A Framework Development to Facilitate the Effective Management of a Sustainable Commercial Property Market

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Abstract

This study addresses issues around the dynamics of the commercial property market which are closely tied to the economic fluctuations that determine economic busts and booms. The main goal of this work was to build a framework for the sustainable management of the commercial property market. The research question was how the best practice in other countries, defined by analysing a broad spectrum of criteria that influence the dynamics of commercial property markets, can be applied in a comprehensive way, to resolve issues related to the sustainable management of the UK`s commercial property market.

The selection, grouping and determination of the significance of criteria, established using a survey presented to experts from different countries, are among the key objectives of this work, helping to establish a system of ranked criteria. Further analysis was carried out using multi-criteria decision-making (MCDM) methods. MCDM methods allow the analyses of both quantitative and qualitative criteria affecting the dynamics of commercial property and to compare selected countries.

The thesis contains the outcomes of a comparative analysis of criteria that affect the commercial property dynamics in the UK, France, Germany and Sweden. According to the literature, the global crisis did not see any decline in commercial property prices in Germany, Norway, Sweden, France, Austria or Switzerland (Section 2.4.1.). Germany, Sweden and France were selected for this study because the commercial property markets aligned to these countries are among the largest and, as such, can be used for comparison with the UK.

The study explores commercial property transactions and rentals market fluctuations via the criteria affecting such dynamics.

Using MCDM methods, a framework was developed to potentially help the national governments, lenders, borrowers and investors make various decisions with respect to the dynamics of the commercial property market, both on a national and international level.

This thesis is expected to be instrumental for future research, to facilitate a broader examination of market dynamics, to help evaluate economic and social, environmental, emotional, and legal and regulatory criteria, as well as the impact thereof, in an integrated manner for the purposes of making decisions in the dynamic environment of the commercial property market.

Keywords: behavioural economics, commercial property, commercial property dynamics, multi-criteria analysis, multi-criteria decision-making, sustainability and cyclicality.

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My study was international in nature therefore, in conducting it, I received contributions from specialists at universities in Germany, Sweden and France. I am grateful beyond measure to the following people from these universities for their support and useful consultations: Professor Alexandra Weitkampf from Dresden Technical University and her lovely team, and Matthias Soot in particular for his warm concern and assistance; Associate Professor Jenny Paulsson from KTH Royal Institute of Technology in Stockholm, as well as her colleagues, Sviatlana Engerstam in particular, for her time and knowledge; Professor Sonia Guelton from University Paris – Est Créteil. I also wish to acknowledge the commercial property specialists in these countries who kindly agreed to take part in my study and found time to complete the survey.

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List of Acronyms and Abbreviations

BOS	Bristol Online Surveys
CAPM	Capital Asset Pricing Model
CO^2	Carbon Dioxide
COPRAS	COmplex PRoportional Assessment
ECB	European Central Bank
ESG	Environmental, Social and Governance
ESRB	European Systemic Risk Board
EU	Europe Union
EUROSTAT	European Statistics
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IPD	Investment Property Databank
LTV	Loan-to-Value
MADM	Multi-Attribute Decision Making
MCDA	Multi-Criteria Decision Analysis
MCDM	Multi/Multiple Criteria Decision Making
MODM	Multi-Objective Decision Making
MSCI	Morgan Stanley Capital International
RICS	Royal Institution of Chartered Surveyors
SAW	Simple Additive Weighting
SCR	Sensitivity of Criteria for Rentals
SCT	Sensitivity of Criteria for Transactions
SPERI	Sheffield Political Economy Research Institute
TOPSIS	Technique for Order Preference by Similarity to an Ideal Solution
UK	United Kingdom
UKGBC	United Kingdom Green Building Council
UNCED	United Nations Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change

USA	United States of America
VAT	Value-Added Tax
WACC	Weighted Average Cost of Capital

List of Definitions

Alternative investments: for the purposes of this thesis, alternative investments are understood as investments in assets other than commercial property. According to (Fraser-Sampson, 2010), such assets should be liquid, publicly traded and might constitute commodities or raw materials.

Alternatives: represent the different choices of action available to the decision maker (Triantaphyllou, 2000, p. 28). The set of alternatives is usually considered to be finite, ranging from a few to several hundreds. They are able to be selected, prioritised and finally ranked (Triantaphyllou, 2000).

Built environment planning policy: spatial planning policy is defined as spatial planning done on the basis of the goals, objectives and methods used to achieve it. In social sciences, the term built environment means a man-made environment that provides human beings with operating conditions, covering everything from buildings to parks.

Capital growth or indirect return: measures the change in asset capital value over a period of time, relative to the capital employed. This measure of the 'growth' component of performance is based on the change in value for properties held at the start and end of an analysis period. Capital growth also takes account of actual transaction prices for bought or sold assets (MSCI).

Commercial building time frame: every commercial property building loses value with the passage of time. However, for the purposes of accounting in its broadest sense, depreciation does not have any effect on the factual changes in the condition of property. Therefore changes in the value of commercial property are tied to the factual age of the building, regardless of its book value.

Commercial property capital renewals: to maintain a building in good condition, the owner or property manager pools a certain amount of money for maintenance and renovation purposes every year, aiming to uphold its value on the market and keep it in adequate condition. Commercial property capital maintenance and renovations are costs that help uphold the qualitative condition of the property on the market.

Commercial property investment environment: is a system of components, changes in its factors affecting the dynamics of this type of property, and long-term observation of the historical changes using a set of indicators helping make investment decisions and control these dynamics.

Commercial property: is 'a property which is not designed or used for residential purposes or for purposes associated with primary industries such as agriculture' (Barnett and Rodell, 2016, p. 3). Commercial property is an asset used for economic purposes because it produces an income (Ball et al., 2001).

Commercial property value maximisation: the goal here is to maximise returns driven by the expectations of the owners of this business and stakeholder groups.

Criteria (basis of valuation): characteristics (qualities) or requirements, to a greater or lesser extent, that each alternative must have.

Debt interest rate: a charge on borrowed capital, money as often as not. Interest constitutes the price of borrowed capital in that the borrower repays loans to the lender with interest.

Decision analysis: a way of evaluating the alternatives.

Decision maker: the person, or a group of persons, that make the final choice between the alternatives.

Decision reliability: the probability of the highest-ranking alternative actually being the most rational one.

Decision-making: a cognitive process when the person (group or organisation) making the decision, evaluates different alternatives, choosing the 'best' one to achieve goals or objectives.

Environmental benefits of sustainable building: a sustainable building is one that is healthy, comfortable, durable, cost and energy efficient and one which uses natural resources rationally across the different stages of its life cycle. This ranges from the choice of location to design and construction, through to operation and renovation or end of life cycle. This type of building has a very low environmental impact, thus contributing to harmony through the maximum conservation of nature, rational use of resources and minimal environmental effect.

Environmental protection expenditure: money spent on activities directly aimed at preventing climate change, reducing pollution or inconveniences caused by manufacturing processes, or the consumption of goods and services.

Environmental taxes: taxes collected on human or business operations that have a negative environmental effect.

Foreign direct investment: investments in the local market coming from other states in the form of the direct acquisition of property in that market. These are tied to acquisitions of fixed property, land, buildings, machinery or corporate stock by foreign nationals and entities.

GDP per capita: a unit of measure of the country's economic performance. It shows the amount of the country's gross domestic product per capita.

Government bond yields: debt securities with maturity of over 1 year that are distributed by the government.

Green leases regulation: every developed state has an approved national green lease policy. The term green lease usually refers to a variety of lease provisions (requirements for landlords and tenants) aimed to reduce negative environmental impact and improve the sustainability of a facility.

Gross domestic product: the final monetary expression of consumer goods and services created over a certain period of time.

Human tendency to forget economy busts: an object of behavioural economics. Behavioural economics is a rather new, yet rapidly evolving branch of science that includes economics and experimental behavioural research aimed at investigating and explaining particular patterns of consumer shopping, for example why investors sometimes make irrational investment decisions, the reasons behind their decisions and the market implications thereof.

Indicator: a quantitative or qualitative parameter that can be measured, assessed, identified (such as the price and duration); a specific quality or attribute of a thing or phenomenon.

Interaction between commercial property market cycle and credit cycle: an action that takes place when two or more objects affect each other or create mutual ties. The commercial property market is related to the borrowing market because investments in commercial property are made with a company's own money and borrowed money. This way, the borrowing market and the property market interact and affect each other.

Interaction between commercial property market cycles and development cycles: the interaction between the commercial property market and the development of this property is somewhat different in nature. This process exhibits a retardation of the dynamics of the development cycle, which is particularly pronounced as the market spirals into a downward trend. Construction of property development projects falls behind changes in the dynamics of the property market.

International trade: exchange of capital, goods, or services among sellers, buyers and brokers in two or more countries.

Investors' expectations: investors require not only higher returns and low risk on commercial property investment, they need a new commercial property buildings that guarantee environmental protection. As a result, commercial property companies need to align their business priorities and adapt to new investors' expectations.

Market rental value: the rental income estimated to be achievable were a property or occupational unit to be newly leased, assuming a normal market lease contract. The market rental value net of all non-recoverable operating costs (NMRV) expressed as a percentage of the net capital value (NCV) at the

same date. The increase in the market rental value, expressed as a percentage of MRV at the beginning of the year (MSCI).

Method (gr. Methodos – way of research): the way to achieve a goal or to operate; an operating procedure consciously employed to achieve a particular goal; the way to investigate phenomena.

Methodology (method + -logy): a science that explains research methods; the theory of general scientific research; the theory of perception of the reality that investigates the way and principles of scientific thought.

Net Reversionary Yield: the market rental value net of all non-recoverable operating costs (NMRV) expressed as a percentage of the net capital value (NCV) at the same date (MSCI).

Number of employed persons: the total number of persons employed in different industries.

Predictive agents: property agents are commercial property specialists working as brokers between the buyer and the seller of commercial properties. The literature considers predictive agents to be persons who whilst brokering a deal between the buyer and the seller, offer an optimistic property price expecting prices to increase further in future.

Regulation of properties valuation standards: International Valuation Standards establish a set of valuation procedures to follow to enforce universal ideas and principles. The auxiliary provisions contained therein, help to apply these principles with consistency.

Regulation of property accounting standards: International Accounting Standards are the main instrument for harmonising accounting, with the power to effectively organise corporate operations. The purpose of International Accounting Standards is to summarise the accounting standards adopted by different countries to establish a set of global accounting regulations. Due to cultural differences, accountants in different countries need to interpret and apply bookkeeping standards with a certain degree of flexibility. As a result, the ease of application of the IFAS varies from country to country.

Reliability: the possibility that a system or product will suit its function on a compliance level.

Renewable resources: solar, geothermal and wind energy.

Return on commercial property: the ratio between the gross annual profit from commercial property and the total investment in the commercial property.

Risk: a stochastic category that is best described and measured as the probability of potential losses.

Sellers` speculative activity: in its broadest sense, speculation includes dealing in high-risk financial instruments with the expectation of high returns. The goal of this kind of trading is to take maximum advantage of market fluctuations. Therefore, speculative activity is virtually unavoidable in any market defined by a high degree of price volatility.

Sensitivity analysis: the repeated execution of a decision model with different inputs (Saltelli et al. 2000).

Social protection expenditure: social protection is connected to the prevention, management and ability to overcome situations that negatively affect people's wellbeing. Social protection consists of policy and programmes geared towards minimising poverty and vulnerability, improving the efficiency of the labour market and to make people better positioned to manage economic and social risks such as unemployment, isolation, diseases, disability and old age.

Social responsibility of commercial property business: corporate responsibility coves all the attitudes that promote the social activity of companies and organisations. Corporate responsibility shows that in additional to the ordinary financial obligations towards their shareholders, businesses also assume responsibility with respect to a larger number of stakeholders such as clients, employees and the general public.

Taxes: legal taxes paid by individuals, companies and other entities. The purpose of taxes such as income and profit tax is to achieve an even distribution of income from business.

Unemployment: the percentage of unemployed persons in the total economically active population, or people of an employable age.

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Chapter 1. Introduction

The aim of this introductory chapter is to present the research problem, provide an overview of the dynamics of the UK commercial property market and consider the importance of this for the country's economy. Initially, the chapter highlights the importance of commercial property business and its relevance to property economics. It then continues with an elaboration of the aim and specific objectives of the thesis, beneficiaries of research and original contribution to knowledge. The last section provides an explanation of the structure of the thesis, focusing on the content and role of the subsequent chapters.

1.1. Research Problem

Empirical evidence suggests that the value of commercial property has fluctuated more in comparison to residential property (European Central Bank, 2010; 2014), the implication of this being that huge losses can occur at times of financial crisis. For example, according to Investment Property Forum (2014), during the most recent Global financial crisis of 2007-2008, commercial property prices fell by 22% in Japan, 29% in Spain, 34% in the US, 67% in Ireland and 28% in the UK (Investment Property Forum, 2014). However, following this downturn in the economy, there are now signs of economic recovery and growth in the property market, illustrating how the market fluctuates in a relatively short period of time. An example of economic recovery and fluctuations in the value of commercial property in the UK, is shown below in Figure 1-1 (permission to reproduce this figure has been granted by Sue Forster, Chief Executive, Investment Property Forum).

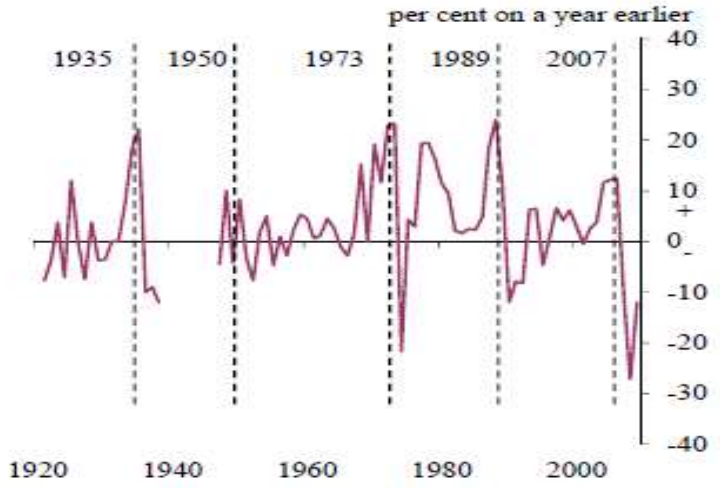


Figure 1-1. The UK commercial property market dynamics (Sources: Investment Property Forum (2014)).

The dynamic nature of the value of UK commercial property is extreme, ranging from plus 25% in 1989 to minus 28% in 2009 across the country. Vanags and Butane (2013) stated that a sustainable investment climate can help to avoid big losses at the time of falling property prices (Vanags and Butane, 2013). Work by Allen and Gale, ''Bubbles and Crises'' (2000) noted that 'busts' often follow a 'boom' in the property market, implying that there is the potential to control the fallout from a financial crisis (Allen and Gale, 2000). However, the problem is substantial commercial property volatility in the UK (Jadevicius and Huston, 2017). Commercial property market volatility is a negative feature of the market that causes an increase in the risk of negative financial return (Jones et al., 2016).

The main question surrounds the possibility of coordinating commercial property prices during its bubble and bust periods, by taking more effective action to accrue buffers that might help when the boom ends (Lane, 2012). Such a coordination system can be created according to the comparative analysis of other countries' commercial property market fluctuations. The existing literature reveals that patterns of rising and falling property prices in European countries, have not happened at the same time across all countries (Ferrari et al., 2010; European Central Bank, 2010; Dreger and Kholodilin, 2013; Investment Property Forum, 2014).

This situation provides us with the opportunity to address the issues related to the UK`s commercial property dynamics via a more effective framework. The patterns of European countries have more or less controlled property market fluctuations through the differences of various national systems. As such, there is a need to examine these systems and apply best practice from these in order to create a sustainable investment climate for commercial property businesses. This research will develop criteria that impact the commercial property market fluctuations and develop a framework to sustainably manage the commercial property market in the UK.

1.2. Research Question

Based on the defined research problem, the following research question was proposed:

How can the best practice in other countries, defined by analysing a broad spectrum of criteria that influence the dynamics of commercial property markets, be applied in a comprehensive way, to resolve issues related to the sustainable management of the UK`s commercial property market?

1.3. Research Aim and Objectives

The aim of the research is to develop a framework for the sustainable management of the commercial property market and to apply this to the UK.

The research consists of the following eight objectives:

1. To review the literature from the field of behavioural economics which studies the role the property market plays in decision-making in the finance industry.
2. To investigate the economic 'booms and busts' that have had an impact on the property market.
3. To analyse the current property investment environment in the UK and Europe.
4. To describe stakeholders in the commercial property market and their contribution to this market.
5. To analyse the property market's performance (on the basis of market fluctuations) during the period 2001 to 2017 in the UK, France, Germany and Sweden.
6. To develop criteria for property market performance which supports a healthy commercial property market development and which promotes successful property investments.
7. To evaluate the current property market in the UK and compare it with other selected countries using developed criteria.
8. To develop a framework to sustainably manage the commercial property market in the UK, and provide recommendations to stakeholders on the benefits of the framework.

1.4. Significant Contribution to Knowledge

This study has made the following contributions to existing theory:

1. The links between commercial property market behaviour and the action of macro level criteria such as economic, environmental, social, emotional, legal and regulatory have been investigated.
2. A framework for the sustainable management of the commercial property market has been developed.
3. The criteria for commercial property market performance which support the healthy development of the commercial property market and which promote successful property investment, have been developed.
4. The criteria affecting the commercial property market have been weighted by their relevance to the market and their sequence of relevance has been established.
5. The developed criteria have been placed into five groups that could serve as a foundation for a macro-level assessment of commercial property market dynamics.

This study has made the following contributions to existing practice:

1. Using MCDM methods, two models have been developed to provide a basis for making effective decisions in the volatile environment of both commercial property transactions and rentals markets. The first model can be used to compare the UK with other countries. The second one, 'Dolls', can be considered as a standard to use when making different decisions about the volatile environment of commercial property markets.

1.5. Beneficiaries of Research

This research will explore issues around the volatility of the UK commercial property market, attention only being paid to the macro factors which influence property market dynamics. This process will help to identify decisions made by participants in the commercial property market which may impact 'boom and bust' market movements. The developed framework will allow the identification and assessment of criteria which may help facilitate healthier commercial property market dynamics. The assessment framework will also allow commercial property market stakeholders to control the commercial property market, making it less volatile which in turn should facilitate a less severe depression of the economy.

The research will make recommendations to the stakeholders highlighting the benefits of such a framework which also has the potential to be adopted for international markets.

Contributions to knowledge will allow the generation of a framework for a sustainable built environment which could be of use to interested parties e.g. governments, banks, investment funds and strategic investors in other countries (Weber, 2016).

The criteria developed in this study, can be potential points of reference for making all kinds of decisions through a comparison of countries and groups of criteria for these players. The framework may be applied to resolve matters pertaining to the dynamics of commercial property transactions market and the dynamics of the commercial property rentals market.

MCDM methods will be applied innovatively in the analysis of the sustainable commercial property sector and for the development of the framework for the sustainable management of the commercial property market.

1.6. Overview of Chapters

Chapter 1 highlights the importance of the commercial property business and its relevance to the economy, also including the research problem and research question. It then continues with an elaboration of the aim and specific objectives of the thesis, beneficiaries of research and significant contribution to knowledge.

Chapter 2 contains an overview of the literature within the scope of objectives 1, 2, 3 and 4 of the study. Firstly, the behavioural economics is reviewed to investigate the articles where behavioural economics has been related to the behaviour of property market players. Secondly, the impact of booms and busts on the property market is discussed on the basis of the opinions laid down in the academic literature. Based on a thorough literature review, the reasons behind property dynamics are then analysed through a dissection of cycles of economy, their ties with cycles of property and the role of market players in this. Countries with stable commercial property dynamics suitable for a comparison are then selected. The potential to control market cycles and the commercial property management frameworks currently available, are discussed. Additionally, this chapter describes the stage of data collection, in which macro criteria are identified on the basis of the results of the literature overview. The chapter presents a description of the criteria and their relationship to the commercial property market. The data were collected via a survey given to commercial property experts in the countries under analysis. Finally, at the end of the chapter, there is a summary of the macro criteria by group, providing a basis for the development of a framework for the sustainable management of the commercial property market. The chapter concludes with a list of criteria affecting the dynamics of commercial property, these also drawn from the current literature.

Chapter 3 presents a description of the methods of the study employed to attain its objectives. The significance of the literature reviewed for this study and its application in the process of work, is discussed first. The discussion then turns to the multiple-criteria decision-making (MCDM) methodology and the process of its application, as well as the survey questionnaire employed. The rationale for the application of MCDM methods to build a framework for the sustainable management of the commercial property market, is then presented. An overview and application of the questionnaire is discussed. Finally, the statistical analysis is introduced, complete with the formulas of all of the techniques described above and the process of their application.

Chapters 4, 5 and 6 describe the data collection, analysis and results. Chapter 4 analyses the dynamics of commercial property transactions, rentals and the economic conditions' indicators in the UK, France, Germany and Sweden between 2001 and 2017. It also provides a descriptive analysis of commercial property dynamics in the capital cities of the said countries. The chapter closes with the outcomes of stage 1.

Chapter 5 describes stage 2 of the data collection, where the data were collected using a Questionnaire Approach. Experts were polled to verify the criteria and identify their relevance for the dynamics of the commercial property market. The scope and structure of the survey is described first, the compatibility of expert opinions tested. This is followed by a comparative analysis of the survey results, describing the relevance of the criteria for the dynamics of commercial property transactions and rentals, separately.

The 3rd stage of data collection is described in Chapter 6 where both qualitative and quantitative data are described. Qualitative criteria are quantified based on the results of the expert survey, such data have their own quantitative expression ranging on an ordinal significance scale from 1 to 6. Thus, the criteria measurement tools were determined by way of expertise. The quantitative criteria measurement tools were chosen through reliance on statistical and property data sources. This chapter provides a detailed explanation of the information on criteria measurement tools needed for the purposes of the application of multiple-criteria decision methods. The chapter closes with a summary and outcomes.

Chapter 7 contains a comparative analysis of the countries using MCDM methods. The chapter starts with a case study involving a comparison of the UK, France, Germany and Sweden using the SAW, COPRAS and TOPSIS methods. This is followed by a sensitivity analysis of the criteria and alternatives and a discussion of the results of these methods.

Chapter 8 comprises a test of the validity of the model using three years of historical quantitative data. An observation of the comparative dynamics of the countries over time follows. An artificial country is created to potentially serve as a standard for the purposes of the managing commercial property market fluctuations. A framework for the sustainable management of the commercial property market.

Chapter 9 presents some of the general outcomes, the significant contribution to the knowledge and the limitations of the study.

Figure 1-2 displays a visual representation of the thesis structure.

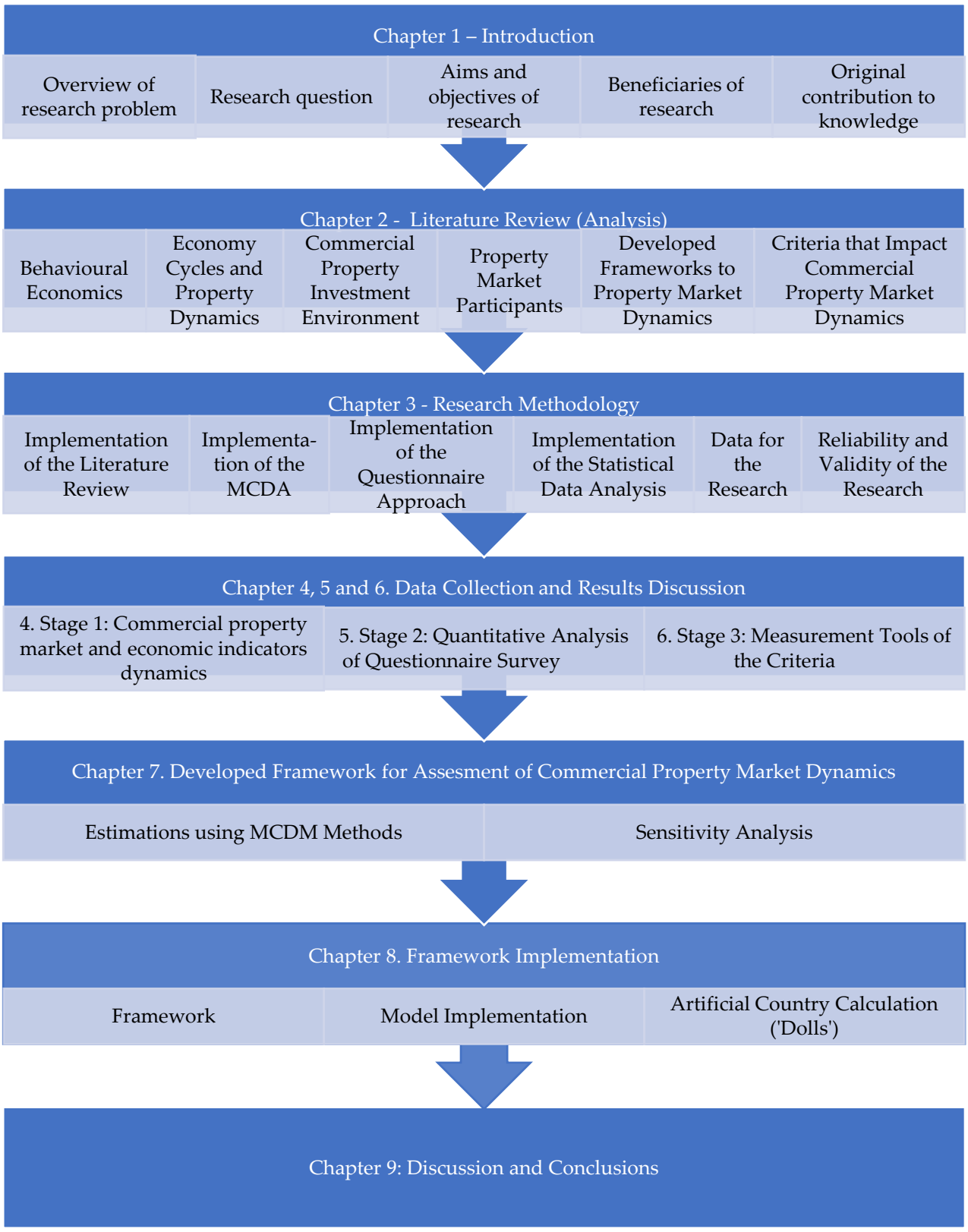


Figure 1-2. Thesis Structure.

(Source: Self Study).

Chapter 2. Literature Review

2.1. Introduction

This research is entitled 'A Framework Development to Facilitate the Effective Management of a Sustainable Commercial Property Market'. The term framework is used to denote a platform for supporting a structure which facilitates decision making. It provides a foundation on which the decision maker can test commercial property market dynamics for a specific country or a specific decision. It is envisaged as a system that supports a healthy and stable property market through the management of property market fluctuations in order to minimize life cycle costs and to hold capital values as stable as possible. Effective management is considered as the process by which stakeholder decision making is related to the retention of capital value.

For the purposes of formulating and addressing the problem, study question and objectives, a literature analysis was performed including an analysis of the literature on property-related frameworks already in place. Based on this, this thesis features an analysis of the dynamics of commercial property sale prices and rent rates, complete with a broad range of criteria affecting these dynamics. The resultant criteria are divided into groups that affect sustainable decision making. These are the psychological (emotional) criteria that drive the dynamics of property and criteria that affect dynamics grouped as economic, social and legal & regulatory criteria. Using these criteria, weightings are assigned acting as anchors that will help decision making.

The subject of this work is the dynamics of the commercial property market and its relationship with various criteria. The thesis explores the possibility of controlling these dynamics and of making decisions that are tied to the dynamic nature of the market. A brief explanation of the literature covered by the analysis and of the reasons for the analysis is presented below.

Winner of the Nobel Prize for economics Robert J. Shiller, predicted the 2008 collapse in property prices. He shared his insights in his book entitled 'Irrational Exuberance'. Irrational exuberance is the term usually used to describe unusually enthusiastic behaviour on the part of investors, manifesting itself through prices rising up to levels that are not supported by any fundamental indicators (Schiller, 2000; Samson, 2014). For a long time, economic sciences were developed on the assumption that decision makers were perfectly rational individuals who made totally rational decisions to help maximise their wellbeing. Their behaviour is always perceived as rational because they have all the necessary information about the market and are able to identify every possible alternative. This implies that every person is logically consistent, is aware of the rules and follows them when making decisions.

The 2017 Nobel Prize for contributions to economic sciences was also awarded to Richard Thaler, a researcher who carried out an evaluation of human behaviour that is more in line with reality. Thaler is known as the father of behavioural economics, this branch of economic sciences combining different facets of human behaviour to explain the economic motives of decision making. Supporters of behavioural economics analyse the economy through psychological aspects of behaviour and contest the rational existence of the economy. Behavioural economics describes the psychological qualities that affect decision making and decision-making processes. One of the most basic thinking and decision-making strategies – so-called psychological heuristics – is anchoring. People choose something as an anchor and base their decisions on it. On that basis, one could conclude that with a wider and/or adequately thorough framework and large number of anchors, decision making could be carried out more effectively.

Researchers have been trying to make sense of anomalies that negate rationality as the foundation of common economic thought even before 2005. These anomalies include mistakes that rational market players should not make. When such mistakes affect prices and return rates, the market becomes ineffective.

The continuous growth of property prices is driven by an increasing population, the supply of property for this population lagging behind (Brzezicka and Wisniewski, 2014). The growth in property prices is impacted by many different criteria, some of them promoting growth, others bringing it down. Therefore, in addition to its tendency to grow, the commercial property market tends to follow patterns of cyclic variation (Jadevicius et al., 2017; Baum, 2001; Barras, 1994) because it is affected by positive and negative criteria.

