Appendix 8.5 – User's inputs to the real option's vacancy model.

Inputs	***Description***
Risk Free	10 Year Portuguese Government Bond Yield.
Inflation	Expected annual inflation rate of the respective economy for the next 8 years. An accurate proxy for such variable might be the average annual inflation rate for the last 8 years within that same economy.
Probability	Fund's managers confidence that, in 1 year, they are able to find a new tenant that pays the requested rental premium (ranges from 0% to 100%).
Premium targeted	Rental premium targeted by the fund over the existing tenant's annual rent stablished in its lease contract. This new rental amount is the one which, in the perfect scenario (*Scenario 2*), the new tenant will pay (ranges from 0% to 100%).
Monthly Rent under the existing contract	Monthly rental amount that was initially agreed with the current tenant to be paid every month. This refers to the amount stablished on the rental contract, not the actual delayed rental amount received from the existing tenant.
Annual Rent under the existing contract	Monthly rent under the existing contract times twelve months.
Nº of monthly rental payments delayed	Average number of months that the existing tenant is delayed in term of rental payments.

Appendix 8.6 – The Gentleman Square's inputs to use in the real option's tool (one of the tenants from *Edifício Península*).

Risk Free	1.05%
Inflation	4.53%
Probability	50%
Premium targeted	20%
Monthly Rent under the contract	€ 1,500.00
Annual Rent under the contract	€ 18,000.00
Nº of rental payments delayed	3

Appendix 8.7 – Real Option tool's output (value of the option).

Year		0		1
NPV No Option (Scenario 0)	**€**	**120,686.80**		
NPV (Scenario 1)			€	173,526.42
NPV (Scenario 2)			€	115,684.28
NPV with Option (Scenario 1 and 2)	**€**	**143,102.77**		
Value of the Option	**€**	**22,415.97**		

Appendix 8.8 – Sensitivity Analysis (nº of monthly rental payments delayed = 3)

Targeted Premium	Probability										
€ 22,415.97	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	€ 16,348	€ 16,955	€ 17,561	€ 18,168	€ 18,775	€ 19,382	€ 19,989	€ 20,596	€ 21,202	€ 21,809	€ 22,416
10%	€ 8,106	€ 10,968	€ 13,830	€ 16,692	€ 19,554	€ 22,416	€ 25,278	€ 28,140	€ 31,002	€ 33,864	€ 36,726
15%	€ 951	€ 5,244	€ 9,537	€ 13,830	€ 18,123	€ 22,416	€ 26,709	€ 31,002	€ 35,295	€ 39,588	€ 43,881
20%	-€ 6,205	-€ 480	€ 5,244	€ 10,968	€ 16,692	€ 22,416	€ 28,140	€ 33,864	€ 39,588	€ 45,312	€ 51,037
25%	-€ 13,360	-€ 6,205	€ 951	€ 8,106	€ 15,261	€ 22,416	€ 29,571	€ 36,726	€ 43,881	€ 51,037	€ 58,192
30%	-€ 20,515	-€ 11,929	-€ 3,343	€ 5,244	€ 13,830	€ 22,416	€ 31,002	€ 39,588	€ 48,174	€ 56,761	€ 65,347
35%	-€ 27,670	-€ 17,653	-€ 7,636	€ 2,382	€ 12,399	€ 22,416	€ 32,433	€ 42,450	€ 52,468	€ 62,485	€ 72,502
40%	-€ 34,825	-€ 23,377	-€ 11,929	-€ 480	€ 10,968	€ 22,416	€ 33,864	€ 45,312	€ 56,761	€ 68,209	€ 79,657
45%	-€ 41,980	-€ 29,101	-€ 16,222	-€ 3,343	€ 9,537	€ 22,416	€ 35,295	€ 48,174	€ 61,054	€ 73,933	€ 86,812
50%	-€ 49,135	-€ 34,825	-€ 20,515	-€ 6,205	€ 8,106	€ 22,416	€ 36,726	€ 51,037	€ 65,347	€ 79,657	€ 93,967

Appendix 8.9 – Sensitivity Analysis (nº of monthly rental payments delayed = 1)

Targeted Premium	Probability										
-€ 4,403.32	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	-€ 10,471	-€ 9,865	-€ 9,258	-€ 8,651	-€ 8,044	-€ 7,437	-€ 6,831	-€ 6,224	-€ 5,617	-€ 5,010	-€ 4,403
10%	-€ 18,714	-€ 15,852	-€ 12,989	-€ 10,127	-€ 7,265	-€ 4,403	-€ 1,541	€ 1,321	€ 4,183	€ 7,045	€ 9,907
15%	-€ 25,869	-€ 21,576	-€ 17,283	-€ 12,989	-€ 8,696	-€ 4,403	-€ 110	€ 4,183	€ 8,476	€ 12,769	€ 17,062
20%	-€ 33,024	-€ 27,300	-€ 21,576	-€ 15,852	-€ 10,127	-€ 4,403	€ 1,321	€ 7,045	€ 12,769	€ 18,493	€ 24,217
25%	-€ 40,179	-€ 33,024	-€ 25,869	-€ 18,714	-€ 11,558	-€ 4,403	€ 2,752	€ 9,907	€ 17,062	€ 24,217	€ 31,372
30%	-€ 47,334	-€ 38,748	-€ 30,162	-€ 21,576	-€ 12,989	-€ 4,403	€ 4,183	€ 12,769	€ 21,355	€ 29,941	€ 38,528
35%	-€ 54,489	-€ 44,472	-€ 34,455	-€ 24,438	-€ 14,421	-€ 4,403	€ 5,614	€ 15,631	€ 25,648	€ 35,665	€ 45,683
40%	-€ 61,644	-€ 50,196	-€ 38,748	-€ 27,300	-€ 15,852	-€ 4,403	€ 7,045	€ 18,493	€ 29,941	€ 41,390	€ 52,838
45%	-€ 68,800	-€ 55,920	-€ 43,041	-€ 30,162	-€ 17,283	-€ 4,403	€ 8,476	€ 21,355	€ 34,234	€ 47,114	€ 59,993
50%	-€ 75,955	-€ 61,644	-€ 47,334	-€ 33,024	-€ 18,714	-€ 4,403	€ 9,907	€ 24,217	€ 38,528	€ 52,838	€ 67,148

Appendix Chapter 9 – Asset Concentration Risk

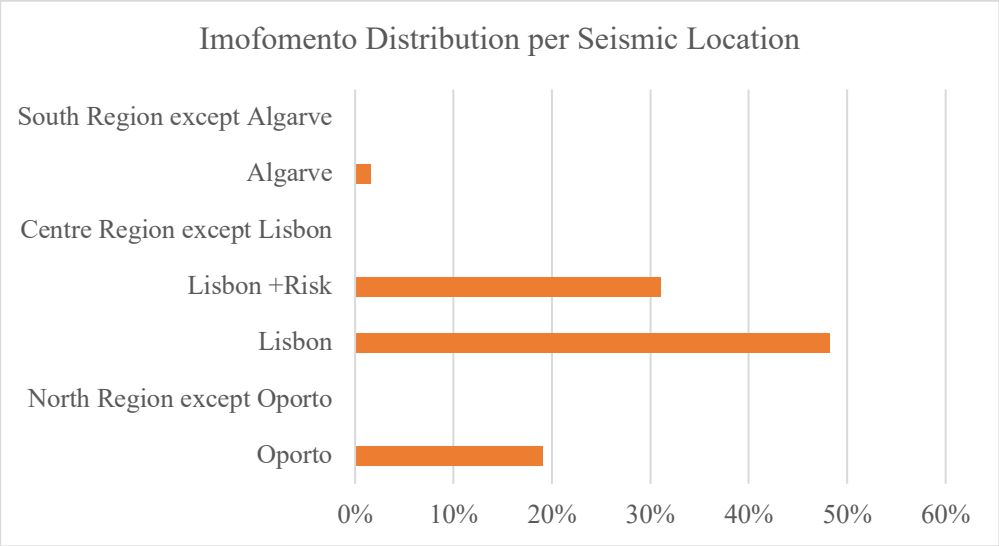
Appendix 9.1 – List of Imofomento's properties where the fund is more concentrated in terms of value, ranked from highest to lowest.

Rank	Property
1	Vasco da Gama
2	Rua Camilo Castelo Branco 43
3	CCB 45
4	Edifício Península
5	Picoas Plaza

Appendix 9.2 – Seismic locations and respective levels of earthquake risk. The scores range between the levels 0 and 3, with 3 being the highest score that reflects a large seismic risk, translated into a high probability of seismic occurrences. The "Lisbon +Risk" location contains some specific sub-locations that were considered to be the ones with higher risk of earthquake, therefore not being considered in the location "Lisbon", namely *Avenida da Liberd*ade, *Avenida de Ceuta*, *Almirante Reis*, *Vale de Alcântara*, *Vale de Chelas*, *Área do Hospital de São José* (Agência Portuguesa do Ambiente 2014).

Location	Seismic Score
1. North Region except Porto	Level 0
2. Centre Region except Lisbon	Level 0
3. Porto	Level 1
4. Lisbon	Level 2
5. South Region except Algarve	Level 2
6. Lisbon + Risk	Level 3
7. Algarve	Level 3

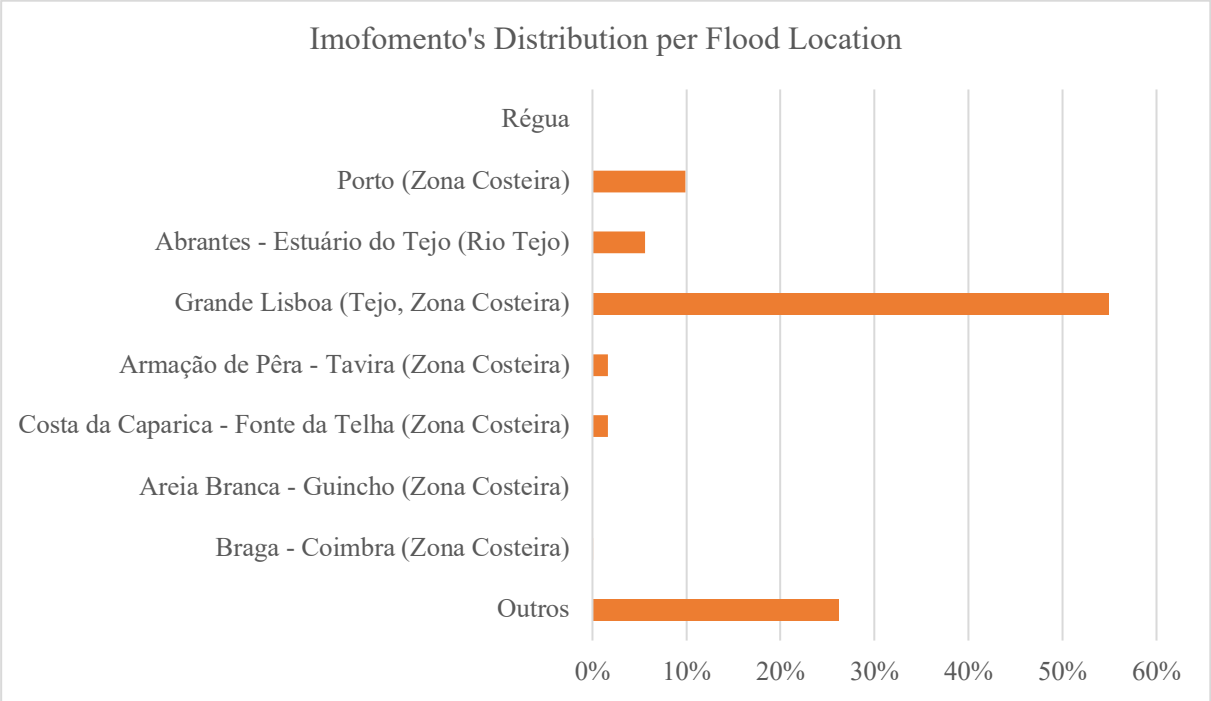
Appendix 9.3 – Weight of each seismic location in the overall portfolio.



Appendix 9.4 – Flood locations and respective levels of earthquake risk. The scores range between the levels 0 and 2, with 2 being the highest score reflecting the highest flood risk.

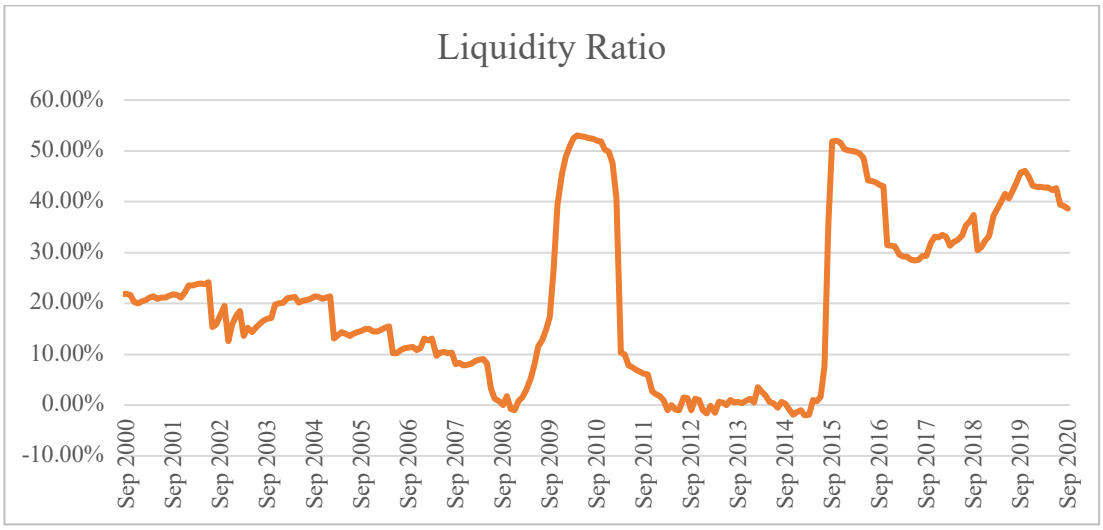
Location	Seismic Score
1. Régua	Level 2
2. Porto (Coast*)	Level 2
3. Abrantes to Estuário do Tejo	Level 2
4. Grande Lisboa (Tejo Coast)	Level 2
5. Armação de Pêra to Tavira (Coast)	Level 1
6. Costa da Caparica to Fonte da Telha (Coast)	Level 1
7. Areia Branca to Guincho (Coast)	Level 1
8. Braga to Coimbra (Coast)	Level 1
9. Others	Level 1

Appendix 9.5 – Weight of each flood risk location in the overall portfolio.



Appendix Chapter 10 – Liquidity Risk

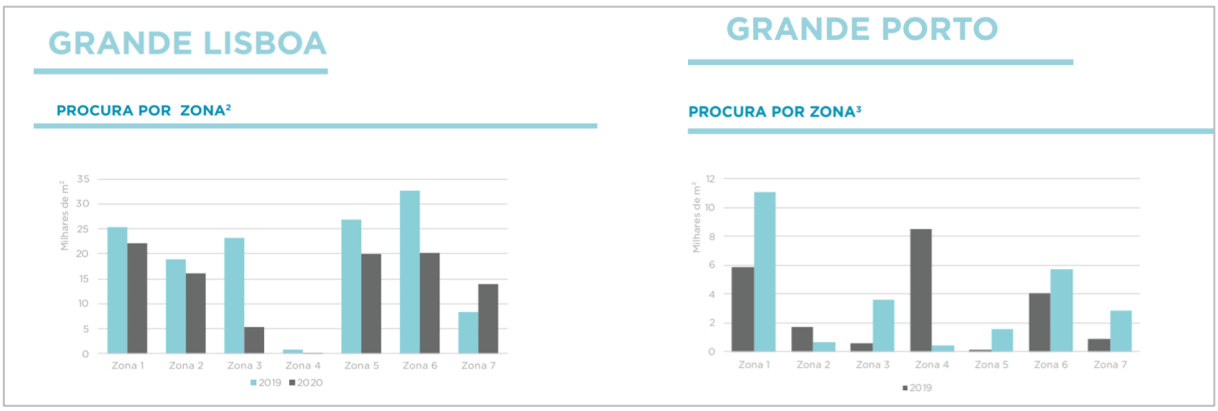
Appendix 10.1 – *Imofomento*'s liquidity ratio between 2000 and 2020.



***Appendix 10.2* –** Summary of the zones used in the liquidity score, with the respective location and rents.

Number	Zone	City	Name	Rent (€/m^2/month)
1	Zone 1	Lisbon	Prime CBD	€19-23/m^2/month
2	Zone 5	Lisbon	Parque das Nações	€18.5-19/m^2/month
3	Zone 2	Lisbon	CBD	€17-18/m^2/month
4	Zone 3	Lisbon	New Office Zone	€16.5 – 17.5/m^2/month
5	Zone 4	Lisbon	Historic and Riverside Zone	€16-17/m^2/month
6	Zone 1	Porto	Porto Boavista	€15.5-18/m^2/month
7	Zone 2	Porto	Downtown	€14-17/m^2/month
8	Zone 6	Lisbon	Western Corridor	€13.5-16/m^2/month
9	Zone 6	Porto	Matosinhos	€12.5-14/m^2/month

***Appendix 10.3* –** Demand per location zone in Lisbon and Porto, in 2019 and 2020. Source: Cushman and Wakefield.



Appendix 10.4 – 10 properties listed in terms of its liquidity score.

TOP	Score	Building		Value
1	4.90	Vasco da Gama	€	53,162,099.00
2	4.50	Ant. Aug. Aguiar	€	8,335,528.00
3	4.44	Av. Liberdade, 160	€	9,256,485.50
4	4.44	Av. Liberdade, 160	€	9,256,485.50
5	4.40	Av. Liberdade, 245	€	1,313,200.00
6	4.35	CCB 45	€	27,201,250.00
7	4.35	CCB 45	€	27,201,250.00
8	4.35	Mouzinho Silveira 11,15 e 19	€	6,162,528.00
9	4.28	Rua Sao Jose 169 a 175	€	4,651,860.40
10	4.25	Telheiras	€	412,407.00
TOTAL			€	146,953,093.40

Appendix 10.5 – Bottom 10 properties listed in terms of its liquidity score.

BOTTOM	Score	Building		Value
1	1.36	Coimbra	€	211,831.50
2	1.80	Entreposto Feijó	€	5,247,745.00
3	2.25	Columbano Bordalo Pinheiro	€	4,142,466.50
4	2.35	Quinta do Lago	€	2,268,731.00
5	2.60	Vale de Lobo	€	2,817,751.00
6	2.60	Edificio DHL	€	4,616,875.00
7	2.65	O Parque (Restelo)	€	4,958,345.50
8	2.70	Estádio Bessa	€	7,616,883.50
9	2.78	Quinta Grande	€	216,200.00
10	2.80	Edif. Eça de Queiroz	€	2,365,922.50
TOTAL			€	34,462,751.50

Appendix 10.6 – Stress Tests, with the different scenarios for September 2020. The first table summarises *Imofomento*'s information from September 2020.

30.09.2020			
NAV (€)	**Real Estate (€)**	**Liquidity (€)**	**Value Unit (€)**
512,952,180.02	314,539,610.31	198,412,569.71	5.9024

Scenario	Flow %	Value of Redemptions (€)	Δ Liquidity (€)	Number of Units Redeemed
Liquidity Stress				
Fixed Percentage Redemptions				
10%	10%	51,295,218.00	147,117,351.71	8,690,569.60
20%	20%	102,590,436.00	95,822,133.71	17,381,139.20
30%	30%	153,885,654.01	44,526,915.70	26,071,708.80
40%	40%	205,180,872.01	-6,768,302.30	34,762,278.40
50%	50%	256,476,090.01	-58,063,520.30	43,452,848.00
Redemption Largest Investor	37%	189,646,066.24	8,766,503.47	32,130,331.09
Historical Redemptions				
Max Loss 2015-2020	20.36%	104,432,826.83	93,979,742.88	17,693,281.86
Max Loss 2010-2015	1.57%	8,064,394.57	190,348,175.14	1,366,290.76
Max Loss 2005-2010	3.35%	17,208,480.15	181,204,089.56	2,915,505.58
Expected Shortfall (ES)	1.40%	7,196,908.57	191,215,661.14	1,219,319.02
VaR 5%	0.15%	778,955.62	197,633,614.09	131,972.69
VaR 1%	0.47%	2,393,818.65	196,018,751.06	405,567.00
Redemptions per Investor Type				
Non-monetary financial institutions	75%	14,938,165.11	183,474,404.60	2,530,862.89
Resident individual-investors	65%	226,258,032.35	-27,845,462.64	38,333,225.87
Enterprises	25%	3,393,937.62	195,018,632.09	575,009.76
Non-resident individual-investors	40%	49,386,184.20	149,026,385.51	8,367,136.11
Scenario	**Value Real Estate (€)**		**Total Loss (€)**	
Assets				
Seismic Risk				
Properties Level 3 Risk – Lisboa	97,701,855.31	5,146,397.04	44,227,139.16	154,185,430.55
Properties Level 3 Risk – Algarve	5,086,482.00	358,714.92	2,393,307.72	196,019,261.99
Default				
Top 5 Tenants Default	-	9,430,451.04	9,430,451.04	188,982,118.67
Top 10 Tenants Default	-	11,657,442.60	11,657,442.60	186,755,127.11
Top 15 Tenants Default	-	13,491,243.96	13,491,243.96	184,921,325.75

Appendix Chapter 11 – ESG Risk

Appendix 11.1 – Organizational scoreboard.

Organizational Assessment

#	KRI	E,S,G	Metric
1	Property investment policy	G	The organization has a property investment policy defined.
2	Responsible property investment (RPI) policy	G	The organization has a responsible property investment policy defined.
3	Formal commitment on RPI	G	The organization mentions RPI aspects in the funds' prospects for Real Estate assets.
4	ESG in contracts	G	ESG topics are mentioned in contract clauses or green leases.
5	Investment committee's supervision	G	The investment committee supervises all ESG aspects.
6	International standards	G	International standards/ frameworks are considered for materiality analysis (TCFD, SASB, GRI, GRESB, etc.).
7	ESG risk in pricing	G	The level of ESG risk exposure affects pricing offered/paid (e.g. OPEX and CAPEX assumptions).
8	Due diligence commitment	G	The due diligence encompasses third-party consultants, site visits and interviews to personnel.
9	Comparison with past performance	G	The team monitors the ESG scores at a property level and assesses historical performance for risk management purposes.
10	SDG alignment	G	The team has an SDG alignment strategy in place.
11	Budget availability	G	There is sufficient budget available to ensure that the systems and procedures needed to achieve the target are put in place.
12	ESG impact on financial performance	G	The ESG impact on financial performance is assessed.

Real Estate Team/ Department

#	KRI	E,S,G	Metric
1	Conflicts of interests	G	Employees at BPI GA are not related, except professionally, with the purchase, sale and rental of the buildings the company owns.
2	Separation of powers	G	The first line of defence in risk management is separated from the second and third ones.
3	Bribery, money laundering and corruption	G	Whether cases of bribery, corruption and money laundering were identified over the last 3 years, regarding any member of BPI GA.