The dynamics of the property market correlates with the entire economy in a positive way (Kaminsky et al., 2004, Schularick, 2011; Kiyak et al., 2012, Allen and Gale, 2000; Gyourko, 2009; Chakraborty, 2009). When the economic situation is favourable, investing in property becomes a profitable thing to do, leading to further increases in prices that sometimes are not affected by key criteria and are tied to behavioural factors (Brzezicka and Wisniewski, 2014). The commercial property investment environment is a system of components, where changes in its factors affect the dynamics of property. Long-term observation of changes on the basis of a set of indicators, facilitates the ability to make successful investment decisions and control said dynamics. With reference to this, the literature analysis for this thesis, covered areas such as behavioural economics, booms and busts, economy cycles and property market dynamics, the commercial property investment environment, developed frameworks related to property market dynamics management and assessment, and the criteria that impact sustainable commercial property market dynamics. The literature analysis was carried out using a wide range of literature sources of

journals such as Applied Economics, Journal of Banking & Finance, Journal of Property Investment & Finance Journal of Property Research, Journal of Public Administration, Financial Analysts Journal, Urban Studies, Journal of Global Legal studies, Journal of Accounting and Finance, Journal of Economic Methodology, History of Economic Ideas, Behavioral Real Estate, Oxford Review of Economic Policy, working papers of Bank for International Settlements, Property Investment Forum, RICS and ERES.

2.2. Analysis of Behaviour Economics

The theory of behavioural economics is relatively new in the world of science, composed of a blend of psychological and economic knowledge. As such, an overview of papers by Heukelom (2011), Samson (2014), Thaler (2018) and Truc (2018) will be given to help define and describe this area. These researchers have described the history of the development of the theory and summarised current knowledge around behavioural economics. This review also includes articles where behavioural economics have been related to the behaviour of property market players.

In his article, Heukelom (2011) provides an overview of the work of researchers who have considered the theory of behavioural economics, including Daniel Kahneman, Amos Tversky, Richard Thaler, Matthew Rabin, George Loewenstein, Colin Camerer, and David Laibson. In his conclusions, he notes that Kahneman, Tversky and Thaler suggest steering economics down the psychological road, at the same time preserving the fundamentals of traditional economics as an objective anchor to rely upon. He also argues that so far, behavioural economics has had no effect on the theory of market behaviour and action of macroeconomic phenomena.

Samson`s (2014) work focuses on behavioural economics where psychological experiments have been used to build theories of human decision making, finding many errors in relation to human thinking and emotions. Samson notes that according to behavioural economics, people make choices based on insufficient knowledge, their available knowledge involving uncertainty while dependent on the context in which decisions are made. He also describes human behavioural theories including the Prospect Theory, Bounded Rationality, the Dual-System Theory, Temporal Dimensions and Social Dimensions, concluding that optimal choice is affected by insufficient knowledge, feedback and the possibility to process information, factors which often have to do with uncertainty and are driven by context. People are affected by easily accessible information and are susceptible to social norms, many human choices are not the product of in-depth deliberation.

Nobel Prize winner Thaler (2018) argues that researchers of behavioural economics have noticed that decision making is affected by how information is presented to the consumer. He suggests that the theory of economics brings economic thought back to where it started, to the times of Adam Smith, Irving Fisher and John Maynard Keynes, the implication that behavioural economics is not a revolutionary change in the theory of economics, but rather a continuation of what had been already started. In 1979, Tversky and Kahneman published research disclaiming the viewpoint that human decisions are always optimal, calling this the Prospect Theory (Thaler, 2018). This theory suggests that human decision-making choices are affected by how information is presented: the context, the so-called framing of information or anchor. Use of an anchor can constitute relying on prior experience when making decisions or the way the object or phenomenon of choice, is described.

Truc (2018) compared both 'new' and 'old' behavioural economics, examining the nature of the relationship among psychologists, behavioural economics and economists. He describes elements of behavioural economics such as the concept of the space of interaction, highlighting the role of outsiders, strategic thinking and negotiation. He also comments on what behavioural economists say about their own discipline, including its compatibility with the underlying trends of economics. However, observing that behavioural economics takes account of the concept of key economics as compatible, there are also many contradictions, accentuating the controversy surrounding different concepts present in both psychology and economics and the use of mathematics. In his opinion, conventional economists became more open to new ideas only when it became possible to simulate these ideas mathematically. He concludes that the framing effect is a good case in point of how the concept of psychology is integrated into economics. Framing is the main concept of behavioural economists, one that reveals the psychology behind the behaviour of an economic market player, yet the difficulties in transforming it into an official economic language make the understanding of its impact on economics limited. The theory of behavioural economics has been on the receiving end of some criticism as well. Authors like Spiegler (2019) and Berg (2020) criticising the direction the development of the theory of behavioural economics has taken.

Spiegler (2019) presents a critical discussion on the theoretical style normally employed to disseminate the theory of behaviour, arguing that the subjects of psychology and economics are, for all practical reasons, fundamental and that realisation of the transformative potential of this combination requires a larger dose of abstract theory. Disregarding this could mean that behavioural economists and their followers, may only be relevant for a brief period of time, sacrificing any long-term influence. In conclusion, Spiegler (2019, p. 191) states that, '…the fact that behavioural economics has sung its music with a low-volume theory register is one of the reasons for its popularity'.

Berg (2020) argued that improved empirical realism is considered a key objective for the purposes of behavioural economics, taking 'as if' arguments into consideration. These 'as if' arguments are presented in behavioural economics in a specific way, adding new parameters based on the outcome of the decision instead of pointing to marked or empirically substantiated psychological processes that would really explain it. They believe that a pronounced emphasis lies on sets of axiomatic norms that are not grounded in empirical research, having studied the extent to which behavioural economists who want to filter data against optimisation problems based on more intricate parameters, are able to achieve an improved empirical justification. In conclusion, they argue that in order to improve the expected accuracy and descriptive realism of economic models, one needs to pay more attention to the decision-making process and conduct bolder, normative research, based on a broader set of criteria.

Despite the above, several researchers have made a significant contribution to the application of the theory of behavioural economics when analysing the behaviour of property market players. Thaler (2018) described the roots of behavioural economics, analysing the phenomenon of the formation of property bubbles and the dynamics of financial markets. The latter manifests through unpredictable changes in listed stock market prices on the open market, when prices are significantly different from stock valuations based on book keeping data.

Another Nobel Prize winner, R. Shiller, predicted capital bubbles and busts based on an analysis of investor behaviour (Samson, 2014). He argued that speculative bubbles are the product of excess enthusiasm on behalf of investors. He drew emphasis to the finding that doubt regarding potentially high capital costs, is overcome by investors' emotions such as envy and zest. He also identified another type of prejudice driving the formation of capital bubbles as overconfidence, this meaning investors interpret the upward movement of prices as an enduring tendency. However, economic bubbles are not a positive aspect of the economy as they are usually followed by a rapid drop in prices, the so-called bust (Samson, 2014).

Brzezicka and Wisniewski (2014) discussed the topic of property speculative price bubbles, defining the concept of a price bubble as based on the behaviour of market players, presenting a description of an environment that produces price bubbles and their cause. They found that even though behavioural factors often remain unseen, they play a significant role in the process of the formation of property bubbles, this being particularly true of individual and social psychology. Various actions by property market players that can be referred to as behaviour in general, have been, and most likely still are, a synergic causal factor. Market players make more or less conscious decisions in a behavioural environment, creating this environment themselves and later, because of their own individual actions,

change it to eventually feel the consequences of these actions. However, in a shift of emphasis, Hsieh (2015) analysed the significance of decision-making in compulsory acquisitions or eminent domains, arguing that governments make a lot of decisions giving more regard to property than to the rights of an individual.

Wyman et al. (2011) studied theories of the effective market and argued that property valuation requires a new approach. They maintained that the theory of market effectiveness does not reflect reality, because in reality, the market is ineffective due to a lack of information and the psychological behaviour of market players. From this point of view, markets are complicated adaptive systems affected by the results of the behaviour of market players. Market players change their behaviours in view of the form in which new information is presented. That way, their behaviour can have a potential effect at a macro level, which could be invisible on a micro level. As such, they suggest that more property values obtained under different scenarios and with different methods, should be presented instead of just one.

Black et al. (2003) carried out a study of property expert behaviours when making decisions. This study argues that property appraisers often make, or anchor, opinions on property values based on asking prices and not on closed transactions. Such prices may differ in the final stage, when an agreement on the price is reached and the transaction is closed. Related to this, Black et al also suggest that the access to bank credit depends on the experience of the employee, and not on objective reasoning (Black et al., 2003). The anchor phenomenon in the property market was also addressed by Crosby and Hughes (2011) who conducted an analysis of the literature which revealed banking operations to be procyclic. This means that as the economy grows, the impact of banking operations increases. They also argued that property valuation results affect the procyclic decisions of banks in that the determined value of the property, is an anchor on which the bank relies to help decide the size of loan to give.

Salzman and Zwinkels (2013) also studied the impact of behaviour on decision making in terms of property investment. They stressed that the behaviour of property investors can be biased and involves both psychology and sociology. Psychological bias, as addressed by various researchers, exists in the property market on the buyer's part in the form of over-optimism, confirmation bias, momentum effect, herd behaviour, irrational exuberance, regret theory, money illusion, mental accounting, loss aversion and home bias. On top of that, they stressed that this psychological bias is affected by property valuations, which can be subjective due to availability heuristics such as non-closed transactions used for comparison purposes, confirmation bias, anchoring e.g., the opinion of another appraiser, misalignment of interest and asymmetric information, and client pressure. Ahmad et al. (2018) conducted a study aiming to disclose the behaviour of institutional property investors and the possibilities of mitigating bias. They

noted the importance of knowing the behavioural trends in the property management industry. Their interviews revealed that behavioural trends can affect the thinking, decisions and investment strategies of fund managers.

2.3. Analysis of Economy Cycles and Property Dynamics

Wyplosz (2000) suggested that 179 financial crises occurred globally from 1973 to 1991, while Laeven and Valencia (2013) argued that during the 1970–2011 period, the world had more than 147 banking crises. So varying perceptions simply about the number of busts, suggests that there is no exact explanation of what a bust is and how it can be measured. Most economic busts have occurred due to banking crises, subsequent economic busts called financial crises (Schularick, 2011; Kiyak et al., 2012). After experiencing a string of global economic busts between 1970 and 2009, scientists started to analyse the impact of the property market on the economy, specifically on financial systems, of countries affected. Gibilaro and Mattarocci (2016) found that property market trends are one of the drivers of bank risk, but historically, only two financial busts were caused by crises in the property market. The first financial bust started in Japan in 1991 (Kiyak et al., 2012), the second in 2007 in the USA when the stock value of property collapsed (Kiyak et al., 2012). There were no busts that were caused by crises of the property market in the UK and all of Europe. Ohers have also drawn attention to property booms as an important stage in economic dynamics because oftentimes, a crisis is followed by a boom (Allen and Gale, 2000; Gyourko, 2009; Chakraborty, 2009).

It is often the case that property bubbles are created during boom periods (Crowe et al., 2013; Dreger and Kholodilin, 2013). Property bubbles are when the cost of commercial property, at the time of transaction, rises above the income which they can produce. The economic determination of commercial property prices is, in many ways, like any other assets. Features such as heterogeneous and constrained supply, infrequent trading, high transaction costs, long-term rental contracts, the lack of price transparency due to the role of bilateral negotiations, using the property as collateral for lending or for external finance of construction and mortgage finance for the occupancy period, illustrate the complexity of commercial property dynamics (Davis and Zhu, 2009; Davis and Zhu, 2011). These features can give rise to cyclical behaviour meaning that boom and bust can define the status of the system (Kiyak et al., 2012), where property prices fluctuate in relationship with other factors.

Weber (2016) suggested that property cycles depend on certain economic behaviours carried out by market participants, the practitioners who make up the property market (Weber, 2016). This implies that

the main engine of the economy, and the weakest part of the economy, is the consumer. Due to the volatility of the consumer's mood, the economy tends to fluctuate from fast running to complete stagnation, depending on periods of overestimation, of excessive optimism in human psychology and during undue pessimism. This is called the economic cycle (Jadevicius et al., 2010; Weber, 2016; Jadevicius et al., 2017; Burns and Mitchell, 1946). The theory of cycles supports an understanding of the need to resolve problems around loss which occur during commercial property market fluctuations.

The historical analysis of the economy`s cyclical behaviour started at the beginning of the 19th century. The event that caused the creation of cycle theory was the Great Depression that took place mostly during the 1930s. The economists have suggested a few hypotheses to explain the causes of it. In 1935 J. M. Keynes analysed the economic environment and proposed fiscal and monetary policy measures to overcome the busts (Keynes, 1935). This work of John Maynard Keynes on macroeconomics has explained cyclical macro-fluctuations of countries' economies.

The definition 'business cycle' was first introduced by Burns and Mitchell (1946). They stated ''business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises'' (Burns and Mitchell, 1946, p.3). The Royal Institution of Chartered Surveyors stated that "business or economic cycles are fluctuations in economic activity, which historical analysis will show proceed in an economic activity with upward spurts followed by pauses and relapses" (RICS, 2012, p. 53). Consequently, to analyse the fluctuation of a country's business activities, the business cycle definition is used.

According to the literature, the longest cycles belong to capital investment and property, lasting approximately 50 years. The urban development cycle lasts for around 20 years, investment in buildings from 15 to 20 years, the long production lags involved in property development lasting around 9-10 years. The business cycle for the property and investment markets, are shorter at approximately 4 to 5 years. Richard Barras in the article "Property and the economy cycle: building cycles revisited" has stated that "the evidence must be open to debate when proposing a cycle of 50 years duration to describe episodic phases of growth in a 200-year history of industrialisation" (Barras, 1994, p. 184).

The summary of cycles and their lengths are shown below in Table 2-1.

Table 2-1. The Cycles and their Lengths, Researchers and Sources of Literature.

Investment type/Factors	Type of cycle	Length, years	Researcher	Sources of literature
Investment in inventories	Minor cycle	3-5	Kitchin (1923)	Jadevicius et al., 2017
Investment in machinery	Major cycle	7-11	Juglar (1862)	
Investment in building	Long swing	15-20	Kuznets (1930)	
Investment in innovations	Long wave	48-50	Kondratieff and Stopler (1935)	
World power	Hegemony cycle	100-150	Modelski (1978)	
Capital investment	Long cycles	50	Forrester (1977)	
Wrong anticipations	Commodity	2-6	Kaldor 91934)	
	Minute cycle	1-2	Elliott (1939)	
Development of society	The Third Wave	Thousands of years	Toffler (1970)	Geipele and Kauškale, 2013
Business cycle on the property market	Short cycle	4-5	Sherman (1991), Schumpeter (1939), Duijn (1983) and Solomou (1988)	Barras, 1994
Long production lags involved in property development	Long cycles	9-10	Sherman (1991), Schumpeter (1939), Duijn (1983) and Solomou (1988)	
Urban development	Long swings	20	Sherman (1991), Schumpeter (1939), Duijn (1983) and Solomou (1988)	
The industrialized world economy	Long waves	50	Sherman (1991), Schumpeter (1939), Duijn (1983) and Solomou (1988)	

Investment type/Factors	Type of cycle	Length, years	Researcher	Sources of literature
Investment markets return		4-5		McGough and Tsolacos, 1995
Property development		4-5	MacGregor (1995)	Baum, 2001
A commercial property	Production cycle	2-6		ESRB, 2015
Post-World War II office market in the US	Vacancy rate cycle	12	Wheaton (1987)	Weber, 2016
Property cycles in the UK	Total returns for all property types	4-12, on average 8 years	RICS (1999)	

(Source: Self Study).

The authors mentioned above, have tried to classify the cycles according to duration in order to contribute to understanding about the cycles and their stages and starting points for the future discussions. Many have examined the predictability of cyclical property patterns including Krystalogianni et al. (2004), Jadevicius et al. (2010) and Kiyak et al. (2012). These authors have argued that during cycles, fluctuations in the property market repeat and recur: stages are not temporarily isolated or random. Weber (2016) argued that cycles could be treated not only as the process that describes economic dynamics, but also as a socially effective dimension proposing that cycles depend on certain economic behaviours by market participants.

2.3.1. Cycles Stages

According to academic literature, all economic cycles consist of four periods: decline, bust (crisis), recovery and boom (Kiyak e al., 2012). Burns and Mitchell (1946) called this phases of recession, contraction, revival and expansion. According to RICS, "They are based around four key economy principles: depression, recovery, boom and recession (also frequently referred to as boom, downturn, upturn and stabilization)" (RICS, 2012, p. 53). Technically, the economy cycle can be represented as shown below in Figure 2-1.

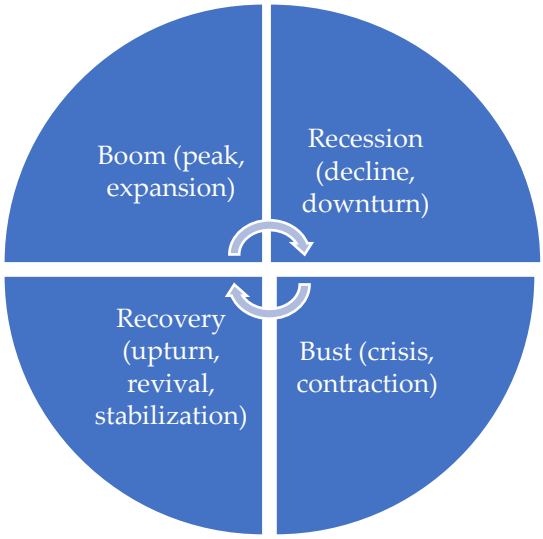


Figure 2-1. Economy Cycle Stages (Source: Self Study).

Boom (peak/expansion) is at the top of the economy cycle. The main economy factor, gross domestic product growth, is on the peak. The production reaches its maximum and unemployment rates are low. Economically, staying in the boom phase for a long time is difficult because the pace of consumption growth is higher than the growth rate of population and productivity. Consumer optimism reaches its peak, and if it lasts a few years, consumers begin to buy more goods frivolously. Due to a significant increase in demand, and a lack of labour, reduced production capacity ensues. At this point, optimistic consumers agree to pay over the odds only because they want to have the products here and now. Wages and prices start to grow, and inflation starts to rise. This is when the central bank must take measures to control inflation by raising interest rates to increase income on its loans, at the same time suspending new loans. With a significant increase in interest rates, investment projects become unprofitable. Tangible investments begin to decelerate while GDP growth diminishes. Consumers realize that property prices will not increase forever and stop buying second or third properties. However, builders still have unfinished projects and "push" them into the property market while speculators rush to sell excess property. When the demand stops, businessmen stop further development and begin to release employees. Consumer confidence shrinks suddenly, and the economy shifts into the next phase of deceleration: a recession.

Recession (decline/downturn) is the period when demand is decreasing, unemployment begins to rise, and production starts to decline as does inflation. Intensive redundancies occur and production falls. In

parallel with this, stockpiles in warehouses are growing. New-build construction almost stops and bankruptcies begin as loans remain unpaid. This signals the collapse of banks: the bust is starting.

Bust (crisis/contraction) is the lowest point of the economy cycle. At this time, unemployment is high, demand low, there is decreased production capacity, and the gross domestic product reaches its lowest point. If this process continues, the recession may go into depression. The contraction of the economy depends on how much it has bypassed the pace of natural development. In such a situation, the government usually intervenes. The state must spend on developing the infrastructure while others save and thereby create missing jobs. Anti-cyclical governments save their money and reduce their obligations.

Recovery (upturn/revival/stabilization) is the stage where the national economy starts to recover. Unemployment falls, productivity rises, demand is growing, and the gross domestic product is rising. At the very beginning, recovery is still close to zero, but it is already positive. As unemployment decreases, consumption increases. At that time, central banks are generally active in reducing interest rates to stimulate borrowing. As consumer expectations are improving, the demand for essential and less essential goods is restored. Employees feel better about their future and turn to banks for loans. If the banks are healthy enough, they start to lend which results in even more consumption. Businessmen in the industrial and service sectors begin to see positive growth trends. They then seek loans from banks for business development (construction, new or more efficient equipment or other manufacturing developments). Such business development encourages job creation so that unemployment starts to decrease. The economy is turning into a phase of prosperity.

In order to avoid the big losses in a bust period, the country governments manage the cycles by using economic policy tools.

2.3.2. Cycles Management and Assessment

According to the literature, governments solve economic policy problems by using four functions: 1. provide the legal foundations which allow the economy to function; 2. plan and implement an economy stabilisation policy; 3. influence the allocation of resources, and 4. prepare an income redistribution programme (Gwartney et al., 1998; Phelps, 2003; Colander, 2006; Morris et al., 2010). All those issues are solved using three principal methods to establish control: the allocative function, the stabilization function, and the distributive function (Morris et al., 2010). The stabilization function is used in order to manage an economic fluctuation. It is managed by using monetary and fiscal policies meaning that the economy depends on the model of monetary and fiscal policies in the country. These policies tend to cool down the economy when there is a boom and stimulate the economy when there is a bust. A monetary policy approach stabilizes inflation and output as it is counter-cyclical in nature. The focus of monetary

policy is to ensure price stability. Fiscal policy is often used to smooth fluctuations in economic activity by changing taxes. However, Sutherland (2010) has stated that the fiscal policy actions by countries with high public debt and high government deficits tends to be procyclical. The countries that have low public debt and surpluses, tend towards a counter-cyclical fiscal policy (Sutherland, 2010). The economic variable that fluctuates in the same direction as the total economic activity (upstream, downstream) is procyclical. A variable that changes in the opposite direction from the whole economic activity is countercyclical. Variables that do not have a clear direction during the business cycle are acyclic. The property market has a positive correlation with the overall state of the country's economy and is related to economic fluctuations, therefore, it is procyclical.

The countries can manage a property business cycle through monetary and fiscal policies and create procyclical or countercyclical fluctuations in that business.

Some factors that impact the business fluctuation are contradicted. The main task for each government is to keep a balance between the contradictory factors of their economy. For example, reduced unemployment leads to higher salaries and prices which together contribute towards higher inflation (Friedman, 1977). In the short term, this can stimulate the economy, but eventually, unemployment will rise.

Some business activities can be prohibited in order to promote a balanced economy, e.g. laws can restrict the activity of the competition. However, there are two issues to be aware of: 1) government restrictions cannot limit the main rule of the free market where everyone has the right to freely choose their activities and spend their income as they want, and 2) environmental sustainability has been widely accepted as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The free market`s rules and the demands of sustainability are two aspects which can be contradictory . The question of responsibility becomes very important when sustainability aspects arise in all economic fields and in the commercial property business as well.

2.3.3. Cyclicality and Sustainability

The procyclicality of the commercial property market is defined as a process where during the period of expansion the property market comes up and during the period of recession it comes down in line with whole economy dynamics (Kaminsky et al., 2004).

It is assumed as the economy is booming, commercial property dynamics show an increase in development and financing by investors and banks. From the investor's point of view, sustainable construction provides an adequate long-term return. Sustainable properties can adapt well to changes in the environment, both the social and economic environment, thereby minimizing the risk of lower income.

The existing literature about sustainability has focused on a set of environmental, economic and social concepts. The environmental set was first developed by Elkington (1998), the economic set was first developed by O'Riordan (1993) and the social set was first developed by Lützkendorf and Lorenz (2005). Environmental sustainability comprises materials, energy, noise emissions, waste, traffic volume, separation and disposal of old building materials, land use/pollution, climate change and biodiversity. It also means reducing the area used, conserving resources and avoiding harmful materials and emissions. Social sustainability is based on social dimensions such as feelings of well-being, aesthetics, health and comfort, safety and user satisfaction, appropriate habitat and social integration.

Economic sustainability aims to minimize life cycle costs and retention of value (material, commodities and capital). Functional aesthetic aspects such as maximizing functionality, adaptability, ease of operation and design should also be taken into account. Sustainability here is about ensuring that all enterprises, government services, natural resources, property and communities can continue in the future: it is generally agreed that it is difficult to measure the level of commercial property market sustainability. When the economy is in a downturn, the commercial property market also falls. In this situation, the cyclicality of the property market makes that market less sustainable as booms and busts impact commercial property market dynamics.

2.3.4. Commercial Property Market Dynamics

The commercial property market which is dynamic and diverse, has been chosen as the field of study. This market is much more cyclical than the residential property market (European Central Bank, 2010; 2014), meaning that participants in commercial property markets experience severe losses during market busts. Barnett and Rodell (2016, p.3) defines commercial property as '…property which is not designed or used for residential purposes or for purposes associated with the primary industries such as agriculture…'further identifying three main types of commercial property: office, retail and industrial. Ball, MacGregor and Lizieri (2012) have described commercial property as an asset used for economic purposes because it produces an income.

The cyclicality described above is typical of commercial property markets, the said market dynamics being considered procyclical. Being pro–cyclical means fluctuating the same way as other variables in business and having an impact on those variables. This means that in times and conditions of prosperity in the commercial real estate market, many participants in thatmarket will behave in such a way that not only corresponds to this growth, but also tries to extend this period.

Commercial property market participants play a huge role in this, illustrating how the procyclicality of commercial property works (Weber, 2016). Investors will construct and sell more property projects, users

will expand their business and will rent more property while borrowers will borrow money for the development of commercial property. The countercyclical activity in this case is to reduce the costs of investors and other users of commercial assets by controlling their financial dealings through banks and other credit institutions, and through government legislation drafted in order to prevent busts from happening again.

Some scientists have explored various types of commercial property and its cycles from peak to peak and from bust to bust, studies highlighting the relationship between external factors and commercial property dynamics. According to Barras and Ferguson (1987), the UK commercial property market has experienced nine-year main building cycles, transmitted through shorter four to five-year business cycles. McGough and Tsolacos (1995) investigated the procyclicality and countercyclicality of commercial property cycles in the UK, office spaces and its connection with the real economy. Scott and Judge (2000) found evidence that commercial property values have a cycle over a period of 7-8 years through their analyses of the capital values for investment property. Jadevicius and Huston (2017) has estimated the pattern of commercial property rentals volatility and found that the commercial property market shows 8-year property cycles measured from peak-to-peak and bust-to-bust. He stated that there are two key cycles of commercial property in the UK: the first is a 4-5 year business cycle, due to changes in economic activity related with rentals, values and property development. These actions create the other cycle connected with the expansion phase of longer-term dynamics (Jadevicius and Huston, 2017).

The existing literature about the cyclicality mainly deals with the determining of factors that impact the procyclicality of the commercial property market as that makes this market less sustainable. The contradiction between the procyclicality of commercial property and its sustainability have to be resolved by creating a framework for the sustainable management of the commercial property market.

2.4. Analysis of the Current Commercial Property Investment Environment

An investment constitutes any property acquisition made in anticipation of a return including the acquisition of commercial property. An environment is a group of components and criteria affecting investment. Ergo, the investment environment for commercial property is a system of components, any changes in these components affecting property dynamics. Longitudinal observations of historical changes using a set of indicators, are of help when making investment decisions to control this dynamic.

Commercial property dynamics impact returns on investments (Geltner, 2001). Investors themselves, look for the best returns available for their capital in different asset markets. Commercial property as capital

value, is determined by the relationship between the return and the rental price. Rental prices are akin to balance for property market supply and demand, whereas capital value acts as a signal for developers. Every time commercial property investors decide to invest their money with a relevant return, they accept the risk that they might lose both (Geltner, 2001). The higher the expected return, the higher the risk of failure. From the investor's point of view, the capital price for an investment is calculated as the cost of the equity and borrowed money. The cost of borrowed capital is the interest rate that a property business`s owner pays for its financial obligation to the bank, bondholder or other kind of lender. Equity costs are a percentage of the annual return that equity holders should receive when investing their money. The risk of losing the return depends not only on the individual investor and the market but also on the correlation between all property investors, the economy and legal policy system as a whole. The risk for each of these groups can in turn be broken down into two components: systemic and non-systemic components. Systemic risk is a risk specific to the entire market, or a segment of it. Non-systemic risk is a risk specific to a specific investment decision. Resilience to systemic risk depends on the creation of a sound property market return, economy cycles and legal policies. Resilience to non-systemic risk depends on the decision of a particular investor i.e. how to distribute their own and borrowed capital and what the price of that capital is. The totality of systemic and non-systemic risk defines the expected return on investment or property yield; the ratio of income to value.

Numerous studies have explored the determinants of these key metrics (Lorenz et al., 2008; Fernández, 2005). Within this literature, the Weighted Average Cost of Capital (WACC) and Capital Asset Pricing Model (CAPM) models have been widely employed as a starting point to examine the concepts of systemic risks and unsystemic risks. The measurements making up these models comprise investment environment factors considered when making the decision to invest (Figure 2-2).

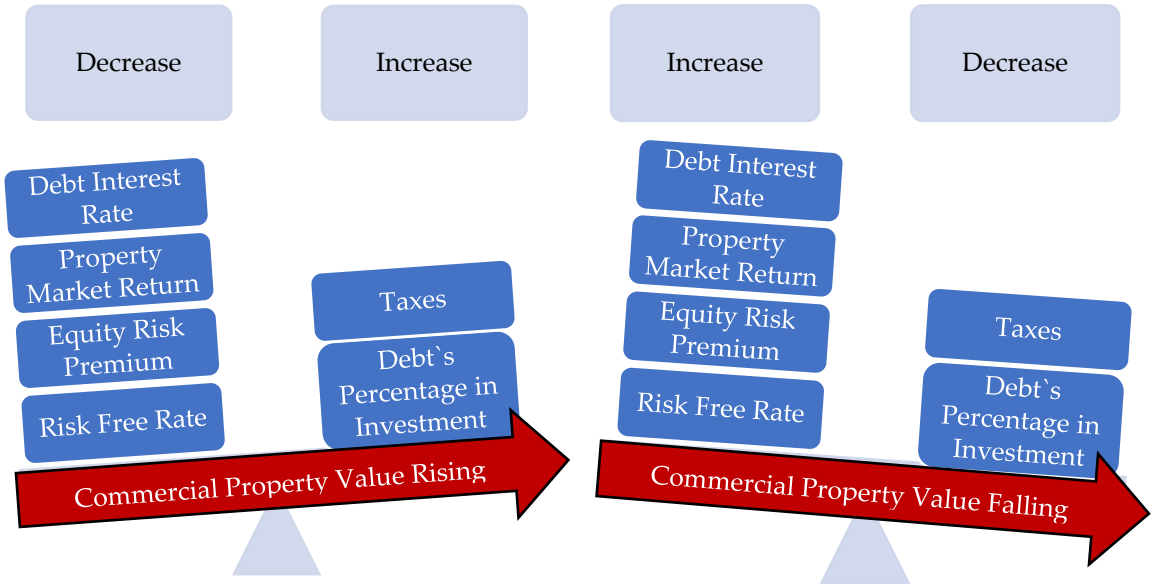


Figure 2-2. Commercial Property Dynamics and Investment Environment Factors (Sources: Self-study).