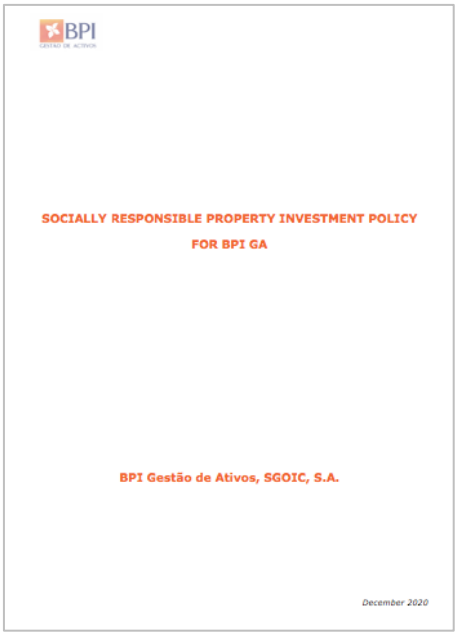
Active Ownership

#	KRI	E,S,G	Metric
1	Tenant engagements	G	Tenant engagements were made during the last year.
2	ESG in tenant engagements	G	Whether ESG factors are taken into account in tenant engagements.
3	Tenant exclusions	G	Tenants were excluded when necessary, namely when there was too much ESG risk exposure and engagements were made without efficacy.
4	Constructions	G	Constructions, developments or renovations were made when needed.

Appendix 11.2 – Socially Responsible Property Investment Policy fand complementary manual of procedures.

Socially Responsible Property Investment – *Policy*

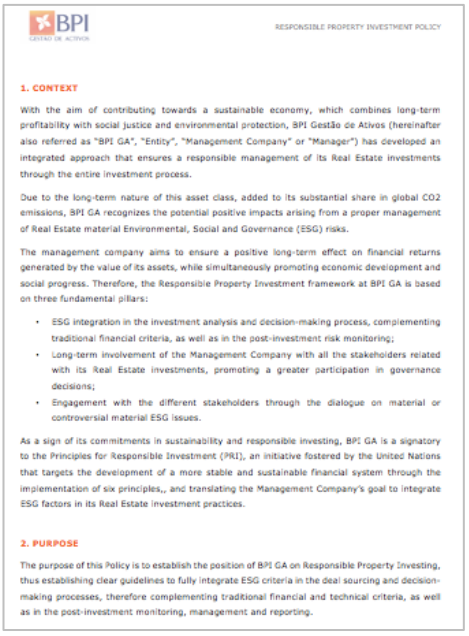
We developed this Policy in collaboration with BPI GA's SRI and Real Estate Departments. It aims to establish the company's position on Responsible Property Investing, defining guidelines to integrate ESG criteria in the deal-sourcing and decision-making processes, as well as in the post-investment monitoring, management and reporting. The strategy complements traditional financial and technical criteria.



SOCIALLY RESPONSIBLE PROPERTY INVESTMENT POLICY
FOR BPI GA

BPI Gestão de Ativos, SGOIC, S.A.

December 2020



RESPONSIBLE PROPERTY INVESTMENT POLICY

1. CONTEXT

With the aim of contributing towards a sustainable economy, which combines long-term profitability with social justice and environmental protection, BPI Gestão de Ativos (hereinafter also referred as "BPI GA", "Entity", "Management Company" or "Manager") has developed an integrated approach that ensures a responsible management of its Real Estate investments through the entire investment process.

Due to the long-term nature of this asset class, added to its substantial share in global CO2 emissions, BPI GA recognizes the potential positive impacts arising from a proper management of Real Estate material Environmental, Social and Governance (ESG) risks.

The management company aims to ensure a positive long-term effect on financial returns generated by the value of its assets, while simultaneously promoting economic development and social progress. Therefore, the Responsible Property Investment framework at BPI GA is based on three fundamental pillars:

- ESG integration in the investment analysis and decision-making process, complementing traditional financial criteria, as well as in the post-investment risk monitoring;
- Long-term involvement of the Management Company with all the stakeholders related with its Real Estate investments, promoting a greater participation in governance decisions;
- Engagement with the different stakeholders through the dialogue on material or controversial material ESG issues.

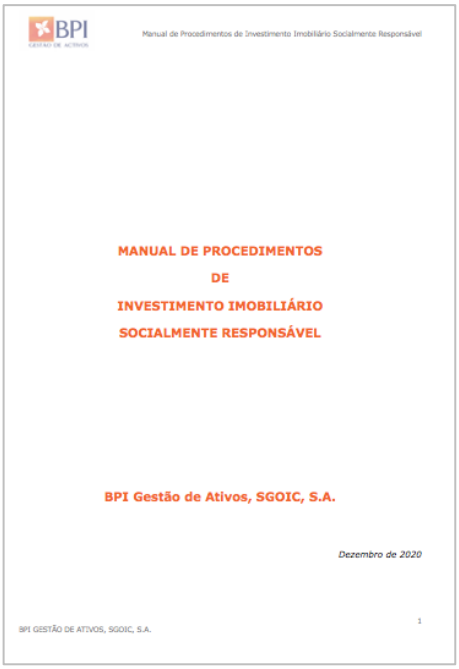
As a sign of its commitments in sustainability and responsible investing, BPI GA is a signatory to the Principles for Responsible Investment (PRI), an initiative fostered by the United Nations that targets the development of a more stable and sustainable financial system through the implementation of six principles,, and translating the Management Company's goal to integrate ESG factors in its Real Estate investment practices.

2. PURPOSE

The purpose of this Policy is to establish the position of BPI GA on Responsible Property Investing, thus establishing clear guidelines to fully integrate ESG criteria in the deal sourcing and decision-making processes, therefore complementing traditional financial and technical criteria, as well as in the post-investment monitoring, management and reporting.

Socially Responsible Property Investment – *Manual of Procedures*

We developed a manual of procedures to complement the Policy. It describes the process followed by the company to incorporate ESG criteria in all the stages previously mentioned.



Manual de Procedimentos de Investimento Imobiliário Socialmente Responsável

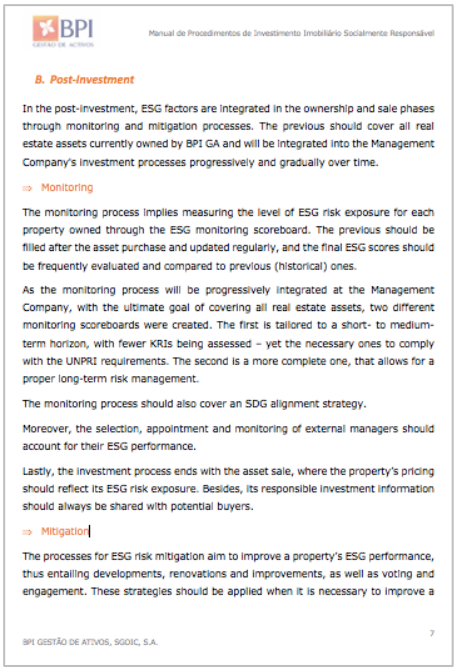
MANUAL DE PROCEDIMENTOS
DE
INVESTIMENTO IMOBILIÁRIO
SOCIALMENTE RESPONSÁVEL

BPI Gestão de Ativos, SGOIC, S.A.

Dezembro de 2020

1

BPI GESTÃO DE ATIVOS, SGOIC, S.A.



Manual de Procedimentos de Investimento Imobiliário Socialmente Responsável

B. Post-Investment

In the post-investment, ESG factors are integrated in the ownership and sale phases through monitoring and mitigation processes. The previous should cover all real estate assets currently owned by BPI GA and will be integrated into the Management Company's investment processes progressively and gradually over time.

⇒ Monitoring

The monitoring process implies measuring the level of ESG risk exposure for each property owned through the ESG monitoring scoreboard. The previous should be filled after the asset purchase and updated regularly, and the final ESG scores should be frequently evaluated and compared to previous (historical) ones.

As the monitoring process will be progressively integrated at the Management Company, with the ultimate goal of covering all real estate assets, two different monitoring scoreboards were created. The first is tailored to a short- to medium-term horizon, with fewer KRIs being assessed – yet the necessary ones to comply with the UNPRI requirements. The second is a more complete one, that allows for a proper long-term risk management.

The monitoring process should also cover an SDG alignment strategy.

Moreover, the selection, appointment and monitoring of external managers should account for their ESG performance.

Lastly, the investment process ends with the asset sale, where the property's pricing should reflect its ESG risk exposure. Besides, its responsible investment information should always be shared with potential buyers.

⇒ Mitigation

The processes for ESG risk mitigation aim to improve a property's ESG performance, thus entailing developments, renovations and improvements, as well as voting and engagement. These strategies should be applied when it is necessary to improve a

7

BPI GESTÃO DE ATIVOS, SGOIC, S.A.

Appendix 11.3 – Property Assessment Scoreboard. Used in the deal sourcing (pre-investment) and in the monitoring phases (post-investment).

#	KRI	E,S,G	Metric
1	Energy efficiency	E	Energy efficiency represented by the energy class (from the energy certificate).
2	Percentage of renewable energy	E	Percentage of renewable energy from the total energy consumed (from the energy certificate).
3	Waste management	E	Existence of waste management procedures in place (e.g. recycling bins).
4	Water management	E	Existence of water management procedures in place (e.g. automatic taps).
5	Negative impact on biodiversity	E	No incidents with negative impacts on nearby biodiversity were verified in the last 5 years.
6	Contaminated land	E	No land contamination due to bad waste management or bad water management.
7	Resilience to natural disasters: Floods and sea level rise	E	Propensity of the property's location to the occurrence of floods and sea level rise (defined in the Asset Concentration section).
8	Resilience to natural disasters: earthquakes	E	Propensity of the property's location to the occurrence of earthquakes (defined in the Asset Concentration section).
9	Access to public transports	E	Building located in an area with access to the different types of public transports: metro, train, bus, boat, plane.
10	Infrastructure quality	S	No incidents due to the infrastructure/ materials were verified in the last 5 years.
11	Building safety: procedures and equipment	S	Existence of safety procedures/equipment in place (emergency exits, first aids kits, equipment and procedures for fires, earthquakes, floods).
12	Security	S	The building has a security team in place.
13	Adaptations for handicapped	S	The building has the necessary equipment/ infrastructure for handicapped people.
14	Property certification scheme/label	E	Building has a property rating/certification scheme (e.g. LEED, NAHB Green, BREEAM, CASBEE, HQE, DGNB)

Appendix 11.4 – Scoreboard for assessing tenants, sellers and providers of external services. The score is measured for tenants in the deal sourcing (pre-investment) and in the monitoring phases (post-investment), for sellers in the deal sourcing phase. and for the providers of external services in the monitoring phase.

#	KRI	E,S,G	Metric
1	**Human rights compliance**	S	Compliance with the global human rights standards.
2	**No child labour**	S	Compliance with the global standards against child labour.
3	**Labour standards compliance**	S	Compliance with the global labour standards.
4	**No connection with controversial weapons**	S	No connection with controversial weapons and scandals, such as nuclear ones, in recent years.

Appendix 11.5 – Choice of SDGs: goals, targets and indicators being tracked.

Goal	Target	Indicator
Goal 6. Ensure availability and sustainable management of water and sanitation for all.	**6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	**6.3.1** Proportion of wastewater safely treated.
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.	**7.2** By 2030, increase substantially the share of renewable energy in the global energy mix.	**7.2.1** Renewable energy share in the total final energy consumption.

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.	**8.7** Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms.	**8.7.1** Proportion and number of children aged 5-17 years engaged in child labour, by sex and age.
	8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.	**8.8.1** Frequency rates of fatal and non-fatal occupational injuries, by sex and migrant status.
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.	**9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.	**9.4.1** CO2 emission per unit of value added.
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable.	**11.5** By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.	**11.5.1** Number of deaths, missing persons and persons affected by disaster per 100,000 people.
Goal 12. Ensure sustainable consumption and production patterns.	**12.5** By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	**12.5.1** National recycling rate, tons of material recycled.
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide	**16.5** Substantially reduce corruption and bribery in all their forms	**16.5.2** Proportion of businesses that had at least one contact with a public official and that

access to justice for all and build effective, accountable and inclusive institutions at all levels.		paid a bribe to a public official or were asked for a bribe by those public officials during the previous 12 months.

Appendix 11.6 **–** SDG alignment strategy for BPI GA: SDG targets, target date, scope and strategies.

SDG	Target Date	Scope	Strategy
16.5.2	2021	Organizational level	Monitor that no corruption practices are verified in the management company. This should be measured through briberies paid to public officials.
8.7.1	2021	Tenants External services providers	Eliminate and/or do not incur in business with any current tenant or provider of external services which is related to child labour scandals.
8.8.1	2021	Tenants External services providers	Assure that current tenants and external services providers are in compliance with labour rights, as well as with health and safety standards, by addressing the number of incidents and fatal injuries occurred.
6.3.1	2023	Renovations, improvements and developments	Reduce water pollution caused by constructions, not dumping hazardous chemicals.
12.5.1	2023	Tenants Monitoring	Engage with the different tenants to increase recycling patterns across portfolio assets.

7.2.1	2026	Deal sourcing Renovations, improvements and developments Tenants	Increase the portfolio's proportion of renewable energy, from the total energy consumed. This means prioritizing the acquisition and developing buildings with greener features, improving the current assets in the portfolio which have a low percentage of renewable energy, and monitoring tenant's activities in this matter, mitigating through engagements when necessary.
9.4.1	2026	Deal sourcing Renovations, improvements and developments	Upgrade current infrastructure and give priority to new acquisitions that present greener features, thus decreasing the CO2 emissions of the overall portfolio and increasing the efficiency in resource usage.
11.5.1	2026	Deal sourcing Renovations, improvements and developments Monitoring	Decrease the number of deaths caused by natural disasters by ensuring that buildings are safe in their construction features and quality of materials, and by having the correct procedures and equipment in place for coping with these extreme events.

Appendix 11.7 – Scoreboard for construction interventions.

#	KRI	E,S,G	Metric
1	ESG in interventions	G	ESG matters were considered in renovations, improvements or developments.
2	Ecological impacts	G	Incidents that affected the environment and non-compliance with environmental permits, standards and regulations, were not verified during the last year.
3	Light pollution	E	Efficiency in the minimisation of light pollution to the surrounding community.
4	Noise pollution	E	Efficiency in the minimisation of noise pollution to the surrounding community.

5	Water management	E	Water conservation measures were employed.
6	Waste management	E	Management of waste by diverting construction and demolition materials from disposal was verified.
7	Health and safety	S	There was a constant monitoring of health and safety at the construction site.
8	Certified label for materials	G	There were requirements on the use of certified (or labelled) sustainable building materials.
9	Green building	G	Building achieved a green building certification.
10	Renewable energy	E	Renewable energy technologies were installed when feasible.

Appendix 11.8 – Targets for the UNPRI score maximization. This Appendix details the strategy for obtaining the highest possible score in each question, according to the client's profile and business activities. Questions are divided according to the period when they are fully maximized, either 2020, 2023 or 2026. Note that the UNPRI has two open questions with no scoring, that will be answered considering the 2020 reporting year.

Questions with a maximum score obtained in December 2020
RE 1) Create of a Responsible Investment Policy for the Real Estate asset class (RPI), covering the ESG approach to new constructions, major renovations, standing investments and tenants (excluding tenants if necessary). A complementary manual of procedures is advised as well. **RE 2)** Incorporate the responsible commitment in the prospectus, which can be considered the equivalent to formal LPAs in private equity.

RE 3.1) Consider materiality data and recommendations from the SASB, GRI and TCFD throughout the entire ESG risk management strategy, by integrating them into the different action plans.
Questions with a maximum score obtained in December 2023
RE 9) Require, for development projects and major renovations, the management of waste by diverting construction and demolition materials from disposal, the minimisation of light and noise pollution to the surrounding community, the performance of an environmental site assessment, the protection of surface and ground water by controlling and retaining construction pollutants, as well as the constant monitoring of health and safety. The compliance with the previous requirements is done through the scoreboard for construction interventions. **RE 11)** Collect the ESG performance of each building for electricity consumption, water consumption and waste production, through two monitoring scoreboards – one tailored to a short- to medium-term horizon with fewer KRIs being assessed, and a more complete one for a proper long-term ESG risk management. **RE 12)** Determine targets for the KPIs being tracked considering both incremental improvements based on past performance, by comparing ESG internal scores obtained through time, and targeting global benchmarks, through the SDG alignment strategy. **RE 13)** Support ESG targets in the monitoring phase through operational-level benchmarks to assess and analyse the performance of assets against sector performance, by ensuring budget availability, by hiring external verification services to audit performance, systems and procedures, as well as to develop minimum health and safety standards, which are in fact a law requirement in Portugal. The previous supporting measures can be monitored through the scoreboards.

RE 18) Share responsible investment information with potential buyers, namely the company's high-level commitment to responsible investment – such as being a PRI signatory – and the alignment with international standards and entities, as well as sharing the Responsible Property Investment Policy (or its key aspects) and the outcome of a latest ESG risk assessment.

RE 19) Report ESG matters to investors and beneficiaries, in aggregate, both formally and through public sustainability reports, as well as through digital or physical events or meetings. An ad hoc or informal reporting on serious ESG incidents is also performed.

Questions with a maximum (or almost maximum) score obtained in December 2026

RE 3) Assess materiality in the pre-investment phase at the asset level, for all Real Estate assets in the portfolio, which is achieved through the deal-sourcing scoreboard.

RE 4) The exposure to ESG risks, assessed through the due diligence, allowed the management company to identify risks and value creation opportunities, with the help of the deal sourcing ESG scoreboard (pre-investment), leading to the abandonment of new investments when necessary. The investment committee discusses all ESG factors, and this exposure affects the price paid/offered through CAPEX and/or OPEX assumptions.

RE 5) Conduct a proper due diligence by doing a high-level review for initial ESG red flags through the deal sourcing scoreboard, as well as through a technical due diligence on specific issues made by third party consultants, ESG questionnaires sent to target companies, site visits and in-depth interviews with management and personnel. Moreover, the actions based on the risks and opportunities identified are also considered in the post-investment plans – through the post-investment (monitoring) scoreboard – and the investment committee is the ultimate responsible for ensuring that all ESG due diligence is completed in the same manner as the other key due diligences, indicated in the RPI Policy.

RE 10) Require, aimed at construction interventions, green certifications for new buildings, the usage of certified sustainable building materials, the installation of renewable energies and water conservation measures, the health and well-being of occupants. Also, require for some interventions to become net-zero carbon emitters within five years of completion. The compliance with the previous requirements is done through the scoreboard for construction interventions.

RE 14) Create value by manging ESG risks and opportunities through property specific ESG action plans based on pre-investment research, due diligence and materiality findings, as well as adjusting them based on performance monitoring findings and hiring external advisors to provide support with specific ESG value creation opportunities.

RE 16) ESG/RI certification or label is attributed to the assets in the portfolio, provided by an independent ESG/sustainability initiative or labelling scheme.

RE 17) Engagements with tenants are defined through an appropriate engagement strategy, by organising events focused on increasing sustainability awareness and training, tackling energy and water consumption and/or waste production, as well as offering green leases and offering shared financial benefits from equipment upgrades.

Open questions with no score (to be answered in the 2020 reporting year)

RE 13.1) During 2020, two processes that support meeting ESG targets were implemented, namely the development of ESG scoreboards – that allow BPI GA to obtain final ESG scores based on the assessment of materiality KRIs at the organizational and portfolio levels – and the development of an SDG alignment strategy.

RE 15) A long-term ESG action plan allows for a stable and consistent increase in ESG performance, thus demanding the appropriate systems in order to manage potential issues on an ongoing basis and creating value while managing risks. The action plan for the management company is divided in three periods, obtaining a fully maximized grade for the

reporting year of 2026. Moreover, the scoreboards aim to create an historical database that allows for comparisons with past performance and inferences on materiality and mitigation strategies, that can be differentiated between different industries. The SDG alignment strategy also aims to be fully implemented until 2026. Therefore, the overall strategy for risk management aims to increasingly impact ESG performance and financial performance through time, creating value and decreasing the undesired ESG risk exposure.

Appendix 11.9 – Answers to the UNPRI for the three periods – until December 2020, 2023 and 2026. Questions with no score are not considered in this table.

Question	Sep 2020	Dec 2020	Dec 2023	Dec 2026
RE 1	(D)	(A)	(A)	(A)
RE 2	(D)	Minority: (A).	Majority: (A).	All: (A).
RE 3	(D)	(A); (B); (C).	(A); (B); (C).	(A); (B); (C).
RE 3.1	(D)	(A); (B); (C).	(A); (B); (C).	(A); (B); (C).
RE 4	Minority: (A).	Minority: (A); (B); (D); (E); (G).	All: (A); (B). Majority: (D); (E); (G); (H).	All: (A); (B); (D). Majority: (E); (G); (H).
RE 5	Majority: (C); (D).	Majority: (C); (D); (G). Minority: (A); (E).	All: (A); (B); (D); (G). Majority: (C); (E).	All: (A); (B); (C); (D); (E); (G).
RE 9	(E);(I).	(A); (C); (D); (E); (I).	(A); (C); (D); (E); (H); (I).	(A); (C); (D); (E); (H); (I).
RE 10	All: (G). Majority: (D). Minority: (F).	All: (G). Majority: (D). Minority: (F).	All: (G). Majority: (D); (F). Minority: (B); (C).	All: (G). Majority: (B); (C); (D); (F). Minority: (E).
RE 11	All: (A).	All: (A). Majority: (B); (C).	All: (A); (B); (C).	All: (A); (B); (C).

RE 12	(D).	(C).	(A); (C).	(A); (C).
RE 13	All: (F). Majority: (D).	All: (A); (F). Majority: (C); (D).	All: (A); (C); (D); (F).	All: (A); (C); (D); (F).
RE 14	(D).	Minority: (A); (B); (C).	All: (A); (B). Majority: (C).	All: (A); (B); (C).
RE 16	(D).	(C).	(B).	(A).
RE 17	Minority: (B).	Minority: (A); (B).	Majority: (A); (B). Minority: (C); (E).	Majority: (A); (B). Minority: (C); (E).
RE 18	Majority: (A).	All: (C). Majority: (A); (B). Minority: (E).	All: (A); (B); (C). Majority: (E).	All: (A); (B); (C); (E).
RE 19	(D).	(A); (B); (E).	(A); (B); (C); (E); (F).	(A); (B); (C); (E); (F).

Appendix Chapter 12 – Valuation

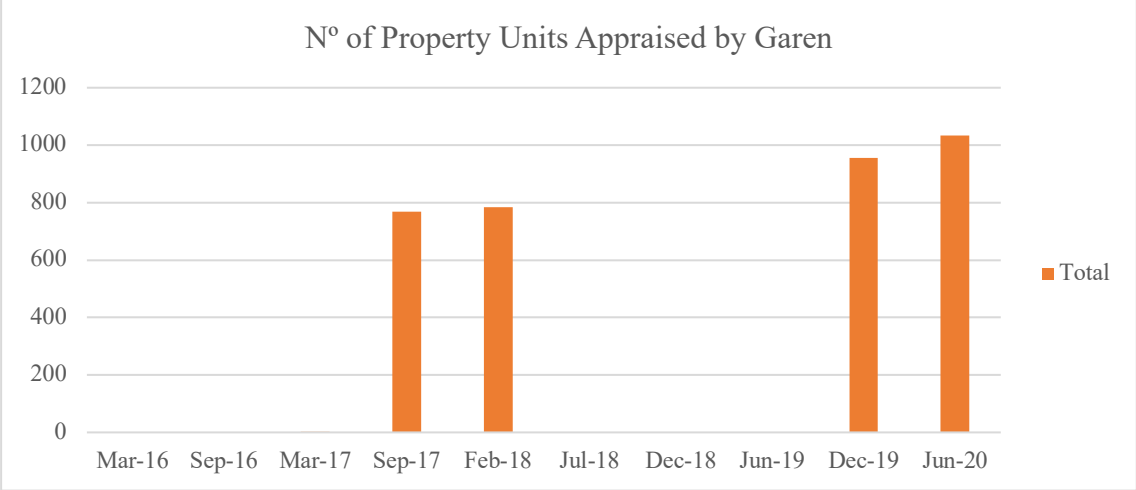
Appendix 12.1 – *Imofomento*'s appraisal experts, retrieved from *Imofomento*'s prospect.