In general, the costs of finance show the scope of an investment risk criterion. The cost of equity reflects the return that investors expect from investment in a specific real estate property. It goes without saying that the expected return must match market conditions and opportunities.

Changes in the value of property and transactions by inclusion, follow the pattern of movements in the investment landscape. If the Risk-free rate, Debt interest rate, Equity risk premium and Property return on the market as a whole are on the rise, the value of property also rises. If these drop, the value of property also drops. The situation with the structure of borrowed and own capital is quite the opposite. If the share of borrowed capital in the total invested capital and taxes increases, the value and sale price of property increases. However, these indicators are not the only ones that drive investors' decisions with respect to the management of commercial property. Investors are also concerned about the sustainability of their investments, social responsibility and environmental matters. In addition to investors, other groups of players in this market also have their own interests. Regarding banks, the important thing is to lend money responsibly while governments have to manage crises and state assets. That is why the investment landscape includes more aspects than the ones outlined above.

Therefore, the investment environment can be analysed via components such as: (1) the social environment; (2) the economic environment; (3) the environmental environment; (4) the investment

culture, and (5) the legal environment. In terms of the specifics of international investment, there is also the international environment. All these components can be measured using quantitative and qualitative criteria.

When making an investment decision, it is important that the criteria of the investment environment be properly identified. These criteria may present themselves as factors or indicators. A factor is a force affecting the investment environment, while an indicator changes in parallel with the investment environment and could therefore be an excellent tool for the purposes of making investment decisions and for diagnosing the investment environment. Since both the economy and the dynamics of commercial property follow a certain cycle, observations of historical changes in factors help when making decisions to invest or to manage such dynamics.

As the goal of this work is to build a framework for the management of the dynamics of commercial property based on the experience of different countries, certain comparable countries were chosen to meet this aim. Countries with commercial property dynamics different to that in the UK were chosen, these countries further described on the grounds of their investment environment.

2.4.1. The Choice of Comparable Countries

The UK commercial property market is one of the largest and in general, the more volatile property market in the world (Devaney, 2010). However, academic studies show that there are some countries where property markets are not so volatile (Dreger and Kholodilin, 2013). In order to examine this further, the growth within the commercial property rentals markets of North America, Australia, Europe - excluding the UK (hereinafter – Europe) - and Pan Asia (hereinafter - Asia), has been tested. The UK rentals market has been separated on purpose to compare it with other markets. This measure of growth is based on the change in value of properties held at the beginning and end of an analysis period (Morgan Stanley Capital International (MSCI, 2018). These data have been collected from the MSCI real estate analytics portal and have been recalculated as a market rental value growth index (Chapter 4, equation (20)). Figure 2-3 shows the phases of the rise and fall in the commercial property market rental value growth index (2005 = 100).

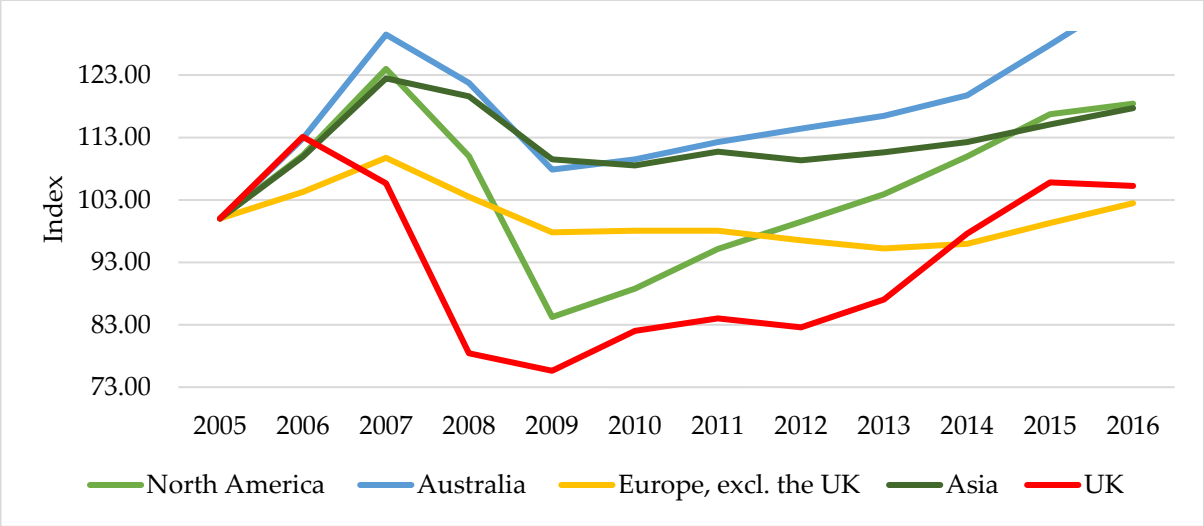


Figure 2-3. Commercial Property Capital Value Growth Index, 2005=100 (Source: Self-study).

While North American, Australian, Asian and European commercial property capital values were growing up to 2008, UK property values were decreasing from 2007 (Figure 2-3). The commercial property markets in other areas, also decreased up to 2009. The situation changed in 2010 when commercial property market capital values started to grow. However, the range of analysed commercial property markets dynamics differed. Asia, Australia and Europe have been relatively stable, as they have not experienced major booms and busts. In Europe, commercial property values decreased by 5.7% in 2009 compared with 2008, and in Asia by 2.3%. From 2009 until 2016, both continents had similar dynamics (Figure 2-3). To examine the commercial property market comparison analysis of the UK with a less volatile continent, Europe has been chosen as it has more commercial property market data available and a longer stable economy (Denavey, 2010).

Property market dynamics have been investigated by many researchers. The demand for studies examining the dynamic cities on a global scale was created by economic movements such as globalisation and moving from hierarchical organisations to networks (Lubin and Esty, 2010). A series of studies concerning commercial property market dynamics have been conducted specifically focusing on the influence of fiscal and monetary policies on commercial property supply and demand. In these studies, key indicators such as vacancy rates and the income return on an investment, also known as yield, have been reviewed. Hoesli et al. (2008) examined the relationship between commercial property returns in terms of fiscal and monetary factors while Davis and Zhu (2011) assessed the relationship between commercial property price movement and behaviour alongside the performance of individual banks.

Researchers have also examined how commercial property price movements affect a bank's performance and its lending decisions.

The differences in property market dynamics across Europe have been highlighted by Dreger and Kholodilin (2013), who reported that some countries have institutional frameworks that prevent speculative activity in the property market. They analysed eight European countries and the USA, analysing busts in the US, the UK, Ireland, Spain and the Netherlands, and booms in Scandinavia. Their comparative analysis showed that Germany had low volatility.

Baum (2001) analysed commercial property market performance in Europe, concluding that although European economies were in harmony, this did not necessarily mean that European property markets were aligned, describing how their dynamics were driven by property cycles.

However, the existing literature reveals that the process of the rise and fall of property prices in European countries, has not happened in the same way. While some countries have had a fall in property prices, others have simultaneously seen an increase. For example, there was no crisis from 2007 to 2009 in countries with strong economies, or in countries with strong commercial property markets as France, Finland, Sweden, Malta, Luxembourg, Germany, Belgium, Austria and Switzerland (European Central Bank, 2010; 2014; MSCI, 2018). The same situation has been seen with property crises. While some countries have experienced crises relating to both residential and commercial property, others have had only residential property crises, or have not had any crises at all, over the same time frame.

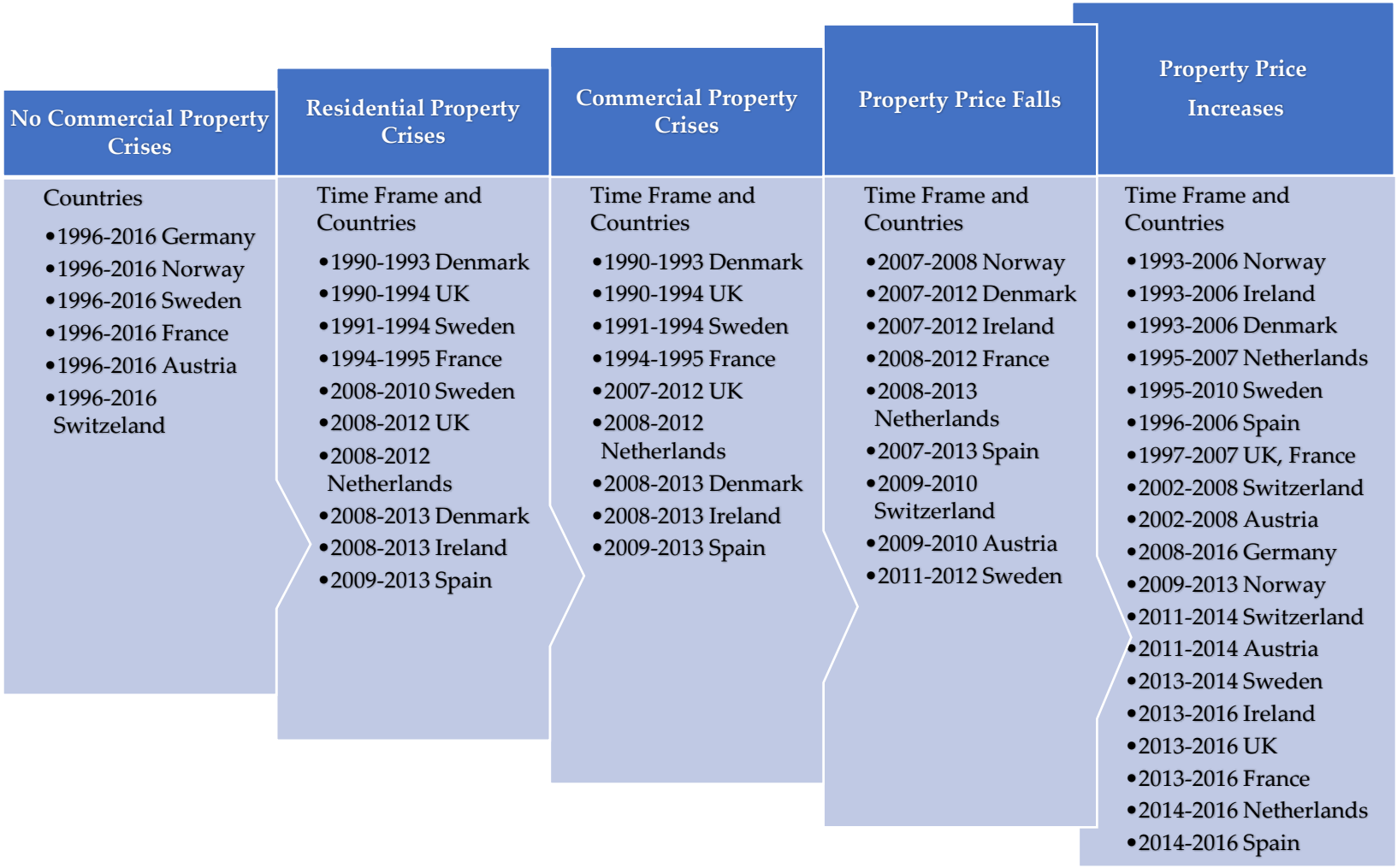


Figure 2-4. Property Market Performance of Countries with Strong Economies (Sources: Self Study according to MSCI and academic literature (Ferrari et al., 2010; European Central Bank, 2010; Dreger and Kholodilin, 2013; Investment Property Forum, 2014; MSCI, 2018).

Three countries have been chosen for the current analysis according to the amount of data available in MSCI. Data that include the period 2000 to 2017, have been found for Germany, Norway, Sweden and France. As the size of Norway's property market as estimated by the MSCI, is small compared with the other three countries, Germany, Sweden and France were selected for the study (MSCI, 2018).

2.4.2. Description of the Investment Environment of each Country

This section describes the investment environment of the UK, France, Germany and Sweden, based on a comparison of quantitative social, economic and environmental indicators in 2017. It also describes the specifics of the legal systems in each country. Definitions of the key comparable indicators are presented in a List of Definitions in the thesis, page xi. To begin with, a comparison of the countries' social indicators such as population, the percentage of employed persons in the total population, the level of unemployment and the expenditure of social protection per capita are given.

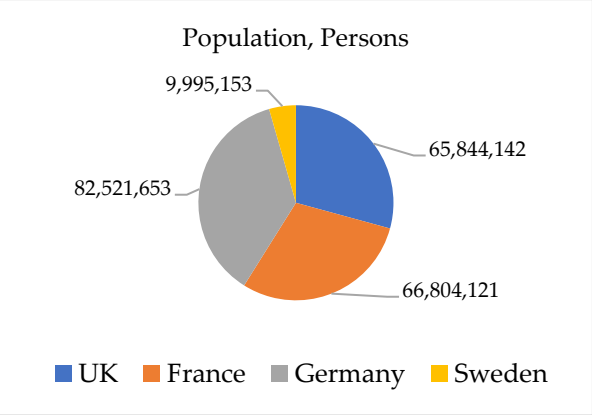


Figure 2-5. Population (Source: Eurostat database).

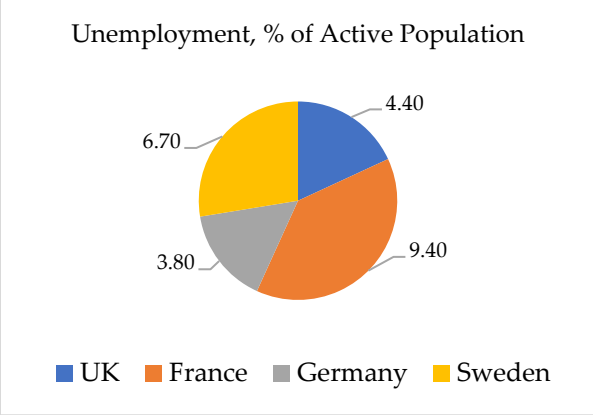


Figure 2-6. Unemployment level: % of active population (Source: Eurostat database).

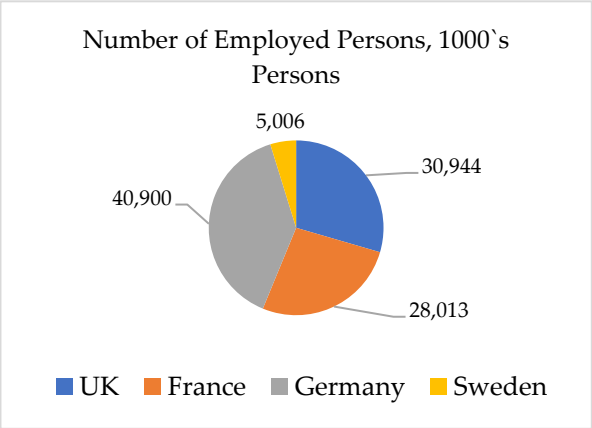


Figure 2-7. Number of employed persons: thousands (Source: Eurostat database).

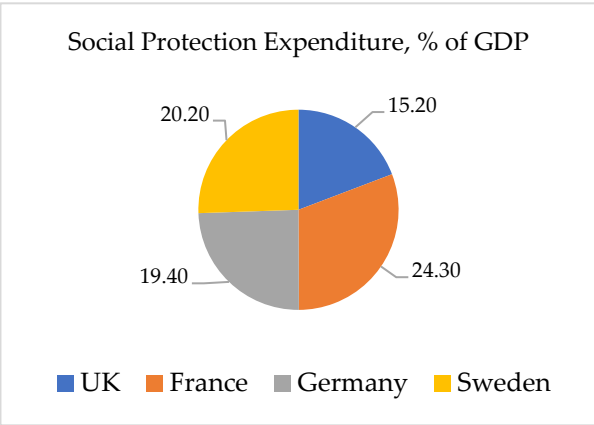


Figure 2-8. Social protection expenditure: % of GDP (Source: Eurostat database).

Regarding the populations of the countries under analysis, the Eurostat database reveals that as of the end of 2017, Germany had the largest population (82.52 M), followed by France (66.80 M), with the UK slightly behind (65.84 M). Sweden's population was the smallest (9.99 M). Looking to Figure 2-6, the highest level of unemployment was in France (9.4%), followed by Sweden (6.70%), and the UK (4.40%). Germany had the lowest levels of unemployment (3.80%). Figure 2-7 shows that the largest number of employed persons was observed in Sweden (5 M/9.99 M = 50.08%), followed by Germany (40.90 M/82.52 M = 49.56%), and the UK (39.94 M/65.84 M = 47.00%). The number of employed persons in France was the smallest (39.94 M/65.84 M = 41.93%). Even though the UK was third by the number of employed persons, the social protection expenditure as a percentage of the GDP in this country is the smallest (Figure 2-8).

It stands at 15.20%, placing the UK below Germany (19.40%), Sweden (20.20%) and France (24.30%) which means that the social environment differs from country to country.

The following is a comparison of the countries' economic indicators: annual GDP growth; taxes collected; environmental taxes collected and government bond yields.

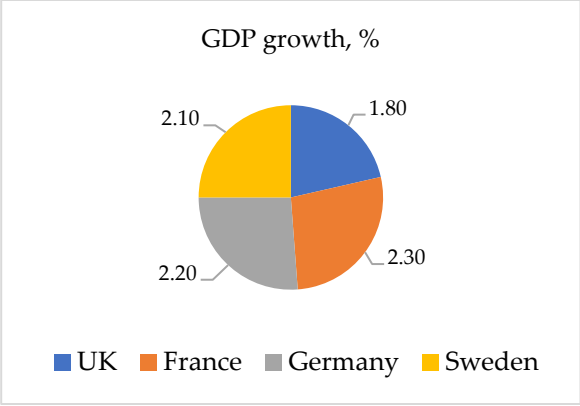


Figure 2-9. Annual GDP growth (Source: Eurostat database).

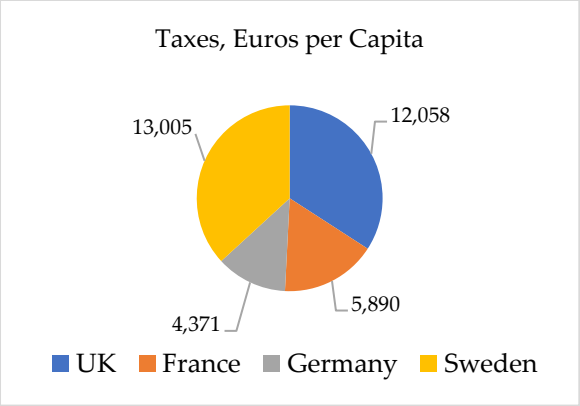


Figure 2-11. Taxes, euros per capita (Source: Eurostat database).

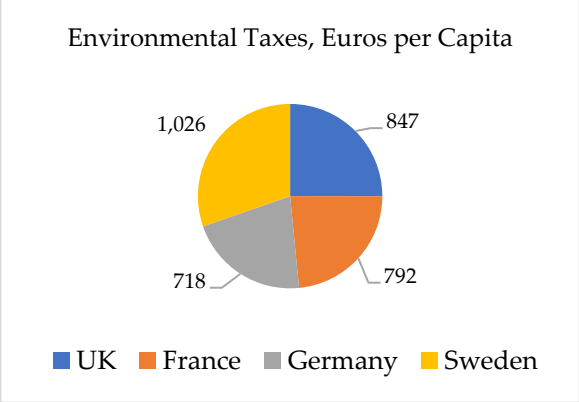


Figure 2-10. Environmental taxes, euros per capita (Source: Eurostat database).

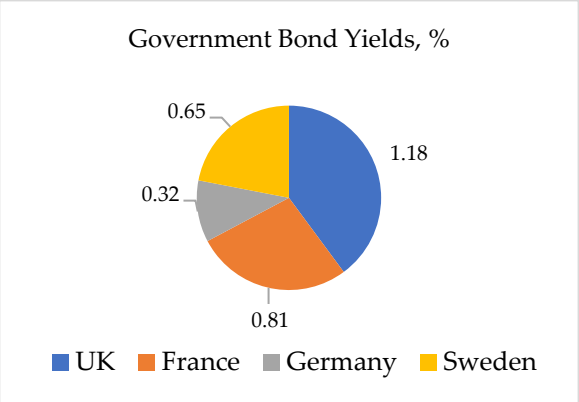


Figure 2-12. Government bond yields, % (Source: Eurostat database).

The annual GDP growth rate shown in ascending order in Figure 2-9, was the lowest in the UK (1.80%), followed by Sweden (2.10%), Germany (2.20%) then France which had the largest GDP growth figure in 2017 (2.30%). The largest amount of taxes paid per capita was registered in Sweden (EUR 13.01 thousand) (Figure 2-11). This is followed by the UK (EUR 12.06 thousand) while in France and Germany, the amount of taxes paid per capita (EUR 5.89 thousand and EUR 4.37 thousand) was nearly half the amount for Sweden and the UK. Figure 2-10 shows the amount of environmental tax per capita. Here too, Sweden was in the lead (EUR 1 thousand), the UK coming in second (EUR 0.85 thousand) with France (EUR 0.79 thousand) and Germany (EUR 0.72 thousand) close behind. When it comes to analysing the investment environment, it is critical to consider government bond yields. As often as not, investors keep an eye on government bond yield rates (Figure 2-12). As this indicator grows, an increase in the cost of borrowed capital (such as interest rates on loans) drives a drop in commercial property prices. The highest government bond yield rate was seen in the UK (1.18%), followed by France (0.81%), Sweden (0.65%) and

Germany (0.32%). As can be seen, there is a big difference in the amount of taxes per capita. The yields from government bonds also differs substantially. The following is a comparison of globalisation indicators such as international trade (Figure 2-13) and foreign direct investments (FDI) (Figure 2-14). These aside, one of the key indicators critical to investors is the return on commercial property. Its comparison is displayed in

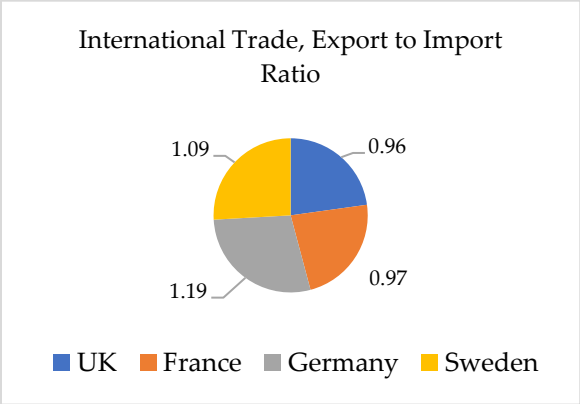


Figure 2-15.

Figure 2-13. International trade, export to import ratio (Source: Eurostat database).

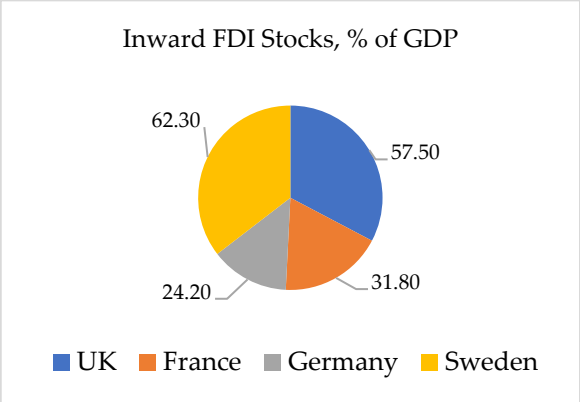


Figure 2-14. Inward FDI stocks, % of GDP (Source: Eurostat database).

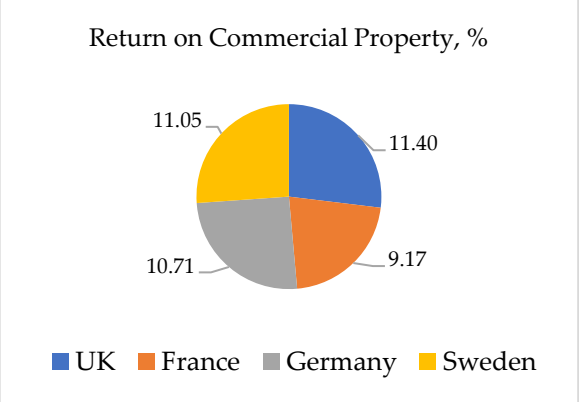


Figure 2-15. Return on commercial property, % (Source: MSCI, 2018).

Germany (export to import ratio: 1.19) and Sweden (export to import ratio: 1.09) sold more goods and services overseas than they bought in, while France (export to import ratio: 0.97) and the UK (export to import ratio: 0.96) were the opposite. These countries sold less goods and services overseas than they bought in from foreign countries (Figure 2-13). The largest amount of inward FDI was seen in Sweden (62.30% of GDP) and the UK (57.50% of GDP), with France (31.80% of GDP) and Germany (24.20% of GDP) having half the amount of influx from inward foreign direct investments, measured as a percentage of GDP. This could indicate an absence of a legal base to favour foreign investors or point to the fact that

the investors were able to find more appealing markets for their investments. The fact that Sweden and the UK were attractive in terms of investments in commercial property is evident in the return performance shown in

Figure 2-15. The highest return rate can be seen in the UK (11.40%), followed by Sweden (11.05%), Germany (10.71%) and France (9.17%).

The UK commercial property market fluctuated from upturn to recession over the period 1970 and 2019. Recessions occurred between 1973 and 1975, 1990 and 1994. In 2007, commercial property prices fell and rose three times. The underlying causes were favourable finance conditions and the growth of borrowed moneys in invested capital. On top of that, in addition to banks, other sources of finance emerged in 2002–2008. This period saw the establishment of investment funds, offering competition with banks regarding financing of investment commercial property projects. A Financial Services Authority (the FSA was replaced in 2013 by the Prudential Regulatory Authority (PRA) and the Financial Conduct Authority (FCA)) study has shown that banks refused to comply with the Loan-to-Value Ratio (LTV) requirement and in doing so, neglected responsible lending (Building Societies Association, 2011). In 2012, the interim Financial Policy Committee (of the Bank of England) issued a recommendation to UK banks to use more conservative commercial property valuations.

The French property market also experienced downfalls in 1990 and in 2008, these falls impacting on the residential property market (Pollard, 2010). Between 2008 and 2012, French banks gradually tightened their financing requirements in view of the deteriorating economic conditions for commercial property developers and investors (Point et al., 2013). First and foremost, the country started implementing normative restrictions on loans: in 2008, Basel II; in 2012, Basel 2.5, and in 2014, Basel III (de Bandt et al., 2018).

The German commercial property market remained stable during the period 1990 to 2008 for several reasons. First of all, German banks were more responsible in their lending operations and complied with conservative commercial property valuation requirements (Fecht and Wedow, 2014). Second, Germany was able to use borrowed moneys for investment expansion post 1989, after the collapse of the Berlin wall (Boston, 2012). At a time when many countries were going through a commercial property crisis, new investment opportunities emerged in Germany (Boston, 2012).

One of the most prominent commercial property crises occurred in Sweden in 1990–1993. This happened because prior to the crisis, the country had favourable conditions in which to borrow money for investments into commercial property as well as a favourable tax system. After changes were introduced in tax policy and interest loan rates increased, property values started to drop. Since a large portion of the

capital invested in property was borrowed capital, banks were faced with the problem of client insolvency and the threat of bankruptcy. A collapse of banks was avoided when the government lent financial assistance to prevent a financial crisis. This historical moment revealed three facts: (1) the property market and the financial market are tightly connected to each other; (2) national governments can manage the consequences of economic crises if they prepare for them in advance by accumulating financial resources, and (3) banks must develop tools to control the solvency of their clients. According to ESRB (2015), poor regulation of the financial market and negative interest rates were among the main reasons behind Sweden's commercial property boom. Swedish banks engaged in responsible lending, this preventing a crisis in the commercial property market in 2008.

Analysis of the differences between the four countries has shown that the amount of direct foreign investment in Germany and France, was below that in the UK and Sweden. German law contains provisions that are not characteristic of other countries. For instance, the relationship between the owner and the manager of property are viewed legally as a special category of unjust enrichment (Rupp, 2017). This also has to do with the potential to invest in property through the acquisition of land. Land acquisitions are usually subject to specific conditions and restrictions to prevent excessive land speculation (Rupp, 2017). Yet investors have access to fundamental freedoms pertaining to free capital movement and establishment (EU, 2017). This means that they can establish entities and purchase stock in commercial property companies, or fund bonds in these countries. That said, free movement of investment often is hindered by language and cultural barriers. The possibility of the existence of economic differences between countries due to cultural differences has been addressed by Guiso et al. (2009a, 2009b).who stated that national culture may also have a certain degree of significance for the trust in economic relations among the countries.

2.5. Analysis of the Participants and their Contribution to the Property Market

According to the European Systemic Risk Board, the four major groups of market participants in commercial property markets are governments, borrowers, lenders and investors (ESRB, 2015). To prevent the formation of property bubbles and a situation of unsustainable growth, governments draw up strategies to minimise any overheating of the economy. More information about the management of economic fluctuations at a governmental level, is presented in section 2.2.2.

Borrowers are firms whose activities relate to commercial property. With regards to market risk, fluctuations in commercial property markets affect the ability of the commercial property borrower to service their debt. The lenders are banks and intermediate investors who are exposed to credit risk when

extending loans. Lending for commercial property sometimes looks deceptively simple. In many cases, the investor takes the loan from the bank in order to have higher returns, in addition to investing their own money in bonds and shares in commercial property directly.

In 2000, Scott and Judge suggested that property market players such as agents, have influenced property prices. They stated that investment property prices were sometimes calculated by agents according to optimistic future expectations that were higher than actual changes in commercial property.

However, Weber, 2016 stated that property dynamics depended on certain economic behaviours engaged in by market participants, as the practitioners who make up the property market. She mentioned groups of property market participants such as "brokers, market analysts, attorneys, lenders, building managers, investors, title companies, architects and designers, builders and general contractors, engineers, environmental analysts, appraisers, planners and surveyors" (Weber, 2016, p. 594).

According to the literature, the professionals who influence property market performance are planners, investors, architects, lawyers, bankers, developers, property market analysts, advisors, valuers and agents.

2.6. Analysis of Current Developed Frameworks related to Property Market Dynamics Management and Assessment

This chapter presents a critical review of literature on frameworks pertaining to the making of property management, investment, and other decisions. It deals with and describes the components of such frameworks. Scientists have begun to address the issue of commercial property market sustainability because the built environment has a negative impact on the Earth's ecosystem. For example, the UK Green Building Council (UKGBC) report that in the UK, the built environment produces about 40% of the UK's total carbon dioxide emissions (UKGBC, 2020).

2.6.1. Macro Prudential Regulation

The biggest impact of commercial property market dynamics is on the financial institutions that provide loans for this business. As such, a type of management system has been developed to reduce financial losses during times of economic downturn and consequent property busts. It is a macro prudential regulation for banks and / or the financial system as a whole (Borio, 2003). Macro prudential regulation is used to observe the relationship between individual financial institutions and individual property markets, focusing on the procyclical behaviour of the financial system in an effort to maintain its stability. However, this regulation is suitable for use by banks, but not for other commercial property market participants. After Global financial crises the international financial organisations prepared the

new banking laws and regulations, which help to create the countercyclical capital buffer for the property market busts management.

2.6.2. Frameworks Related to Construction and Property Crises Management

An overview of the literature on frameworks revealed three works related to construction and property management. They are authored by Kaklauskas et al. (2011), Tupėnaitė et al. (2015) and Kaklauskas and Zavadskas (2016). Kaklauskas et al. (2011) conducted a study to analyse the effects of recession on the construction and property sectors. They noted that crisis management calls for an integrated analysis and rational decision-making on a micro-, meso-, and macro-level. The authors accentuated that crisis management covers economic, political, and legal and regulatory decisions. This article analyses situations in Lithuania, the EU, Asia, the US, and elsewhere in the world and dissects their similarities and differences when it comes to crisis management. Based on that, the authors proposed a construction and property (CARE) crisis management model. This model covers the above variable micro-, meso-, and macro-factors. The authors highlighted several macro-tendencies to manage crises under the CARE model, such as low interest rates, the tax system, the VAT share of construction, salaries in the construction business, housing starts, construction costs, consumer confidence index, housing affordability index, harmonised consumer price index, the demand for construction, the rules of construction, labour non-flexibility and laws, public procurement, corruption, positive aspects of the current crisis, political stability, global and financial crisis owing to a crisis in values, tensions amidst the society, the government, and so on (Kaklauskas et al., 2011, p. 284). However, this paper rather focuses on the construction sector, reviewing the global development tendencies on a macro level and providing recommendations for the management of the Lithuanian construction and property crisis on a macro level. Furthermore, there is no clear definition as to which factors are specifically assigned to which level. The authors however do identify two macro-level groups: macro-environments and macro-economic.

In a 2015 monograph, Tupėnaitė et al. analysed the aspects of construction and property market fluctuations. The authors discussed factors of land, construction, and residential property price variations. They also delved into the subject of tools to manage such fluctuations during the recession in Lithuania and individual foreign countries. The authors analysed the effects of various factors and indicators on the dynamics of property. They also estimated the correlation between residential property prices and indicators such as (Tupėnaitė et al., 2015, p. 77): 1) Construction Price Index (0.009), 2) Housing Transactions (0.227), 3) Housing Loans (0.284), 4) GDP (0.382), 5) Return On Investment (0.434), 6) Customer Expectations (0.485), 7) Supply of New Dwellings (0.624), 8) Interest rates (0.720), 9) Inflation (0.826). Ergo, this paper focuses more on residential property, the construction sector, and the supply of

land lots. The authors structured indicators affecting fluctuations of residential property by group (Figure 2-16) and identified factors that influence the supply of land lots (Figure 2-16).

Kaklauskas and Zavadskas (2016) argue in their monograph that in order to design an efficient building environment life cycle, all of its aspects first need to be studied, paying attention to the effect of micro, meso, and macro environmental factors. The authors suggest that this analysis cannot be performed with any kind of ease, because the building and its environment constitute a complex system from the technical, technological, economic, social, cultural, and ecological point of view. In their opinion, all subsystems affect the overall efficiency, with the inter-dependence of the subsystems playing a large role. The efficiency of the life cycle of the built environment is therefore believed to depend on the rationality of its phases, just as it does on the ability to satisfy the needs of those concerned. The authors pursued a goal of finding an effective way to alter the plan, design, construction, operation, renovation, and demolition based on sustainable practice. Kaklauskas and Zavadskas (2016) say that for a construction project to be efficient, it needs to be carried out within certain boundaries defined by the built environment. The authors suggest that the factors differ from country to country, and the scheme will differ as well. The authors furthermore argue that, after the effects of micro, meso, and macro variables affecting the built environment have been analysed, their differences in a particular country could be identified based on best practice. In reliance on such differences, the key consequences for the specific country can be determined, and analysis of a large number of countries can reduce any kind of bias. The authors disclosed, schematically on a micro, meso, and macro level, the factors that could have an impact on the efficiency of the built environment). This means that the built environment needs to be efficient without a certain set of boundaries that the economic, fiscal and legal factors define (Kaklauskas and Zavadskas, 2016, p. 74). The authors outlined the fiscal factors, drawing a line between them and the economic factors. Whereas Afonso and Sousa (2012) argue that fiscal policy is a tool to control the economy.

Figure 2-16 shows the elements of the frameworks as suggested by the aforesaid authors.

Figure 2-16. Frameworks for the Built Environment and Construction (Kaklauskas et al. (2011); Tupėnaitė et al., 2015).

2.6.3. Frameworks Related to the Area of Commercial Property

In addition to crisis management in the field of construction, some papers have been found in the area of commercial property, complete with frameworks that facilitate the making of decisions. There are Ellison and Sayce (2007), Das et al. (2010), Šaparauskas et al. (2011), Komarovska et al. (2015), and Lin (2014).

Ellison and Sayce (2007) established a series of criteria for the assessment of the sustainability of commercial property. The authors addressed sustainability as a set of investment risks. The goal of their work was to define the risks and include them in the assessment of commercial property investment risk. The authors defined criteria to be considered for the purposes of managing the risk of investment in commercial property. They only analyse technical factors of commercial property that determine the

technical sustainability of the building. Their work contains a practical kit of these criteria that can be employed to assess the efficiency of any commercial property. This kit of criteria is presented by the authors as key to the sustainable operation of the commercial property.

The article by Das et al. (2010) dissects the aspects of maintenance of commercial buildings. The authors observe that building management so far lacks a framework for the analysis of decisions, which makes it rather difficult to compare different building frameworks. The authors introduced a model designed to compare nine basic building frameworks: basement, façade, wet area, sanitary installations, heating, ventilation and air conditioning, lift, electrical installations, and fire protection. Based on questionnaire data and direct interviews with building management experts, each framework of the building had separate sets of priorities designed. The authors argue that the platform of multi-criterion decision analysis that these latter afford offers greater benefits in terms of building maintenance and economy and is suitable for any kind of commercial property. Unfortunately, the authors do not address the impact of external factors on economic benefits.

The goal of the article by Šaparauskas et al. (2011) was to compare various designs of the building or its structure and to choose the best alternative on the basis of optimum criteria. To that end, the authors considered four alternatives of building façades. The results of their study revealed that although it is not as important as the phase of usage, construction is just as relevant as the rest of lifecycle stages. A case study of the assessment of building façades was produced to illustrate the applicability and efficiency of the proposed approach. The study revealed that the phase of building design is extremely important when it comes to resolving technical, economic, social, and environmental issues.

The article by Komarovska et al. (2015) introduces a theoretical model of selection of the investment strategy, which is aimed to determine the potential appeal of the investment. As an example, the results of an analysis of commercial–industrial zones in Vilnius, Lithuania, are presented. The criteria for the analysis are the following: geographical location, land lots and/or groups of land lots in the district, business operation and planning activity, as well as development of infrastructure and transport communications on an engineering level. This framework of development indicators is proposed for application by combining two aspects: practical promotion of investment and sustainable territory development. Investments have been proven to be vital for sustainable regional development.

In her article, Lin (2014) reviews the latest literature on property cycles. She is seeking ways to compare the sectors of housing and commercial property. The author introduces a framework for the comparison of these two sectors. The product of this study is a new comparative framework designed for the systematic analysis of matters of housing and commercial property market regulation and for the making

of business decisions. The author argues that what is considered the norm in one property sector may appear unusual in another one. This can require specialist knowledge. Therefore, with this article she aimed to make her own contribution to the pool of literature that helps the user to understand property markets better. The author also accentuates that a comparative residential and commercial property market analysis should lead to more questions about the shifting property economic environment and raise awareness of the unstable nature of market cycles.

Figure 2-17 shows the elements of the frameworks as suggested by the aforesaid authors.

Figure 2-17. Frameworks for Commercial Property (Ellison and Sayce (2007), Das et al. (2010), Šaparauskas et al. (2011), Lin (2014) and Komarovska et al. (2015).

However, while commercial property market dynamics are influenced by financial institutions and are subject to macroprudential regulation, these dynamics are also influenced by other factors. The results of the literature analysis suggest that so far there have been no scientific studies creating a framework for the sustainable management of the commercial property market.

Many of the established criteria systems are suitable for decision making related to buildings sustainability or a construction. Therefore, the task of this work is to create a framework that is linked to the dynamics of the commercial property market, rather than to quality of buildings or the construction.

The works of the authors referred to in Figure 2-16 rather relate to construction and property management and sustainability. Kaklauskas et al. (2011) analyse the impact of recession on the sectors of construction and property. For this analysis, the authors suggest macro, meso, and micro levels. Tupenaite et al. (2015) analysed factors that affect fluctuations of residential property and land lots. The authors primarily focused on the historical data of Lithuanian property and their correlations and relied on the experience of foreign countries.

Kaklauskas and Zavadskas (2016) proposed a Model for a Complex Analysis of the Life Cycle of the Built Environment. The authors present a scheme of factors affecting the efficiency of the built environment (see Figure 2-16). However, their analysis did not concern the commercial property market.

Whereas the authors referred to in Figure 2-17 dealt with the risks of investment in commercial property (Ellison and Sayce, 2007), aspects of maintenance of commercial buildings (Das et al., 2010), compared different designs of the building or its structure to choose the best alternative on the basis of various criteria (Šaparauskas et al., 2011); besides they identified the potential appeal of investment (Komarovska et al., 2015) and introduced a framework for the comparison of residential and commercial property (Lin, 2014). Even though Lin (2014) mentioned the shifting economic environment of property and the unstable nature of market cycles, none of the authors addressed the factors that influence the dynamics of the commercial property market.

However, with reference to the above framework, one can say that the issue of sustainability is relevant both for the entire built environment and individual property sectors. The existing literature about sustainability has focused on a set of environmental (e.g. Elkington, 1998), economic (e.g. O'Riordan, 1993) and social concepts (e.g Lützkendorf and Lorenz, 2005). These aspects are also touched upon by some of the authors of the literature analysed. Furthermore, Kaklauskas and Zavadskas (2016) also actualised legal and regulatory factors. It means, the framework for commercial property dynamics has to include a wide range of criteria covering all aspects of sustainable market dynamics including economic, environmental,

social and legal and regulatory components that can be subsumed to macro level. Weber (2016) argues that thinking about the dynamics of property, can be used to explain the economic processes related to property and also as socially effective interactive structures formed by property market participants. This is of importance as she notes that property dynamics are influenced by human factors. In this way, there is a place where human activity can have a significant impact on the commercial property market, therefore, emotional factors (Roberts, C. and Kimmet, P., 2009) that can influence decision-making have to be included in a system of criteria for commercial property market dynamics analysis as well. The aim of this work is to design a framework for the sustainable management of the commercial property market. For that purpose, the experience of other countries has been employed by drawing a comparison between them and the UK. This will give this thesis another level of information – a macro context. Details such as the technical parameters of buildings, their physical characteristics, precise location, infrastructure, and costs of upkeep and management, building materials and their quality, or the form of building management are left out of the scope of the analysis.

2.7. Analysis of the Criteria that Impact Sustainable Commercial Property Market Dynamics

This chapter presents a critical overview of the literature on criteria that affect property dynamics. There is currently no model to help market participants make management decisions in a dynamic commercial property environment. Therefore, based on the analysis of the literature about frameworks related to commercial property dynamics management and assessment, the following categories of criteria will be examined: (1) economic (2) environmental (3) social (4) emotional and (5) legal and regulatory.

2.7.1. Economic Criteria

Commercial property is a business area that is affected by human economic activity, the literature referring to a number of economic criteria that determine the dynamics of the property (commercial property included) market. Higgins and Osler (1998) and Scott (2013) agree that the property market is under the influence of domestic monetary and fiscal policy. These authors argue that these two criteria define the dynamics of the commercial property market. Monetary policy can be described as a set of measures and actions developed and implemented by the state to regulate economic processes by controlling the quantity and price of money (Blanchard et al., 2010). By controlling the amount of money in any given country, governments aim to regulate human economic activity. In contrast, the purpose of fiscal policy is to regulate government spending and revenue (Blanchard et al., 2010). Its two main elements are expenses and taxes. Fiscal policy may affect demand and the degree of economic activity, income distribution and methods employed by the government to allocate resources. Both monetary and

fiscal policy determine the dynamics and growth of gross domestic product, this defined as the final monetary expression of consumer goods and services created over a certain period of time (Lepenies, 2016). Gross domestic product also includes income from the commercial property market. The dynamics of this criterion affects fluctuations in the commercial property market, making it one of the criteria influencing cyclic variations, the ups and downs of the property market (Barras, 1994; Davis and Zhu, 2011; Bruneau and Cherfouh, 2018).

Barras (1994) argued that cyclic variations in the gross domestic product could have been the reason for the property boom, and surge in demand, for rental property in England in 1973 and 1990. Davis and Zhu (2009) studied the extent to which the growth of property prices was affected by overall economic growth and the lending operations of banks. Bruneau and Cherfouh (2018) analysed criteria affecting the yield of the UK office market as dependent on the total amount of money on the market and on financial conditions. They focused on the effect of gross domestic product, the dynamics of a risk-free interest rate, the growth of rental rates and the supply of money in the financial market. The growth of the supply of money in a country drives consumption. Another criterion that affects the growth of consumption is taxes. Taxes are part of fiscal policy, tax increases having a positive effect on consumption thus promoting the price dynamics in various business markets, commercial property included. With growing consumption, the total amount of available money grows in a country`s financial market. In their study, Afonso and Sousa (2012) highlighted the correlation between taxes and the gross domestic product, which is why taxes are also considered an important criterion when analysing commercial property dynamics criteria. Corporate tax on commercial property affects the yield rate of commercial property, this growth driving overall consumption and property prices into the bargain.

All the above authors have demonstrated that property prices are critical to the fiscal, monetary and financial stability of a state. The state regulates the amount of money available by issuing and selling debentures. Debentures are redeemed after a period of time for their purchase price plus interest accrued. This interest rate on government securities is the unit of measure of risk-free investments in any given country (Blundell, 2009); Bruneau and Cherfouh, 2018). Studies by Jones et al. (2015) and Blundell (2009) indicate a connection between the interest rate on government securities, the risk premium for property investors and the yield rate of property. Jones et al. (2015) emphasised that even though the future yield rate of long-term bonds will most likely affect the yield of property (Bruneau and Cherfouh, 2018), it is probable that these two yield rates will not grow in parallel with each other because of concurrent acceleration in the growth of rent rates. Blundell's (2009) analysis showed that the dynamics of the measure of the return that investors expect from risky investment in commercial property, has to do not

only with the yield rate of government securities, but with global changes pertaining to climate change as well. In their papers, these authors (Blundell, 2009; Jones et al., 2015; Bruneau and Cherfouh, 2018) address the issues of the dynamics of commercial property price growth and the related dynamics of returns. When the return in property has no appeal, there are alternative investment options available. If a portion of investment capital is invested in an object rather than property, this choice on the part of the investor, will also affect the dynamics of property prices.

Elona (2014) noted that, despite the restriction in international investments activity imposed by regulatory investment barriers and the asymmetry of information, investors keep a close eye on changes in the relative market value of the countries within their global investment portfolio, outside of a crisis. This incentivises investors to obtain a better understanding of the investment locale (Elona, 2014). However, during a recession, investors tend to invest in markets that they are familiar with; in other words, countries with stronger trade ties. Marsh and Pfleiderer (2013) provided evidence of how the distribution of assets changes depending on the economic situation: an upturn or a downturn. The authors noted that during the global crisis of 2008, up to 40 per cent of all assets held by investors generated losses, this causing many investors to sell their risky assets and replace them with other safe assets. This stands as evidence that in a downturn situation, investors tend to look for alternative investments, both in the local market and internationally.

(Case et al., 2005) analysed the dynamics of international property. They observed that the fluctuation of this type of property is similar to that caused by globalisation. Scientists explain globalisation as a process that raises the volume of international trade (Taylor et al., 1996) and foreign direct investments (Smarzynska Javorcik, 2004). Barkham et al. (2017), Case et al., 2005) and McAllister (1999) analysed the effects of globalisation on the dynamics of property while Barkham et al. (2017) described how globalisation has changed the property market. All the above authors argue that bringing down trade barriers, progress in transport and communications, and financial liberalisations, have allowed international trade to grow at a particularly fast rate. Foreign direct investments from progressive countries have been flowing into emerging markets in a bid to find cheaper production (Barkham et al., 2017). Investments in property are facilitated by the reduction, or abolition, of the national control of capital, advanced communication technologies and accelerated innovations in financial markets. Mcallister (1999) focused primarily on the obstacles to international property investments. The results of this study show that the cost of information is the main obstacle to international direct property investments (McAllister, 1999). The data on property distribution trends, supports the opinion that the

degree of integration of the property market is much lower than that of the securities market (McAllister, 1999).

Rapson et al. (2007) and Brodowicz (2017) looked at maximising the value of commercial property and social responsibility. Rapson et al. (2007) focused on socially responsible property investments in the United Kingdom. The goal of the study was to analyse the practice of stock and property investment by large fund managers to determine the products and activities that contribute to socially responsible investment. In their conclusions, Rapson et al. (2007) found that one-half of the companies studied, take action to consider the environmental impact of property investments. Brodowicz (2017) focused on socially responsible property investments, finding that such investments are designed not only to earn a return and social benefits, but also to provide environmental gains. The need to maximise the value of commercial property has also been addressed by scholars such as Deller and Maher (2009) and Gassner (2019). Deller and Maher (2009) believe that from a public administration viewpoint, an increase in property value is a direct consequence of municipal decision making, this also allowing local officials to observe how property market prices in a particular locale respond to tax changes that the same officials initiate (Deller and Maher, 2009).

Commercial property returns have been analysed by Hoskins et al. (2004), Nappi-Choulet (2006), and Davis and Zhu (2009). Hoskins et al. (2004) studied the relationship between commercial property return and macroeconomic criteria. They dissected the dynamics of commercial property in Australia, Canada, the US, and the United Kingdom between 1985 and 1999, and its relationship with macroeconomic criteria. They noted that the dynamics of certain groups of properties share similar trends, because the return on such groups is rather attractive to foreign investors. Nappi-Choulet (2006) studied a model of investments and development in 1997–2002, at the time of a regeneration in French property, designing a typology of key market players based on their property market investment policies. The results of this study revealed that property investors basically aim to make speculative changes and short-term investments because of high levels of return on investments into commercial property regeneration.

Davis and Zhu (2009) observed that economic growth has a positive connection with the growth of the property return rate and bank yield rates. Bank yield is directly related to loan interest rates (Davis and Zhu, 2009), the bank loan interest rate is a unit of measure of the price of money on the market. The price of money is perceived as an interest rate payable for the right to use it, i.e. to borrow money. This is why the interest rate on loaned capital also affects the dynamics of commercial property, this allowing investors to invest their own, as well as borrowed funds (Davis and Zhu, 2009). Davis and Zhu (2009) analysed the relationship between change in commercial property prices and banking operations and

noted that when commercial property prices increase, the volume of bank loans and interest margins also increases.

The interaction between commercial property dynamics, the amount of loans and the influence of this interaction on the commercial property market, has been examined in work by Barras (1994); Davis and Zhu (2009) and Jones et al. (2017). Barras (1994) analysed the relationship between property and economic cycles, concluding that one of the criteria relevant to the property construction cycle was the interest rate. Davis and Zhu (2009) observed that commercial property price growth correlates with the growth of bank profits, indicative of a correlation, and mutual influence, between the commercial property market and the dynamics of banking operations. Jones et al. (2017) studied the effects of commercial property business borrowing on bank bankruptcies on a global scale, drawing on experiences in the UK. Their conclusions are that property crises are significantly affected by the interaction between banks and commercial property. In addition to this interaction, one can also observe an interaction between the dynamics of the commercial property market and the dynamics of property development Barras (1994). This interaction causes a further increase in the risks of banking operations and property transactions.

The effects of this criterion on the dynamics of the commercial property market have been analysed by Barras (1994), Scott (2013), McCartney (2008) and Davis and Zhu (2009). Barras (1994) noted that a long cycle of property development is established early in a new cycle of investment in commercial property, although this can happen much later, as much as a decade later. This creates an additional supply of commercial property. In the book entitled 'The Property Masters', Scott (2013) also observed that the curves of commercial property construction and sales never meet. McCartney (2008) conducted an empirical study of the development of Dublin's office market. The author noted that commercial property developers are not equipped to predict downturns in the property market, making it difficult for them to foresee market prices at the end of construction. Apart from the additional supply of commercial property under construction, both the timeframe of commercial property and capital renovations of this type of property, are two additional factors affecting the dynamics of the market for this type of property (Crosby et al., 2012; Bond et al., 2019).

Since property deteriorates year by year and cannot always be renovated through annual repairs, this type of property has a limited life timeframe. In addition, replacing these types of properties takes time, affecting both the supply of properties and the dynamics of their prices. Bokhari and Geltner (2018) and Reilly (2013) point out that commercial properties which have deteriorated, have lower rent rates and sale prices. Bokhari and Geltner (2018) studied the effect that structural deterioration has on rent and the sale prices of properties. The authors observed that the life timeframe of property tends to be slightly

shorter for residential properties than commercial properties. Reilly (2013) analysed both the functional and economic deterioration of commercial property, stressing that both types of deterioration affect the price of the property.

Crosby et al. (2012), Bond et al. (2019), and Ghosh and Petrova (2017) studied the effects of capital commercial property restoration on property prices. Crosby noted that the larger the capital investment in building renovation, the lower the negotiable sale price. Bond raised the issue of whether capital investments in commercial buildings really contribute to the dynamics of rental rates of such buildings. In their conclusions, the authors suggested that this hypothesis was correct through their comparative analysis of renovated buildings, or buildings in good condition.

Ghosh and Petrova (2017) analysed the extent to which capital investments in commercial buildings aimed at maintaining their condition, affected the commercial property market. They concluded that capital investments affect future returns on these buildings, but that this depends on the condition of the building itself. The cost to renovate each commercial building depends on its age and the needs of its operators to ensure seamless integration of the building into a contemporary environment. For this reason, this thesis also addresses the effects of renewable resources on the dynamics of the commercial property market.

The demand for wind, sun, geothermal energy and biofuel will most likely undergo rapid growth driven by environmental needs. The importance of renewable resources for the cohesive development of commercial property has been analysed by Adelaja et al. (2010), Axon et al. (2012), Walker et al. (2014), Dröes and Koster (2016), Mbungu et al. (2018) and Onuoha et al. (2018). Adelaja et al. (2010) focused on 'brown fields' and the possibility of their rebuilding in order to adapt them to use renewable resources. Adelaja et al. observed that local zoning restrictions tend to impede the implementation of renewable energy projects but that brown field areas could be developed using renewable energy in the near future, provided governments demonstrate a national interest in this field. Axon et al. discussed the possibility of protection against environmental change in rented commercial spaces. This discussion was based on theoretical and practical cases and aimed to look at how the social and legal relationships between market players and their financial and economic foundations, determine the choice of strategy for the improvement of building energy efficiency. They argued that ownership of energy resources and a changing community could influence the success or failure of achieving this common goal.

Walker et al. (2014) presented a different approach to the impact of using alternative resources on the property market. They noted community members' concerns about the value of their properties if located near wind power plants and analysed how people living next to them perceived the value of their property. One of their conclusions was that such a study should be larger in volume, because it is difficult

to differentiate between factual and imaginary losses, and that local investors in wind power plants and the owners of properties situated near such plants, should start a dialogue to socially maximise the value of this business.

Mbungu et al. (2018) analysed the possibility of reducing the cost of electricity, comparing levels of consumption of electrical energy from renewable resources with levels of electricity consumption in commercial buildings, at relevant times of the day. In their conclusion, they argued that costs are lowest when both sources of energy are used in an optimised fashion, facilitating the opportunity for some cost efficiency in the operation of a commercial building. Onuoha et al. (2018) addressed the matter of what could incentivise investors to invest in green commercial properties, noting that the biggest incentives would be cost efficiency, government policies, green certification, and the developers' expectations with reference to return rates. Tax exemptions were notably the main criterion driving investment.

The following table lists the economic criteria selected for further research and the sources of literature that refer to such criteria as having a connection to the dynamics of commercial property prices.

Table 2-2. A summary of the sources of literature on economic criteria affecting the dynamics of commercial property.

Criterion Number	Economic Criteria	Literature
C1	Gross domestic product	Barras (1994); Scott (2013); Higgins and Osler (1998); Davis and Zhu (2011); Bruneau and Cherfouh (2018)
C2	Taxes	Higgins and Osler (1998); Afonso and Sousa (2012); Agnello and Sousa (2013);
C3	Government bond yields	Blundell (2009); Jones et al. (2015); Bruneau and Cherfouh (2018)
C4	Alternative investments	Fraser-Sampson (2010); Marsh and Pfleiderer (2013); Elona (2014)
C5	International trade	Mcallister (1999); Case et al. (2005); Barkham et al. (2017);
C6	Foreign direct investment	Mcallister (1999); Case et al. (2005); Barkham et al. (2017)
C7	Commercial property value maximisation	Deller and Maher (2009); Rapson et al. (2007); Davis and Zhu (2009)

Criterion Number	Economic Criteria	Literature
C8	Contradiction between commercial property value maximisation and social responsibility	Deller and Maher (2009); Rapson et al. (2007); Jones et al. (2009); (Roberts, C. and Kimmet, P., 2009); Brodowicz (2017)
C9	Return on commercial property	Hoskins et al. (2004); Nappi-Choulet (2006); Davis and Zhu (2009)
C10	Debt interest rates	Davis and Zhu (2009)
C11	Interaction between commercial property market cycles and credit cycles	Barras (1994); Davis and Zhu (2009a, 2009b); Jones et al. (2017)
C12	Interaction between commercial property market cycles and development cycles	Barras (1994); Scott (2013); McCartney (2008); Davis and Zhu (2009)
C13	Commercial building time frames	Bokhari and Geltner (2018); Reilly (2013)
C14	Commercial property capital renewals	Crosby et al. (2012); Ghosh and Petrova (2017); Bond et al. (2019)
C15	Renewable resources	Adelaja et al. (2010); Axon et al. (2012); Walker et al. (2014); Dröes and Koster (2016); Mbungu et al. (2018); Onuoha et al. (2018)

Source: Self Study.

2.7.2. Environmental Criteria

(Blundell, 2009) believes that CO^2 regulation will result in higher property investment risks, meaning that the yield rates of commercial property will increase. As such, it can be said that addressing environmental issues also affects the dynamics of commercial property prices. In the opinion of the World Bank, the property sector needs to reduce its CO^2 footprint by 36 per cent before 2030 (Amaral et al., 2013). Unless every state works to reduce global warming as a matter of priority, the evidence suggests increased global

temperatures in coming decades. In 2018, commercial properties in the UK were responsible for 23 per cent of all CO^2 emissions across the country. Global warming and increasing environmental pollution on a global scale, are serious modern problems, putting human life in jeopardy. To prevent the consequences of climate change, it is critical that greenhouse gas emissions are reduced.

Even though scientists have been dealing with the greenhouse effect and issues around global warming for quite some time now, the first crucial international initiative only appeared in the 1980's, the first conference on climate change taking place in 1979. It was held by the World Meteorology Organisation (WMO) and drew attention to the global importance of this matter. The United Nations Environment and Development (UNCED) conference, hosted by Rio de Janeiro, Brazil in 1992, was another important initiative. It aimed to acknowledge the problems cause by climate change and to reach agreement on the precautions to take to mitigate these problems. This conference saw the signing of the United Nations Framework Convention on Climate Change (UNFCCC). It was the first, intergovernmental, environmental convention geared towards recognising global warming. Later, in 1997, the Kyoto agreement was signed.

The Kyoto protocol is an internationally and legally binding agreement which aims to minimise greenhouse gas emissions on a global scale. In compliance with the obligations stipulated in these documents, countries employ subsidies, regulations, and a plethora of economic measures to minimise this kind of pollution. Fiscal policy measures such as environmental taxes and similar economic instruments, designed and proposed to tackle this problem, play a critical role in preventing climate change: this is an important issue regarding sustainable development. Responsibility for pollution covers a variety of taxes designed to regulate the behaviour of manufacturers and consumers. The aim of this tax obligation is to prevent the effects that harmful activities have on the environment, or to promote the reduction of harmful waste. The idea to use environmental taxes to address environmental issues is not new having been devised by Pigou in 1920. Currently, environmental taxes are regarded as a key fiscal policy measure as the level of taxation impacts on the economic decisions of individuals and helps protect the environment, promoting the use of technology and fuel with a smaller carbon footprint, as well as the reduction of carbon dioxide production.

Environmental taxes have yet another purpose. Liapis et al. (2014) noted that commercial property investors find it helpful to know the environmental taxes that could affect cash flow from investment, if any. Because environmental taxes are becoming increasingly relevant to commercial property owners, operators and investors, environmental tax is also included in the scope of the study of this paper, as one of the criteria affecting the dynamics of the property rental and sale market. Environmental taxes also

constitute a source of financial resources for governmental authorities. Therefore, environmental spending is another relevant criterion that could affect the behaviour of the players on the commercial property market.