6. Os Peritos Avaliadores de Imóveis

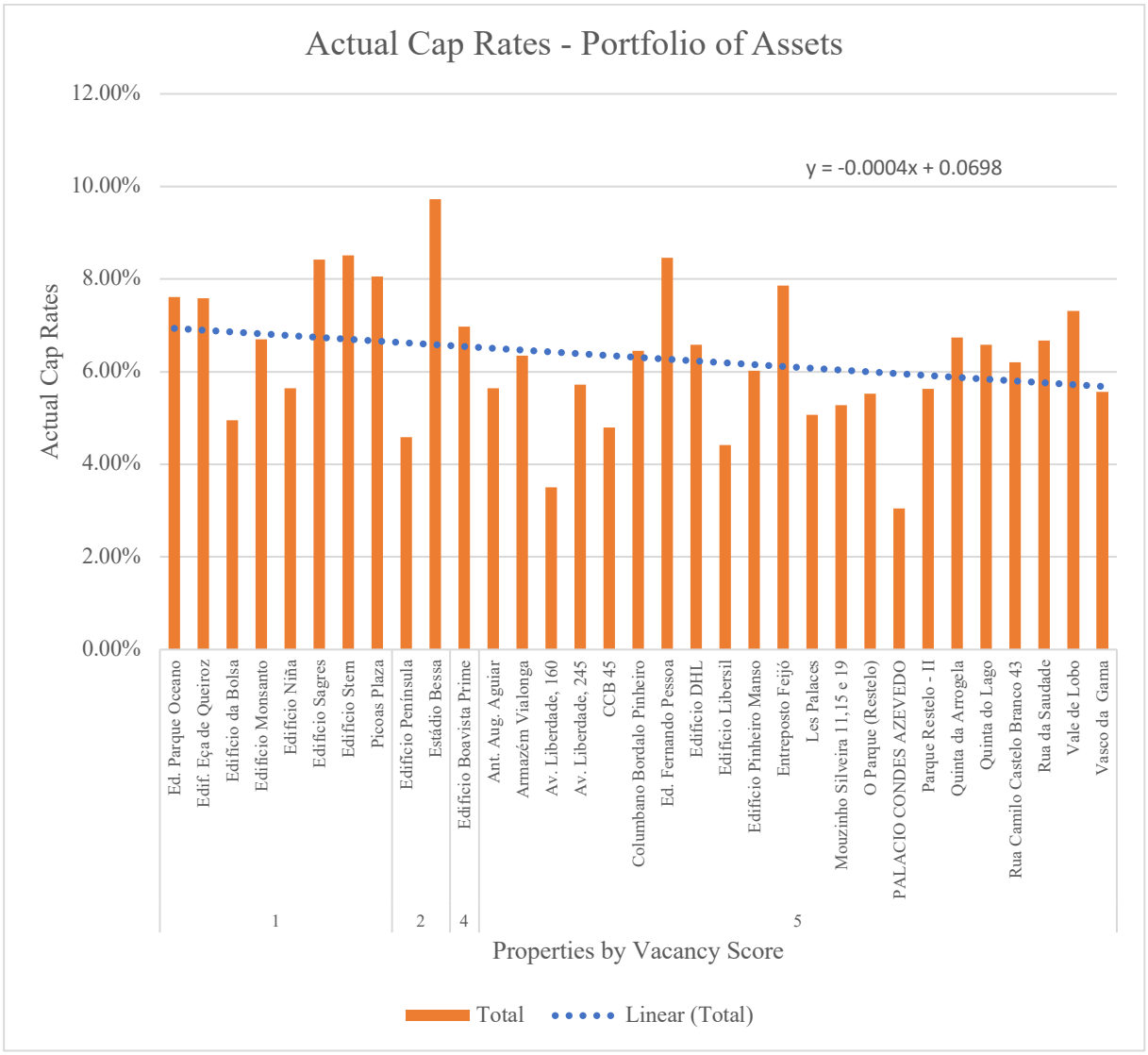
Os peritos avaliadores são:

Água Branca – Projectos de Engenharia,Lda.
AURA Real Estate Experts Portugal, Lda
Besturban – Avaliação e Gestão de Patrimónios Imobiliários, Lda.
BDOTPRIME – Mediação Imobiliária, Lda.
CBRE – Consultoria e Avaliação de Imóveis Unipessoal, Lda
CPU Consultores - Avaliação Imobiliária e Certificação Energética Lda
Cushman & Wakefield – Consultoria Imobiliária Unipessoal, Lda
Garen – Avaliação de Activos, Lda.
Gesvalt Premium, SA
JLL – Sociedade de Avaliações Imobiliárias Unipessoal, Lda.
Ktésios Appraisal – Consultoria e Avaliação de Imobiliário, Lda.
Leksi – Consulting Unipessoal,Lda.
Prime Yield – Consultadoria e Avaliação Imobiliária, Lda
PVW – Price, Value and Worth – Avaliações Imobiliárias, Lda.
Structure Value – Avaliações Imobiliárias, Lda.
Torres Mascarenhas, Lda.
Urbanflow – Engenharia e Consultoria, Lda.

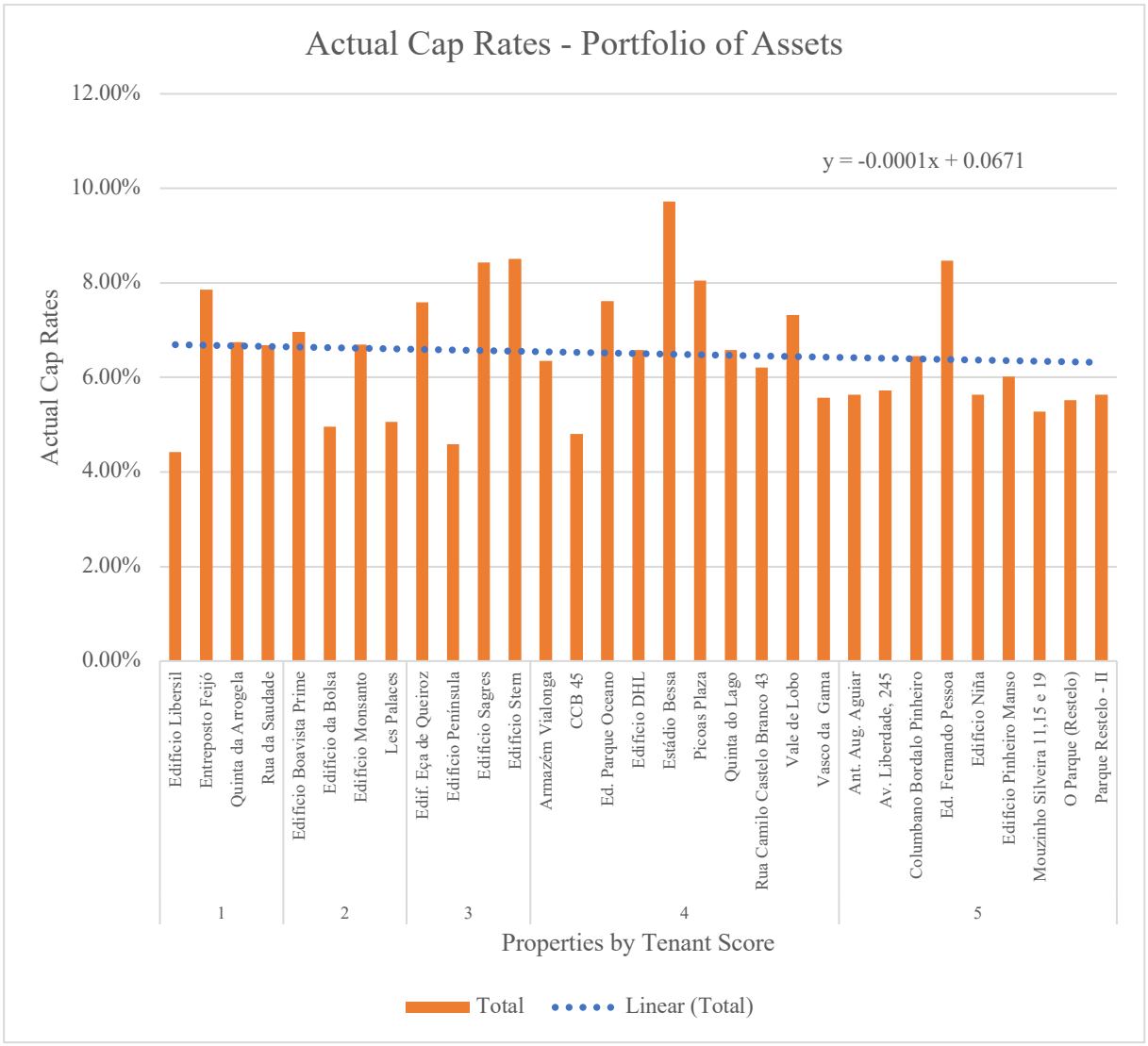
Appendix 12.2 – Number of property units (fractions) subject to valuation by the appraisal expert firm *Garen - Avaliação de Activos, Lda.*



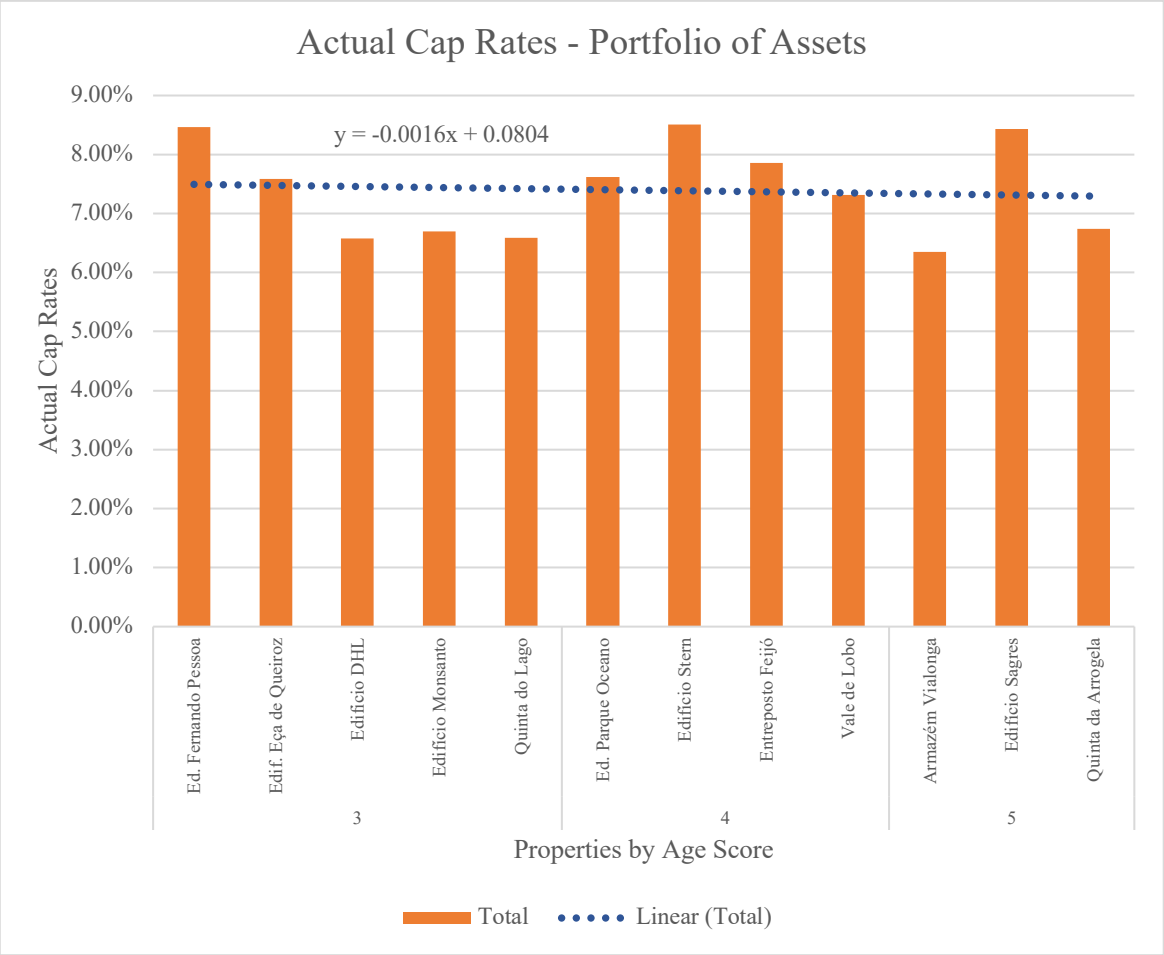
Appendix 12.3 – Vacancy scores plotted against the correspondent actual cap rates for each property. The vacancy score ranges from 1 to 5, with the level 1 corresponding to the highest vacancies (and highest vacancy risk), and the level 5 corresponding to the lowest vacancies. The plot shows that lower vacancy levels correspond to lower actual cap rates.



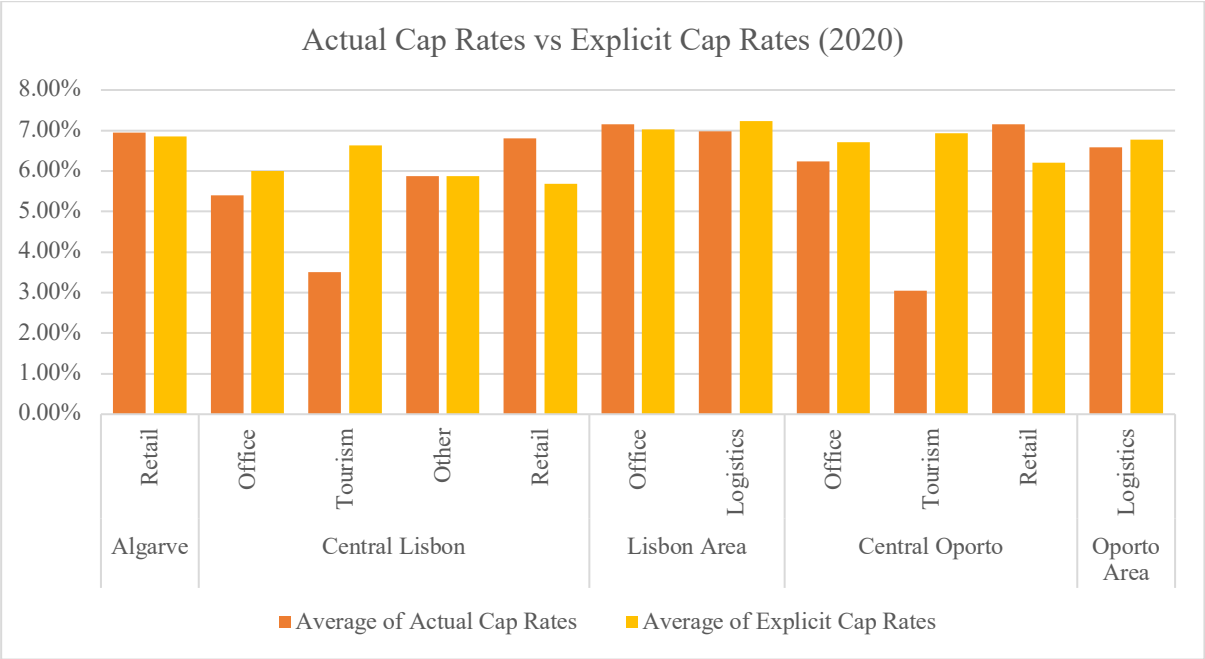
Appendix 12.4 **–** Tenant scores plotted against the correspondent actual cap rates for each property. The tenant score ranges from 1 to 5, with the level 1 corresponding to the riskiest tenants, and the level 5 corresponding to the best tenants. The plot shows that less risky tenants correspond to lower actual cap rates.



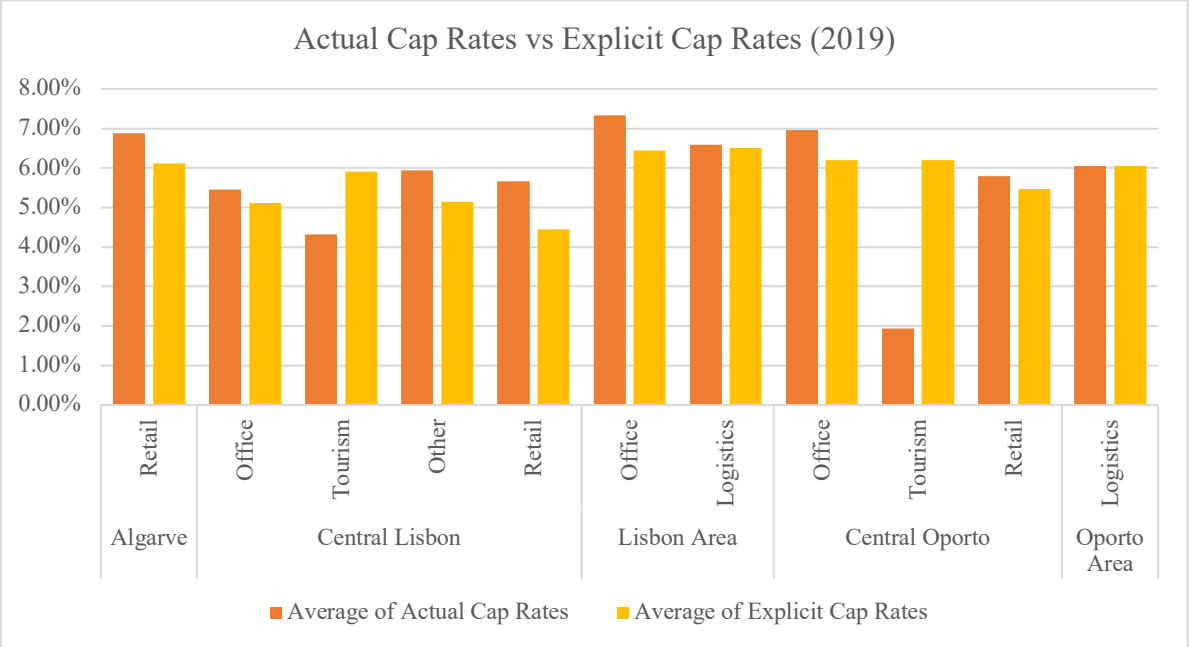
Appendix 12.5 – Building age scores plotted against the correspondent actual cap rates for each property. The age score ranges from 1 to 5, with the level 1 corresponding to the oldest buildings (and thus riskiest), and the level 5 corresponding to newest ones. The plot shows that less risky buildings in terms of the age factor correspond to lower actual cap rates.



Appendix 12.6 **–** Final results of the explicit capitalization rates model, plotted against the actual capitalization rates in 2020. The findings are grouped by sector within 5 different geographical areas – Algarve, Lisbon, Porto, Central Lisbon and Central Porto.

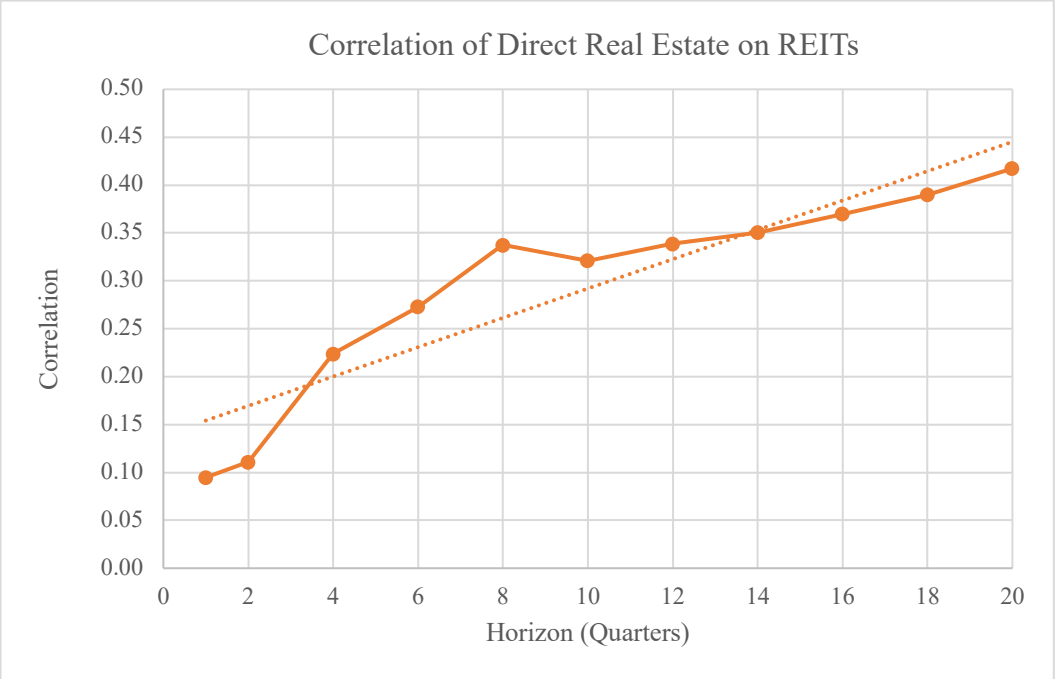


Appendix 12.7 **–** Final results of the explicit capitalization rates model, plotted against the actual capitalization rates in 2019.



Appendix Chapter 13 – REITs

Appendix 13.1 **–** Correlation between direct Real Estate and REITs.



Appendix 13.2 **–** Relevant investment legislation in Portugal for Real Estate funds, extracted from *Imofomento*'s official prospectus.

Limits to Investment
a) Real Estate assets must have a weight of 66.67% or higher of the overall portfolio's AuM.
b) Real Estate physical assets must have a weight of 33.33% or higher of the overall portfolio's AuM.
c) A single Real Estate asset must not have a weight higher than 20% of the overall portfolio's AuM.
d) The limit for the acquisition of participation units in external Real Estate funds (including REITs) is 25% of the overall portfolio's AuM.

Appendix 13.3 – Optimal portfolio for each strategy and current *Imofomento* portfolio's weights.

		Direct Real Estate	REIT	Hedged REIT's Index	Cash
	Imofomento	66.81%	-	-	33.19%
	70 / 30	70%	30%	-	-
	70 / 25 / 5	70%	25%	-	5%
No Hedge	***Min Var***	64.00%	2.67%	-	33.33%
	Tangency Portfolio	60.60%	6.07%	-	33.33%
Hedge	***Min Var***	63.36%	-	3.31%	33.33%
	Tangency Portfolio	61.01%	-	5.66%	33.33%

Appendix 13.4 – Performance indicators for each strategy, including current *Imofomento*'s indicators.

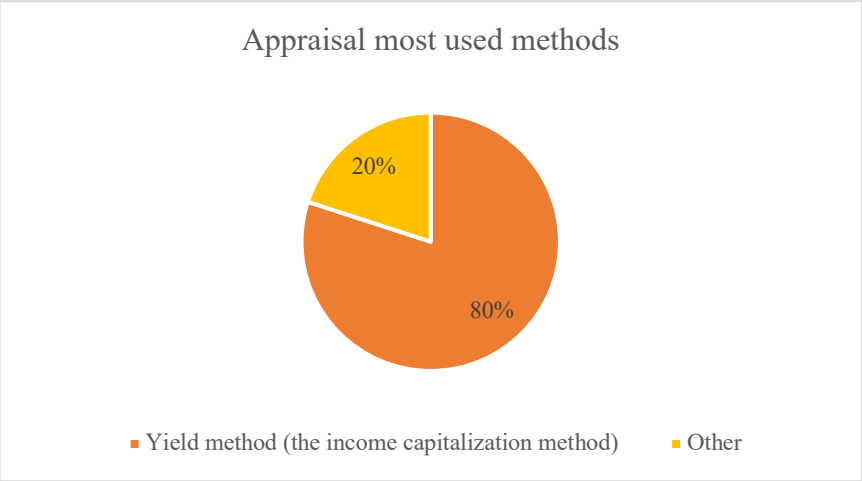
		Annualised Return	Annual Volatility	Info Sharp Ratio
	Imofomento	3.424%	2.37%	1.45
	70 / 30	19.71%	10.20%	1.93
	70 / 25 / 5	17.07%	8.48%	2.01
No Hedge	***Min Var***	4.90%	2.29%	2.14
	Tangency Portfolio	6.50%	2.61%	2.49
Hedge	***Min Var***	4.96%	2.20%	2.26
	Tangency Portfolio	5.90%	2.54%	2.32

Appendix 13.5 – *Imofomento*'s historical performance (2015-2019) it had invested in REITs under each strategy.