Kim and Kim (2018) determined that environmental spending affects business yields, influencing its growth in a negative way: this might also be true for the commercial property market. Researchers Balaban and Puppim de Oliveira (2017) argue that ecological and sustainably renovated buildings can ensure energy efficiency and significantly reduce CO2 emissions, potentially leading to lower operating costs and better health conditions in such buildings. Therefore, high environmental taxes, or large governmental spending on environmental protection, as well as higher costs of building reconstruction, basically pay off as huge benefits for building owners and tenants (Ellison and Sayce, 2007).

The benefits of cohesive properties for the environment and humans, have also been highlighted by Onuoha, Aliagha and Rahman (2018), Remøy and Wilkinson (2012), and Hebb et al. (2010). The purpose of the study by Onuoha et al., was to identify and stimulate the motivating criteria that affect developer and investor decisions to invest in green commercial properties. 350 property developers were surveyed, the findings revealing that environmental tax exemptions, reduced operating costs of buildings and the reduction of other costs, are related to governmental policies, environmental certification and return motivation. It was also established that the tax exemptions that apply to green buildings, affect the supply of green commercial properties the most.

The study by Remøy and Wilkinson (2012) focused on the aim of the cities of Melbourne and Amsterdam to minimize CO2 emissions through the redevelopment of commercial properties. The results of their study revealed similarities and differences regarding both cities, where building adaptation could mitigate the effects of climate change. Hebb et al. (2010) analysed corporate investments in commercial property and its management, as used to reduce the environmental effects of building construction and operation. Over the past decade, attention has been paid to community property development projects where social and environmental aspects, pertaining not just to the building but the project location and the community around it, are integrated into management and investment decisions. Some examples of such projects include affordable and labour housing, city revitalisation and the refurbishment of abandoned territories. The more socially biased issues such as aspects of employment, are also important elements of responsible property investment (Hebb et al., 2010).

The following table lists the environmental criteria selected for further research and the sources of literature that refer to such criteria as having a connection with the dynamics of commercial property prices.

Table 2-3. A summary of the sources of literature on environmental criteria affecting the dynamics of commercial property.

Criterion number	Environmental Criteria	Literature
C16	Environmental taxes	Liapis et al. (2014)
C17	Environmental protection expenditure	Balaban and Puppim de Oliveira (2017); Ellison and Sayce (2007)
C18	Environmental benefits of sustainable buildings	Ellison and Sayce (2007); Hebb et al. (2010); Remøy and Wilkinson (2012); Balaban and Puppim de Oliveira (2017); Onuoha et al. (2018)

Source: Self Study.

2.7.3. Social Criteria

Even though recently there has been an abundance of literature on environment-friendly buildings and environmental changes in the commercial property market, the amount of attention given to the social impact of the commercial property sector on labour, employment and health and safety, has been relatively small. For these criteria to be analysed more often, the narrow concept of green buildings is being abandoned in favour of a more comprehensive definition, one that encompasses environmental and social aspects and provides a better reflection of the goals of responsible investment (Hebb et al., 2010).

Issues around the responsibilities of commercial property businesses, have already been analysed by Friedman (1970), who emphasised that the tenet of social responsibility also means that one needs to rely on more than mere market mechanisms to allocate limited resources. With growing populations, the matter of allocation of limited resources is gaining an increasing amount of relevance. Cairncross and Abramovitz (1991) studied issues of social potential and were the first to use the term 'social potential' (Cairncross and Abramovitz, 1991). They concluded that if we were to compare two countries that have a similar level of income yet different gross populations, the country that has the larger population will experience quicker economic development. Papanicolas et al. (2019) also emphasized that countries which spent more on social services also spent more on health care. One phenomenon of social services is the national social support policy and spending on the social protection of the citizens of the country. The growth of an expenditure of social protection is linked with ageing populations, poverty and unemployment rates.

Researchers at the Sheffield Political Economy Research Institute (SPERI), have studied the connection between the growth of population and the growth of the economy in the United Kingdom, finding that populations usually grow in tandem with production output. However, they observed that this relationship has weakened recently meaning that the share of the gross domestic product per capita has declined. Greter (2019) studied the impact of the dynamics of residential and commercial property prices on Asian and US markets, specifically the dynamics of the gross domestic product per capita. Greter noted that in some countries, the growth of per-capita GDP mirrors the growth of commercial property prices; however, the dynamics of property prices is also affected by global criteria. This becomes evident observing the similarities between the dynamics of commercial property prices in individual countries.

Hoskins et al. (2004) analysed the relationship between gross domestic product, inflation and unemployment rates against returns on property in Australia, Canada, the United Kingdom and the United States. A pattern analysis based on correlations, revealed a set of macroeconomic relations between national markets and their commercial property markets. Even though the results varied from period to period and from country to country, underlying trends were similar. The authors suggested that there is a negative relationship between unemployment rates and returns on commercial property.

Hebb et al. (2010) analysed the influence of environmental protection and social environment on the property market around issues of responsible investment in commercial property in Canada. More socially biased matters such as aspects of employment, are also an important element of responsible property investment. A survey method was employed which identified a lack of empirical evidence, allowing the conclusion that financial performance is more important than ESG standards. However, Hebb et al. were convinced that by following high ESG standards, companies can minimise their risks and strengthen their reputation and ability to recruit and keep highly skilled employees because responsible corporate behaviour is seen favourably by the public.

Jones et al. (2009) surveyed ten investment property companies in the United Kingdom about issues of social responsibility including environmental protection, jobs and community. It was observed that the availability of cheap credit and large cash flow from private investors, had promoted a virile property investment market in the United Kingdom, but that the global financial crisis imposed the challenge of corporate social responsibility. In the long run, a financial crisis can stimulate the emergence of business models that are more sustainable and responsible. Roberts, C. and Kimmet, P. (2009) compared two concepts: social responsibility and sustainable commercial property investment, the goal of this research to scrutinise the similarities and differences between these two concepts in the context of commercial

property. It was concluded that investments in sustainable commercial property have a direct connection with social responsibility.

The following table lists the social criteria selected for further research and the sources of literature that refer to such criteria as having a connection with the dynamics of commercial property prices.

Table 2-4. A summary of the sources of literature on social criteria affecting the dynamics of commercial property.

Criterion Number	Social Criteria	Literature
C19	GDP per capita	Greter (2019)
C20	Unemployment	Hoskins et al. (2004)
C21	Number of employed persons	Hebb et al. (2010); Deller and Maher (2009)
C22	Social protection expenditure	Papanicolas et al. (2019)
C23	Social responsibility of commercial property business	Jones et al. (2009); Roberts, C. and Kimmet, P. (2009); Brodowicz (2017)

Source: Self Study.

2.7.4. Emotional Criteria

In her article, Weber (2016) highlighted the role property professionals play in property dynamics, concluding that an economist could analyse events using factual information to identify which of the events are random and which are cyclical. However, apart from researchers, there are also practitioners in the field of property who are required to make decisions that are relevant in that very moment. The activities of such specialists affect regularities that are later classified as property cycles. The goal of Weber's article was to dissect some of the mechanisms that render property cycles effective structures. Interviews with participants regarding their beliefs and behaviours, revealed that the respondents followed a perception that metaphorically speaking, the market is like an autopilot that is not affected by any social interests, financial incentives or political pressures. Furthermore, this entire 'machine', built by the hands of economic entities, has its own momentum, interacting with other environmental criteria, implying that it needs to be adjusted to when making decisions.

In light of the above, the current study comprises an overview of literature relating to 'players' in the commercial property market such as sales agents, owners (sellers) of property and investors, while also acknowledging the context of the human ability to forget about any economic crises.

Forward-looking property agents are referred to in research by Scott and Judge (2000) which examined commercial property cycles between 1956 and 1996. Scott and Judge argue that in fixing the sale prices of property, property agents ground their calculations on their perception of future price variations that do not necessarily mirror current price variations. They go on to suggest that there is yet another possible reason behind the dynamics of commercial property: sale activity that cannot be justified by cycles but can be perceived as sale opportunities, which may, in turn, be a partial indication of short-term mood. Investors who think that buyers for commercial property exist, are prepared to pay above the actual market value of the property. In doing so, they accept offers from forward-looking property agents and buy the property. Modern-day investors prioritise on investments into existing and potential commercial properties, or companies, that have any at their disposal. They are also quick to respond to changes in business models and new technologies and are able to prepare built-to-suit commercial properties.

Considering the increasing appeal of new business models, investors aim to invest or increase their investments in properties that can be used in a flexible fashion. Scott (2013) argues that many investors perceived the 1974 crisis as a unique event, one caused by flaws in the framework of bank regulation and property development control; however, the 1990 crisis showed that it was not a one-of-a-kind phenomenon (Jones et al., 2017). This type of thinking had long-lasting consequences on investors' expectations (Jones et al., 2017) and as Jones et al. observed, such a change in investor expectations can, to a certain extent, have an effect on long-term changes in the demand on the commercial property market.

If the prevalent sentiment on the market is that there are plenty of investors who wish to buy malls for example, their owners could use this opportunity to sell this property (Jones et al., 2017). This creates a set of assumptions around the speculative activity of commercial property sellers, which in turn enables the artificial inflation of property prices. Foreign investors drive transactions by paying high prices and thus creating liquidity/transaction models that have nothing to do with commercial property market prices (Jones et al., 2017). In their study, Higgins and Osler (1998) found that changes in the financial market can have a significant effect on the speculative behaviour of property sellers. They suggest that monetary policy could be tightened in response to excessive speculative activity, i.e. loaning money at higher interest rates when property is used to secure the loan. This should make speculative activity on the part of commercial property sellers/owners, more difficult. They further argue that tax policy, or any other form of regulation, could provide a broader set of focused measures aimed at preventing speculative property bubbles.

Property booms, or even bubbles, and the resulting crises, have never prevented humanity from excessive consumption when the market is on the rise (Bennett, 2011; Weber, 2016). Weber calls this 'collective

amnesia' (Weber, 2016, p. 599). She believes that upturns and recessions in the property market are caused by human error on the part of the market players, especially by their tendency to forget, or ignore, the possible outcomes of the crisis. Pyhrr et al. (1999) note that property cycles are quite long and therefore national economies have every chance to take them into consideration and avoid similar hardships in the future. In contrast, Weber (2016) believes that the cyclic dynamics of property indicates that people and organisations are still to learn that history will repeat itself, despite the consequences of any prior crises. The following table lists the emotional criteria selected for further research and the sources of literature that refer to such criteria as having a connection with the dynamics of commercial property prices.

Table 2-5. A summary of the sources of literature on emotional criteria affecting the dynamics of commercial property.

Criterion Number	Emotional criteria	Literature
C24	Predictive agents	Scott and Judge (2000)
C25	Investors' expectations	Scott (2013); Jones et al. (2016)
C26	Sellers' speculative activity	Scott (2013); Higgins and Osler, (1998); Jones et al. (2016)
C27	Human tendency to forget economy busts	Bennett, 2011; Weber (2016)

Source: Self Study

2.7.5. Legal and Regulatory Criteria

Legal and other regulatory actions are necessary to regulate mutual economic relationships between individuals. The current thesis deals with four legal and regulatory criteria affecting the dynamics of commercial property prices: spatial planning policy, commercial property evaluation, accounting standards and green lease regulations. The birth of the idea of economic planning was followed by the advent of other levels of planning. The idea of planning economic actions and spatial planning was formed under the understanding that national governments should assume responsibility for their actions. Spatial planning affects the construction business and these two sectors are strictly regulated.

The development of commercial property projects and addressing land-related matters, is subject to the control of spatial planning. Actions taken by planning control institutions, may hamper the smooth running of business. Spatial planning follows the law, or other regulations, including documents setting the course of spatial development and the functional priorities of the use of territories. Scott (2013) emphasised the importance of spatial planning for the dynamics of commercial property prices explaining

that as the growth of construction increases the supply of commercial property so that if demand drops, the vacancy rates of leasable premises and buildings increase. Any increase in vacancies reduces the growth of rent rates, or even causes them to decrease.

In their article, McParland et al. (2002) analysed differences in the application of property valuation standards across European states. Property valuations are required by commercial property investors in order to make decisions about whether to buy or to sell, besides which, commercial property may be used as security based on its value as determined by a valuator. McParland et al. noted that the main goal of valuation standards is to provide clients and valuators with an understanding of the terms and basis for value. It is critical that valuation standards evolve in line with developments in the property market so that they can perform their function in the valuation process. McParland et al. found that there has been limited progress made in the field of harmonising standards in Europe.

A study of commercial property cycles and property values in the UK by Scott and Judge (2000) reiterated that measuring the value of property leads to numerous methodological problems in time. Since many commercial properties are traded on extremely rare occasions, valuations can only be grounded on 'comparable' rather than identical deals on the property market. This process is further aggravated by the poor market for many classes of property in certain locations. The diversity of commercial property as investment property and the absence of regular transactions makes it more difficult to carry out a completely representative and generally recognised valuation. An article by Baum et al. (2011) also showed that property valuations are prone to certain 'valuation inertias': a tendency for valuators to overestimate falling property markets and underestimate property in rising markets.

According to the literature, in common with property valuation standards, accounting standards also affect the dynamics of property prices. These two activities are related, because accounting standards require that a commercial property valuation be routinely carried out for accounting purposes. Scorte et al. (2009) suggest that accounting information allows and facilitates the making of decisions and helps clear up any uncertainty about the future of operations. They also suggested that the 2008 crisis might have been strengthened by a widespread erroneous attitude towards accounting standards. Having analysed the importance of accounting information in the period of a property crisis, Scorte et al. introduced the role of accounting when disclosing public and private information to stakeholders, illustrating how this information can be used to mitigate the consequences of a crisis or even overcome it.

When the cost of money is low, individuals and companies tend to get into substantial debt to banks in order to purchase property. However, in this case, the growth of the property market has been artificially created by the supply of cheap money, causing the bubble to burst.

Al-Saleh and Mahroum (2015) analysed political measures introduced to promote environmental sustainability. They found that many of the green policy measures that had emerged over the past few decades, were focused on facilitating environmentally friendlier processes. They argued that efforts to focus investors on green policies eventually have a tendency to grow, even in the absence of any favourable conditions in terms of taxation. Gillingham et al. (2009) and Al-Saleh and Mahroum (2015) also emphasised some of the problems relating to landlords being unable to recover the costs of increasing energy efficiency through the purchase price, or rent, of the property, while the tenant is encouraged to underinvest in higher energy efficiency. They maintain that owing to the relatively short history of environmental certification, there is little evidence of the impact of certification of environmentally friendly buildings with reference to decisions pertaining to property acquisition, rent or renovation.
The following table lists the legal and regulatory criteria selected for further research and the sources of literature that refer to such criteria as having a connection with the dynamics of commercial property prices.

Table 2-6. A summary of the sources of literature on legal and regulatory criteria affecting the dynamics of commercial property.

Criterion Number	Legal and Regulatory Criteria	Literature
C28	Built environment planning policy	Scott (2013)
C29	Regulation of property valuation standards	Scott and Judge (2000); McParland et al. (2002); Baum et al. (2011)
C30	Regulation of property accounting standards	Scorte et al. (2009)
C31	Green lease regulation	Gillingham et al. (2009); Al-Saleh and Mahroum (2015)

Source: Self Study.

2.8. Chapter summary

In summary, the analysis of the literature on behavioural economics has revealed that human decision-making is affected by psychological aspects (Heukelom, 2006; Samson, 2014; Thaler, 2016; Truc, 2017). It does not have a theory of market behaviour nor a theory on the action of macroeconomic phenomena (Heukelom, 2006). Market players change their behaviours depending on the form of presentation of new information and as a result, their behaviour can have a potential effect at a macro level, invisible at a micro level (Wyman et al., 2011). Conventional economics 'believes' in the potential to predict future prices (Carlsson and Johansson-Stenman, 2012). Governments make many decisions which give more priority to property than to the rights of the individual (Wing Hsieh, 2015) and the behavioural trends of individual market players can affect the thinking, decisions and investment strategies of the decision-maker (Black et al., 2000; Crosby and Hughes, 2011; Wyman et al., 2011; Carlsson and Johansson-Stenman, 2012; Salzman and Zwinkels, 2013; Brzezicka and Wisniewski, 2014; Ahmad et al., 2018).

Investigation of the 'booms and busts' that have had an impact on the property market, reveals that property market trends are one of the drivers of bank risk. However, only two financial busts were caused by crises in the property market. The first started in Japan in 1991 (Kiyak et al., 2012), the second in 2007 in the USA when the stock value of property collapsed (Kiyak et al., 2012).

The state of the property market has a positive correlation with the overall state of the country's economy and is related to economic fluctuations, therefore, is termed procyclical. The procyclicality of a property market is defined as a process whereby during a period of expansion, the property market experiences a boom, but during a period of recession, it deflates in line with whole economy dynamics (Kaminsky et al., 2004). When the economy is in a downturn, the commercial property market also falls. In this situation, the cyclicality of the property market makes that market less sustainable as busts impact commercial property market dynamics.

The current property investment environment in the UK and Europe shows that there are differences in property market patterns of fluctuation in the UK and other countries. According to the literature, commercial property prices did not fall in Germany, Norway, Sweden, France, Austria or Switzerland during the global crisis triggered by substantial decreases in property prices in the USA and the UK in 2007. As such, Germany, Sweden and France have been selected for comparison with the UK in this study.

The contribution of property market participants to the market shows that in times of prosperity in the commercial property market, many participants will behave in such a way that not only corresponds to this growth but that they will also try to extend this period. Therefore, commercial property market

participants play a huge role in this, illustrating how the procyclicality of commercial property works (Weber, 2016). However, governments have the tools and power to control the cyclical behaviour of property markets by regulatory systems of monetary and fiscal policies.

While commercial property market dynamics are influenced by financial institutions and are subject to macro-prudential regulation, these dynamics are also influenced by other factors. The results of the literature analysis suggest that so far, there have been no scientific studies to create a framework for the sustainable management of the commercial property market. Therefore, based on the analysis of the literature about frameworks related to commercial property dynamics management and assessment, the following categories of criteria will be examined: (1) economic (2) environmental (3) social (4) emotional and (5) legal and regulatory.

The system encompasses 31 units of criteria, sorted into these five sets: economic, environmental, social, emotional and legal and regulatory criteria (Appendix XI).

Both quantitative and qualitative criteria which impact commercial property market dynamics throughout the world, were identified from the literature. A total of 31 criteria that impact commercial property transactions and rentals dynamics, were identified and used to build a framework that helps to guide decision-making in the property market. The next step was to understand which criteria are important for property market rentals and transaction dynamics, and which are not. A questionnaire approach has been used to ascertain the level of relevance of the criteria as validated by experts (see Chapter 5).

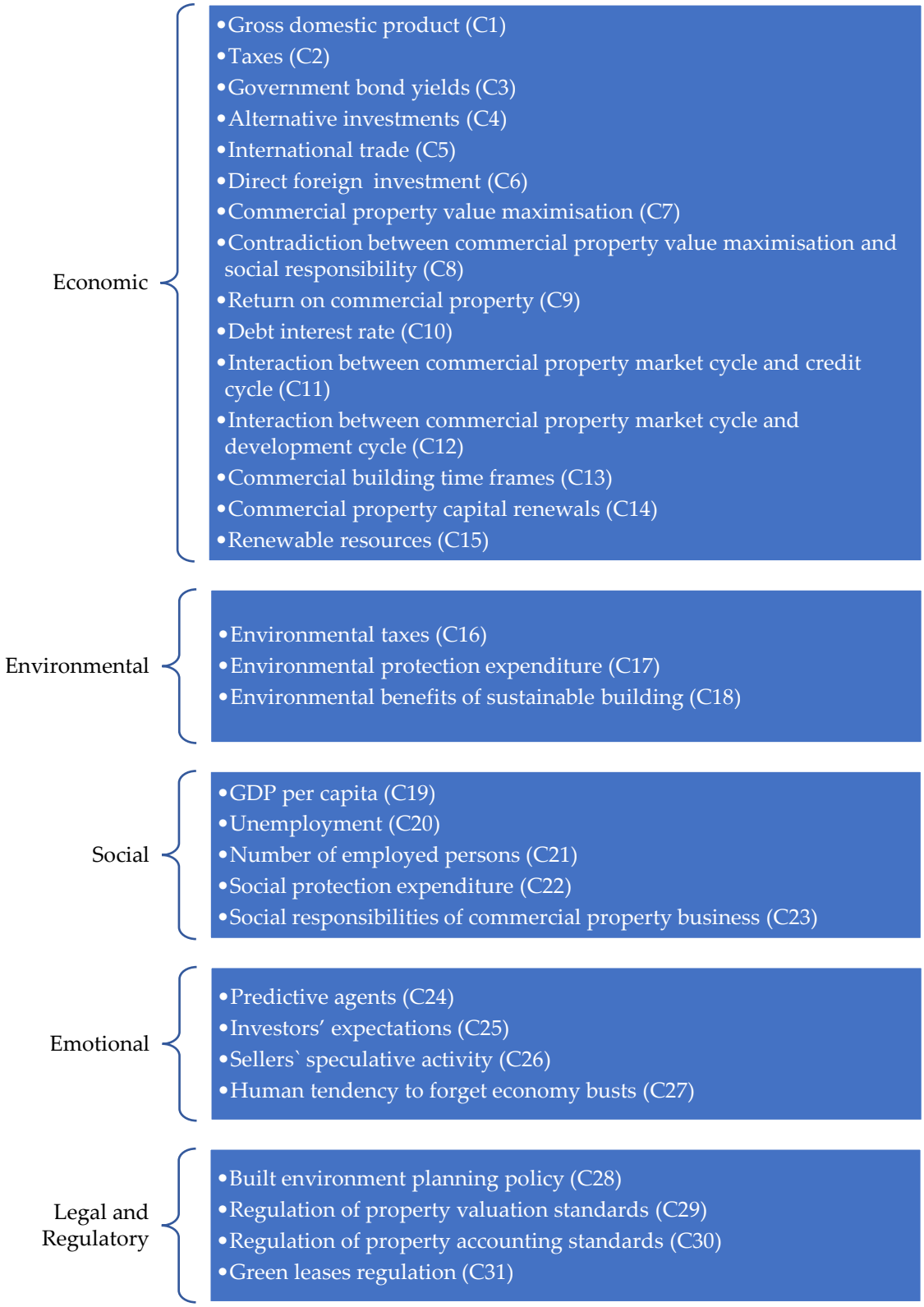


Figure 2-18. Criteria that impact commercial property market dynamics

Chapter 3. Research Methodology

3.1. Introduction

Chapter 3 focuses on the research methodology. The first step is to summarize the methods selected to achieve the aim and objectives of the research. The second step is to justify application of the methodology, show equations, and the last step is to explain where the data was sourced, concepts of reliability and validity and the ethics which have been followed.

The methodology can be defined as a general principle of knowledge. Each field of science has its own research methods. Traditionally, the concept of the method was associated with the positivist perspective and quantitative techniques (Bryman, 2012). Some researchers prefer an interpretive perspective technique (Pandey and Pandey, 2015). The quantitative and qualitative research methodology is based on two different paradigms which are philosophical (Kaplan and Duchon, 1988; Bryman, 2012). The first way is the positivist social reality and the second way is the interpretive made on a subjective basis (Kaplan and Duchon, 1988; Bryman, 2012). The real estate market can be investigated with a combination of quantitative and qualitative research as the post-positivist approach (Angelelli and Baer, 2015). Multiple criteria decision-making methods include the quantitative and qualitative research methodology. MCDM is one of the most appropriate approaches for executing the investigation process using comparative analysis (Zavadskas et al., 2017; Maliene, 2011). The research includes a statistical measurement, structured protocols techniques, questionnaire and experts, synthesis, and aggregation methods in order to achieve the criteria for the MCDM technique.

As the main aim of the current study is to create a theoretical framework for the sustainable management of the commercial property market, both quantitative and qualitative criteria that impact commercial property market dynamics throughout the world, have been collected. This step of the study was carried out via the literature review. The literature review was also used to select appropriate countries for comparison with the UK. The relevance of the selected criteria of relevance to property market dynamics, has been determined through use of a questionnaire survey using the Multiple Criteria Decision-Making (MCDM) method. As the main approach of this research is a comparative analysis, MCDM methods are one of the most appropriate ways to execute this task (Triantaphyllou, 2000; Maliene, 2011; Zavadskas et al., 2017). Quantitative data have been analysed using statistical tools. The chosen methodology is described in detail in the sections below. The scheme of the relationship of the objectives with the methods is shown in Figure 3-1.

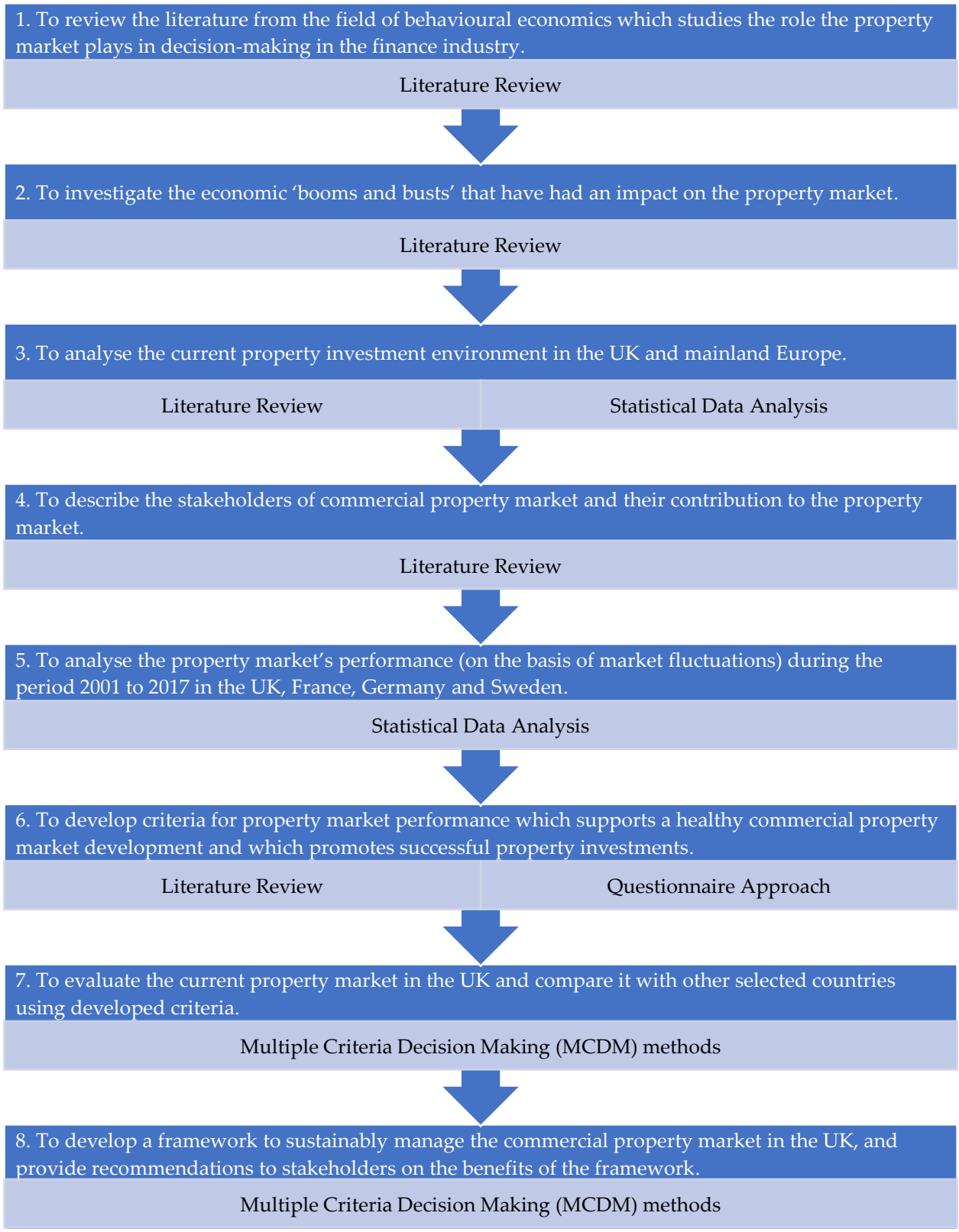


Figure 3-1. The scheme of the relationship of the objectives with the methods.

3.2. Methodology Design

For this thesis, principles of cognition have informed the research methods and techniques (Kardelis, 2002), an outline of the methodology given in Figure 3-2 below.

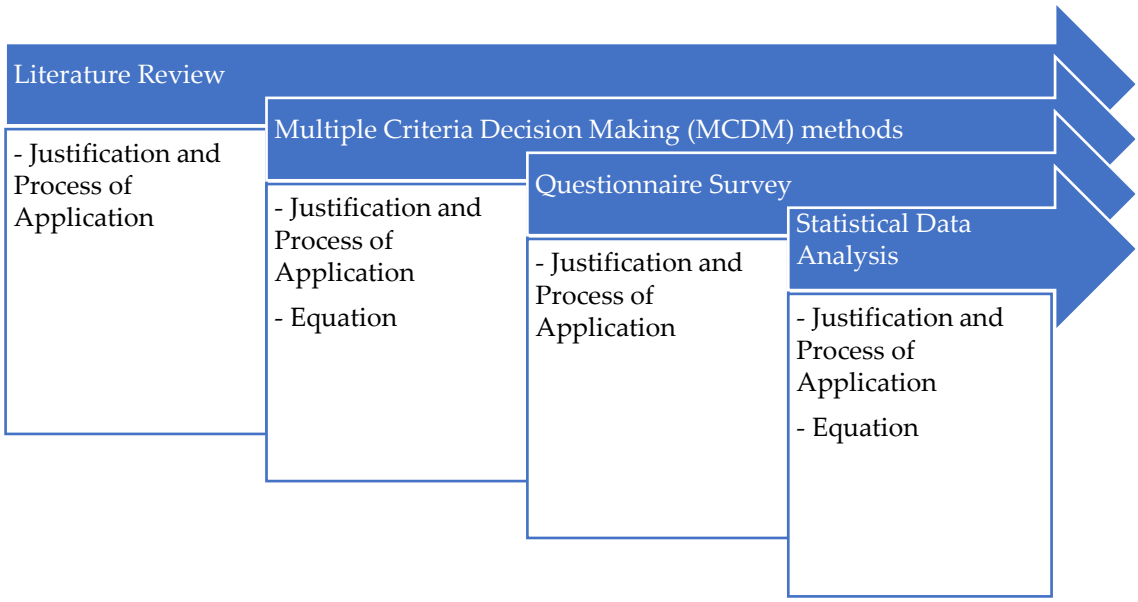


Figure 3-2. Outline of the research methodology (sources: Self -Study).

In order to rationalize the research, a literature review and three different sourcing techniques have been used. Those techniques are Multiple Criteria Decision-Making methods, a questionnaire survey and statistical analysis of the data. The data analysis comprised a mixed methods approach of both qualitative and quantitative techniques. The qualitative research comprised the narrative analysis of the literature. The other data which was collected using a questionnaire survey, has been transformed into quantitative data and statistically analysed. Each data analysis approach is described in its own section (Figure 3-2).

3.3. Literature Review

The literature review is one of the most important tools for the researcher. Chris Hart (2018) stated that: "the literature review is the analysis, critical evaluation and synthesis of existing knowledge relevant to research problem" (Hart, 2018) but he makes no mention of the role of the literature review in identifying a research problem. Anthony Onwuegbuzie and Rebecca Frels (2016) however, emphasize that the literature review is not only a tool for identifying the research problem, but it is also a method and technique for conducting research and gathering information (Onwuegbuzie and Frels, 2016). Therefore,

the literature review in this research was used to identify the research problem, to formulate the research question and aim, to set objectives, collect information and summarise the findings.

3.3.1. Justification of Application

Many social science studies solve problems based on empirical facts, e.g. the problem of the effect of an economic crisis on the property market. This problem is not a new one. Economists have been addressing this since the Great Depression (Dow, 2007). Because of their work, this problem has been clarified, is sufficiently well known and empirically investigated. Work by Allen and Gale, ''Bubbles and Crises'' (2000) noted that 'busts' often follow a 'boom' in the property market, implying that there is the potential to control the fallout from an economic crisis, if the factors that lead to this bust can be identified (Allen and Gale, 2000). The authors of 'The economics of commercial property markets'' suggest that commercial property dynamics are constantly influenced by economic factors (Ball et al., 2001). Those factors have been identified by Barras (1994); Higgins and Osler (1998); Ellison and Sayce (2007); Scott (2013); Scott (2013); and Komarovska et al. (2015), some of these qualitative rather than quantitative in nature. The influence of quantitative factors can be ascertained by using statistical analysis. However, it is not possible to calculate the influence of qualitative factors directly by using these techniques. The problem of measuring / analysing both quantitative and qualitative factors has been solved by using Multiple Criteria Decision – Making methods in this research. These methods have been used to compare the UK to other countries' volatile commercial property markets, in order to create a framework for a healthier and more sustainable property market, in common with the experience of other countries.

The research question has been formulated by reference to the existing literature, specifically literature about the dynamics of commercial property markets across different countries. In some countries, trends in the property market have been not so volatile. This may be because government and relevant institutions have the tools to manage property dynamics (Dreger and Kholodilin, 2013). Based on this hypothesis, a research question was formulated to investigate whether or not a coordinated system of commercial property dynamics can be created in the UK, based on the experiences of other countries.

There is no indication in the literature of a quantitative and qualitative criteria system as a tool for the sustainable management of the commercial property market. Therefore, the aim of research is to develop such a framework. As economic crises affect the commercial property market, the implementation of this aim can indirectly contribute to a more balanced economy. The process followed for the literature review is shown below.

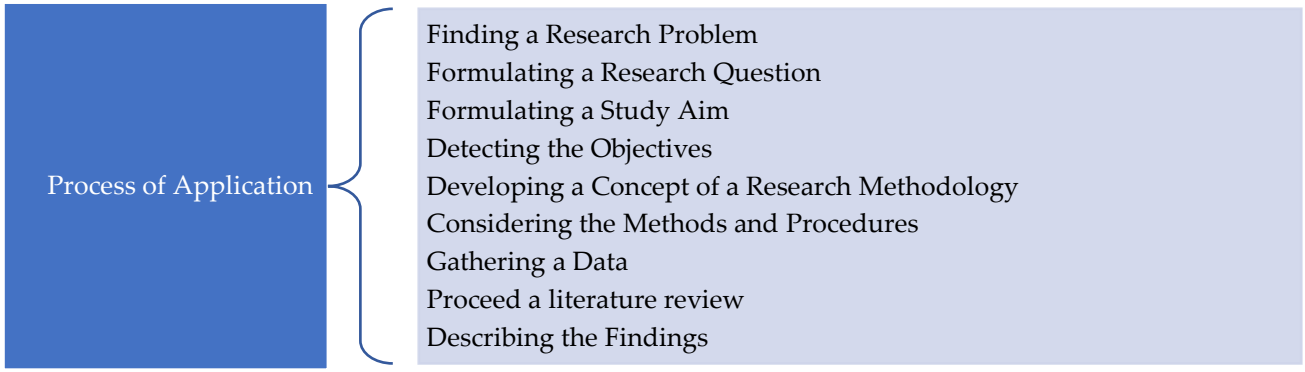


Figure 3-3. The process of literature review application (sources: Self -Study).

3.4. Multiple Criteria Decision - Making (MCDA) Analysis

Multi-Criteria Decision Analysis (MCDA) (Maliene et al., 2018) is a solution system that helps to develop alternatives in the decision-making process. It analyses decisions to find the best solution under specified conditions. This system is designed to solve problems using a variety of Multi-Criteria Decision Making (MCDM) methods. With these methods, alternatives can be analysed as a whole, and via individual variables, the purpose being to choose the best alternative from many alternatives.

Scientists have divided MCDM methods into two classes, namely Multi-Attribute Decision Making (MADM) and Multi-Objective Decision Making (MODM) methods (Triantaphyllou, 2000). MADM methods are used to select a rational alternative from a list of known alternatives (Zavadskas et al., 2017; Hwang and Yoon, 1981). MODM methods are used when the task is to solve a range of objective functions that are optimized simultaneously (Hwang and Yoon, 1981).

The objective of this research is to assess commercial property market dynamics, in different countries, based on an established set of sustainable commercial property assessment criteria. Commercial property rentals and capital market dynamics will be ranked from best to worst. Since the property dynamic problem is of a discrete nature, the MADM method is suitable for use in this case. MADM includes widely used methods for the quantitative analysis of qualitative and quantitative data including: Simple Additive Weighting (SAW) (Fishburn, 1967); Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) (Hwang and Yoon, 1981), and COmplex PRoportional ASsessment (COPRAS) (Podvezko, 2011; Stefano et al., 2015)). These methods will be used to resolve the following important decision-making situations in the commercial property market: 1) evaluation of commercial property market dynamics, 2) causal analysis of commercial property booms and busts, 3) evaluation of property market performance in some countries, 4) evaluation of investment risk in commercial property markets, 5) selection of country

for investment, 6) evaluation and selection of flexible commercial property dynamic management systems.

3.4.1. Justification of Application

While many Multi-Criteria Decision-Making methods have been developed, it has not yet been determined which method is the most suitable for solving concrete problems (Podvezko, 2011; Stefano et al., 2015; Maliene et al., 2018). In general, MCDM methods have been applied to analyse problems around the best decision in areas such as waste management (Goulart Coelho et al., 2017), mechanical engineering (Sen et al., 1998; Jahan and Edwards, 2013; Venkata, 2013; Balin et al., 2016), building maintainability (Das et al., 2010), water resources (Hajkowicz and Collins, 2007; Giupponi, 2007; Giupponi, 2014), investment portfolio optimisation (Beheshti et al., 2016), and property analysis and investment in construction (Maliene, 2011; Mulliner et al., 2013, 2016; Zavadskas et al., 2017; Kaklauskas et al., 2018). Methods such as SAW, TOPSIS and COPRAS have been used in property and construction (Maliene, 2011; Mulliner et al., 2013, 2016; Kaklauskas, 2016; Komarovska et al., 2015), and in management (Antucheviciene et al., 2011; Lahdelma et al., 2000). Ginevičius and Podvezko (2009) also used SAW, TOPSIS and COPRAS to assess socio-economic development in regions of Lithuania. In the scientific literature, there is no application of MADM methods to analyse commercial property rentals and capital markets.

The chosen methods are suitable for the analysis of problems, where there are a variety of possible alternatives that can be assessed by application of criteria (attributes). "Alternatives represent the different choices of action available to the decision maker"(Triantaphyllou, 2000, p. 28). Criteria reflect certain aspects of the analysis of alternatives, each describing one feature of each alternative (Venkata, 2013). Because different criteria reflect different approaches to alternatives, the said criteria can be controversial and can also be measured with different units of measure. Therefore, criteria have to be determined by their relative significance, showing how one criterion is more important when compared to another. As such, this analysis helps to structure and process information in order to present it mathematically (Venkata, 2013). The relevance of a criterion is determined such that it indicates the influence of that criterion on the problem under consideration. In this research, the relevance of criteria is determined by asking commercial property professionals via a Questionnaire survey (chapter 3.4.).

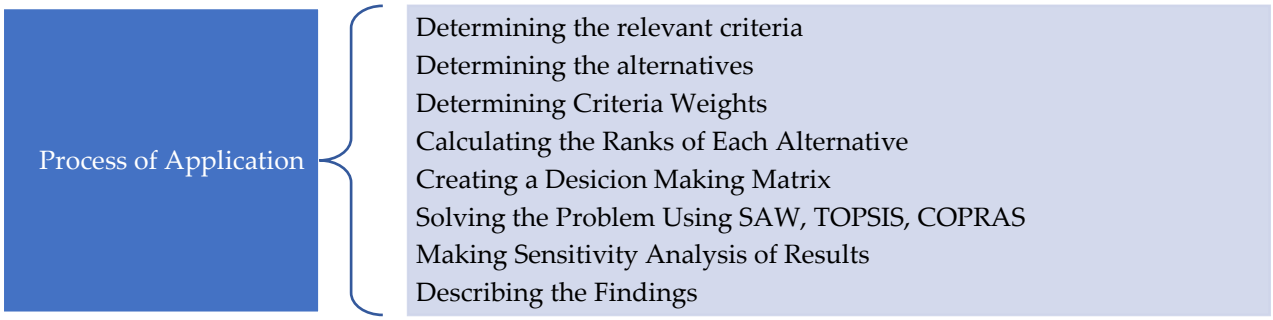


Figure 3-4. MADM: the process of application (source: Self -Study).

The most commonly used methods for the quantitative analysis of criteria are SAW, TOPSIS and COPRAS. Prior to application of the aforementioned methods, the steps below for the creation of the decision-making matrix, are followed (Triantaphyllou, 2000; Mulliner et al., 2016):

1) Determination of the assessment criteria
2) Selection of decision alternatives for comparison
3) Determination of criteria weights (significance)
4) Calculation of criteria values for each alternative
5) Creation of a decision-making matrix with the aforementioned data

SAW Method

The Simple Additive Weighting (SAW) method was developed by Fishburn (Fishburn, 1967). It is the simplest and the widest used MADM method (Triantaphyllou, 2000; Venkata, 2013).

Its steps of application are:

1) normalization of the matrix of decisions
2) multiplication of each criterion value by its corresponding weight
3) summation of the resultant values in order to obtain a final score

The alternative with the highest score is the rational solution.

TOPSIS method

The Technique for Order Preference method is based on the concept that the optimal alternative has the minimum distance from the "positive ideal" solution and the maximum distance from the "negative ideal" solution. The rules for applying the method were developed by Yoon and Hwang (Hwang and Yoon, 1981).

Its steps of application are:

1) normalization of the matrix of decisions
2) weighting the normalized matrix

3) identification of the “positive ideal “and "negative ideal" solutions

4) calculation of the distance between the comparative and the "ideal" solution, and between the comparative and the "negative ideal" solution

5) determination of the relative distance of each comparison option with the "ideal" option.

The rational version will be the one whose distance to the “ideal” option value is the largest (Hwang and Yoon, 1981).

COPRAS method

The COmplex PRoportional ASsessment (COPRAS) method was developed by Lithuanian scientists (Zavadskas et al., 1994).

Its steps of application are:

1) normalization of the matrix of decisions

2) weighting the normalized matrix

3) calculation of the values of alternatives as the sum of the maximized and minimized variables

4) determination of the relative efficiency of the alternatives and creation of an alternative priority line where alternatives are ranked

The higher the efficiency, the better the alternative (Zavadskas et al., 1994).

Some similar criterion positions can be different for the different alternatives. To determine where the influence of criteria is more random, and where criteria play a crucial role in decision-making, a sensitivity analysis should be carried out (Butler et al., 1997, Triantaphyllou, 2000; Li et al., 2013; Mulliner et al., 2016; Maliene et al., 2018). Those criteria whose relative relevance values are widely dispersed when comparing one alternative to another, should be assessed by their sensitivity to weight changes (Maliene et al, 2018). In that way the decision maker will be able to make a better decision when the most critical criteria are determined (Triantaphyllou, 2000).

Finally, the sensitivity analysis of results calculated with MADM methods, has been made in order to determine the most critical criteria and the most sensitive alternatives. The equations of all calculations which apply to MADM methods are shown on Chapter 3.4.2.

Sensitivity analysis

Sensitivity analysis is considered to be a mandatory step for the analysis of various multiple-criteria decision-making problems (Li et al., 2013). In this study the methodology of Triantaphyllou and Sánchez (1997) has been applied. The finding of the best alternatives is used for sensitivity analysis.

Sensitivity analysis of criteria`s steps of application are:

1) finding the most critical criterion

2) reversing the existing ranking of the alternatives by making changes on the current weight of criterion

Finally, the critical criterion is estimated by finding the smallest value.

Sensitivity analysis of alternatives is made changing the most critical criterion`s weights on a scale of -5%, - 50%, 50%, and 5 % (Mulliner et al., 2016). Its steps of application are:

1) estimation of criteria weights on a scale of -5%, - 50%, 50%, and 5 %

2) finding the best alternative using MCDM methods

3) ranking the alternatives

3.4.2. Equations

The criteria for the assessment of commercial property markets are described in Chapter 7, while the selection of countries for comparison is described in Chapter 2, section 2.3.1. The criteria weights (significances) have been determined using a Questionnaire survey (Chapter 5.4.4., 5.5.4.) and subsequent statistical analysis (Chapter 5.4., 5.5.). The criteria assessments have been performed to non-dimensional rates according to the equation (Triantaphyllou, 2000; Banaitiene et al., 2008):

$$\mathbf{a_{ij}} = \frac{\mathbf{x_{ij}}}{\sum_{\mathbf{i=1}}^{\mathbf{m}} \mathbf{x_{ij}}} ; j = 1,2, 3..., n \quad (1)$$

where,

x_{ij} is the input data, often expressed in different units

a_{ij} is a value of relative weight (significance) for the alternative i^{th} in terms of the criterion j^{th}

m is the number of alternatives

n is the number of criteria.

The criteria values for each alternative have been processed in accordance with their measurements using statistical data and ranking reversal within the interval scale. This has been done to quantify criteria which it is not possible to evaluate in any other way as these are qualitative (Chapter 7). Alternatives and criteria values have been used for the decision-making matrix creation.

Theoretically, the decision-making matrix structure consists of a number of alternatives and a number of criteria. Each criterion has a relative significance or weight. An example of such a structure matrix is shown below:

(2)

Criteria					
	C_1	C_2	C_3	…	C_n
Alts.	(w_1	w_2	w_3	…	w_n)
A_1	a_{11}	a_{12}	a_{13}	…	a_{1n}
A_2	a_{21}	a_{22}	a_{23}	…	a_{2n}
.	.	.	.	.	.
.	.	.	.	.	.
A_m	a_{m1}	a_{m2}	a_{m3}	…	a_{mn}

Figure 6. A Typical Decision Matrix (Source: Triantaphyllou, 2000, p.3)

where:

A_i are the alternatives, where a_{ij} (i=1,2, 3..., m, and j=1,2, 3..., n) denote the value of the i-th alternative

C_j are the criteria for making a decision

w_j are the weights (significances) that denotes the weight of the criterion C_j

When the decision-making matrix is created, MADM methods can be applied using the equations shown below.

SAW equations

Here, each criterion is given a weight, the sum of all weights to be equal to 1 (Venkata, 2013). The normalized decision matrix for maximizing (positive) criteria is calculated as follows (Afshari et al., 2010):

$$\mathbf{a_{ij}} = \frac{\mathbf{x_{ij}}}{\mathbf{x_j^{max}}} \text{ i = 1,...., m, j=1,2, 3,..., n} \quad (3)$$

and for minimizing (negative) criteria as follows:

$$\mathbf{a_{ij}} = \frac{\mathbf{x_j^{min}}}{\mathbf{x_{ij}}} \text{ i = 1,…, m, j=1,2, 3,..., n} \quad (4)$$

where:

a_{ij} is the score of the i^{th} alternative with respect to the j^{th} criteria

x_{ij} is the input data, often expressed in different units

$\mathbf{x_j^{max}}$ is the maximum number of x in the column of j

$\mathbf{x_j^{min}}$ is the minimum number of x in the column of j

The simple additive weighting method evaluates each alternative, A_i, using the following formula (Fishburn, 1967):

$$\mathbf{A_i} = \sum \mathbf{a_{ij}}\, \mathbf{w_j}; \text{ i=1,2, 3,…, m, } \quad \text{j=1,2, 3,…, n} \quad (5)$$

where:

A_i is the evaluating alternative

a_{ij} is the score of the normalized value for the alternative i^{th} in terms of the criterion j^{th}

w_j is the weighted criterion

The alternative with the highest score is for the rational solution.

TOPSIS equations

The normalization of the decision matrix is done using Euclidean metrics. The equation (Behzadian et al., 2012) is:

$$\mathbf{a_{ij}} = \frac{\mathbf{x_{ij}}}{\sqrt{\sum_{i=1}^{m} \mathbf{x_{ij}^2}}} \; ; \; \mathbf{j = 1, 2, 3, \dots, n; \; i = 1, 2, 3, \dots, m} \quad (6)$$

where:

a_{ij} is the score of the normalized value for the alternative i^{th} in terms of the criterion j^{th}

x_{ij} is the input data, often expressed in different units

The columns of the normalized decision matrix are multiplied by the associated weights. The weighted and normalized decision matrix is obtained by the following equation:

$$\mathbf{V_{ij} = \; a_{ij} \; w_j \; ; \; j = 1, 2, 3, \dots, n; \; i = \; 1, 2, 3, \dots, m} \quad (7)$$

where:

V_{ij} is the value for the weighted normalized decision matrix, and

w_j are the associated weights for multiplying the columns in the normalized decision matrix

"positive ideal" and "negative ideal" solutions are determined using equations (8) and (9), respectively (Triantaphillou, 2000):

$$\{\mathbf{V_1^+, V_2^+, \dots, V_n^+}\} = \left\{\left(\underset{i}{\mathbf{Max}}\, \mathbf{V_{ij}} | \mathbf{j \in J}\right), \left(\underset{i}{\mathbf{Min}}\, \mathbf{V_{ij}} | \mathbf{j \in J'}\right) \middle| \mathbf{i = 1, 2, 3, \dots, m}\right\} \quad (8)$$

$$\{\mathbf{V_1^-, V_2^-, \dots, V_n^-}\} = \left\{\left(\underset{i}{\mathbf{Min}}\, \mathbf{V_{ij}} | \mathbf{j \in J}\right), \left(\underset{i}{\mathbf{Max}}\, \mathbf{V_{ij}} | \mathbf{j \in J'}\right) \middle| \mathbf{i = 1, 2, 3, \dots, m}\right\} \quad (9)$$

where:

$\mathbf{V_n^+}$ is the "positive ideal" solution

$\mathbf{V_n^-}$ is the "negative ideal" solution

$\mathbf{J}$ is the index set for maximizing (positive ideal) criteria

$\mathbf{J'}$ is the index set for minimizing (negative ideal) criteria

The distances from the "positive ideal" and "negative ideal" solutions are measured. The two Euclidean distances for each alternative are computed as given in equations (10) and (11), respectively:

$$\mathbf{S_I^+} = \left\{\sum_{j=1}^{n} \left(\mathbf{V_{ij} - V_j^+}\right)^2 \right\}^{0.5} ; \; \mathbf{j = 1, 2, 3, \dots, n; \; i = 1, 2, 3, \dots, m} \quad (10)$$

$$\mathbf{S_I^-} = \left\{\sum_{j=1}^{n} \left(\mathbf{V_{ij} - V_j^-}\right)^2 \right\}^{0.5} ; \; \mathbf{j = 1, 2, 3, \dots, n; \; i = 1, 2, 3, \dots, m} \quad (11)$$

where:

$\mathbf{S_I^+}$ is the distance of each alternative from the ideal

$\mathbf{S_I^-}$ is the distance of each alternative from the negative ideal

The relative closeness to the "ideal" solution is calculated as shown in the following equation:

$$\mathbf{C_i} = \frac{\mathbf{S_i^-}}{\mathbf{S_i^+ + S_i^-}}\ ;\ \mathbf{i = 1, 2, 3, \ldots, m; 0\ \leq\ C_i \leq\ 1} \quad (12)$$

where $\mathbf{C_i}$ is the solution that is closest to the "ideal" one. Higher values of C_i mean that the rank is better.

COPRAS equations

COPRAS allows for both maximizing (positive) and minimizing (negative) criteria to be considered within the matrix (Zavadskas et al., 1994).

The first step is the normalization of the decision – making matrix:

$$\mathbf{d_{ij}} = \frac{\mathbf{q_i}}{\sum_{\mathbf{j=1}}^{\mathbf{n}} \mathbf{x_{ij}}}\ \mathbf{x_{ij}} \quad (13)$$

where:

$\mathbf{d_{ij}}$ is the sum of the weighted values

$\mathbf{q_i}$ is the weight of the i^{th} criterion

x_{ij} is the value of the i^{th} criterion of the j^{th} alternative

The sums of the weighted normalized criteria ($\mathbf{S_i^+}$ and $\mathbf{S_i^-}$) of the ith alternatives are calculated as follows:

$$\mathbf{S_i^+\ =\ \sum_{j=1}^{n} d_{ij}\, w_j\, z^+;\ d_{ij} \geq\ 0;\ z^+\ =\ 1;\ j =\ 1, 2, 3, \ldots, n;} \quad (14)$$

$$\mathbf{S_i^-\ =\ \sum_{j=1}^{n} d_{ij}\, w_j\, z^-;\ d_{ij} \geq\ 0;\ z^-\ =\ 1;\ j =\ 1, 2, 3, \ldots, n;} \quad (15)$$

where:

$\mathbf{S_I^+}$ is the maximizing (positive) sum of criteria

$\mathbf{S_I^-}$ is the minimizing (negative) sum of criteria

a_{ij} is the score of the normalized value for the alternative i^{th} in terms of the criterion j^{th}

w_j is the weighted criteria

$\mathbf{z^+}$ is the relative maximizing significance

$\mathbf{z^-}$ is the relative minimizing significance

The aggregated value for each alternative $\mathbf{A_i^{COPRAS}}$ is calculated using the following formula:

$$\mathbf{A_i^{COPRAS}\ =\ S_I^+\ +\ \frac{\sum_{i=1}^{m} S_i^-}{S_i^- \sum_{i=1}^{m} \frac{1}{S_i^-}}\ ;\ i = 1, 2, 3, \ldots, m;} \quad (16)$$

The alternative with the highest value $\mathbf{A_{optimal}^{COPRAS}}$ is established as the best solution:

$$\mathbf{A_{optimal}^{COPRAS}\ =\ \max_i\ +\ \left(S_i^+ + \frac{\sum_{i=1}^{m} S_i^-}{S_i^- \sum_{i=1}^{m} \frac{1}{S_i^-}}\right)\ ;\ i = 1, 2, 3, \ldots, m;} \quad (17)$$

Sensitivity analysis equation

The most critical criterion and the most critical criterion weight are defined using the sensitivity analysis. This analysis involves measuring how the smallest relative change in percentage terms can change criterion weight, and how it impacts the choosing of the best alternative (Triantaphyllou and Sánchez, 1997). The sensitivity coefficient of criterion Cj, was denoted as SCj, and was used as a measure of the sensitivity to change of criterion weight as follows:

$$\mathbf{SC_j} = \frac{\mathbf{1}}{\mathbf{D_j}} \text{ ; j = 1,2,3,…,n} \quad (18)$$

where,

$\mathbf{SC_j}$ is the sensitivity coefficient of criterion C_j

D_j is the smallest relative change of criterion C_j`s weight value W_j

3.5. Questionnaire Survey

Questionnaire surveys are one of the most useful tools for research, especially when it is necessary to collect both qualitative and quantitative data. In this research, a survey is used to question property professionals on quantitative and qualitative criteria, which are then described and analysed.

3.5.1. Justification of Application

In general, surveys can be classified as both qualitative and quantitative (Flick, 2009). The qualitative survey facilitates a deeper understanding of the topic under investigation, the quantitative survey comprising questions presented in a structured format. For all practical purposes, the methodology of social surveys can be grounded on the principles of hypothetical deduction and hypothetical induction. Hypothetical deduction is a way to test theory, while hypothetical induction is a way to develop it . The current survey was based on the principle of deduction. Findings can be presented in figures or charts, using means or mean deviations (Creswell, 2014). In this study, the structured format is designed to allow ranking of a set of criteria regarding their level of relevance (Triantaphyllou, 2000). One aspect of questionnaire surveys criticized by Creswell (2014) is that the structure / format of questionnaires which have been created and shared with participants, cannot be changed during the process of data collection. Criteria relevance is a measure to determine the influence of criteria on the dynamics of the commercial property market. For this survey, the criteria were rated on a semantic differential scale (Carroll et al., 1959). The respondent evaluates between two opposite words from “Not important” to “Extremely important”, these at each end of a differential scale from zero to five. Following this rating exercise, the results of the survey will be subject to scrutiny by the MCDM model (Triantaphyllou, 2000; Mulliner et

al., 2016, Maliene et al., 2018). Mulliner et al (2016) and Maliene et al (2018) have emphasized the importance of the use of collected data as it is one of the stages of MCDM methodology. Interestingly, it has also been suggested that questions on controversial issues may not be answered by participants.

The process of application of the survey is shown below.

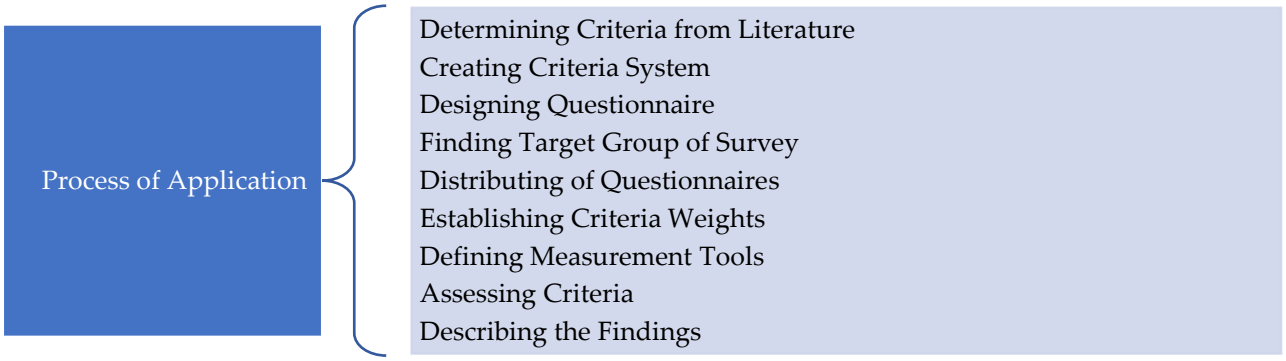


Figure 3-5. The process of questionnaire survey application (source: Self -Study).

The design of the questionnaire was defined by the purpose of the survey which was to identify the relevance of the criteria that impact commercial property market dynamics, these criteria determined from scientific literature. This tool was chosen as a method of collecting structured data (Gaizauskaite and Mikene, 2014) so that said data could be adapted for application of MCDM techniques to explore the links between theory and fact.

The survey questionnaires were based on multiple-choice questions. The respondents were also asked to indicate their country of specialisation, profession and professional experience in years. These were all multiple-choice questions allowing data to be collected both on the relevance of the criteria and the competence of the respondents. Two questionnaires were created, one focused on the dynamics of transactions prices, the other one, rentals (Appendix II). They are rated using a Likert scale of 0 (completely unimportant) to 5 (extremely important) according to their relevance to commercial property market dynamics. As the respondents are from different countries, the questionnaires were translated into German and French.

Oppeinheim (1992) distinguished four types of variables that can be explored via questionnaires: dependent, independent, controlled and uncontrolled. A dependent variable is one that can be explained with one or more independent variables. Controlled variables have a connection with dependent and independent variables, while uncontrolled variables have no such connection. The questionnaire criteria were analysed as independent variables that affect the dynamics of commercial property in their totality. By virtue of their definition and logical significance, the criteria (qualitative and quantitative) were split

into five groups: (1) economic criteria, (2) environmental criteria, (3) social criteria, (4) emotional criteria, and (5) legal and regulatory criteria (Chapter 2). Data collected through the survey made it possible to compare these and to examine the weights of individual groups.

Participant selection was carried out using the snowball principle, as the total number of potential respondents was unknown, and they were not easily accessible. Under the snowball principle, just like a snowball rolling down a hill, the number of participants increases over the course of the survey. Initially, the surveys were presented to a focus group of commercial property professionals. These are people who work at banks, legal institutions and property companies. Commercial property professionals were selected because of their direct ties with the subject of the survey. The questionnaires were distributed within the countries covered by the study: the UK, France, Germany and Sweden. Commercial property professionals were selected on the basis of references, contacts and recommendations provided by experts already participating in the survey. Some surveys were completed by hand, others distributed online to reduce costs. Some questionnaires were printed on paper and handed out during meetings with professionals.

The data analysis strategy was to describe the respondents and to statistically analyse the relevance of criteria across the four countries. The results were analysed using MCDM methods, demographic data analysed using descriptive statistics. The relevances of the criteria were used to: 1) determine the weight of each criterion by total number of the criteria; 2) compare individual countries, and to 3) measure the qualitative criteria by the assignment of numeric values of relevance for each criterion of each country. To achieve these goals, the means of the relevance of each criterion were calculated.