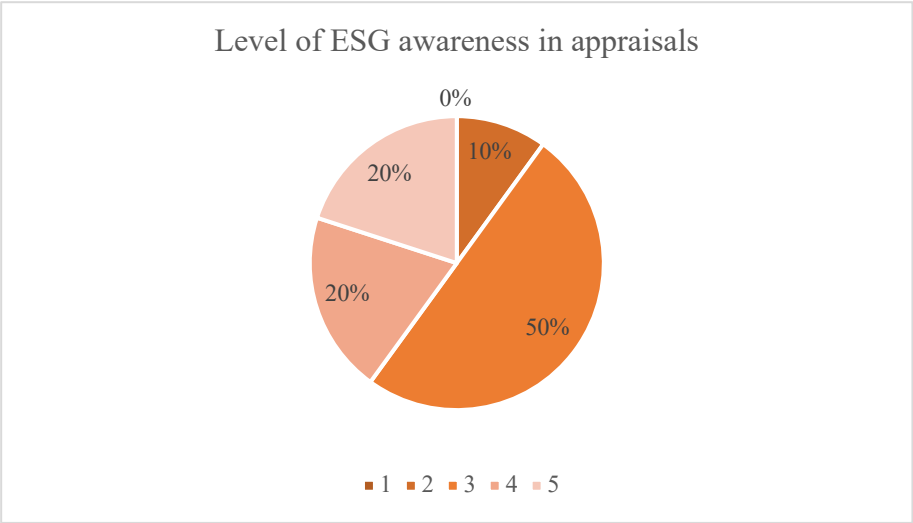
	REIT or Hedged REIT index	Annualised Return	Annual Volatility	Info Sharp Ratio
Imofomento	**0%**	**3.424%**	**2.37%**	**1.45**
No Hedge Min Var	2.67%	4.837%	2.24%	2.16
No Hedge Tangency Portfolio	6.07%	6.635%	2.63%	2.52
Hedge Min Var	3.31%	4.538%	2.17%	2.09
Hedge Tangency Portfolio	5.66%	5.613%	2.37%	2.37

Appendix Chapter 14 – Knowledge initiative

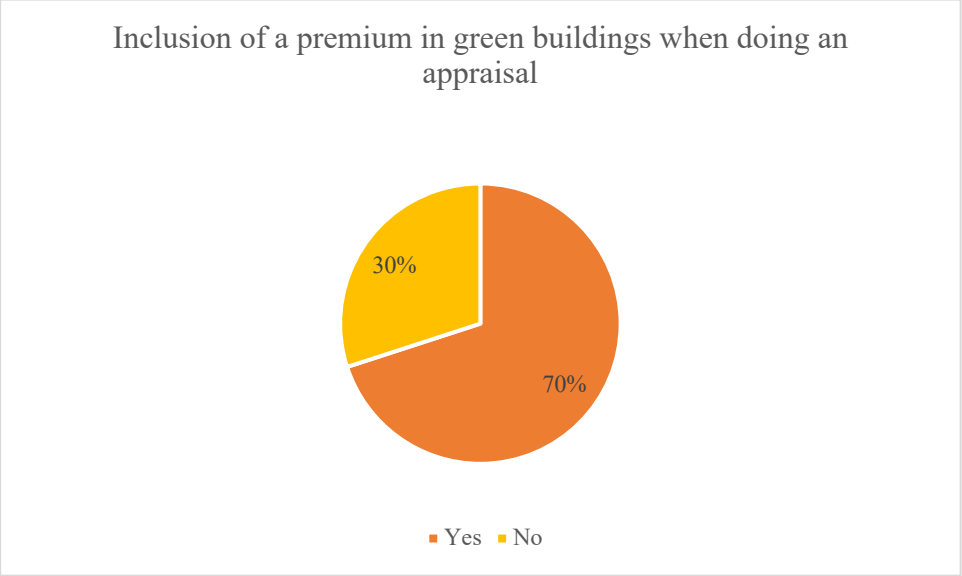
Appendix 14.1 – Appraisers' answers to the most commonly used appraisal method.



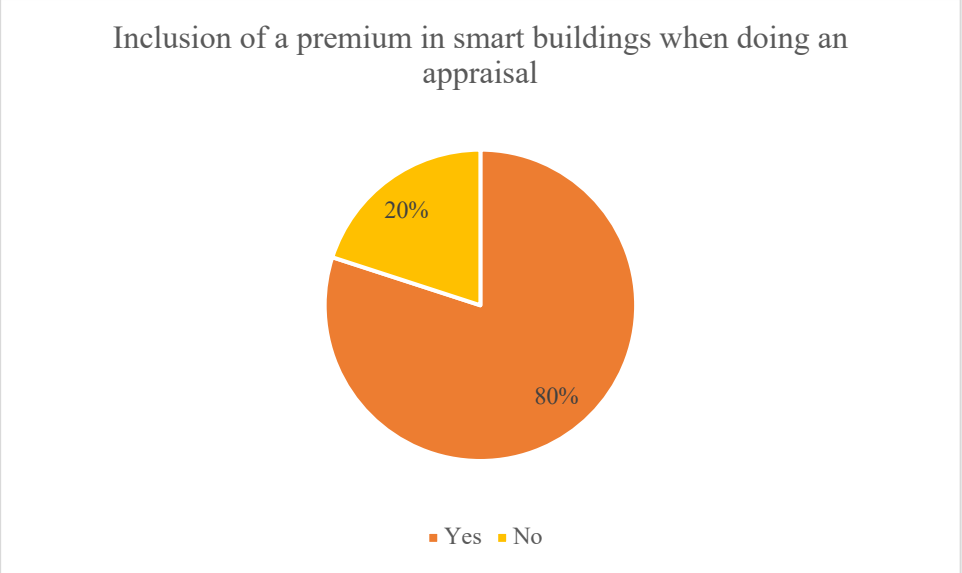
Appendix 14.2 – Appraisers' answers related to the use of ESG-related information in appraisals. Legend: 1- We do not take ESG into consideration; 2- Yes, but we do not use this information when making appraisals; 3-We vaguely take energy certificates into account when making appraisals; 4- We observe in some detail the ESG aspects such as energy classification, CO2 emissions, among others, when making appraisals; 5- We integrate ESG aspects into evaluations



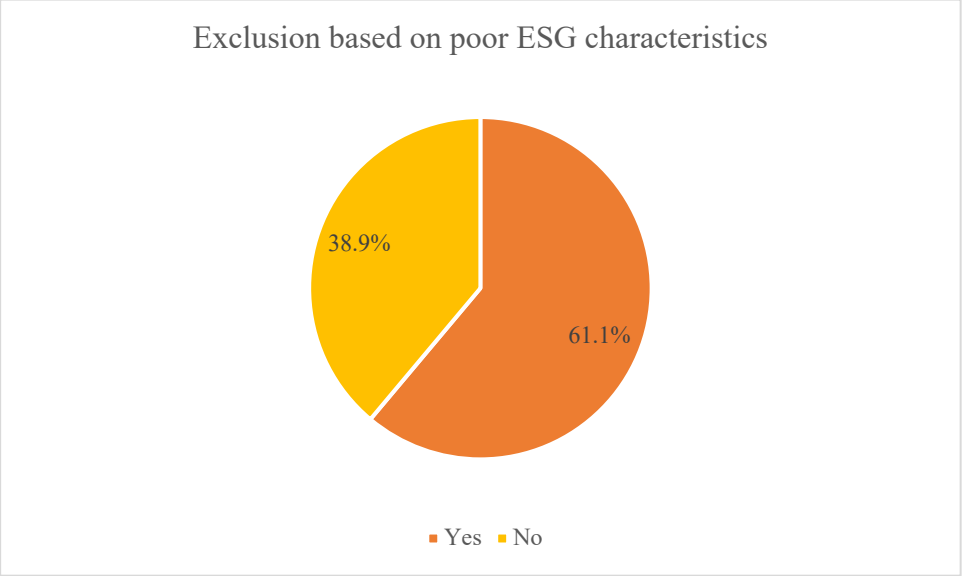
Appendix 14.3 **–** Appraisers' answers concerning whether they include or not of a premium when appraising a green building.



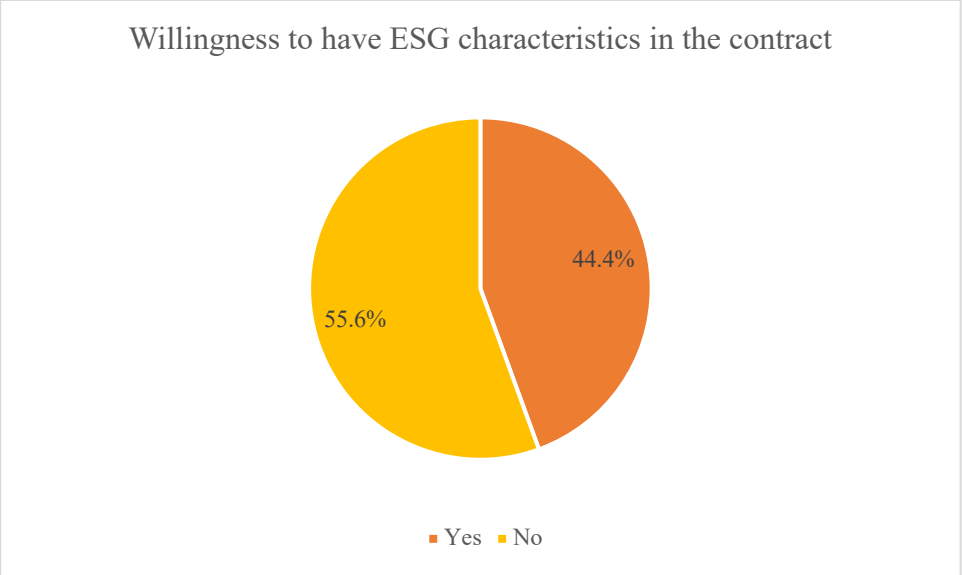
Appendix 14.4 **–** Appraisers' answers to the inclusion or not of a premium when appraising a smart building.



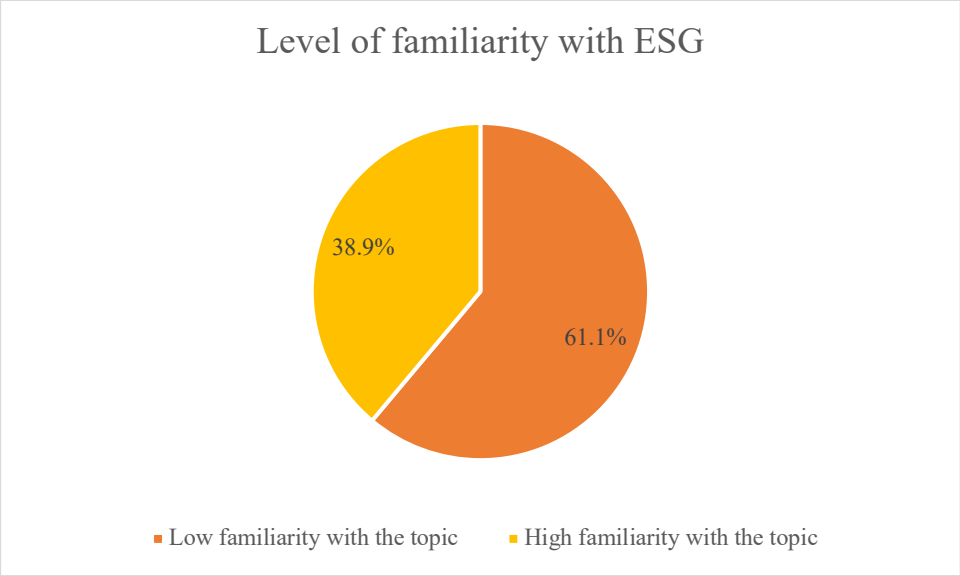
Appendix 14.5 – Tenants' answers to the exclusion of properties based on poor ESG characteristics.



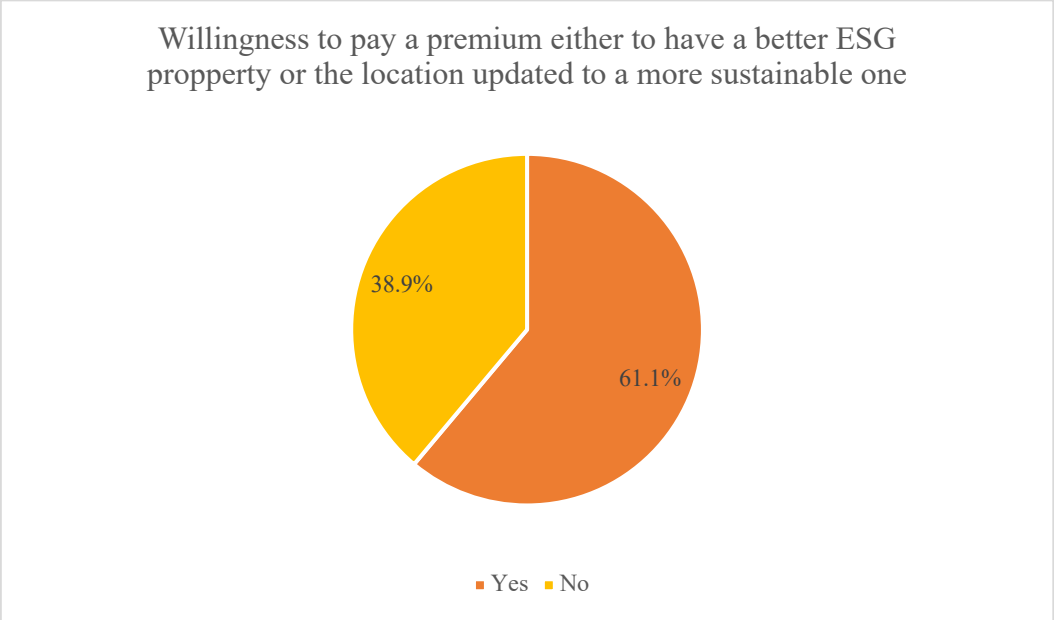
Appendix 14.6 – Tenants' answers regarding the inclusion of ESG characteristics in the contracts.



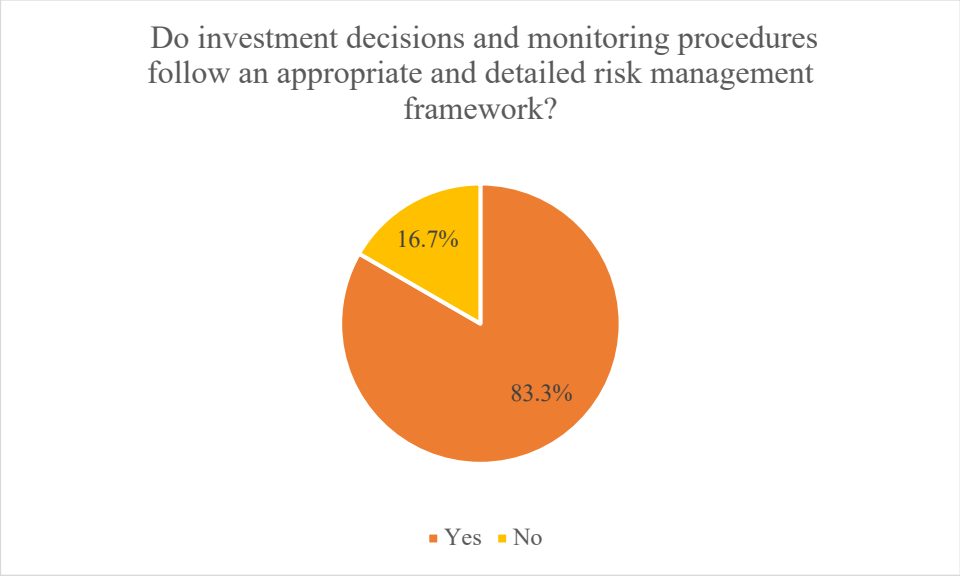
Appendix 14.7 – Tenants' answers regarding the level of familiarity concerning the ESG topic.



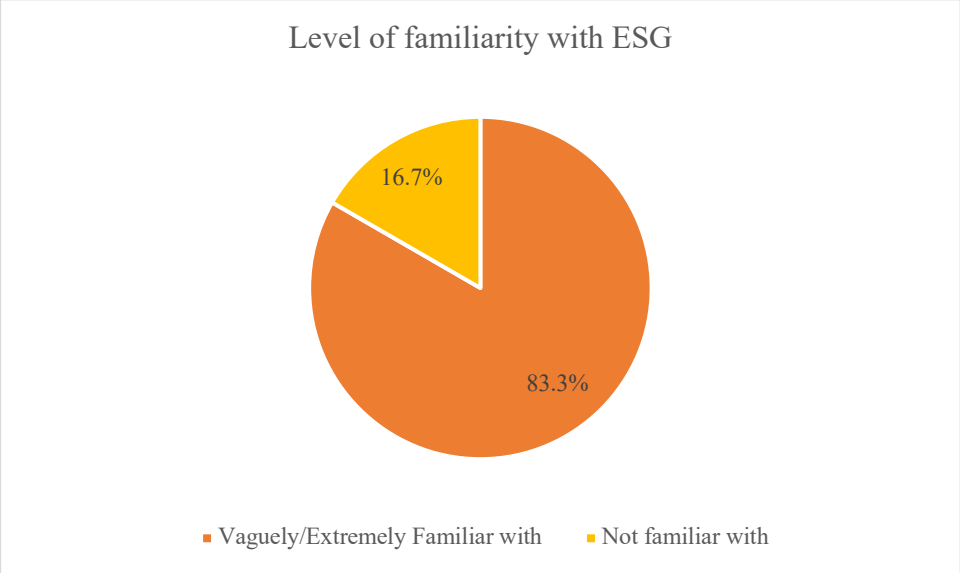
Appendix 14.8 – Tenants' answers regarding their willingness to pay a premium for a better ESG property or to have the location updated to a more sustainable one.



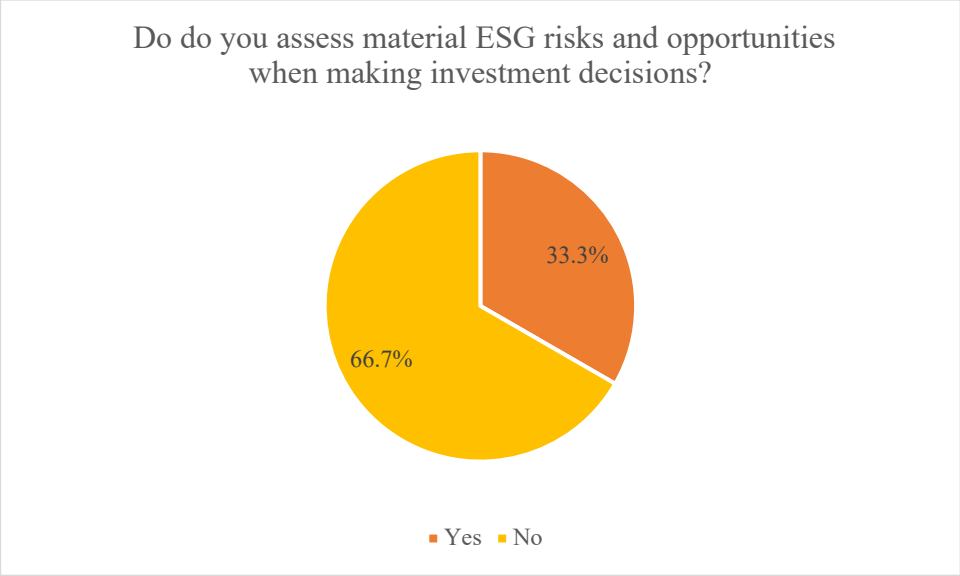
Appendix 14.9 – Real Estate committee perspective on having the right investment procedures as well as an appropriate risk management framework.



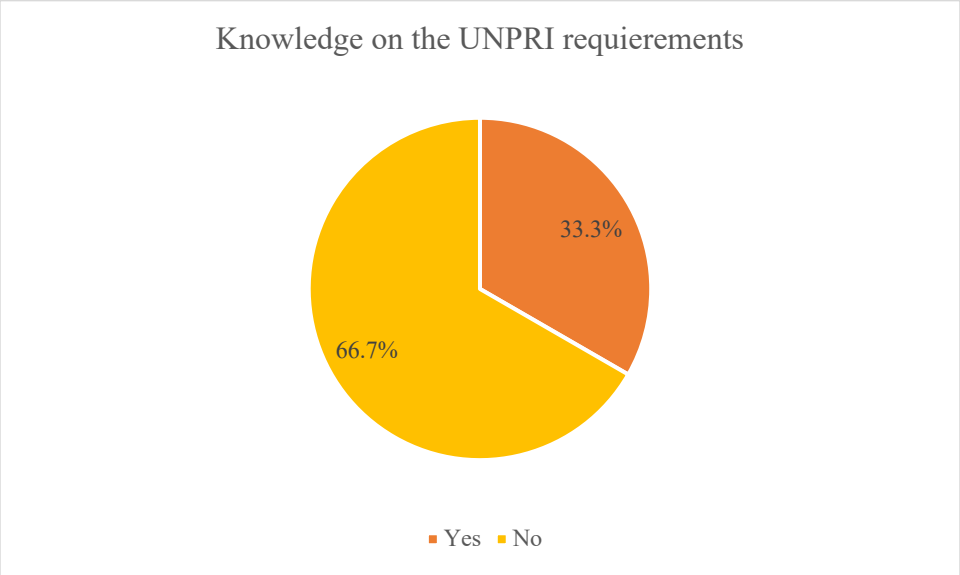
Appendix 14.10 – Real Estate committee awareness about ESG.



Appendix 14.11 – Real Estate committee perspective on assessing material ESG risks and opportunities when making investment decisions.