The data analysis strategy also included application of Cronbach's Alpha to evaluate the reliability of the respondents' replies and of the Mann-Whitney U test to determine any potential material differences between the UK and other countries with Bonferroni corrections applied to minimise type-I errors.

Criteria determination, its system, target groups description, questionnaire distribution, analyses and findings are described in Chapters 5-6.

3.6. Statistical Analysis

Statistical analysis is one of the tools for analysing quantitative information about human beings to deny or confirm scientific hypotheses. As Shahdad Naghshpour (2012), the author of the book 'Statistics for Economics' stated: "Statistics is the science of life" (Naghshpour, 2012, p. xi). Christian Dreger and Konstantin A. Kholodilin (2013) stated that some countries have institutional frameworks that prevent larger amplitudes of dynamics in the property market (Dreger and Kholodilin, 2013). Statistical analysis

is a tool for identifying those countries whose commercial property volatilities are low by using the comparative analysis of their commercial property markets' historical dynamics. Thereby, the statistical analysis in this research was used to select comparable countries regarding their commercial property market dynamics, to analyse their economic, environmental and social criteria, and property experts' answers as well. The countries that were found were compared with the UK. Moreover, the hypotheses regarding the relevance of the criteria for the commercial property market dynamics and the property professionals' answers to the questionnaire's reliability have been tested.

3.6.1. Justification of Application

In general, statistical approaches have been applied to analyse quantitative data when property market dynamics are compared (Brounen and Jennen, 2009; Clark and Bawden, 2011; Machek, 2012; Chen et al., 2014; Palm, 2015; Oyedokun et al., 2015; He et al., 2018). The comparative analysis has been used for the office property market in Sweden (Palm, 2015), in the UK (Oyedokun et al., 2015) and in Europe (Brounen and Jennen, 2009); for the retail market in central Europe (Machek, 2012), in China (Chen et al., 2014) and in the UK (Clark and Bawden, 2011); and for logistic space in the whole world (He et al., 2018). Grouping of data and its analysis has been used in non-parametric data tests for the housing market (Prochorskaite et al., 2016). The non-parametric tests can be applied to sample analysis, when there is a ranked observation. These tests include the descriptive and interpretive statistics that are suitable for comparing the samples.

In this study, the quantitative data has been analysed using descriptive and interpretive approaches to the statistics. Many studies analyse quantitative data using descriptive statistics models as "descriptive tasks consist of describing a large amount of data succinctly" (Bandyopadhyay and Forster, 2011, p. 41). Descriptive statistics have been applied to analyse: 1) commercial property rental values and capital values, 2) dynamics of economic, environmental and social data, and 3) ranked scales of criteria collected using the survey. This data has been presented as charts and compared as variables. Additionally, the ranked observations have been analysed using an interpretive statistics' non-parametric test. Non-parametric statistics are based on distribution-free parameters that are unspecified. This kind of statistical analysis includes descriptive and interpretive approaches. As the analysed data has the ranked scales and is freely distributed, the Mann-Witney U test, Post Hoc test (Bonferroni correction) and Cronbach Alpha coefficient of reliability have been used.

The process followed for the statistical analysis is shown below.

Figure 3-6. The process of statistical analysis application (source: Self -Study).

The data for determining the relevant countries has been analysed with these steps:

1) Reviewing commercial property dynamics in a number of countries across the world
2) Selection of the countries for the comparison
3) Selection of the economic, environmental and social criteria for those countries
4) Comparing the chosen countries' economic, environmental and social criteria dynamics
5) Making the questionnaire for the Survey
6) Testing the responces

Firstly, commercial property dynamics in the relevant countries have been reviewed using the literature. The comparable countries have been chosen and presented as charts and compared as variables. Secondly, the commercial property sector has been selected using the literature review. Finally, the selected countries' economic, environmental and social criteria dynamics have been presented as charts and compared as variables.

The questionnaire survey data has been imported from the Bristol Online Survey database and the coded responses have been transformed to a scale from one to six, in accordance with the ranks of significance. The transformed data has been tested with Cronbach`s Alpha Coefficient of reliability and Mann-Whitney U test.

Its steps of application are:

1) application of Cronbach`s Alpha
2) application of Mann-Whitney U test

Cronbach`s Alpha test

Cronbach's Alpha coefficient was chosen to assess the internal compatibility of the scale used in the survey, aiming to determine the relevance of the criteria for the dynamics of commercial property transactions

Cronbach's Alpha coefficient is used for assessing agreement among several quantitative variables (respondents or experts) that are assessing different situations or criteria (Pinto et al., 2014; Flynn et al., 1990). It was developed by Lee J. Cronbach (Cronbach, 1951).

Its steps of application are:

1) performing the matrix, where respondents are positioned in the matrix columns, and criteria are positioned in the matrix rows.
2) defining the sum of deviation of each row
3) calculating the total score of each respondent
4) calculating the correlation of each respondents

Coefficient alpha is a reliability coefficient calculated in an interval (Cronbach and Shavelson, 2004). The coefficient is a correlation with a possible range from 0 to 1.00.

Mann Whitney U test

The Mann Whitney U test was developed by Mann, Henry B. and Whitney, Donald R. (1947). This test is applied in order to determine if there are statistically significant differences in an independent variable between two groups.

Its steps of application are:

1) finding two samples for the comparison
2) estimating of the mean ranks and sum of rank
3) determination of whether there are statistically significant differences between two groups

The test helps determine each criterion's significance in accordance with the null hypothesis theory. The null hypothesis shows that there is no difference between two groups' ranked observations. Therefore, the test helps to reject or retain this hypothesis (Mann and Whitney, 1947).

In order to determine the stochastic dominance of the specific sample pairs, the Post Hoc test was used. The questionnaire survey resulted in many specific groups of the independent variable. In order to resolve the multiple comparison problem, the Bonferroni correction has been used as one of the post hoc tests suitable for comparing independent samples.

The Bonferroni correction was developed by Carlo Emilio Bonferroni (Bland and Altman, 1995).

Its steps of application are:

6) calculation of the number of comparable independents
7) calculation of mean differences, standard error and significances among the groups.

3.6.2. Equation

The descriptive and interpretive statistical equations that have been used in this research are shown below.

Descriptive statistics equations

The percentage changes have been calculated by taking the difference between the second and first values, then dividing this difference by the first value and multiplying the result by 100.

The percentage changes are calculated by the equation:

$$\%\Delta=\frac{\mathbf{V_2}-\mathbf{V_1}}{\mathbf{V_2}}x100\% \quad (19)$$

Where:

%Δ is the percentage change value

$\mathbf{V_2}$ is the second value

$\mathbf{V_1}$ is the first value

The index of dynamics in the property market is calculated by the equation:

$$\mathbf{i} = \mathbf{V_1} + \left(\mathbf{V_1}\left(\frac{\mathbf{V_2}}{\mathbf{100}}\right)\right) \quad (20)$$

Where:

i is the index of capital or market rental growth

$\mathbf{V_2}$is the second value of capital or market rental growth

$\mathbf{V_1}$is the first value of capital or market rental growth

For the interpretive statistics used for questionnaire survey analysis, the distribution of scores for each group of the independent variable has been measured using the mean and standard deviation.

The mean or average of the data series has been calculated by the equation:

$$\bar{x} = \frac{\sum_{i=1}^{N} x_i}{N} \quad (21)$$

Where:

$\bar{x}$ is mean of the observations

x_i is i^{th} observation

N is number of observations

The sum of all observations is divided by the number of observations. The mean shows where the centre of the distribution is.

The standard deviation of the data series has been calculated by the equation:

$$S = \sqrt{\frac{\sum_{i=1}^{N}(X_i - \bar{X})^2}{N-1}} \quad (22)$$

Where:

S is the standard deviation

X_i is ith observation

$\bar{x}$ is mean of the observations

N is number of observations

The standard deviation is the average distance between any point and the mean, and it shows how thin or squashed is the normal distribution, and whether it is the same for all the groups of variables. As the standard deviation has shown that the distribution of scores for each group of the independent variable does not have the same shape.

Interpretive statistics equations

Cronbach Alpha coefficient

The Cronbach Alpha coefficient is estimated by the equation:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum s_i^2}{s_T^2}\right) \quad (23)$$

Where:

α is Cronbach`s Alpha coefficient

k is the number of items

s_i^2 is the variance of ith item

$s_T^2$is the variance of total score T formed by summing all the items

The Mann Whitney U test has been performed using two equations for each group (sample):

$$U_x = n_x n_y \frac{n_x(n_x+1)}{2} - R_x \quad (24)$$

$$U_y = n_x n_y \frac{n_y(n_y+1)}{2} - R_y \quad (25)$$

Where:

U is the calculated test statistic

n_x is the number of observations in the first group

n_y is the number of observations in the second group

R_x is the sum of ranks assigned to the first group

R_y is the sum of ranks assigned to the second group

A higher U value provides stronger evidence for the null hypothesis that the differences between some of the results are statistically significant.

Post Hoc test

A significance level of 5% is the minimum requirement for the analysis of the probability of relationship among the independent variables. However, there are differences between the independent variables' probability when a single independent and many (family) independents are tested. Therefore, the Bonferroni correction has been used for the post hoc test as a family of independents are being analysed. The number of comparable independents can be calculated by the equation:

$$k\,(k\,-\,1)/2 \tag{26}$$

Where the k is the number of involved groups. The Bonferroni correction is calculated by the equation:

$$\alpha/k \tag{27}$$

α is alpha level (usually 0.05)

3.7. Data for the Research

Research objectives 1 and 3 have been carried out using the literature review. In order to achieve the research objectives that related to the countries' comparative analysis (objectives 2 and 4), the secondary data has been collected from a number of countries' statistics databases, Eurostat database, Morgan Stanley Capital International (MSCI) database. The primary data collection has been conducted through a questionnaire survey with professionals in the commercial property field in Germany, France, Sweden and the UK. The choice of these companies as a source of primary data is justified by the fact that their owners and employees have been working with commercial property in different markets and thus possess a lot of different information about those markets. To investigate economic 'booms and busts' that have had an impact on the property market, the respondents have been selected according to their job duties and connection to commercial property leasing and selling processes. The collected primary and secondary data have been used for achieving research objectives 5, 6 and 7.

3.8. Reliability and Validity

This study was conducted in accordance with the concept of data reliability (Chapter 5.3) and validity (Chapter 8). Every scientific research must meet these two criteria. Therefore, when scientific research lacks reliability, it cannot be valid. However, validity and reliability are two concepts that can exclude each other. This means that it is not possible to think in advance that the valid tests have high reliability. As the surveyed commercial property professionals work in different companies and in different countries, this provides different insights on the same subject and thus creates a concept of reliability. And the fact that the research used well-chosen methods, the justification of which is based on the literature

review, is confirmed by the concept of data validity as the research had links to the intended study metrics and their theoretical justification.

3.9. Ethical Considerations

The examples of non-ethical scientific behaviour include data production, falsification and plagiarism. All of these offences were avoided in this research. The survey participants were given full details of the investigation in advance, and their permission to use their data and their consent to participate in the study were requested. All names of the respondents and their workplaces were hidden. All respondents who participated in the survey after the entry into force of the General Data Protection Regulation were invited to participate in the survey only as referenced professionals.

Chapter 4. Data Collection and Results Discussion Stage 1: Dynamics of the commercial property market and its economic indicators

4.1. Introduction

This chapter deals with the dynamics of capital growth, market rental value growth, net reversionary yield and returns on commercial property in the UK, France, Germany and Sweden, as well as presenting statistical data on the economic condition of each of these countries. It also showcases the estimated dynamics of capital growth and the market rental value growth index. This index is calculated using equation (19) found in Chapter 3, the dynamics estimated over the period 2001 to 2017. The 2000 index amounts to 1 to allow explanation of dynamics as growth compared to the 2000 result. During this period, some of the most vivid dips in the dynamics of commercial property were seen because of the global crisis in 2007–2008. These dynamics are analysed to understand shifts in commercial property market indicators from country to country during an upturn and a downturn, and the positioning of economic statistical data at these times. Data regarding capital growth, market rental value growth, net reversionary yield and returns on commercial property, were taken from the MSCI database, the statistical data, from the Eurostat database. A summary and the sources of the indicators used for the purposes of the analysis, are presented below.

Table 4-1. Summary and sources of indicators used for the analyses.

Measurements	Unit of measurement	Source
Capital Growth	Percentage	MSCI
Capital Growth Index	Index	Calculated using equation (19). MSCI database.
Market Rental Value Growth	Percentage	MSCI
Market Rental Value Growth Index	Index	Calculated using equation (19). MSCI database.
Net Reversionary Yield	Percentage	MSCI
Return on commercial property	Percentage	MSCI
Gross domestic product	GDP growth (annual %)	Eurostat Database
Number of employed persons	Percentage of population	Calculated as Number of employed persons to Population ratio. Eurostat Database

Measurements	Unit of measurement	Source
International trade	Export to import ratio	Eurostat Database
Taxes	Euros per capita	Calculated as Taxes to Population ratio. Eurostat Database
Foreign direct investment	Inward, euros per capita	Calculated as Inward to Population ratio. Eurostat Database
Environmental taxes	Euros per capita	Calculated as Environmental taxes to Population ratio. Eurostat Database
GDP per capita	Euros per capita	Calculated as GDP to Population ratio. Eurostat Database
Social protection expenditure	Euros per capita	Calculated as Social protection expenditure to Population ratio. Eurostat Database
Government bond yields	Percentage	Eurostat Database
Unemployment	Percentage of active population	Eurostat Database

The indicators used for the purposes of the analysis include information relevant to the commercial property market. These are data that describe the dynamics and yield rates of both sale and rental markets. These data were gathered from a single source in order to have a reasonably objective level of comparability: the MSCI database. Economic condition indicators include information relevant to the economic, environmental and social landscape in each country. These data were also gathered from a single source to achieve a reasonably objective degree of comparability: the Eurostat database.

4.2. Dynamics of commercial property market and economic indicators for each country

This section contains data for each individual country.

4.1.1. The United Kingdom

Figure 4-1 displays the dynamics of commercial property capital growth and its index in the UK. This data shows that the indicator grew from 2001 to 2006, experiencing a visible drop in capital growth between 2006 and 2009. The lowest capital growth rate was observed in 2008 (-26.4%), the highest pre-crisis growth rate in 2006 (13.0%) the highest post-crisis growth rate in 2014 (14.1%). Capital growth rate was negative in 2012 (-2.5%) and in 2016 (-0.6%).

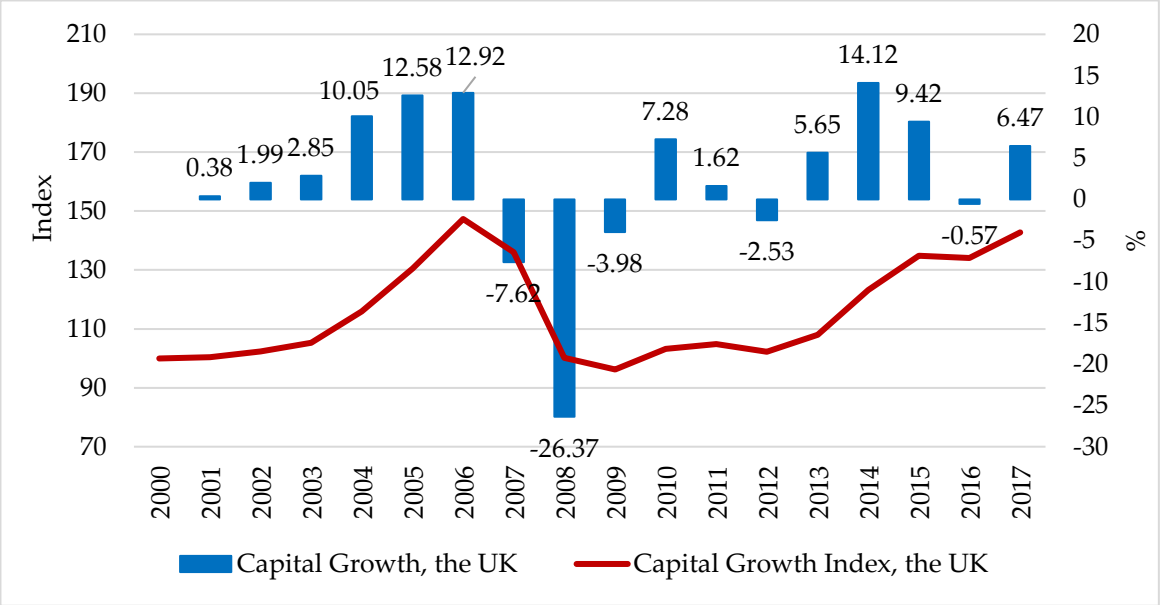


Figure 4-1. The Dynamics of the UK`s Capital Growth and its Index

The commercial property capital growth index in the UK shifts within the range +47.3 % and -3.8 %, compared to the 2000 baseline figure. The highest growth index was observed in 2006, the lowest in 2009. Since 2009, dynamics have been positive, the growth index standing at 42.8 % in 2017. Two minor dips were observed in 2013 and in 2016.

Figure 4-2 displays the dynamics of commercial property capital growth and its index in London. The dynamics in London followed a similar pattern to the UK overall, however, after the 2007–2009 recession, no negative capital growth was observed either in 2012 or 2016. The data presented in Figure 4-2 suggest that a significant decline in capital growth took place between 2006 and 2009. All of the indicators grew between 2001 and 2006. The lowest capital growth rate was observed in 2008 (-26.4%), the highest pre-crisis growth rate occurred in 2006 (14.9%), the highest post-crisis, in 2014 (17.2%).

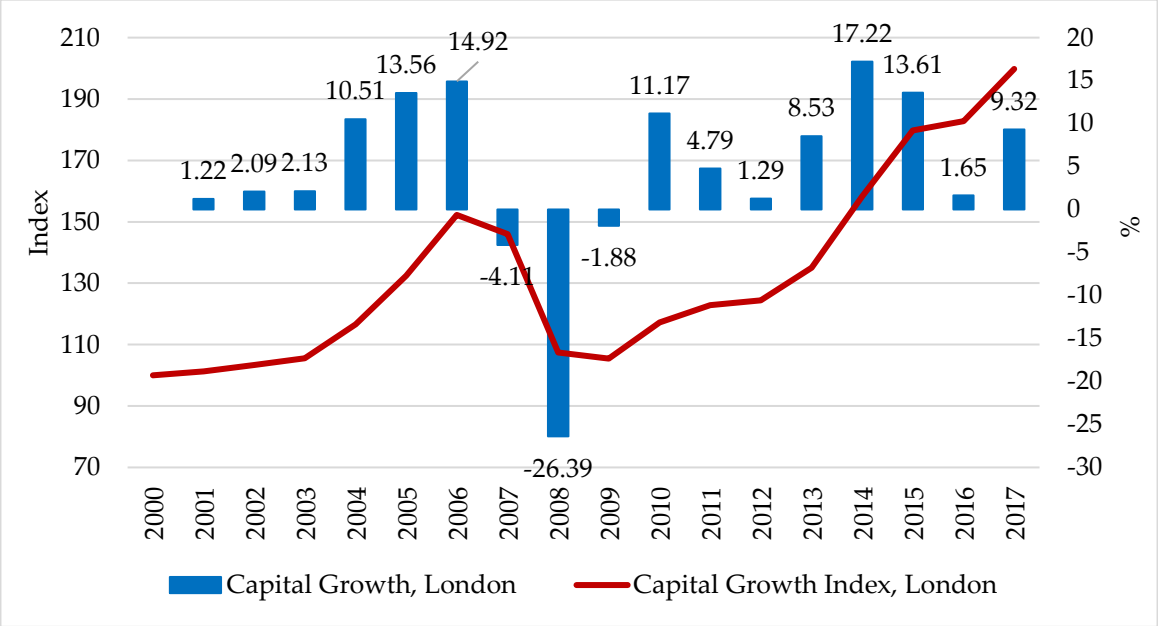


Figure 4-2. The Dynamics of the London`s Capital Growth and its Index

The index of London-based commercial property capital shifts within the range +99.8% to +5.4%, compared to the 2000 baseline figure. The largest increase was observed in 2017, the smallest in 2009. Since 2009, the dynamics of growth index have been positive, peaking in 2017. Some minor growth index retardations were observed in 2012 and in 2016.

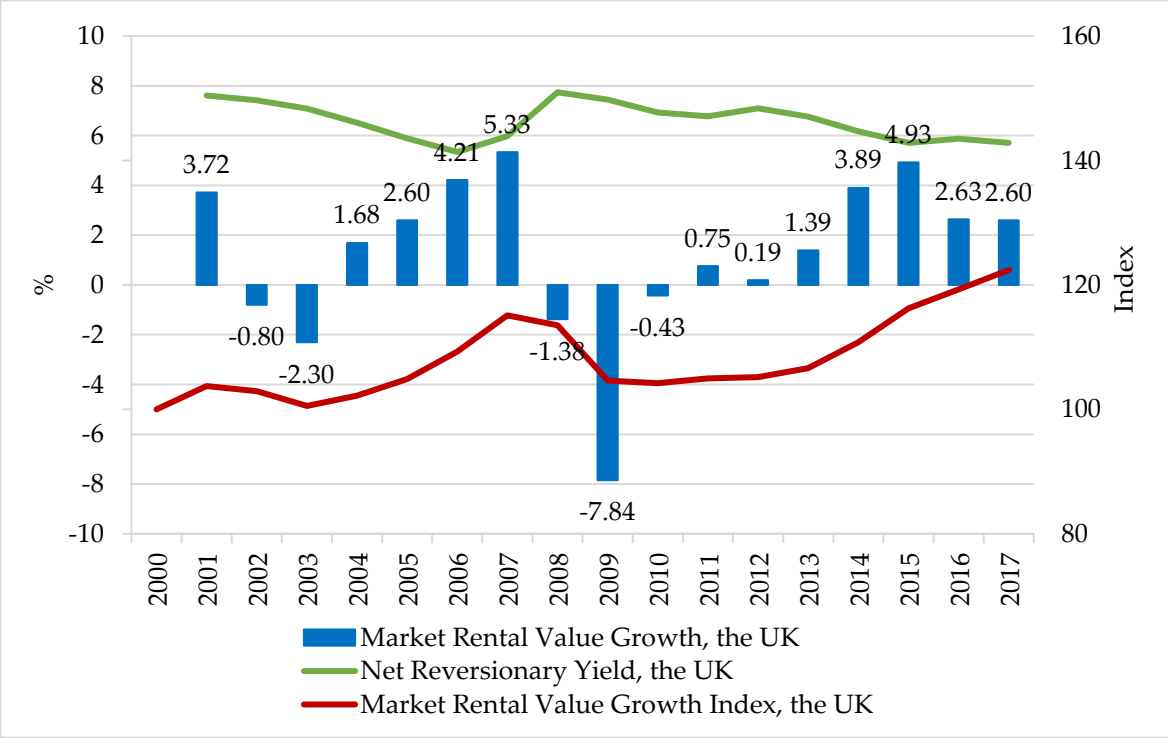


Figure 4-3. The Dynamics of the UK`s Market Rental Value Growth, its Index and Net Reversionary Yield

Figure 4-3 displays the dynamics of commercial property market rental value growth, its index and yield in the UK. The growth of indicators has been inconsistent since 2001. In 2002–2003, the market rental value growth rate was negative at -0.8% and -2.3%. An increase in growth rates was observed from 2004–2007 while yield was on the decline until 2006, standing at 5.3%. The market rental value growth rate became negative in 2008 (-1.4%). It was at its lowest in 2009 (-7.8%) but even in 2000, this indicator was negative (-0.4%). Yield peaked in 2008 (7.7%), but this was not sustained. The highest pre-crisis market rental value growth rate was observed in 2007 (5.33%), and post-crisis, in 2015 (4.9%). Yield reacted earlier and was at its lowest in 2006.

According to the indices, the largest increase in the rental market value growth index of commercial property in the UK was observed in 2017, the smallest in 2009. Since 2009, the dynamics have been positive, the growth index reaching 42.8 % in 2017. The commercial property rental market value growth index in the UK does not go beyond the 2000 baseline. The smallest growth was registered in 2003 (0.5 %). There was an upsurge of +15.1 % in 2007, compared to 2000, and a drop to +4.2 % in 2010, compared to 2000.

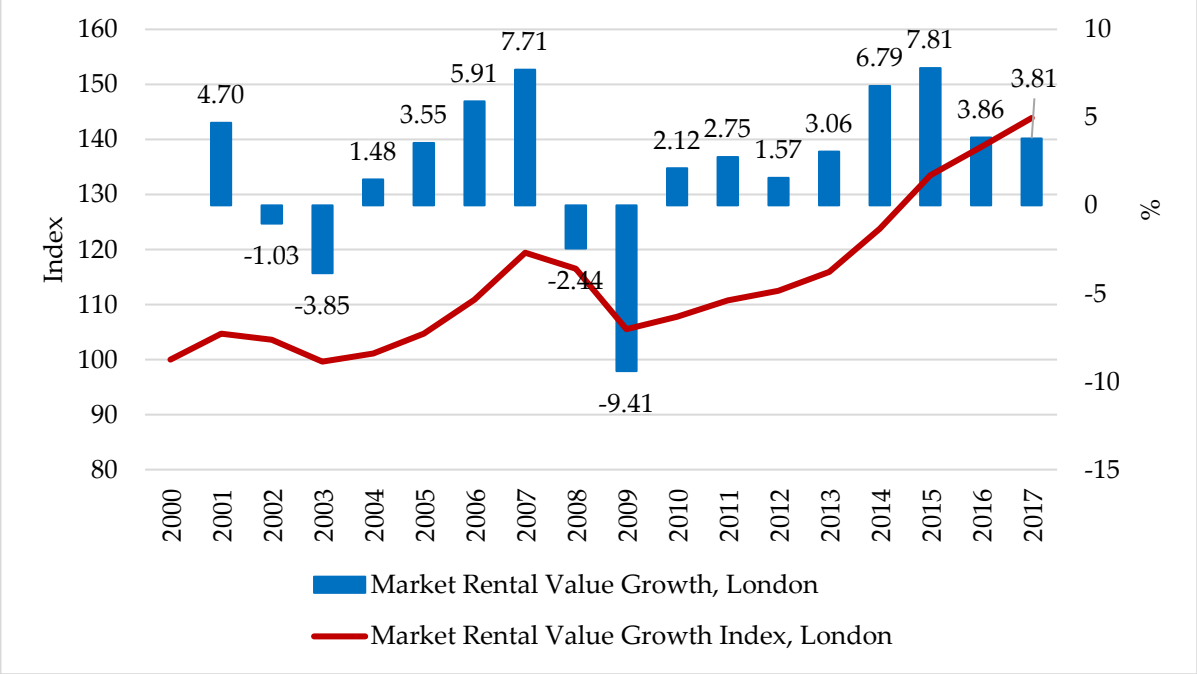


Figure 4-4. The Dynamics of London`s Market Rental Value Growth and its Index

Figure 4-4 displays the dynamics of commercial property market rental value growth and its index in London. The growth rate of this indicator was also inconsistent. In 2002–2003, market rental value growth rate was negative at -1.0% and -3.8%. An increase across all indicators was observed from 2004–2007. The growth of market rental values became negative again in 2008 (-2.4%). Capital growth rate was at its lowest in 2009 (-9.4%), the highest pre-crisis growth rate observed in 2007 (7.7%), and post-crisis, in 2015 (7.8%). However, after the 2008–2009 recession, no negative market rental value growth rate occurred in either 2012 or 2016. In London, the commercial property rental growth index shifted within the range +43.9 % and -0.4 %, compared to the 2000 baseline.

The largest increase was observed in 2017, the smallest in 2003. Between 2004 and 2007, the dynamics of growth indices were positive (19.4 %) but in 2009, there was a dip to +5.5 %, compared to 2000. Overall, the dynamics of growth indices were positive up to 2007 (14.9 %) after which there was a decline that continued until 2012. The growth index of commercial property rental market value in 2012 stood at +4.4 compared to 2000.

This analysis of commercial property indicators shows that market rental value fluctuations lagged behind those of capital and yield. While the capital growth rate was at its lowest in 2008, the growth rate of market rental values bottomed out in 2009.

The following is a description of economic condition indicators. Table 4-2 shows that some of the indicators followed a downward trend during downturns, climbing during an upturn but also that some moved in the opposite direction. Government bond yields and unemployment are presented separately. The rest of the indicators followed the directional shift of the cycle. Some lagged behind, some shifting sooner or later than the capital prices of other commercial property.

The data presented in Table 4-2 shows that the dynamics of returns on commercial property (-22.0%), the number of employed persons (45.9 % of population) and government bond yields (4.5%,) mirrors the 2008 downturn in capital growth. In contrast, gross domestic product (a -4.2 % change compared to the previous period in 2009), taxes per capita (8.8 EUR thousand in 2009), environmental taxes per capita (0.7 EUR thousand in 2009), gross domestic product at market price per capita (27.8 EUR thousand in 2009), social protection expenditure per capita (4.7 EUR thousand in 2009) and unemployment (8.1% in 2011), reacted later, after 2008. Data on inward FDI per capita are available for periods after 2013. This indicator was also slower to react (21.7 EUR thousand in 2015), whereas capital growth rate was at its highest in 2014. International trade (1.0 export/import ratio) remained consistent until 2011 during the period covered by this analysis, while the growth of capital prices was at its lowest in 2008, the growth of rental values at its lowest in 2009.