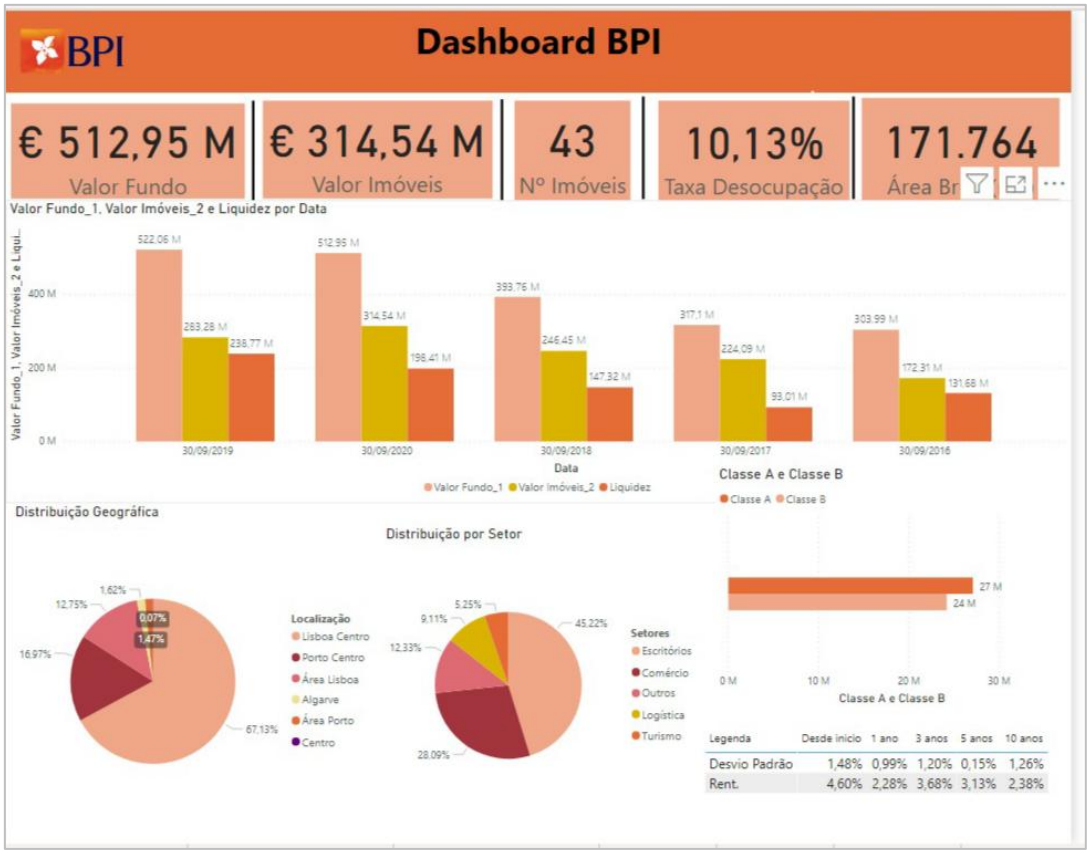
Appendix 14.12 – Real Estate committee perspective on UNPRI requirements.

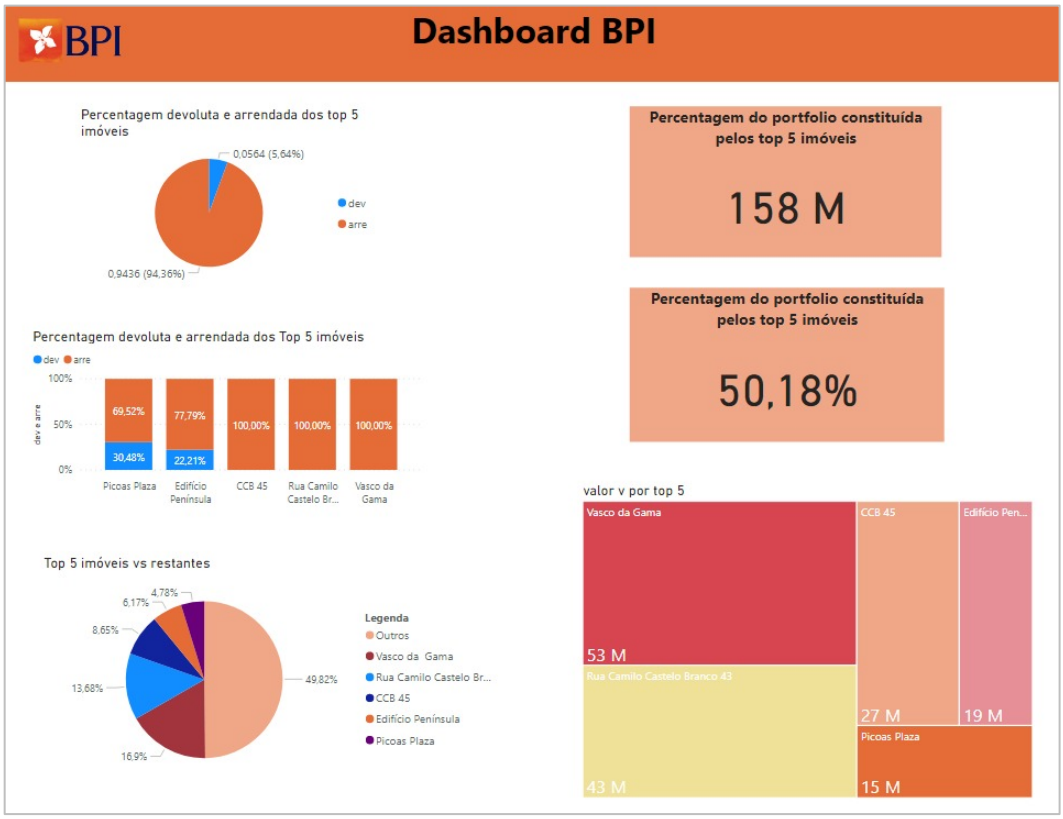


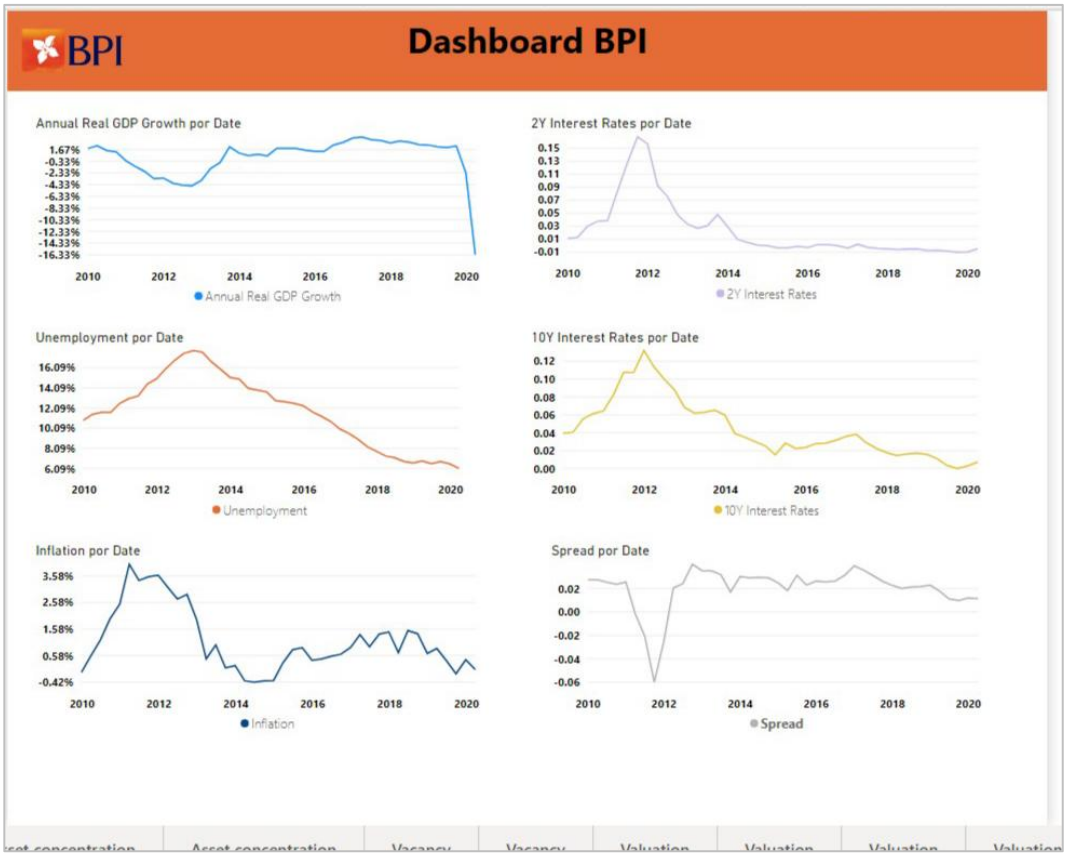
Appendix Chapter 15 – Conclusions

Appendix 15.1 – Power BPI Dashboard: *Using Tech for Better Results*

The Power BI was the software chosen to bridge the thesis' output with the client for risk monitoring purposes, through a dashboard that gathers the systematic and idiosyncratic risks. This tool was primarily chosen due to its versatility and appealing design. With the use of slicers, as well as other filters, information can be changed instantaneously, and the results will change correspondingly. The dashboard depicts the current situation of *Imofomento* regarding each specific risk is updated automatically whenever new information is inserted in the correspondent Excel files.

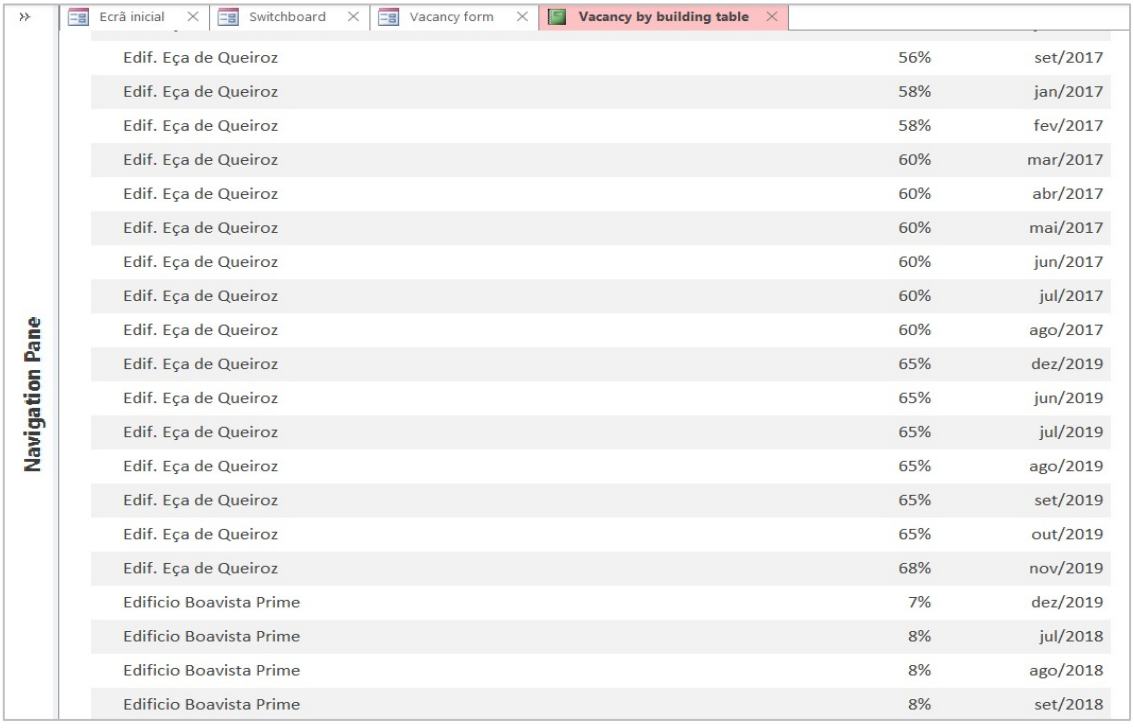



BPI
Dashboard BPI
Percentagem devoluta e arrendada dos top 5 imóveis
0,0564 (5,64%)
0,9436 (94,36%)
dev
arre
Percentagem do portfolio constituída pelos top 5 imóveis
158 M
Percentagem do portfolio constituída pelos top 5 imóveis
50,18%
Percentagem devoluta e arrendada dos Top 5 imóveis
dev arre
100%
50%
0%
69,52%
30,48%
77,79%
22,21%
100,00%
100,00%
100,00%
Picoas Plaza
Edifício Península
CCB 45
Rua Camilo Castelo Br...
Vasco da Gama
valor v por top 5
Vasco da Gama
53 M
CCB 45
27 M
Edifício Pen...
19 M
Rua Camilo Castelo Branco 43
43 M
Picoas Plaza
15 M
Top 5 imóveis vs restantes
4,78%
6,17%
8,65%
13,68%
49,82%
16,9%
Legenda
Outros
Vasco da Gama
Rua Camilo Castelo Br...
CCB 45
Edifício Península
Picoas Plaza


BPI
Dashboard BPI
Annual Real GDP Growth por Date
1.67%
-0.33%
-2.33%
-4.33%
-6.33%
-8.33%
-10.33%
-12.33%
-14.33%
-16.33%
2010
2012
2014
2016
2018
2020
Annual Real GDP Growth
2Y Interest Rates por Date
0.15
0.13
0.11
0.09
0.07
0.05
0.03
0.01
-0.01
2Y Interest Rates
Unemployment por Date
16.09%
14.09%
12.09%
10.09%
8.09%
6.09%
Unemployment
10Y Interest Rates por Date
0.12
0.10
0.08
0.06
0.04
0.02
0.00
10Y Interest Rates
Inflation por Date
3.58%
2.58%
1.58%
0.58%
-0.42%
Inflation
Spread por Date
0.02
0.00
-0.02
-0.04
-0.06
Spread
Asset concentration
Asset concentration
Vacancy
Vacancy
Valuation
Valuation
Valuation
Valuation

Appendix 15.2 – Access Database: *Using Tech for Better Results*

The Access was the software chosen to bridge the thesis' output with the client for a better data management, through a database that gathers the systematic and idiosyncratic information used for this study's analysis. This tool was primarily chosen due to its ease when it comes to store and analyse fundamental datasets abouts specific fund's features. The database created is divided into each specific field pointed out in this study as relevant to keep up with by the fund's management team. Moreover, this information is directly linked with automated excel files, which enables the fund's management team to easily update fund's information throughout time.



Edif. Eça de Queiroz	56%	set/2017
Edif. Eça de Queiroz	58%	jan/2017
Edif. Eça de Queiroz	58%	fev/2017
Edif. Eça de Queiroz	60%	mar/2017
Edif. Eça de Queiroz	60%	abr/2017
Edif. Eça de Queiroz	60%	mai/2017
Edif. Eça de Queiroz	60%	jun/2017
Edif. Eça de Queiroz	60%	jul/2017
Edif. Eça de Queiroz	60%	ago/2017
Edif. Eça de Queiroz	65%	dez/2019
Edif. Eça de Queiroz	65%	jun/2019
Edif. Eça de Queiroz	65%	jul/2019
Edif. Eça de Queiroz	65%	ago/2019
Edif. Eça de Queiroz	65%	set/2019
Edif. Eça de Queiroz	65%	out/2019
Edif. Eça de Queiroz	68%	nov/2019
Edificio Boavista Prime	7%	dez/2019
Edificio Boavista Prime	8%	jul/2018
Edificio Boavista Prime	8%	ago/2018
Edificio Boavista Prime	8%	set/2018

A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics

The Drivers of Retail Real Estate Performance: The Case of Shopping Centers

Catarina Vilar Correia Caldeira de Albuquerque

Work project carried out under the supervision of:

Professor Melissa Porras Prado

04-01-2021

The Drivers of Retail Real Estate Performance: The Case of Shopping Centers

Abstract: This paper presents an empirical examination of the macroeconomic determinants of shopping centres. We relied on panel data regression to test the relation between hedged indexes and various independent variables. The results indicate shopping centres respond to real GDP growth, net disposable income growth and industrial production growth. The paper also concludes that a strong tenant mix, stable sales and footfall growth, low exposure to tenant risk, and green practices are crucial to achieving higher returns.

Keywords: Real Estate, Shopping Centers, Drivers, Panel Data, Hedged Indexes, Tenant Mix, Sustainability, Green Shopping Centers.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Table of Contents

1. Introduction

There are distinct approaches to consider when investing in the real estate market, either through directly acquiring a property, buying shares from Real Estate Investment Trusts (REITs) or listed real estate firms, or investing in non-listed real estate funds (open-ended or closed-end funds). Nonetheless, as portfolio managers and commercial real estate investors, it is crucial to own a diversified portfolio, which means investing in different real estate types – offices, retail, hotels, etc. Understanding each property type's determinants is of great importance to make relevant capital allocation decisions and gain exposure to specific markets.

Therefore, this paper aims to identify the macro and micro factors affecting a specific real estate segment's performance: shopping centres. Firstly, by constructing real estate hedged indexes, we built a panel data and used the fixed effects estimation to capture the countries' fixed effects to understand the relation between shopping centres and certain macroeconomic variables. Secondly, we believe various micro factors impact shopping centres' returns, mainly the tenant mix, the tenants' sales growth, footfall growth, low exposure to tenant risk, and the implementation of green and sustainable practices.

This research is part of a consulting project developed in collaboration with *BPI Gestão de Ativos*, which is one of the major Asset Managers in Portugal and seeks to identify the fundamental drivers affecting real estate investments, in particular shopping centres. Hence, the micro factor analysis is based on *BPI Gestão de Ativos'* real estate portfolio, denominated *Imofomento*, and the respective shopping centres holdings.

2. Literature Review

Real estate represents a valuable asset class in pension funds, insurance companies, sovereign wealth funds, and other institutional investors portfolios. More specifically, direct real estate has gained an important role in capital allocation when considering the long-term investments. For instance, Delfim and Hoesli (2019) used US data covering over three decades and concluded that medium to long term investors should allocate 20% of the portfolio in direct real estate. However, unlike the public markets in which other assets are traded, such as equities and bonds, commercial real estate transactions occur in private, illiquid markets. Therefore, the performance of this market may be hard to measure due to the scarcity of information. To overcome this problem, the paper developed by Stevenson (2000) gains relevance as he studies the concept of hedged real estate indexes, which was previously developed by Gilberto (1993). Because indirect real estate securities such as REITs are highly correlated with the stock market, the purpose of building hedged indexes is to obtain a proxy for the direct real estate market, by removing the influence of the general equity market.

Furthermore, the direct real estate incorporates distinct specificities as an asset class compared with other securities types. Direct real estate is an investment that tends to have a long-term perspective; therefore, macroeconomic drivers are fundamental. Indeed, most academic studies focus on macroeconomic variables as factors of systematic risk at which most commercial real estate securities are exposed. Even though some of those academic papers do not focus specifically on commercial real estate but rather on real estate funds, as Delfim and Hoesli (2019) mention, real estate funds are found to be suitable substitutes for direct investments, especially open-end core funds.

For instance, Delfim and Hoesli (2016) explored the European non-listed real estate funds and, through a panel data analysis, concluded that macroeconomic factors such as real

GDP growth, inflation, the 10-year interest rates, credit spread, money supply and stock market excess return, combined with more specific factors as size and age of the fund, are statistically significant in explaining real estate funds' total returns. Similarly, Matysiak and Fuerst (2013) developed the same panel data analysis to understand the relation between non-listed real estate funds' total return and market movements. The authors concluded that certain macroeconomic factors – real GDP, interest rates and the stock market – were crucial drivers of non-listed real estate funds' performance. Nonetheless, it is proven that most real estate funds do not account for high degrees of diversification, meaning that the idiosyncratic risks contribute to the overall volatility.

Hoskins et al. (2004) studied the patterns between macroeconomic factors and commercial real estate indexes performance through a different approach. The patterns found were verified on major economies such as England, Canada, Australia and the USA. The key-leading market variables were real GDP growth, unemployment, inflation, interest rates and the stock market; hence, the same conclusions as Delfim and Hoesli (2016). However, the authors highlighted that some of these relationships are stronger when the macroeconomic factors are lagged.

Even though the previously mentioned macroeconomic drivers were significant in explaining commercial real estate performance, one could wonder if those same factors affect the different types of commercial real estate – offices, retail, industrial/warehouses, hotels, etc. – the same way. Regarding retail, it is possible to divide the sector between high street retail, supermarkets, shopping centres and malls (JLL 2020). As Eppli, et al. (1998) proves, retail real estate returns ought to reflect the fundamentals of the retail market itself. This is because retail leases often have base rents and additional rents based on retail sales. The latter is mostly influenced by household consumption, which depends on the real GDP, employment rate and

the aggregate household consumption (Ho and Muhammad 2010). Likewise, Eppli and Benjamin (1994) prove that household income explains local retail sales for a particular shopping centre.

Additionally, Patterson (2009) examined the influence of macroeconomic risk factors upon Real Estate Investment Trusts (REITs) that invest specifically in different properties representing the economic sectors. That is industrials/logistics, offices, hotels, residential, retail and self-storage. Even though REITs do not reflect the movements on the direct real estate market due to its high correlation with the stock market (Stevenson 2000), this analysis provides insight on retail REITs and the respective sensitivity to five main economic factors: consumption, inflation, industrial production, real treasury bill rate, and the term structure spread. The author concludes that the five economic variables significantly impact the Equity Index and Retail REIT returns. Simultaneously, the REITs from the industrial, office, and residential property types display varying sensitivity levels to different subsets of these risk factors.

Furthermore, for the specific case of shopping centres, a more comprehensive range of specific factors are proven to be significant in explaining price and rent movements. Shopping centres often create their retail markets; thus, generic types of retail stores and the retailer type are essential determinants of shopping centre base rents (Gerbich 1998). Moreover, one of the most important shopping centre's drivers is the tenant mix (Teller 2008) (Yiu and Xu 2009). For instance, Eppli and Shilling (1993) distinguish two types of tenants: anchors – tenants that create a drawcard for the shopping centre – and non-anchors – tenants that benefit from being located near the anchor. The property owner should choose the optimal allocation of space to maximise the total rental. The allocation should be based on the volume of sales per square meter. The authors also explain that if there is no anchor within the shopping centre, the other tenants' sales will achieve and, therefore, the rent they could afford, will move towards zero.

This will cause the total rental to be less than optimal. Since these anchors create positive externalities to the other tenants around, anchor tenants' rents should reflect that effect.

Another critical driver of shopping centres is the evolution of footfall (Dixon and Marston 2002). Shopping centre owners face a major challenge in determining the optimal balance between a tenant mix that maximises the shopping centre footfall, captures spending growth, and minimises exposure to sectors most prone to online diversification. Therefore, one could see the tenant mix as a portfolio of tenants which maximise income return. Nonetheless, it is crucial to rent shopping centre spaces to reliable tenants who have a low default risk because late payments or no payment affect deeply cash flows and, hence, the income part of the return (Grenadier 1996). Considering the case which the tenants declare bankruptcy, there is another important factor to consider, which is the vacancy rate (Giannotti and Mattarocci 2009). Once a particular space is vacant, the income-producing characteristic of a real estate investment vanishes, and the return depends merely on appraisals. Indeed, this negatively affects potential returns. Property owners must design the leasing contract be prepared for such events, like requiring a guarantee and keep evaluating the default risk of tenants (Blundell, Fairchild and Goodchild 2005).

Lastly, researchers have focused on the effect of e-commerce and online shopping on physical stores' performance. The retail property values are directly exposed to the risk that online shopping diminishes trade at malls and the increase in online sales may negatively affect the percentage of leases (Dixon and Marston 2002). However, e-commerce and physical stores should be seen as complementary sale channels and not threats to each other. Thus, due to the increase of virtual retail space, lease contracts must reflect sales on both channels (Miller 1999). However, the future of the traditional offline shopping centre activity relies on improving the customer's experience by creating innovative and modern spaces that are appealing to the eye and enhance the attraction of consumers (Kare-Silver 2001).

3. Macroeconomic Factor Model

3.1. Data

Based on the previous literature review, this paper analysis the common macroeconomic variables proven to be statistically significant in explaining the performance of commercial real estate and, more specifically, retail real estate. Thus, the economic variables presented in this paper are real GDP growth, inflation, unemployment rate, net disposable income growth, the term structure spread, retail sales growth, and industrial production growth. The quarterly data for these variables were obtained from the Federal Reserve Bank of St. Louis Economic Database (FRED), considering the period between the 4th quarter of 2003 and the 4th quarter of 2015.

The economic justification of these economic risk factors is presented in Hoskins et al., (2004), Patterson (2009), Ho and Muhammad (2010), Matysiak and Fuerst (2013), and Delfim and Hoesli (2016). The real GDP growth (GDP) reflects the quarterly change in the real Gross Domestic Product for each country considered. The inflation measure (CPI) is the change in the quarter-end consumer price index for all urban consumers, not seasonally adjusted. The use of CPI as the measure information is based on Flannery and Protopapadakis (2002); hence, this paper does not explicitly capture the anticipated and unexpected inflation. The unemployment variable (UNEM) states the change in the unemployment rate at the quarter-end. The net disposable income growth[1] (INCOME) is the quarterly change of a particular country's net disposable income. The term structure spread (TERM) is the slope's change (the difference between the 10-year and 2-year Government Bonds) of the yield curve. The volume of retail sales growth (SALES) is measured as the quarterly change on the volume of total retail trade

[1] Opposite to the other variables, data regarding net disposable income was obtained through the OECD database.

sales, in real terms, for a given country, seasonally adjusted. Lastly, industrial production growth (IND) represents the quarter-end growth rates for industrial production.

As mentioned in the literature, private databases mostly hold data, thus imposing a problem in gathering information regarding the shopping centre property returns. Real Estate Investment Trusts (REITs), which specifically invest in shopping malls, were used as a proxy for direct real estate performance to overcome this obstacle. These REITs represent different economies, such as France, Unites States of America, Netherlands, Canada and the UK[2]. We constructed equally weighted portfolios for each economy in order to reflect a more accurate proxy of the direct real estate market. Dividends were not considered as it may mislead the results since they are intrinsic to the specific REIT performance and not the overall market. We obtained the data from Bloomberg, both for the listed real estate securities and the stock market. The stock market takes an important role as it will be explained in the following chapter.

3.2. Methodology

Even though direct real estate and Real Estate Investment Trusts consist of properties and land that produce cash flows, the correlation between returns does not reflect the expected relation at least in the short-term. Indeed, REITs are highly correlated with the stock market in the short run, as proven by Ang (2014). Thus, Stevenson (2000) approach is applied to create hedged real estate indexes that take out REITs' stock market effect. We obtain the hedged index through the following equation:

$$r_t^p = \alpha + \beta r_t^e + \varepsilon_t \quad (1)$$

Where rtp is the unhedged index – equally weighted portfolio capital gains -, the rte is the country's respective equity index capital gains in question, α is the intercept, and β is the estimated beta coefficient. The hedged real estate index can be consequently retrieved as:

[2] The considered REITs are presented in Appendix 10.1. as well as the stock market index used for each country.

$$r_t^{hp} = r_t^p - \beta r_t^e \quad (2)$$

Where $rthp$ is the hedged index. Also, because the relation between REITs and equities may not be constant throughout time, a forty-eight rolling beta is estimated (Stevenson 2000).

Furthermore, we computed the Fixed Effects (FE) regression by building a strongly balanced panel data. The FE model controls time-invariant unobservable variables, which, in this case, a country FE is introduced to control for country-specific differences. The following equation specifies the model applied that captured the main macroeconomic variables affecting shopping centres:

$$r_{it}^{hp} = \theta_0 + \delta_1 GDP_{it} + + \delta_2 CPI_{it} + + \delta_3 UNEM_{it} + + \delta_4 INCOME_{it} + + \delta_5 TERM_{it} \quad (3)$$
$$+ \delta_6 SALES_{it} + \delta_7 IND_{it} + \gamma_i + \mu_{it}$$

Where γ_i is the country-specific dummy variable and μit is the error term. Nonetheless, the unemployment variable was highly correlated with real GDP growth (a correlation of -45%) which decreased the model's explanatory power from 7.84% to 6.2%. Thus, it was not included in the model. A more descriptive statistics are presented in Appendix 10.2.

3.3. Results & Findings

The results from the model previously described for Hedged Indexes focused on Shopping Centers are presented in the following table. The overall explanatory power of the model was, at first, relatively low (6.2%). Nonetheless, by lagging the variables one quarter, the R squared obtained increases to 8%. Even though some variables are not statistically significant, the R squared obtained is substantially lower if they were not included in the model. The estimated coefficients of those not statistically significant variables demonstrate an expected relation and will be further explored. The model's explanatory power is low, leaving a significant part unexplained, which might relate to more specific micro factors of shopping centres and are not included in the model due to the lack of available data.

	Period 2003-2015	
	Coefficients	Coefficients
GDP	1.622**	1.076**
	(0.655)	(0.564)
CPI	1.879	1.692
	(1.211)	(1.207)
INCOME	0.504***	0.518***
	(0.163)	(0.163)
TERM	0.624	0.364
	(0.857)	(0.844)
SALES	0.188	0.725
	(0.871)	(0.816)
IND	-1.22**	-1.089**
	(0.464)	(0.459)
Intercept	0.666	-1.359
	(1.568)	(1.508)
Country Fixed Effects	YES	NO
R-sq:	7.82%	5.92%
Number of observations	244	244
Groups	5	5

Notes: Robust standard errors are computed are reported within parentheses.

***p < 0.01; **p <0 .05; *p < 0.1;

Figure 1- Estimates from the Panel Data Fixed Effects Regression and Pooled OLS Regression

The previous tables' results demonstrate that, with 90% confidence, real GDP growth, the net disposable income growth, and industrial production growth are statistically significant variables. Regarding the real GDP growth variable, the estimated coefficient indicates that a 1% increase in real GDP growth leads to a 1.6% increase in the shopping centres hedged indexes capital gains, *ceteris paribus.* This is because an expanding economy usually translates an increase in household consumption. The high correlation between real GDP growth and the unemployment rate growth also indicates lower unemployment levels (Ho and Muhammad 2010). The relation between inflation (CPI) and the shopping centres' hedged indexes is proven to be positive. Indeed, the literature on the inflation hedging qualities of real estate presents mixed results. This result is consistent with Hoesli et al. (1997), which proves that, in the short-term, retail real estate does not offer substantial hedging benefits against inflation due to

insignificant coefficients. However, this paper does not conclude the long-term inflation hedging characteristics of real estate investments.

Furthermore, the net disposable income variable indicates a positive relation with shopping centres performance. This is consistent with the literature which proves that the household income helps explaining the local retail sales for a particular shopping centre, meaning that, as income increases so do the sales of shopping centres and, consequently, the variable part of the rent increases as well (Eppli and Benjamin, 1994). Hence, the coefficient indicates a 1% increase in the net disposable income leads to a 0.5% increase in the shopping centres' hedged indexes capital gains, *ceteris paribus*. On the other hand, both sales and the term structure slope change are not statistically significant variables. The data gathered from the volume of retail sales is not divided into physical sales and online sales; thus it is possible that the variable is not significant due to the increase of online shopping over the past years, not representing exactly the physical sales. Nonetheless, the coefficient is positive, which was already expected since, according to the literature, a higher retail sales volume indicated better performance of both shopping centres and high street retail (Eppli, Shilling and Vandell, 1998).

Finally, industrial production growth is proven to be a statistically significant variable with a negative coefficient. A common trend that has been observed is the increase in online retail sales and, consequently, a shift from retail stores to warehouses and logistic centres. Hence, an increase in industrial production might enhance industrial/logistics properties' performance while compromising shopping centres' performance. A 1% increase in industrial production indicates a 1.2% decrease in the shopping centres hedged indexes capital gains, *ceteris paribus*.

4. Market Analysis

4.1. The Portuguese Economy Outlook

The Portuguese economic activity registered a steep fall in 2020 due to the coronavirus outbreak and consequential period of mandatory confinement. According to the European Commission (2020), economic output fell, in the first and second quarter of 2020, by 3.9% and 13.9% (quarter-on-quarter), respectively. The sector that suffered the most significant impact was tourism, followed by non-food retail. In the second quarter, across domestic demand components, private consumption dropped by 13.3% (quarter-on-quarter), and precautionary household savings surged. Investment contracted by 9.8% overall amid a sharp decline in equipment investment but investment in construction maintained positive growth.

The economic forecast differs depending on the entity one chooses to analyse. Nonetheless, two entities were selected for this analysis: the European Commission (EC) and the Organization for Economic Co-operations and Development (OECD). Both forecasts predict a sharp decrease in GDP in 2020 before recovering in 2021 and 2022. These estimates are only accurate under the assumption that the most affected sectors (tourism and hospitality) will recover broadly, and an effective vaccine is deployed. The unemployment rate will peak in 2021 and remain above the pre-covid crisis level until 2022. Regarding the gross public debt as a percentage of GDP, the two considered forecast have opposite projections. While EC foresees a decrease for the following two years, OECD predicts that it will reach 139% of GDP in 2022 – Appendix 10.3. presents a more detailed comparison between the two forecasts (European Commission 2020) (OECD 2020).

The current scenario observed in Portugal, and the foreseen economic snapshot comes after a very encouraging recovery for the Portuguese economy, which reported a budget surplus in 2019. It is expected that companies and households increase their debt ratio, which may

compromise the banking sector. Hence, the Portuguese debt outlook must be considered as an essential factor. Rating agencies have maintained or revised the respective rating downwards to stable – Appendix 10.4. describes the rating attributed by different rating agencies.

All things considered, the Portuguese economic scenario may look quite dark. Still, the country will be supported by the Supplementary Budget, which includes an increase of €4.3B to boost spending for 2021. It will receive support by the European Recovery Funds, attributing the country a total value of €15.3B in non-refundable funds.

4.2. Portuguese Retail Real Estate Market

The retail real estate industry is a category within the commercial real estate sector. This segment consists of establishments used solely for business purposes, such as retail stores, shopping centres, supermarkets, and street stores. According to Cushman & Wakefield (2020), this has been the most active sector over the last decades, registering an impressive growth since 1990. As of November 2020, it counted for over 3.89M square meters of Total Stock, with 81% being shopping centres. The future supply for retail space in Portugal is estimated to be 54 200 square meters by 2023, marked by an increased focus on the retail parks combined with the expansion/refurbishment of existing shopping centres.

This commercial real estate sub-category performance is also profoundly affected by the performance of retail sales. Between 2009 and 2014, the retail sales reported a sharp decline on an annual basis, marking the lowest value in 2011 of -5.9%. These years reflect the unfavourable macroeconomic environment the country was dealing with, specifically the aftermath of the Global Financial crisis in 2008 and the *Troika* bail-out in 2011, which ended in 2014. During this period, the total value invested in commercial real estate was significantly lower than in other years. For instance, according to JLL (2020), the total value invested in 2011, €188M, was considerably lower than in 2019, which reported the highest value of €3

289M. Also, during 2011 and 2013, shopping centres prime yields hit an all-time high mostly due to the risk premium associated with the investment.

Regarding prime rents, shopping centres' rents have been increasing, registering a prime rent of around €75/sq.m/month in 2012 and €105/sq.m/month in 2020. Nonetheless, in 2020 the highest prime rents were from the high street retail in Lisbon, mainly in Chiado and Baixa which reported a value of €130/sq.m/month and €120/sq.m/month. Yet, it is important to highlight how this sector was affected by the Covid-19 measures applied in Portugal. Several retailers were forced to close their stores and defer rent due to September to be paid in instalments over 2021 and 2022. The payment of fixed rents in shopping centres was suspended until the year-end, with tenants only required to pay turnover rent and common charges. This affected yields deeply within the retail real estate investment as the income-producing part of the investment had to be suspended for some time (Cushman & Wakefield 2020).

The pandemic has forced retailers to invest in more personalised omnichannel offers, particularly with a greater focus on e-commerce to attract customers. The percentage of revenue coming from e-commerce has been increasing over the years: according to (Eurostat 2020), in 2018, the percentage of e-commerce revenues on the overall revenue was 12%, while in 2019 was 19%. In 2020, it was expected to increase even further due to lockdown restrictions.

All in all, retail is the commercial real estate sector that has been attracting most demand, representing 45% (€1 060M) of the overall investment in real estate in 2020. However, both retail and hospitality are and will most likely continue suffering the hardest hit by the undergoing changes as owners of retail real estate are facing declining revenues. It is expected that in 2021/2022 might register several bankruptcies (Cushman & Wakefield 2020).

4.3. Portuguese Major Shopping Centers

The Portuguese Shopping Centers Association (APCC), which is the national association that brings together companies that invest, promote and manage Shopping Centers, accounts for over 93 commercial complexes, comprising 8 600 stores, representing a total gross leasable area (GLA) of 3.3M square meter – which is more than 90% of the total gross leasable area in Portugal (APCC 2020). Out of the 93 complexes registered by APCC, the top 10 most extensive shopping centres were analysed considering the data available by the end of 2019.

In Portugal, the largest shopping mall is UBBO (previously known as Dolce Vita Tejo), located in Amadora (Lisbon), which has over 122 000 square meters and 280 stores. It was bought in 2018 by AXA Investment Managers – Real Assets for €230M and underwent a significant rebranding process and is now known as the first shopping resort (Carregueiro 2018). UBBO surpassed Centro Colombo, another shopping mall located in Lisbon, due to its renovations and by expanding facilities in recent years. Currently, the shopping is associated with more than unique stores and focuses on entertainment, food/restaurants, and healthcare services - due to a direct link with an on-going construction hospital. UBBO is set to have a unique Nickelodeon theme park, a water park, outdoor markets and a mini-golf court (Baptista 2019).

The overall top 10 shopping malls, presented in Appendix 10.5., represent around 25% of the APCC's reported GLA and 25% of the overall stores. In terms of property owners, Sonae Sierra is the one entity that holds most of the top 10 shopping centres – Centro Colombo, Norte Shopping, CascaiShopping, and Arrábida Shopping. Out of the analysed properties, four are located in the Metropolitan Area of Lisbon and 4 in the Metropolitan Area of Porto. Furthermore, it is important to state that Mar Shopping, both in Porto and Algarve, report a considerable GLA because of IKEA's establishments, which represent a substantial part of the

gross area. That is why the number of stores is relatively lower than other shopping centres with a smaller GLA.

5. Imofomento's Shopping Centers

The *Imofomento* is a diversified, core, open-ended real estate fund, consisting mostly of stabilised, income-producing, commercial real estate. *BPI Gestão de Ativos* (BPI GA) manages the portfolio which accounts for a Net Asset Value of €509.50 M, with €314.55M worth of real estate assets. In terms of sector concentration, the fund is highly concentrated in the office segment, 45.2% (€ 142.2 M), and in the retail segment, 28.1% (€ 88.3 M), as of October 2020. Regarding shopping centres, *Imofomento* has on its portfolio two valuable investments: Picoas Plaza, located in the centre of Lisbon, and Península, situated in the centre of Porto. Both represent investment within the prime area of Lisbon and Porto, respectively. Península was bought in June of 2016, while Picoas Plaza was a more recent acquisition being bought in July of 2020. Consequently, there are not many historical data available; however, there is an opportunity to develop a benchmark based on these two investments, both in terms of risk and return, for BPI GA to consider when considering investing on other shopping centres.

5.1. Shopping Centers' Performance

Eppli et al. (1998) mentioned that retail real estate rents are usually divided into a base rent and a variable rent, which depends on the tenant's sales performance. In other words, the higher the volume of sales of a particular retailer, the higher the rent the property owner will receive. As for the base rent, Sirmans and Guidry (1993)[3] prove that the fundamental drivers are the shopping centre size, age, type of anchor store, traffic count (footfall), and vacant space. The variables total area, age, and type of anchor are used as a proxy for customer drawing

[3] The authors developed an empirical model using a sample of shopping centers from Louisiana, United States of America.

power. Factors that increase the shopping centre's ability to attract more customers and increase property owners' rent demanded. Market conditions are proxied by the amount of vacant space and negatively affect charged rents.

Regarding the Portuguese market, with the exception of 2020, shopping centres' sales have generally reported positive growth since 2015, reaching its highest growth rate of 14.2% in the second quarter of 2017. Considering 2020's performance, sales in shopping centres decrease, on a year-on-year basis, 24% in August and 20% in September. Regarding the overall footfall in shopping centres, one can conclude the growth rate has been stabilising, despite the negative values registered in 2019[4]. Consequently, the average ticket, which is the average amount of sales per customer, has increased due to lower footfall and increased sales.

Considering the previous analysis, it is crucial to evaluate Imofomento's shopping centres performance. Edifício Península, which is regarded as a Boutique Center rather than a shopping centre, is located in Porto. Península was bought for €20.8M and is now worth around €19.4M. In September 2019, Península reported a total annual return of 7.58%, mostly due to the appraisal of 4.65%. According to the data provided by Informa D&B, the total sales of the property's tenants[5] increased by 20% in 2019 compared to 2018. Consequently, the total rental received by BPI GA also increased by 5%, since part of the rent is dependent on the tenants' sales performance. However, in 2020, the property presented a total annual return of 7.26%, slightly lower than the previous year, mostly because to a lower rental value – decreased by 8.58% – caused by the delayed payments and a significant fall on sales. However, the property's value increased by 3.95%, demonstrating the excellent performance of this investment. The vacancy rate of Península, which was showing a downward trend, increased

[4] Appendix 10.6. shows a more detailed graph regarding footfall and sales growth.

[5] The tenants considered are the ones with available financial data on the Informa D&B platform, which are visible in Appendix 10.7.

between 2019 and 2020, reporting a rate of 19.95% and 22.21%, respectively. Furthermore, although the property is considered a Boutique Center, Imofomento holds fractions focused in different sectors. More specifically, 43% of the building is dedicated to shopping activities, 23% represent offices, and the remaining 34% represent both parking and storage units.

On the other hand, Picoas Plaza, which is considered a shopping centre, was recently bought. Hence there is little evidence on its performance. Nonetheless, it is a promising investment mainly due to its location, easy access via public transportation, long-term contracts with reliable tenants, and the rental from the parking space. The property was bought for €15M, with 64% representing commercial units and 36% representing the parking lot. More recently, one of the appraisers of Imofomento's portfolio estimated that the value of the property is equal to €18.5M, with more than half of its value coming from the parking facilities (€9.4M), and the rest from the commercial (€8.9M) and storage (€184K) units. Thus, a substantial percentage of the property's return comes from the parking rather than the shopping centre itself. Furthermore, the vacancy rate of Picoas is 30.48%, relatively higher than Península.

To sum up, these two portfolio holdings, representing around 11% of the whole portfolio, have reported a strong performance. However, these shopping centres present a relatively low capacity of increasing the corresponding footfall – because they are purely focused on the shopping segment -, the vacancy rates are high for this type of property sector[6], there is an underlying uncertainty due to the covid-19 national security measures and are highly dependent on the performance of the Portuguese economy, mainly real GDP growth and household income, as proven in the macro model.

[6] In 2020, shopping centers registered its highest vacancy levels. For instance, in Australia, the average national shopping center vacancy rate was 5.1% (Lenaghan 2020); in the US it was 9.7% (Gray 2020), and in England the rate reached 14.3% (The Retail Bulletin 2020). Also, according to (Slob 2019), Lisbon was one of the cities with the highest retail vacancy rate, reporting a value of 17.2% in 2019.

5.2. Tenant Mix

5.2.1. Optimal Tenant Mix

The tenants' mix refers to the combination of business establishments within a shopping centre to form an assemblage that produces optimum sales and rents to the property owner. In other words, it is the mix of tenants that work well together to enhance the performance of the entire centre as well as performing successfully as individual businesses (Bruwer 1997). A shopping centre is designed to fulfil consumers' needs within a specific community. Hence, it should contain the highest product variety demanded as well as well-known brands. As (Yuo, et al. 2004) proved, retail/service groups' distribution should be concentrated on the core categories, but with as much diversity as possible. Simultaneously, the higher the variety of brand names, the greater the contribution to the rental level.

As Burnaz and Topcu (2011) concludes, there is no one-size-fits-all optimal tenant mix. Yet, shopping centres should look to find tenants who operate in the following businesses: fashion, books/music/photography, electronic goods, footwear, supermarkets (Yiu and Xu 2009), as well as entertainment (for example, cinemas, kids play area, etc.), restaurants/food court, leisure (e.g., gyms), and car parking (Mouton 2014). According to a study conducted by Mouton (2014), 41% of the shopping centre space is concentrated in fashion and accessories, 16% in food stores and food facilities, and 9% to leisure and entertainment[7].

Furthermore, when selecting tenants, one should be able to differentiate between the anchor and non-anchor tenants. According to Eppli and Shilling (1993), an anchor tenant creates a drawcard for the shopping centres. It is a substantially large tenant in the shopping centre that attracts a significant fraction of the shopping public. Usually, these anchor tenants

[7] The rest is divided by the following segments: kids and toys, multimedia and electronics, shoes, coffee and restaurants, sport equipment and fashion, health and beauty, and services.

are offered a discount on the rent due to the long-term leases – which provides stable cash flows in the long-term - and the positive externalities on the tenants nearby (Gerbich 1998). The allocation between anchors and non-anchors should depend on the volume of sales per square meter of retail space.

5.2.2. Imofomento's Shopping Centers Tenant Mix

From the previous analysis, it is possible to conclude that there should be a diversified mix between tenants that maximise the rents and sales. Certain specific tenant types were found crucial within a shopping centre to attract more customers and, consequently, enhance the tenants' portfolio's performance. Hence, it is vital to evaluate the tenant mix of the two shopping centres within Imofomento's portfolio and analyse the tenants' type, sales per square meter and the allocation between anchors and non-anchors.

Firstly, Edifício Península has 17 tenants[8], receiving a total rental of €67 232.96 per month. The average rent per square meter is € 4.67 per month. However, the average rent per square meter excluding offices and car parking is slightly higher, reporting a value of €19.89 per month. This building is located in a prime area in Porto and, compared to the market – which, according to Cushman & Wakefield (2020), is 105/sq.m/month in 2020 – the rent observed is very low. Regarding the tenant mix of the shopping centre itself, excluding offices, it is possible to conclude that the boutique centre is only focused on fashion stores and offers just one coffeehouse – *Starbucks* – and one restaurant – *BBGourmet*. There is an apparent lack of product diversity and anchor tenants, as *BIMBA & LOLA* is the one tenant that, according to (Gerbich 1998), could be considered anchor.

On the other hand, Picoas Plaza accounts for ten tenants representing a total rental of €70 365.48 per month. The average rent per square meter, excluding the parking, is around €10.61,

[8] Appendix 10.8. presents detailed information regarding the tenant type, leased area, and the rental income of Edifício Península, as of October 2020.

which is once again extremely low when compared to the prime market. Concerning the tenant mix, Picoas Plaza is not as focused on fashion stores as Península is. The Lisbon shopping centre mainly offers a wider diversity of products and services, clearly stated in Appendix 10.9. Even though Picoas presents broader tenant diversity, in terms of value the shopping centre is predominantly focused on three tenants: *Saba Portugal* (which is a car parking management company), *Fitness Hut* (which is a gym), and *Livraria Bertrand* (which is a bookstore). The last two tenants can be considered anchor tenants, despite all three signed long-term lease agreements. For instance, *Saba's Portugal* contract ending date is September 2050, while *Fitness Hut*'s lease contract ended in December 2020, but it will be renewed until May 2033.

To conclude, the tenant mix of both shopping centres is relatively poor compared to other major competitors. For instance, Edifício Península is located in a zone where just a few meters away is situated the Shopping Cidade do Porto[9], which offers a wider variety of brands and products[10], a higher number of anchor tenants (e.g. *Mango, Livraria Bertrand, Fitness Hut*, McDonald's, Zara, among others), a supermarket (*Froiz*), car parking, and a music school (*Jahas Rock School Porto*). To attract more customers and increase sales, BPI GA must develop a more robust tenant mix.

[9] The shopping center is owned and managed by Bonaparte S.A., has a gross leasable area of 15 215 square meters and a total of 90 stores .

[10] Shopping Cidade do Porto offers stores focused on the following segments: fashion, home decoration, sports, jewellery, kids and toys, services, restaurants, entertainment, services, books, multimedia, and optical stores (Shopping Cidade do Porto 2020).

5.3. Tenant Risk

5.3.1. Methodology

As a real estate investor, the property must be rented to reliable tenants to guarantee long-term stable cash flows. This means that tenants' creditworthiness is an important factor to consider, especially when analysing retail real estate as part of the underlying rent depends on the retailers' sales. To evaluate each tenant's credit risk, Imofomento relies on the score computed by Informa D&B, which is a company that leads the supply of information and knowledge about the business universe of Portugal and Spain. Particularly, the failure score ranges between 1 and 100. The latter represents the best score possible – indicates the probability of a particular firm/tenant declaring bankruptcy within 12 months and consequently not paying the contracted rent. However, the Informa platform does not provide credit risk information for all tenants within the Imofomento's portfolio as most tenants are small/medium enterprises; there is an evident lack of public financial data.

To better evaluate the risk of the shopping centres' tenants, we developed a correspondence table together with BPI GA regarding the Informa failure score and the credit rating of credit rating agencies such as Moody's and S&P (Appendix 10.10). Once the rating is attributed to each tenant, the S&P one-year transition matrix, presented in Appendix 10.11., is used to compute the probability of default. Given the one-year transition matrix, it is possible to go further and calculate the n-period transition matrices and, therefore, the probability of default for n-periods from now. Firstly, one must transform the transition matrix into a square matrix[11] by eliminating the *NR* column and normalising each transition frequency and, secondly, by adding a row at the end for the *Default* state – which should have zeros in each entry except the last which would be 100% (assuming default is an absorbing state). Taking

[11] The one-year square matrix presented in Appendix 10.12.

the square matrix is denominated matrix *P*, the n-period transition matrix is the *n-th* power of *P*. Clearly, the longer the period considered, the higher is the probability of default (Appendix 10.13).

5.3.2. Tenant Risk Assessment

Shopping centres differ from other types of real estate properties. For instance, it consists of a tenant mix rather than just relying on a single-tenant, often the case of hotels, warehouses, supermarkets, and restaurants. Therefore, given the available data from the platform of Informa D&B, the previously mentioned framework is conducted. Nonetheless, there is another critical factor to consider, which is the tenant concentration. The tenant mix of a shopping centre can be seen as a portfolio of tenants and diversification is a key factor for risk management. Likewise, tenant concentration represents a risk since the property owner is exposed to a considerable loss in case of default.

In Península's case, considering the whole property (i.e. including offices, retail and parking), the tenant that represents the highest percentage of rent on the total rental is *APARC Lda*. The firm occupies fractions of offices and parking, and it pays a total rent that represents 35% of Península's rental as of October 2020. We prove that the tenant is stable and has a low credit risk – failure score of 99, hence a rating of *AAA*. As for the Boutique Center[12] itself, *Italco Moda Italiana Lda* represents 39.88% of the total rental. This is also a tenant with low credit risk, with a failure score of 100, thus rating *AAA* and a 1-year probability of default of zero.

The tenant portfolio is concentrated mainly on three out of seventeen tenants, representing around 67% of the total rental amount. The majority of tenants present low levels of credit risk, with the exception of certain retailers and restaurants, which was already

[12] The Boutique Center only contemplates the retail tenants, excluding parking and offices.

expected due to the covid-19 pandemic. Also, no conclusions are drawn from the tenants with no available data of the Informa D&B platform. A more detailed analysis can be seen in Appendix 10.14. Furthermore, tenants who have a rating equal or lower than *BB*[13] are expected to default within the following 12 months, either by delaying or defaulting on the rental payment.

As for Picoas Plaza, as mentioned on the performance analysis, the property's return comes mostly from the parking segment. The long-term contract and the representative percentage of rent the underlying tenant paid in 2020 are among the most attractive investment features. Indeed, the parking is rented to Saba Portugal S.A. and, as of October 2020, the tenant's rent represents 50.33% of the overall rental. Thus, there is a clear tenant concentration, especially when adding Fitness Hut's importance on the Picoas' tenant portfolio. The gym represents 26.73% of this property's overall rent; therefore, these two tenants' credit risk takes a crucial role. Currently, they both present the highest failure score, 100, which means their credit rating is *AAA*. Consequently, one can conclude the tenant risk is very low. A more detailed analysis of the other tenants is visible in Appendix 10.15.

6. Green Shopping Centers

The development in science and research led to a mind shift as society realised the importance of environmental, social and governance (ESG) issues. The environmentally conscious generations are demanding more sustainable products and for corporations to minimise the carbon footprint. There is no consensus on the framework to be adopted for the sector in question and, regarding shopping centres, there is a broad set of industries working under just one roof. Nonetheless, the importance of sustainable practices is undeniable.

[13] According to Credit Rating Agencies, the rating BB represents the highest rating within the category of *junk bonds*.

There are certain practices shopping centres' owners can adopt to move towards becoming more eco-friendly. According to a survey conducted by (JLL 2019), more than 40% of consumers value the existence of green spaces in shopping centres, 17% wants a gym at their shopping centre, and another 40% look forward stores that offer healthy food and drink products. As Ortegón-Cortázar and Royo-Vela (2017) mention, customers are no longer just attracted to shopping centres to buy what they need but also to enjoy the atmosphere or environment.

6.1. Sustainable Practices

ESG practices must have a strong foundation on the material ESG factors, otherwise known as the sustainability issues, that affect specific sectors' financial performance and concerning the respective stakeholders. Therefore, the following practices follow SASB's Materiality Map (2018) regarding real estate and shopping centres' related businesses. In fact, there are certain practices shopping centres' owners can adopt to move towards holding more eco-friendly properties. Some of these measures can even decrease energy and other costs. However, it is crucial to develop a continuous process of creating awareness and training other stakeholders (i.e. consumers, retailers, property managers, architects/designers, etc.) to accept and implement green practices.

Indeed, sustainable architecture is an essential feature of a shopping centre. This type of properties must be designed to maximise the usefulness of natural rather than artificial light (Aktas 2012). For instance, high window-head heights, high reflective ceiling and wall finishes, narrow floor plans, large facade and skylight openings with high transmittance glazing are some examples to consider. Furthermore, (APCC 2020) highlights the role of technology to manage the ventilation system, determining the optimal temperature and reducing energy consumption. (CBRE 2015) also find that, once a shopping centre replaces its energy

equipment to a more recent one, the largest savings come from reducing the costs from lighting, lifts, escalators and heating, ventilation and air-conditioning. Additionally, shopping centres invest in solar system projects to power certain centres' systems, e.g. air-conditioning (CBRE 2015).

Moreover, with the coronavirus outbreak, shopping centres' future relies on consumers' safety, health, and well-being. Thus, the development and management of green open or indoor spaces within a shopping centre have become a field of interest. Its existence contributes to the community's general welfare enhancing the centres visual and design creates a sense of unity between consumers and nature (Aktas 2012). Also, recycling is a major concern for consumers as well as waste management. In this sense, a good separation of waste combined with a selective collection represents the first steps moving towards a good waste management strategy. Additionally, it is essential that the shopping centre creates sustainable areas to gather all waste and develops a long-term waste management plan.

To conclude, all the stated green practices described are already implemented in many shopping centres worldwide. Particularly, a shopping centre's sustainable design contributes to the stakeholders' welfare and yields greater rents (Sirmans and Guidry 1993). However, in Portugal, there is still a lot to improve in order to create green shopping centres, as all stakeholders' sustainable principles must be aligned for this to work.

7. Future Trends

Shopping centres are a special pattern of a highly decorated and well-organised set of stores with similar or heterogeneous items under one roof (Han, et al. 2019). Unofficially, as Fantoni, et al. (2014) mentions, shopping centres are the “heart and soul of communities” and retail economies' foundation. In previous decades, malls, which were originated in the US, were seen as a full-scale contemporary retail trend, and it was the place to be. Currently, the top five largest malls in the world are located in Asia, with China's New South China Mall in Dongguan

taking the first position on that ranking (Fantoni, Hoefel and Mazzarolo 2014). Nonetheless, an undeniable trend within the retail sector has been taken place in the 21st century: online shopping. In the US alone, the foot traffic fell by 22% from 2018 to 2019 (even before the pandemic) in the top 10 malls. This is mostly due to the growth of e-commerce, which has made retailers question the benefits of developing a broad network of stores or rather invest in online channels (Deloitte 2020). In Portugal, according to CBRE (2020), e-commerce has been presenting a stable growth throughout the past years, yet it still has a modest representation. However, that does not mean shopping centres should accommodate as the focus on customer experience should, and must be, at the centre of developed strategies, particularly when the footfall of shopping centres' has stabilised.

For shopping centres to endure in the digital era they need to reinvent themselves as customers seek for experiences that go further than conventional shopping and past online shopping. Retailers' expenses have been focusing on in-store technology (an increase of 60% between 2018 and 2019) and on investments in advanced analytics and shopper-traffic circulation data gathering mechanisms, while the brands' themselves have been embracing innovative technologies to improve the consumers' experience (Deloitte 2020). By gathering such hard data, both landlords and retailers can improve customer satisfaction and attract new consumers.

Furthermore, shopping centres cannot be associated purely to shopping activity. Undoubtedly, mixed-used real estate developments offer consumers a more desirable and integrated environment to live, work and shop. For instance, the Dubai Mall, located in the United Arab Emirates, includes fashionable residential towers, luxury hotels and lovely landscape view to the most buildings that attract the most tourists (Burj Khalifa, the Dubai Opera and Dubai Fountain). This mixed real estate use also generates additional traffic for the malls while maximising returns on invested capital (Deloitte 2020). Two main segments have

been gaining momentum within shopping centres: entertainment and food sector/restaurants. The entertainment sector incorporates, for example, cinemas, theme parks, bowling alleys, and virtual reality rooms (which already exists in UBBO). Regarding the food sector, it is proven that the highest productivity is observed in the last floor of a shopping mall, which is where usually food courts are located (CBRE, et al. 2016). As mid-cap fashion retailers leave mall areas, it creates an opportunity for property owners to bring a rousing fresh variety of restaurant offerings, creating a new anchor that attracts more visitors to the centre.

7.1. The 2021/2022 Outlook for Portuguese Retail Rents

One of the most affected sectors with the coronavirus outbreak in 2020 was the retail segment. The imposed lockdown forced shopping centres and high street stores to close between March and April – not fully closed as supermarkets and stores selling essential goods were allowed to stay open. The restrictions were less severe in late May and early June, making shopping centres to reduce the number of customers within their physical space; to reduce its opening hours schedule when compared to the standard schedule; to limit the number of persons allowed within the food court (4 members per group); and forcing each store to meet the requirements of a covid-safe space, among other measures (DGS 2020) .

Consequently, physical stores saw their sales significantly decreasing, not being able to pay the contracted rent. To solve this problem, the Portuguese Government will, in the first half of 2021, provide non-refundable financial support to commercial establishments, which the amount will depend on the decrease in revenues incurred due to the lockdown. More precisely, establishments that reported a decline in revenues between 25% and 40% compared to 2019 will be entitled to support of 30% of the rent, up to a maximum of €1 200/month. Retailers that reported a loss higher than 40% may receive up to 50% of the rent, up to a maximum ceiling of €2 000/month. However, this financial support will not be received on a

moment in time as it could take up to 6 months for the Government to send correspondent amount.

However, these measures do not apply for shopping malls. In this specific case, the Parliament approved, within the scope of the Government Budget of 2021, a cut of rents equivalent to the revenue loss, but up to a maximum of 50%. These procedures will begin in the first quarter of 2021, but it may be extended until June if the crisis requires so. Furthermore, the Government will create an incentive mechanism for property owners who want to receive suspended rents immediately. In other words, 2020 rents should start to be paid in January 2021, in twenty-four instalments over the next two years. If owners want to receive the money all at once and are willing to accept that amount at a discount, they will have a further incentive that the prime minister has yet to detail. Tenants who choose to access the credit line will have five years to pay the respective debt. The Portuguese Government's overall costs estimated to be €300M (Lança and Sanlez 2020).

This scenario is particularly concerning for BPI GA since it may take up two years to receive the contracted rents. If the company decides to receive the full amount, it may lose a considerable sum of total rents. Even though the prime minister defines a future incentive, it may not be compensatory for the possible incurred loss. Also, with the fear of 3rd outbreak in 2021, there is the risk that the retail sector will take even longer to recover from the pandemic crisis (Silva 2020).

8. Conclusion

This paper provides an in-depth analysis of the drivers of shopping centres, focusing on the two investments present on Imofomento's portfolio and the Portuguese real estate market. Our conclusions should provide a better understanding of shopping centres' investments and how the risk factors may differ from those of other commercial real estate properties.

Regarding the macroeconomic factors, through a panel data fixed-effects regression, we conclude that shopping centres respond to real GDP growth, net disposable income growth and industrial production growth. Nevertheless, micro factors take a crucial role in explaining these centres' performance, mainly a strong tenant mix, low tenant risk, sales and footfall growth, and the implementation of green practices. Furthermore, in Portugal's particular case, shopping centres' returns are also highly dependent on the parking space's performance.

Lastly, we conclude that shopping centres respond to specific factors that are not significant for other commercial real estates (e.g. offices or warehouses). It is intrinsically related to the retail market itself and the capacity to enhance customer drawing power. It is admitted that, however, there are limitations to this study. The centres' sample is relatively small, and a broader selection should be investigated in further studies. It requires further explorations of the optimal tenant risk for the shopping centres in Imofomento's portfolio.

9. Bibliography

Aktas, Gozen Guner. 2012. “Sustainable Design Proposals in Shopping Center Public Interiors.” *International Journal of Energy and Environment* 6 (1): 109-116.

Ang, Andrew. 2014. “Chapter 11: Real Assets.” In *Asset Management - A Systematic Appraoch for Factor Investing*, 374-380. New York: Oxford University Press.

APCC. 2020. *Centros Comerciais.* Accessed December 15, 2020. http://www.apcc.pt/centros/.

APCC. 2020. “Futuro Verde para Centros Comerciais .” *Shopping* 104: 21-28.

Baptista, Ana. 2019. *Dolce Vita Tejo vai mudar de nome.* 16 January. https://expresso.pt/economia/2019-01-16-Dolce-Vita-Tejo-vai-mudar-de-nome.

Blundell, Gerald, Simon Fairchild, and Robin Goodchild. 2005. “Managing Portfolio Risk in Real Estate.” *Journal of Property Research* 22 (3): 115-136.

Bruwer, Johan. 1997. “Solving the ideal tenant mix puzzle for a proposed shopping centre: A practical research methodology.” *Property Management* 160-172.

Burnaz, Sebnem, and Ilker Topcu. 2011. “A Decision Support on Planning Retail Tenant Mix in Shopping Malls.” *Procedia Social and Behavioral Sciences* 317-324.

Carregueiro, Nuno. 2018. *AXA compra Dolce Vita Tejo por 230 milhões.* 22 January. https://www.jornaldenegocios.pt/empresas/imobiliario/detalhe/axa-compra-dolce-vita-tejo-por-230-milhoes.

CBRE. 2020. “Real Estate Market Outlook 2020 Portugal.” *CBRE Research.* 7 February. https://www.cbre.pt/en/research-and-reports/Portugal-Market-Outlook-2020.

CBRE. 2015. “Sustainable Shopping Centers: Energy, Performance and Value .” *BCSC.*

CBRE, Bouwfonds, Syntrus, and Wereldhave. 2016. “Investment in retail propertyin the Netherlands: a European perspective.”

Cushman & Wakefield. 2020. “Portuguese Real Estate Market.” 13 November. Accessed November 15, 2020. https://www.cushmanwakefield.com/en/portugal/insights.

Delfim, Jean Christophe, and Martin Hoesli. 2019. “Real Estate in Mixed-Asset Portfolios for Various Investment Horizons.” *The Journal of Portfolio Management Special Real Estate Issue* 45 (7): 141-158.

Delfim, Jean Christophe, and Martin Hoesli. 2016. “Risk Factors of European Non-Listed Real Estate.” *Journal of Property Research* 33 (3): 190–213.

Deloitte. 2020. “The future of the mall - Building a new kind of destination for the post-pandemic world.” https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/consumer-industrial-products/ca-future-of-the-mall-en-AODA.pdf.

Devaney, Steven, Pat McAllister, and Anupam Nanda. 2017. “Determinants of transaction activity in commercial real estate markets: evidence from European and Asia-Pacific countries.” *Journal of Property Research* 34 (1): 251-268.

DGS. 2020. *A RESPOSTA DE PORTUGAL À COVID19.* Accessed December 15, 2020. https://covid19estamoson.gov.pt/.

Dixon, Tim, and Andrew Marston. 2002. “U.K. Retail Real Estate and the Effects of Online Shopping.” *Journal of Urban Technology* 9 (3): 19-47.

Eppli, Mark, and John Benjamin. 1994. “The Evolution of Shopping Center Research: A Review and Analysis.” *Journal of Real Estate Research* 9: 5-32.

Eppli, Mark, and John Shilling. 1993. “What’s a Shopping Center Worth?” *American Real Estate Society, conference paper* 283-296.

Eppli, Mark, James Shilling, and Kerry Vandell. 1998. “What Moves Retail Property Returns at the Metropolitan Level?” *Journal of Real Estate Finance and Economics* 13 (6): 317-342.

European Commission. 2020. *Economic forecast for Portugal.* November. https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-performance-country/portugal/economic-forecast-portugal_en.

European Commission. 2020. “European Economic Forecast.” *Institutional Paper 136 - November 2020.*

Eurostat. 2020. *E-commerce revenue share of companies in Europe in 2019, by country.* Accessed November 15, 2020. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_evaln2&lang=de.

Fantoni, Roberto, Fernanda Hoefel, and Marina Mazzarolo. 2014. *The future of the shopping mall.* Accessed December 15, 2020. https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-future-of-the-shopping-mall.

Flannery, Mark, and Aris Protopapadakis. 2002. "Macroeconomic factors do influence aggregate stock returns." *The Review of Financial Studies* 15 (3): 751-782.

Gerbich, Marcus. 1998. "Shopping Center Rentals: An Empirical Analysis of the Retail Tenant Mix." *The Journal of Real Estate Research* 15 (3): 283-296.

Giannotti, Claudio, and Gianluca Mattarocci. 2009. "How to evaluate risk for Italian real estate funds." *Journal of European Real Estate Research* 2 (2): 132-150.

Gilberto, S. M. 1993. "Measuring Real Estate Returns: The Hedged REIT index." *Journal of Portfolio Management* 48 (1): 865-886.

Gray, Alistair. 2020. *US shopping mall vacancies hit two-decade high.* 7 January. https://www.ft.com/content/700164de-30e8-11ea-a329-0bcf87a328f2.

Grenadier, Steven. 1996. "Leasing and Credit Risk." *Journal of Financial Economics* 42: 333-364.

Han, Haoying, Noman Sahito, Thuy Van Thi Nguyen, Jinsoo Hwang, and Muhammad Asif. 2019. "Exploring the Features of Sustainable Urban Form and the Factors that Provoke Shoppers towards Shopping Malls." *Sustainability* 11 (17).

Ho, Kim Hin David, and Faishal bin Ibrahim Muhammad. 2010. "Explaining the macro-economy and retail real estate sector dynamic interaction between prime and suburban retail real estate sectors." *Journal of Property Investment & Finance* 28 (2): 77-108.

Hoesli, Martin, Bryan D. Macgregor, George Matysiak, and Nanda Nanthakumaran. 1997. "The Short-Term Inflation-Hedging Characteristics of U.K. Real Estate." *Journal of Real Estate Finance and Economics* 15 (1): 27-57.

Hoskins, Nicholas, David Higgins, and Richard Cardew. 2004. "Macroeconomic Variables and Real Estate Returns: An International Comparison." *The Appraisal Journal* 72 (2): 163 - 170.

JLL. 2020. "Portugal Market Pulse." 30 September. Accessed November 15, 2020. https://www.jll.pt/content/dam/jll-com/documents/pdf/research/emea/portugal/pt/jll-market-pulse-t3-2020.pdf.

—. 2019. *The future of retail is…not exactly what you might think.* Accessed December 17, 2020. https://www.us.jll.com/en/newsroom/the-future-of-retail-is-not-exactly-what-you-might-think.

Kare-Silver, Michael. 2001. *E-Shock The New Rules: E-Strategies for Retailers and Manufacturers.* Basingstoke: Palgrave.

Lança, Filomena, and Ana Sanlez. 2020. *Lojas dos shoppings vão ter corte na renda em 2021.* Accessed December 16, 2020. https://www.jornaldenegocios.pt/economia/rendas/detalhe/lojas-dos-shoppings-vao-ter-corte-na-renda-em-2021.

Lenaghan, Nick. 2020. *Mall vacancy hits highest in 20 years as retailers shrink.* 12 July. https://www.commercialrealestate.com.au/news/mall-vacancy-hits-highest-in-20-years-as-retailers-shrink-968798/.

Matysiak, George, and Franz Fuerst. 2013. "Analysing the Performance of Nonlisted Real Estate Funds: A Panel Data Analysis." *Applied Economics* 45 (14): 1777–1788.

Miller, Norman. 1999. "Retail Leasing in a Web-Enabled World." *Journal of Real Estate Portfolio Management* 6 (2): 167-184.

Mouton, Beatrice. 2014. *Creating a Tenant Mix and a Leasing Plan.* July. https://www.icsc.com/uploads/event_presentations/BasicsOfLeasingAndTenantMix_BeatriceMouton.pdf.

OECD. 2020. *Economic Forecast Summary* . December. http://www.oecd.org/economy/portugal-economic-snapshot/.

Ortegón-Cortázar, Leonardo, and Marcelo Royo-Vela. 2017. "Attraction factors of shopping centers: Effects of design and eco-natural environment on intention to visit." *European Journal of Management and Business Economics* 26 (2): 199-219.

Patterson, Gary A. 2009. "The Relationship between REIT Property Types and Economic Risk Factors." *ABD Journal* 1.

Shopping Cidade do Porto. 2020. *Stores.* Accessed December 16, 2020. https://shoppingcidadedoporto.com/lojas.

Silva, Hugo Tavares da. 2020. *Há uma enorme probabilidade de vir uma terceira vaga colada à segunda.* Accessed December 16, 2020. https://expresso.pt/coronavirus/2020-11-22-Ha-uma-enorme-probabilidade-de-vir-uma-terceira-vaga-colada-a-segunda.

Sirmans, C. F., and Krisandra A. Guidry. 1993. "The Determinants of Shopping Center Rents." *The Journal of Real Estate Research* 8 (1): 107-115.

Slob, Gertjan. 2019. *Retail Rankings of Europe's major retail destinations.* 11 November. https://locatus.com/en/blog/retail-rankings-of-europes-major-retail-destinations/.

Stevenson, Simon. 2000. "International real estate diversification: Empirical tests using hedged indices." *The Journal of Real Estate Research* 19 (1/2): 105-131.

Teller, Christoph. 2008. "Shopping streets versus shopping malls – determinants of agglomeration format attractiveness from the consumers' point of view." *The International Review of Retail, Distribution and Consumer Research* 18 (4): 381- 403.

The Retail Bulletin. 2020. *Retail vacancy rates edge up in second quarter.* 31 July. https://www.theretailbulletin.com/shopping-centres-and-retail-parks/retail-vacancy-rates-climb-in-second-quarter-31-07-2020/.

The SASB Foundation. 2018. *SASB Materiality Map.* Accessed December 3, 2020. https://materiality.sasb.org/.

Yiu, Chung Yim, and Sherry Y.S. Xu. 2009. "A tenant-mix model for shopping malls." *European Journal of Marketing* 46 (3/4): 524-541.

Yuo, Tony Shun-Te, Neil Crosby, Colin Lizieri, and Philip McCann. 2004. "Tenant Mix Variety in Regional Shopping Centres: Some UK Empirical Analyses." *Real Estate & Planning Working Papers* .

10. Appendix

***Appendix 10.1.* –** Equity Index used to build the hedged indexes for each country.

Country	Equity Index	REITs
USA	SPX Index	Regency Centers Corporation; Federal Realty Investment Trust; Weingarten Realty Investors; SITE Centers Corp
Canada	SPTSX Index	Plaza Retail REIT
UK	UKX Index	Hammerson REIT PLC
France	SXXP Index	Klepierre S.A.; Mercialys REIT SA
Netherlands	SXXP Index	Wereldhave N.V.

***Appendix 10.2.* –** Descriptive Statistics of the Macroeconomic Model.

Descriptive Statistics Dependent Variable

	Mean (%)	St. Dev (%)	Min	1st Qu. (%)	Median (%)	3rd Qu. (%)	Max (%)
% Change CRE Prices							
USA	0.755	11.220	-27.638	-7.335	2.035	8.518	22.971
Canada	3.532	12.491	-15.340	-4.024	1.352	8.745	41.775
UK	0.427	11.446	-40.135	-4.657	2.417	8.459	16.076
France	1.670	9.607	-18.423	-6.162	1.375	7.692	20.973
Netherlands	0.141	9.738	-19.097	-8.002	0.616	8.681	18.256

Descriptive Statistics Independent Variables

USA	**GDP**	**CPI**	**UNEM**	**INCOME**	**TERM**	**SALES**	**IND**
Mean (%)	1.888	0.517	-0.222	0.978	1.525	0.080	0.214
St. Dev (%)	2.571	0.832	5.428	0.993	0.872	0.580	1.570
Min	-8.400	-2.829	-6.381	-2.851	-0.108	-2.429	-6.420
1st Qu. (%)	0.600	0.192	-2.857	0.479	1.151	-0.184	-0.077
Median (%)	2.100	0.541	-1.139	0.926	1.606	0.140	0.418
3rd Qu. (%)	3.200	1.019	0.113	1.575	2.086	0.430	1.051
Max (%)	5.500	2.195	20.126	2.907	2.808	0.949	2.212
Canada	**GDP**	**CPI**	**UNEM**	**INCOME**	**TERM**	**SALES**	**IND**
Mean (%)	0.467	0.413	-0.001	1.063	1.050	0.700	0.105
St. Dev (%)	0.671	0.520	0.041	5.810	0.589	1.118	1.741
Min	-2.260	-1.144	-0.060	-11.187	-0.034	-2.092	-6.048
1st Qu. (%)	0.195	0.027	-0.025	-3.541	0.665	-0.087	-0.836
Median (%)	0.640	0.363	0.000	1.729	1.022	0.793	0.297
3rd Qu. (%)	0.897	0.833	0.014	6.126	1.517	1.619	1.139
Max (%)	1.380	1.739	0.188	10.094	2.152	2.426	2.981
UK	**GDP**	**CPI**	**UNEM**	**INCOME**	**TERM**	**SALES**	**IND**
Mean (%)	0.371	0.548	0.031	0.762	1.167	0.584	-0.148
St. Dev (%)	0.677	0.446	5.696	2.070	1.044	0.565	1.134
Min	-2.061	-0.534	-10.945	-4.402	-0.470	-0.562	-4.490
1st Qu. (%)	0.179	0.203	-4.200	-0.309	0.108	0.150	-0.583
Median (%)	0.529	0.502	0.157	1.054	1.458	0.599	0.104
3rd Qu. (%)	0.747	0.821	3.028	2.151	2.028	0.974	0.490
Max (%)	1.370	1.853	16.072	5.782	2.781	1.760	1.819
France	**GDP**	**CPI**	**UNEM**	**INCOME**	**TERM**	**SALES**	**IND**
Mean (%)	0.282	0.342	0.410	0.809	1.387	0.545	-0.136
St. Dev (%)	0.516	0.446	2.537	5.343	0.750	0.747	1.777
Min	-1.661	-0.501	-5.462	-7.183	0.068	-1.300	-7.664
1st Qu. (%)	0.082	-0.043	-0.968	-4.004	0.684	0.033	-0.528
Median (%)	0.293	0.269	0.366	1.904	1.580	0.633	0.157
3rd Qu. (%)	0.684	0.682	1.471	6.030	1.955	1.133	0.772
Max (%)	1.039	1.391	9.829	8.395	2.402	2.166	2.291
Netherlands	**GDP**	**CPI**	**UNEM**	**INCOME**	**TERM**	**SALES**	**IND**
Mean (%)	0.308	0.390	0.705	0.802	1.321	0.124	0.178
St. Dev (%)	0.763	0.589	4.452	5.324	0.727	1.082	2.355
Min	-3.594	-0.886	-7.563	-9.130	0.051	-3.267	-4.606
1st Qu. (%)	0.002	0.081	-2.347	-2.625	0.679	-0.367	-1.938
Median (%)	0.439	0.428	0.000	-0.581	1.489	0.068	0.390
3rd Qu. (%)	0.624	0.822	4.587	4.827	1.879	0.700	1.965
Max (%)	1.497	1.564	10.526	11.593	2.441	2.864	4.407

Appendix 10.3. **–** Forecast of Economic Indicators developed by the European Commission (EC) and the OECD available in December 2020.

	EC Forecast			OECD Forecast		
Indicators	2020	2021	2022	2020	2021	2022
GDP growth (%, yoy)	-9.3	5.4	3.5	-8.4	1.7	1.9
Inflation (%, yoy)	-0.1	0.9	1.2	-0,1	0.3	0.4
Unemployment (%)	8.00	7.7	6.6	7.3	9.5	8.2
Public budget balance (% of GDP)	-7.3	-4.5	-3	-4.5	-3.8	-2.6
Gross public debt (% of GDP)	135.1	130.3	127.2	136,1	139,7	138.8
Current account balance (% of GDP)	-0.9	-0.5	-0.5	-0.5	-0.6	-0.7

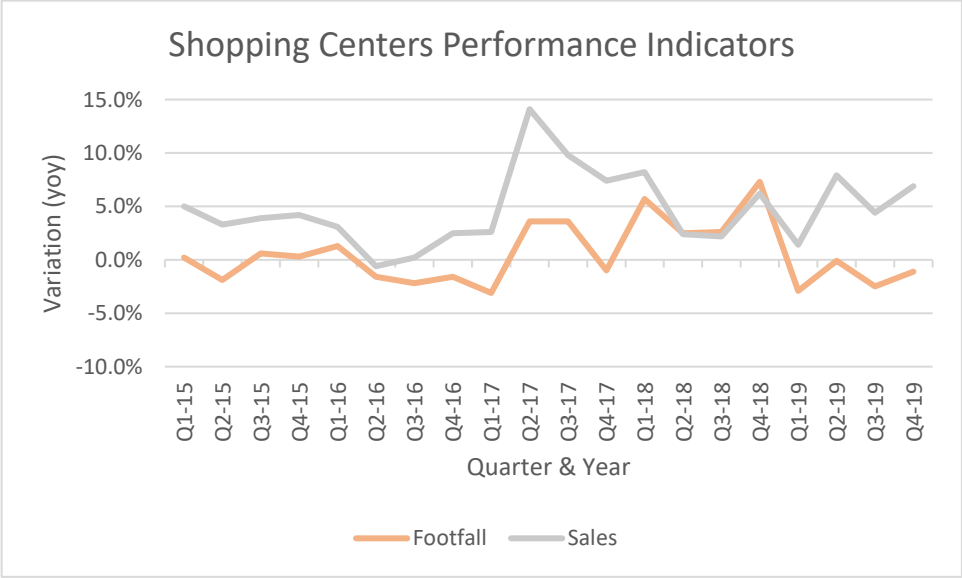
Appendix 10.4. **–** Rating of the Portuguese Debt attributed by the most well-established Credit Rating Agencies and the respective expectation.

Rating Agencies	Rating	Observations
Moody's	Baa3	Positive
S&P	BBB	Stable
FITCH	BBB	Stable
DBRS	BBB+	Stable

Appendix 10.5. **–** Top 10 Portuguese Shopping Centers and Malls based on the Gross Leasable Area (GLA) in 2020.

TOP 10	Shopping Center	Location	MA	GLA (sqm)	Number Stores	Property Owner	Manager
1	UBBO	Amadora	Lisboa	122 000	280	AXA Investment Managers – Real Assets	CBRE
2	Centro Colombo	Lisboa	Lisboa	120 220	338	Sierra Fund / CBRE Global Investors	Sonae Sierra
3	Mar Shopping	Matosinhos	Porto	102 000	210	IKEA Centres Portugal, S.A.	IKEA Centres Portugal, S.A.
4	Norte Shopping	Matosinhos	Porto	85 662	270	Sierra Fund / T.I.A.A - CREF	Sonae Sierra
5	Mar Shopping	Loulé	Algarve	82 000	110	IKEA Centres Portugal, S.A.	IKEA Centres Portugal, S.A.
6	Almada Forum	Almada	Lisboa	78 815	251	Merlin Properties e Auchan	Multi Portugal
7	CascaiShopping	Cascais	Lisboa	74 027	198	Sierra Fund	Sonae Sierra
8	Palácio do Gelo	Viseu	Viseu	73 500	151	Movida Empreendimentos Turísticos	Movida, Grupo Visabeira
9	Parque Nascente	Gondomar	Porto	63 500	135	Klépierre	Klépierre
10	Arrábida Shopping	Gaia	Porto	60 623	178	Sierra Portugal Fund / Sonae Sierra	Sonae Sierra

Appendix 10.6. **–** Portuguese Shopping Centers: Footfall and Sales Growth (*source*: APCC)



Appendix 10.7. **–** Tenants of Edifício Península and the respective sales analysis.

Tenant	Sales 2018	Sales 2019	% Change
APARC LDA	No Data	No Data	No Data
Cardif Services	No Data	No Data	No Data
Italco Moda Italiana Lda	€ 306,818.66	€ 476,188.94	55.20%
BIMBA & LOLA, PORTUGAL LDA	€ 15,940,338.10	€ 20,743,753.44	30.13%
Antonio Montalvão Machado - Associados Soc.de Advogados,RL	No Data	No Data	No Data
Greatprobabilities , Lda	€ 1,284,868.34	€ 978,975.89	-23.81%
PRICELINE BOOKING.COM (PORTUGAL) VIAGENS ONLINE, UNIPESSOAL LDA	€ 7,072,915.00	€ 7,314,266.25	3.41%
Fortera Group SGPS SA	€ 66,488.17	€ 97,289.32	46.33%
BLAZE INFORMATION SECURITY, LDA.	€ 449,457.99	€ 1,001,044.60	122.72%
Union de Creditos Imobiliarios S.A.	No Data	No Data	No Data
STARBUCKS COFFEE PORTUGAL , LDA	€ 9,785,583.27	€ 11,757,068.51	20.15%
MSI Mediação de Seguros Industriais Lda	€ 436,062.68	€ 443,286.37	1.66%
Porta 188, LDA	€ 662,416.72	€ 652,472.69	-1.50%
The Gentleman Square - Comércio Vestuário Unipessoal, LDA	€ 153,459.54	€ 161,533.99	5.26%
Widex - Reabilitação Auditiva Unipessoal Lda	No Data	No Data	No Data
A.AGUIAR MOREIRA LDA	€ 346,499.38	€ 370,784.30	7.01%
BBGOURMET RESTAURAÇÃO, TURISMO E SERVIÇOS LDA	€ 2,555,624.18	€ 2,949,028.97	15.39%
TOTAL	**€ 39,060,532.03**	**€ 46,945,693.27**	**20.19%**

Appendix 10.8. **–** Description of Península's tenants, tenant type, real estate sector and the respective value of the occupied area, and the rent per month as of October 2020.

Tenant	Tenant Type	Real Estate Sector(s)
APARC LDA	Services: Consulting Firm	Offices & Parking
Cardif Services	Services: Insurance Company	Offices
Italco Moda Italiana Lda	Fashion Store	Retail
BIMBA & LOLA, PORTUGAL LDA	Fashion Store	Retail
Antonio Montalvão Machado - Associados Soc.de Advogados,RL	Services: Law Firm	Offices
Greatprobabilities , Lda	Fashion Store	Retail
PRICELINE BOOKING.COM (PORTUGAL) VIAGENS ONLINE, UNIPESSOAL LDA	Tourism: Booking Agency	Offices
Fortera Group SGPS SA	Real Estate Management Firm	Offices
BLAZE INFORMATION SECURITY, LDA.	Services: IT Consulting Firm	Offices
Union de Creditos Imobiliarios S.A.	Credit Firm	Offices
STARBUCKS COFFEE PORTUGAL , LDA	Foodcourt/Coffee	Retail
MSI Mediação de Seguros Industriais Lda	Services: Insurance Company	Offices & Parking
Porta 188, LDA	Fashion Store: Footwear	Retail
The Gentleman Square - Comércio Vestuário Unipessoal, LDA	Fashion Store	Retail
Widex - Reabilitação Auditiva Unipessoal Lda	Hearing Aid Firm	Offices
A.AGUIAR MOREIRA LDA	Textile Store	Retail
BBGOURMET RESTAURAÇÃO, TURISMO E SERVIÇOS LDA	Foodcourt/Restaurant	Retail

Tenant	Area (sqm)		Value	Rent/month
APARC LDA	6,863	€	6,490,755.00	€ [redacted]
Cardif Services	1,399	€	2,234,386.50	€ [redacted]
Italco Moda Italiana Lda	458	€	1,525,764.50	€ [redacted]
BIMBA & LOLA, PORTUGAL LDA	121	€	425,616.50	€ [redacted]
Antonio Montalvão Machado - Associados Soc.de Advogados,RL	193	€	377,699.00	€ [redacted]
Greatprobabilities , Lda	154	€	486,579.00	€ [redacted]
PRICELINE BOOKING.COM (PORTUGAL) VIAGENS ONLINE, UNIPESSOAL LDA	193	€	373,031.50	€ [redacted]
Fortera Group SGPS SA	193	€	385,027.50	€ [redacted]
BLAZE INFORMATION SECURITY, LDA.	140	€	278,221.00	€ [redacted]
Union de Creditos Imobiliarios S.A.	140	€	277,878.50	€ [redacted]
STARBUCKS COFFEE PORTUGAL , LDA	34	€	353,281.50	€ [redacted]
MSI Mediação de Seguros Industriais Lda	180	€	329,173.00	€ [redacted]
Porta 188, LDA	181	€	572,732.50	€ [redacted]
The Gentleman Square - Comércio Vestuário Unipessoal, LDA	50	€	255,081.00	€ [redacted]
Widex - Reabilitação Auditiva Unipessoal Lda	133	€	264,094.50	€ [redacted]
A.AGUIAR MOREIRA LDA	48	€	166,280.50	€ [redacted]
BBGOURMET RESTAURAÇÃO, TURISMO E SERVIÇOS LDA	107	€	310,625.50	€ [redacted]
TOTAL	**10,588**	**€**	**15,106,227.50**	**€ 67,232.96**

For confidential reasons, the value of the rent per month cannot be publicly disclosed.

Appendix 10.9. **–** Description of Picoas' Plaza tenants, tenant type, real estate sector and the respective value of the occupied area, and the rent per month as of October 2020.

Tenant	Tenant Type	Real Estate Sector(s)
FITNESS HUT	Gym	Retail/Leisure
Focca	Retaurant	Foodcourt/Restaurant
LIVRARIA BERTRAND	Bookstore	Retail
REMAX	Real Estate Company	Retail
Saba Portugal - Parques de Estacionamento SA	Car Parking Management Company	Parking
COMPANHIA DAS SANDES	Restaurant	Foodcourt/Restaurant
CES*	Social Studies Company	Retail
MAIS NUTRIÇÂO	Food Store	Retail
ALLSANUS PRESTAÇÃO SERVIÇOS MEDICOS LDA	Medical Services	Retail
COSTUMES RECHEADOS UNIPESSOAL LDA	Restaurant	Foodcourt/Restaurant

Tenant	Area (sqm)		Value		Rent/month
FITNESS HUT	2,388	€	2,731,006.42	€	[redacted]
Focca	90	€	129,606.90	€	[redacted]
LIVRARIA BERTRAND	364	€	701,727.35	€	[redacted]
REMAX	329	€	417,074.81	€	[redacted]
Saba Portugal - Parques de Estacionamento SA	11,540	€	5,449,824.00	€	[redacted]
COMPANHIA DAS SANDES	108	€	160,575.82	€	[redacted]
CES*	225	€	335,127.87	€	-
MAIS NUTRIÇÂO	104	€	125,383.88	€	[redacted]
ALLSANUS PRESTAÇÃO SERVIÇOS MEDICOS LDA	392	€	489,067.48	€	[redacted]
COSTUMES RECHEADOS UNIPESSOAL LDA	65	€	101,956.08	€	[redacted]
TOTAL	**15,602**	**€**	**10,641,350.61**	**€**	**70,365.48**

* CES does not pay rent. However, the contract requires the tenant to pay for ordinary expenses plus VAT per month.

For confidential reasons, the value of the rent per month cannot be publicly disclosed.

Appendix 10.10 **–** Relation between the Failure Score provided by Informa D&B and the rating from S&P.

Min	Max	Rating
95.0	100	AAA
90.0	95.0	AA
80.0	90.0	A
70.0	80.0	BBB
55.0	70.0	BB
40.0	55.0	B
0.0	40.0	CCC/C

Appendix 10.11. **–** One-year Global Corporate Average Transition Rates for 1981-2018 (*source*: S&P).

(%)

From/to	AAA	AA	A	BBB	BB	B	CCC/C	D	NR
AAA	86.99	9.12	0.53	0.05	0.08	0.03	0.05	0.00	3.15
AA	0.50	87.06	7.85	0.49	0.05	0.06	0.02	0.02	3.94
A	0.03	1.69	88.17	5.16	0.29	0.12	0.02	0.06	4.48
BBB	0.01	0.09	3.42	85.44	3.62	0.46	0.11	0.17	6.10
BB	0.01	0.03	0.14	4.83	77.50	6.65	0.55	0.65	9.67
B	0.00	0.02	0.08	0.17	4.93	74.53	4.42	3.44	12.41
CCC/C	0.00	0.00	0.11	0.20	0.59	13.21	43.51	26.89	15.50

Appendix 10.12. **–** Square Matrix One-year Global Corporate Average Transition Rates for the period of 1981-2018.

T = 1								
From/to	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**	**CCC/C**	**D**
AAA	89.82%	9.42%	0.55%	0.05%	0.08%	0.03%	0.05%	0.00%
AA	0.52%	90.64%	8.17%	0.51%	0.05%	0.06%	0.02%	0.02%
A	0.03%	1.77%	92.29%	5.40%	0.30%	0.13%	0.02%	0.06%
BBB	0.01%	0.10%	3.66%	91.56%	3.88%	0.49%	0.12%	0.18%
BB	0.01%	0.03%	0.15%	5.35%	85.77%	7.36%	0.61%	0.72%
B	0.00%	0.02%	0.09%	0.19%	5.63%	85.09%	5.05%	3.93%
CCC/C	0.00%	0.00%	0.13%	0.24%	0.70%	15.63%	51.49%	31.82%
D	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%

Appendix 10.13. **–** Computed probabilities of default for ten periods.

Year/Ratings	AAA	AA	A	BBB	BB	B	CCC/C	D
P(0,1)	0.00%	0.02%	0.06%	0.18%	0.72%	3.93%	31.82%	100.00%
P(0,2)	0.02%	0.06%	0.14%	0.44%	1.83%	8.92%	48.82%	100.00%
P(0,3)	0.05%	0.10%	0.25%	0.76%	3.26%	14.08%	58.36%	100.00%
P(0,4)	0.10%	0.16%	0.37%	1.15%	4.95%	19.04%	64.09%	100.00%
P(0,5)	0.15%	0.23%	0.53%	1.61%	6.82%	23.64%	67.83%	100.00%
P(0,6)	0.21%	0.31%	0.70%	2.14%	8.81%	27.86%	70.49%	100.00%
P(0,7)	0.27%	0.41%	0.91%	2.73%	10.87%	31.69%	72.53%	100.00%
P(0,8)	0.35%	0.52%	1.14%	3.38%	12.96%	35.17%	74.20%	100.00%
P(0,9)	0.43%	0.65%	1.41%	4.08%	15.06%	38.33%	75.62%	100.00%
P(0,10)	0.52%	0.80%	1.71%	4.83%	17.14%	41.22%	76.86%	100.00%

Appendix 10.14. **–** Tenant Risk Analysis based on the Credit Rating of each tenant in Península.

Tenant	Rent/month	Failure Score	Rating	Probability of Default	Expected to Default
APARC LDA	€ [redacted]	99	AAA	0.00%	0
Cardif Services	€ [redacted]	-	-	-	-
Italco Moda Italiana Lda	€ [redacted]	100	AAA	0.00%	0
BIMBA & LOLA, PORTUGAL LDA	€ [redacted]	96	AAA	0.00%	0
Antonio Montalvão Machado - Associados Soc.de Advogados,RL	€ [redacted]	-	-	-	-
Greatprobabilities , Lda	€ [redacted]	40	B	3.93%	1
PRICELINE BOOKING.COM (PORTUGAL) VIAGENS ONLINE, UNIPESSOAL LDA	€ [redacted]	100	AAA	0.00%	0
Fortera Group SGPS SA	€ [redacted]	-	-	-	-
BLAZE INFORMATION SECURITY, LDA.	€ [redacted]	95	AA	0.02%	0
Union de Creditos Imobiliarios S.A.	€ [redacted]	-	-	-	-
STARBUCKS COFFEE PORTUGAL , LDA	€ [redacted]	20	CCC/C	31.82%	1
MSI Mediação de Seguros Industriais Lda	€ [redacted]	96	AAA	0.00%	0
Porta 188, LDA	€ [redacted]	20	CCC/C	31.82%	1
The Gentleman Square - Comércio Vestuário Unipessoal, LDA	€ [redacted]	53	BB	0.72%	1
Widex - Reabilitação Auditiva Unipessoal Lda	€ [redacted]	46	B	3.93%	1
A.AGUIAR MOREIRA LDA	€ [redacted]	65	BB	0.72%	1
BBGOURMET RESTAURAÇÃO, TURISMO E SERVIÇOS LDA	€ [redacted]	43	B	3.93%	1

If the tenant is expected to default, then the number 1 will appear, otherwise is 0. If there is no available date it appears "-".

For confidential reasons, the value of the rent per month cannot be publicly disclosed.

Appendix 10.15. **–** Tenant Risk Analysis based on the Credit Rating of each tenant in Picoas.

Tenant	Rent/month	Failure Score	Rating	Probability of Default	Expected to Default
FITNESS HUT	€ [redacted]	100	AAA	0.00%	0
Focca	€ [redacted]	34	CCC/C	31.82%	1
LIVRARIA BERTRAND	€ [redacted]	78	A	0.06%	0
REMAX	€ [redacted]	-	-	-	-
Saba Portugal - Parques de Estacionamento SA	€ [redacted]	100	AAA	0.00%	0
COMPANHIA DAS SANDES	€ [redacted]	-	-	-	-
CES*	€ [redacted]	-	-	-	-
MAIS NUTRIÇÂO	€ [redacted]	-	-	-	-
ALLSANUS PRESTAÇÃO SERVIÇOS MEDICOS LDA	€ [redacted]	37	B	3.93%	1
COSTUMES RECHEADOS UNIPESSOAL LDA	€ [redacted]	-	-	-	-

If the tenant is expected to default, then the number 1 will appear, otherwise is 0. If there is no available date it appears "-".

For confidential reasons, the value of the rent per month cannot be publicly disclosed.