Table 4-2. The Dynamics of the UK`s Economic Indicators

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indicators that decreased during a crisis																	
Return on commercial property, %	7.4	9.2	10.0	17.1	19.1	18.7	-3.1	-22.0	3.2	14.2	7.8	3.3	11.9	20.2	14.7	4.1	11.4
Gross domestic product (GDP) at market prices, % change on the previous period	2.8	2.5	3.3	2.3	3.1	2.5	2.5	-0.3	-4.2	1.7	1.6	1.4	2.0	2.9	2.3	1.8	1.8
Number of employed persons, % of population	45.5	45.7	45.8	45.9	46.2	46.7	46.7	45.9	46.9	46.7	46.8	46.8	46.9	46.9	46.9	47.0	47.0
International trade (Export/Import ratio)	N/A	N/A	N/A	N/A	N/A	N/A	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Taxes per Capita, EUR thousand	10.0	10.0	9.6	10.5	11.1	11.7	12.2	10.9	8.8	9.7	10.0	10.7	10.5	11.4	13.1	12.1	11.9
Inward FDI per Capita, EUR thousand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.1	20.6	21.7	21.4	20.4
Environmental taxes per capita, EUR thousand	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.0	0.9	0.8

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross domestic product at market prices per capita, EUR thousand	30.8	31.8	30.4	32.4	33.7	35.5	36.9	32.2	27.8	29.6	30.1	32.9	32.5	35.6	40.3	36.8	35.5
Social protection expenditure per capita, EUR thousand	4.2	4.4	4.4	4.8	4.9	5.0	5.3	4.8	4.7	5.0	5.0	5.6	5.4	5.8	6.5	5.8	5.4
Indicators that increased during a crisis																	
Government bond yields, %	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.5	3.4	3.4	2.9	1.7	2.0	2.1	1.8	1.2	1.2
Unemployment, % of active population	5.0	5.1	5.0	4.7	4.8	5.4	5.3	5.6	7.6	7.8	8.1	7.9	7.5	6.1	5.3	4.9	4.4

4.1.2. France

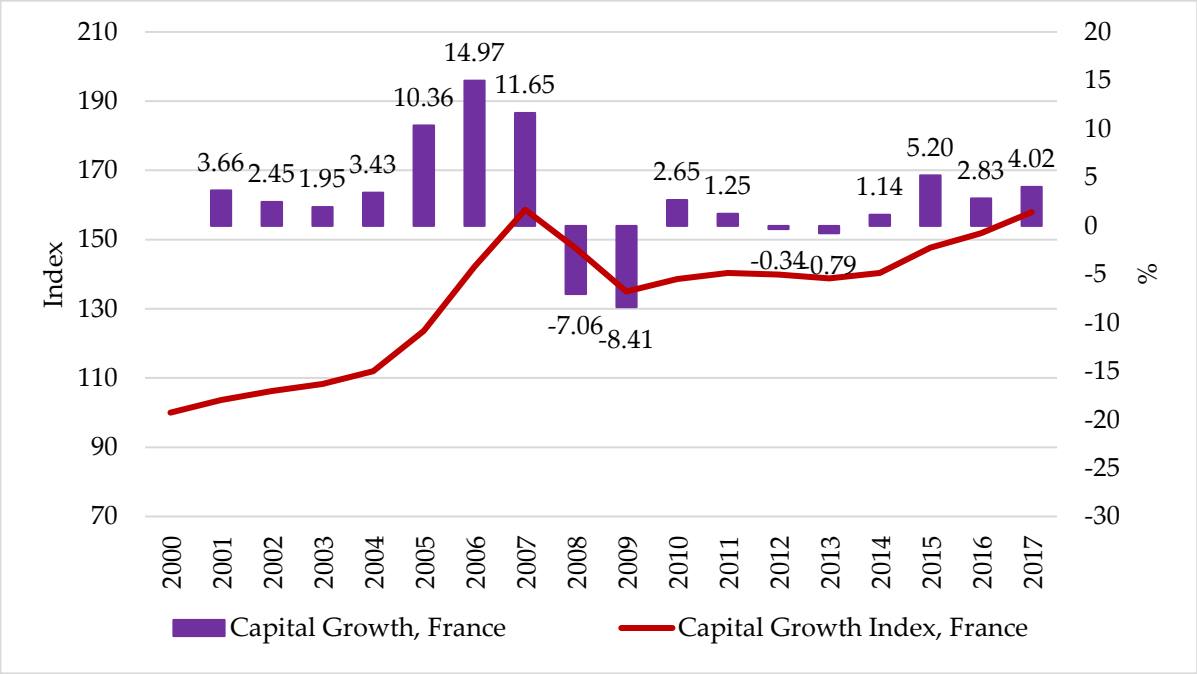


Figure 4-5. The Dynamics of France`s Capital Growth and its Index

Figure 4-5 displays the dynamics of commercial property capital growth and its index in France. All indicators grew from 2001 through to 2006, followed by a pronounced dip in capital growth rates in 2008–2009. The lowest capital growth rate was observed in 2009 (-8.4%), the highest pre-crisis growth rate recorded in 2006 (15%), and post-crisis, in 2015 (5.2%). The capital growth rate after the crisis was negative in 2012–2013 at -0.3% and -0.8%, respectively.

The dynamics of the French commercial property capital growth index point grew throughout the entire period, never dropping below the 2000 level. The largest increase was seen in 2007, the smallest in 2001, compared to the 2000 baseline figure. In 2009, a drop from 58.6 to 35.0 % compared to 2007, can be observed. The 2017 result is a 57.9 % growth compared to the baseline year).

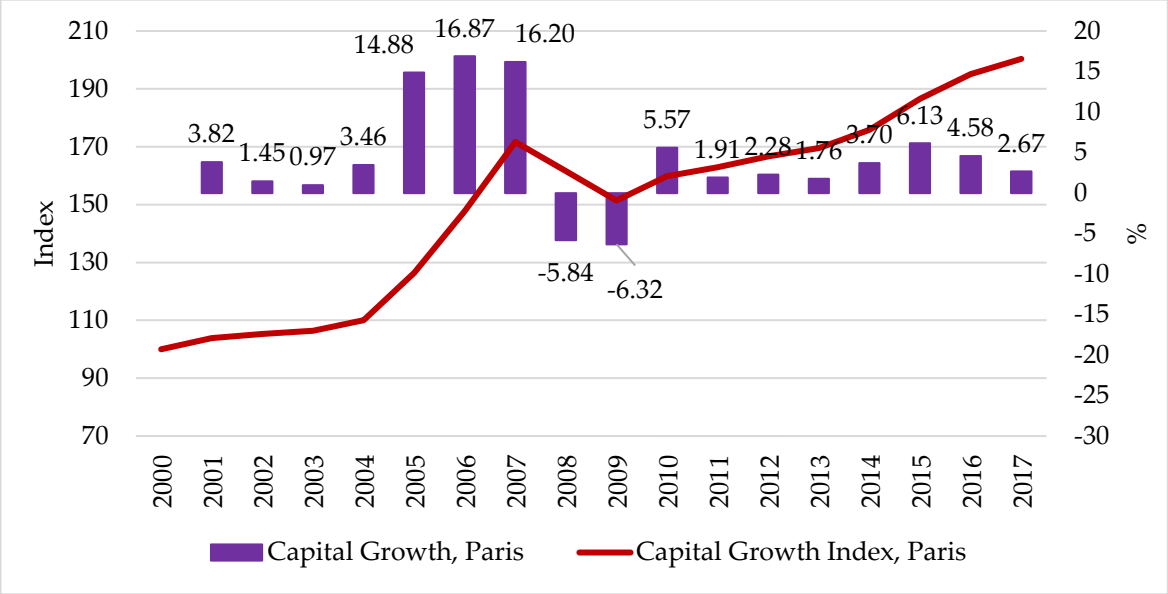


Figure 4-6. The Dynamics of Paris`s Capital Growth and its Index

Figure 4-6 displays the dynamics of commercial property capital growth and its index in Paris. The dynamics of capital growth followed a similar pattern as that of France in general in that since 2001, all indicators grew through to 2006. After the 2008–2009 downturn, there was no negative capital growth rate in either 2012 or 2013. The capital growth rate was at its lowest in 2009 (-6.3%), the highest pre-crisis growth rate recorded in 2006 (16.9%), and post-crisis, in 2015 (6.1%).

The largest growth index in Paris was observed in 2017 (100.3%), compared to the 2000 baseline. Another upsurge was seen in 2007 (71.7%), as well as a drop to 51.4%, compared to 2000, in 2009. Since 2009, the dynamics of capital growth index have been positive, peaking in 2017.

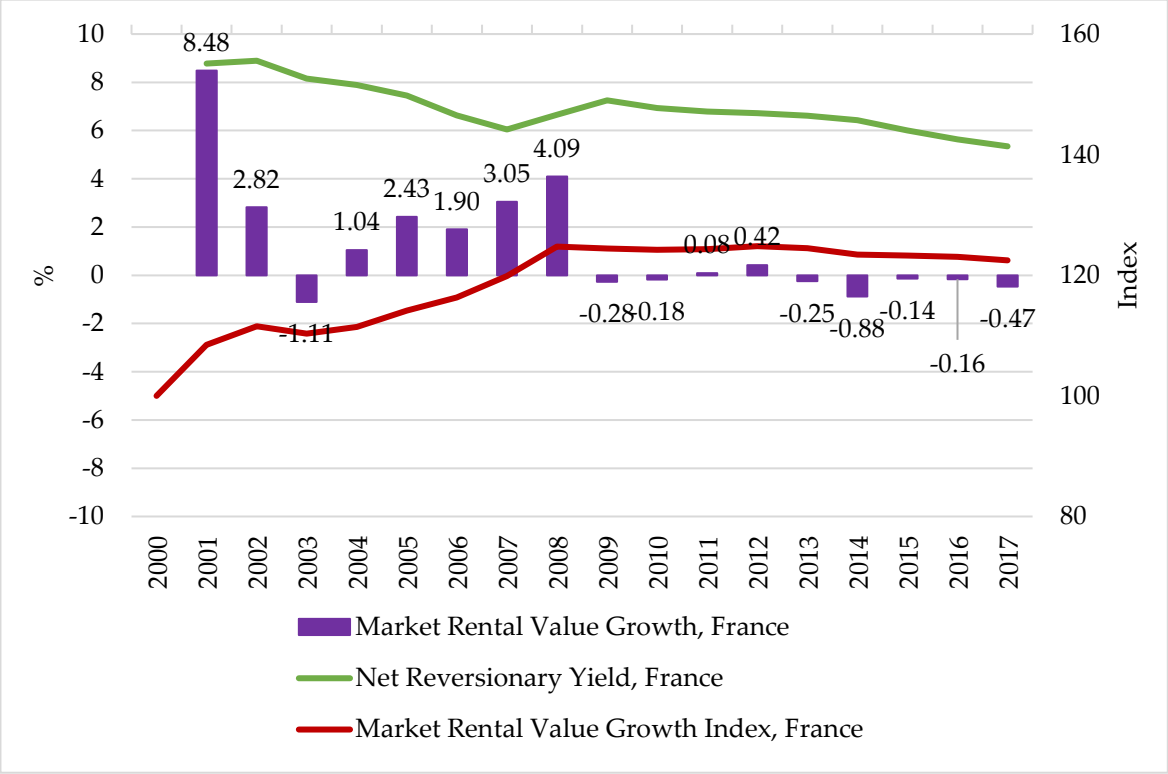


Figure 4-7. The Dynamics of France`s Market Rental Value Growth, its Index and Net Reversionary Yield

Figure 4-7 displays the dynamics of commercial property market rental value growth, its index and yield in France. The growth of these indicators has been inconsistent since 2001. The lowest market rental value growth rate was observed in 2003 (-1.1%). An increase in market rental values can be observed in 2004–2008, while yield was on the decrease through to 2007, levelling out at 6.04%. The growth of market rental values became negative in 2009–2010 (-0.3% and -0.2%, respectively). This growth continued in a negative direction after the crisis from 2013 to 2017, yield also following a downward trend throughout the period of analysis. The highest rate was observed in 2002 (8.9%), the lowest, in 2017 (5.3%). Before the global economic crisis, yield stood at 6.0% in 2007. The highest pre-crisis market rental value growth rate was in 2008 (4.1%), and post-crisis, in 2012 (0.4%).

According to the indices, the dynamics of French commercial property rentals grew throughout this period and did not go below the 2000 baseline. The largest increase was observed in 2012 (24.8%), the smallest in 2001 (8.5%), compared to the 2000 baseline. Since 2008, the growth index of commercial property rental market values in France has been stable, standing at more than 20 per cent above 2000 rental rates.

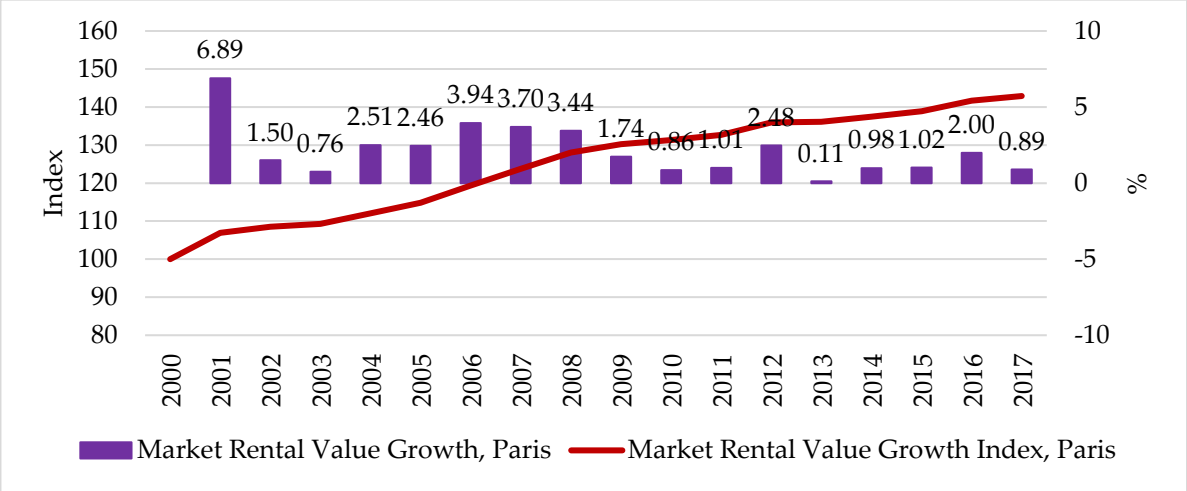


Figure 4-8. The Dynamics of Paris`s Market Rental Value Growth and its Index

Figure 4-8 displays the dynamics of commercial property market rental value growth and its index in Paris. Since 2001, the growth of indicators has been uneven, but always positive. Before the 2008 crisis, the lowest market rental value growth rate was recorded in 2003 (0.8%). During the crisis, the growth rate started to drop in 2009 (1.7%), going as low as 0.9% in 2010. After 2008, values varied in a negative direction reflecting declining growth. The lowest growth figure was observed in 2013 (0.1%), the highest post-crisis market rental value growth rate recorded in 2012 (2.5%). The commercial property rental market value index in Paris grew consistently across the period 2000 to 2017, the largest increase observed in 2017 (42.9 %), compared to the 2000 baseline.

The analysis of commercial property indicators in France shows that market rental value fluctuations lagged slightly behind those of capital prices and yield. The growth rate of market rental values and capital was the lowest in 2009 for the whole country, while the lowest market rental value growth rate in the capital city was at its lowest in 2013. A description of economic condition indicators is given below.

The data presented in Table 4-4 shows that the dynamics for returns on commercial property (-2.2%), gross domestic product (-2.9 % change on the previous period), taxes per capita (4.8 EUR thousand), environmental taxes per capita (0.56 EUR thousand), gross domestic product at market prices per capita (30.1 EUR thousand) and government bond yields (3.65%), mirror the decline in the growth rates of capital and market rental values in 2009. The number of employed (42.32 % of the population in 2011) and unemployed persons (9.30% in 2010), shifted after 2009. The inward FDI per capita data are available for periods after 2013, according to which, this indicator has been growing at an even rate, the post-crisis growth rate of capital and market rental values at its highest in 2016.

Table 4-3. The Dynamics of France`s Economic Indicators

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indicators that decreased during a crisis																	
Return on commercial property, %	11.6	10.5	9.7	11.2	18.3	22.4	18.3	-1.4	-2.2	9.3	7.6	5.9	5.4	7.2	11.2	8.2	9.2
Gross domestic product (GDP) at market prices, % change on the previous period	2.0	1.1	0.8	2.8	1.7	2.4	2.4	0.3	-2.9	1.9	2.2	0.3	0.6	1.0	1.1	1.1	2.3
Number of employed persons, % of population	41.6	42.0	42.4	42.4	42.4	42.3	42.3	42.4	42.6	42.5	42.3	42.5	42.4	42.1	42.0	41.9	41.9
International trade (Export/Import ratio)	N/A	N/A	N/A	N/A	N/A	N/A	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Taxes per Capita, EUR thousand	5.0	4.9	4.9	5.3	5.3	5.3	5.4	5.4	4.8	5.3	5.3	5.5	5.8	5.7	5.9	5.9	6.2
Inward FDI per Capita, EUR thousand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.4	8.7	9.5	10.1	10.9
Environmental taxes per capita, EUR thousand	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross domestic product at market prices per capita, EUR thousand	25.2	25.9	26.4	27.4	28.1	29.2	30.5	31.1	30.1	30.9	31.7	32.0	32.3	32.5	33.1	33.5	34.4
Social protection expenditure per capita, EUR thousand	5.1	5.4	5.6	5.8	6.0	6.3	6.6	6.8	7.1	7.3	7.5	7.7	7.9	8.0	8.0	8.2	8.3
Indicators that increased during a crisis																	
Government bond yields, %	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.23	3.65	3.12	3.32	2.54	2.2	1.67	0.84	0.47	0.81
Unemployment, % of active population	7.8	7.9	8.5	8.9	8.9	8.8	8	7.4	9.1	9.3	9.2	9.8	10.3	10.3	10.4	10.1	9.4

International trade (0.9 export/import ratio) dropped substantially in 2011, while capital price and market rental value growth rates were at their lowest in 2009. At the same time, social protection expenditure per capita grew without variation throughout the whole period.

4.1.3. Germany

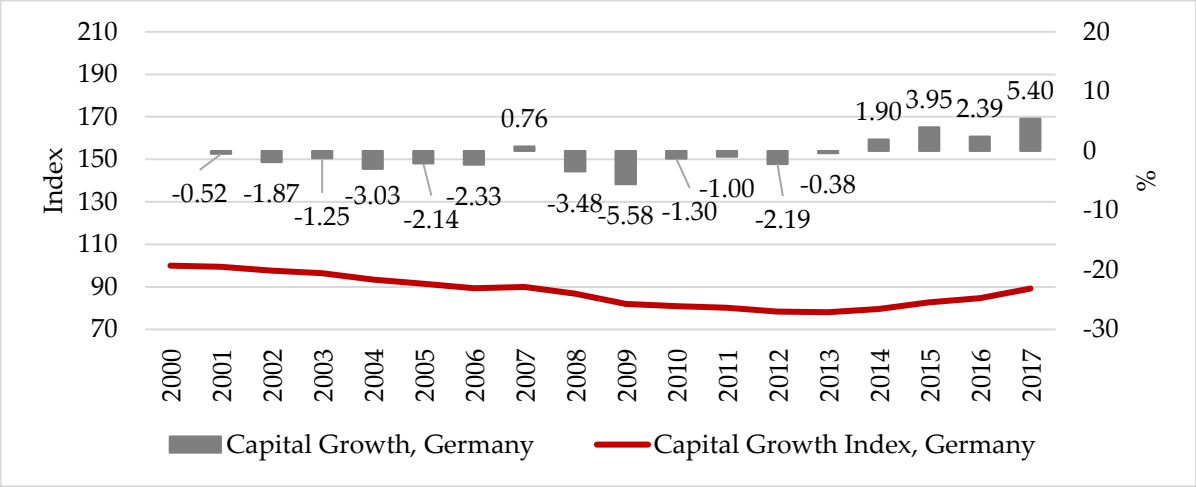


Figure 4-9. The Dynamics of Germany`s Capital Growth and its Index

Figure 4-9 displays the dynamics for commercial property capital growth and its index in Germany. The capital growth curve in Germany differs from those discussed above. Between 2001 and 2007, capital growth was negative. It is only in 2007, that a positive growth rate of up to 0.8% was observed. However, the biggest decline in capital growth occurred in 2009 (-5.6%), i.e. during the crisis. The highest capital growth rate was recorded in 2017 (5.4%). Capital growth after the crisis was negative until 2014.

The dynamics of the commercial property capital growth index in Germany, follows a downward trend throughout the period, decreasing by 21.9 % in 2013 compared to 2000. Since 2013, a tendency for minor growth can be seen up to 2017, amounting to 10.7 %, compared to the baseline year.

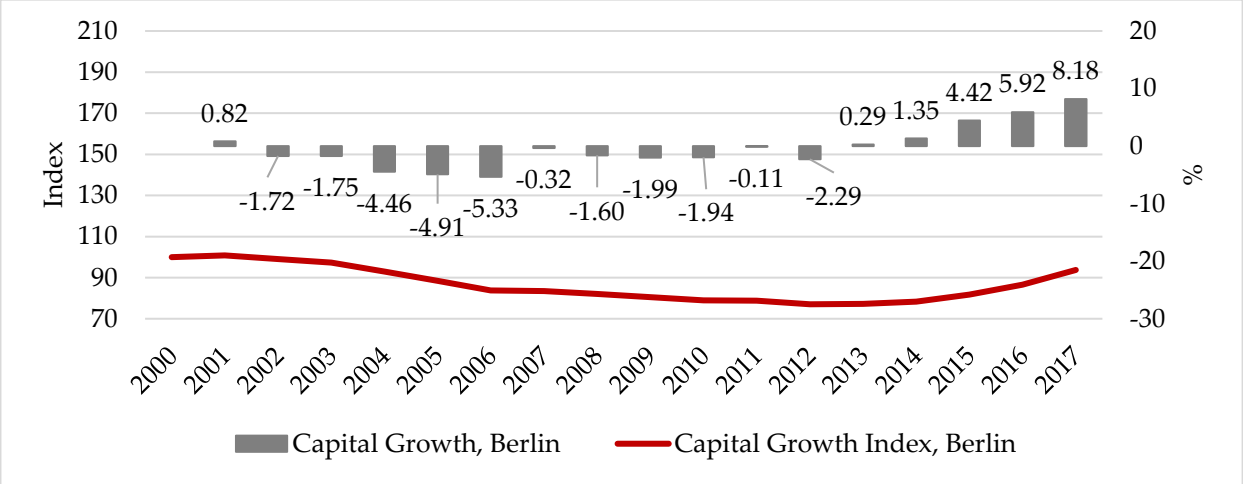


Figure 4-10. The Dynamics of Berlin`s Capital Growth and its Index

Figure 4-10 displays the dynamics of commercial property capital growth and its index in Berlin, seen to follow a similar pattern to that in Germany in general. Capital growth stayed negative between 2002 and 2013. The capital growth rate was at its lowest in 2006 (-5.3%) and highest in 2017 (8.2%). During the 2008–2009 recession, negative capital growth rate varied between -1.6% and -2%.

The growth index of Berlin commercial property capital shifts within the range +0.8 % and -23.0 %, compared to the 2000 baseline. The largest increase was observed in 2001, the smallest in 2012. From 2012, growth increased up to 2017.

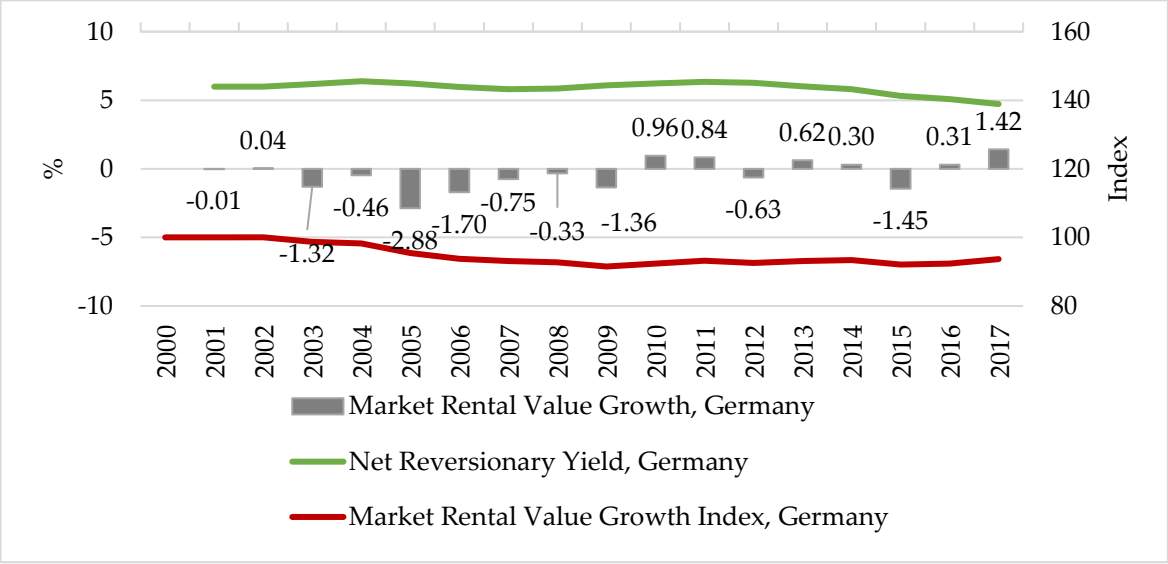


Figure 4-11. The Dynamics of Germany`s Market Rental Value Growth, its Index and Net Reversionary Yield

Figure 4-11 displays the dynamics for commercial property market rental value growth, its index and yield in Germany. Market rental value growth was negative between 2003 and 2010, its growth at its lowest in 2005 (-2.9%). The lowest pre-crisis yield was recorded in 2007 (5.8%). The market rental value growth rate became positive in 2010–2011 (1% and 0.8%, respectively). The lowest yield was registered in 2017 (4.7%), the highest in 2004 (6.4%).

According to the indices, Germany's commercial property rentals dynamics were on the decline throughout the period, shifting within the range +0.03 % in 2002 and at -8.5 % in 2009, compared to 2000. Since 2011, there was a minor improvement that continued until 2014, compared to the baseline.

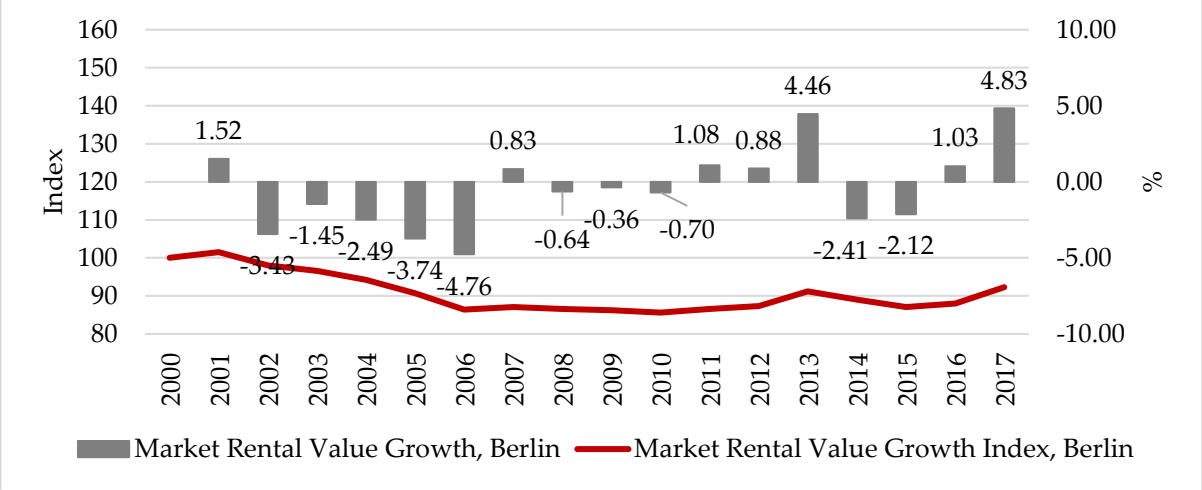


Figure 4-12. The Dynamics of Berlin`s Market Rental Value Growth and its Index

Figure 4-12 displays the dynamics for commercial property market rental value growth and its index in Berlin. The growth rate of the indicators were negative between 2002 and 2007, the highest negative result observed in 2006 (-4.8%). In 2007, market rental value growth was positive (0.8%). During the crisis, the growth rate started on a downward path in 2008 (-0.6%), reaching -0.7% in 2010. After that, the market rental value growth rate remained positive until 2014. In 2014–2015, market rental growth became negative again, -2.4% and -2.1%, respectively. The highest post-crisis market rental value growth rate was recorded in 2017 (4.8%).

The growth of commercial property rental market value indices in Berlin, shifted within the range +1.5 % and -14.4 %, compared to the 2000 baseline. The largest increase was observed in 2001, followed by a decline in 2010. In 2013, there was an increase to -8.8%, compared to 2000. A drop was observed in 2015 and in 2016.

A description of economic condition indicators is given below.

Table 4-4. The Dynamics of Germany`s Economic Indicators

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indicators that decreased during a crisis																	
Return on commercial property, %	11.6	10.5	9.7	11.2	18.3	22.4	18.3	-1.4	-2.2	9.3	7.6	5.9	5.4	7.2	11.2	8.2	9.2
Gross domestic product (GDP) at market prices, % change on the previous period	2.0	1.1	0.8	2.8	1.7	2.4	2.4	0.3	-2.9	1.9	2.2	0.3	0.6	1.0	1.1	1.1	2.3
Number of employed persons, % of population	41.6	42.0	42.4	42.4	42.4	42.3	42.3	42.4	42.6	42.5	42.3	42.5	42.4	42.1	42.0	41.9	41.9
International trade (Export/Import ratio)	N/A	N/A	N/A	N/A	N/A	N/A	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Taxes per Capita, EUR thousand	5.0	4.9	4.9	5.3	5.3	5.3	5.4	5.4	4.8	5.3	5.3	5.5	5.8	5.7	5.9	5.9	6.2
Inward FDI per Capita, EUR thousand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.7	9.5	10.1	10.9
Environmental taxes per capita, EUR thousand	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross domestic product at market prices per capita, EUR thousand	25.2	25.9	26.4	27.4	28.1	29.2	30.5	31.1	30.1	30.9	31.7	32.0	32.3	32.5	33.1	33.5	34.4
Social protection expenditure per capita, EUR thousand	5.1	5.4	5.6	5.8	6.0	6.3	6.6	6.8	7.1	7.3	7.5	7.7	7.9	8.0	8.0	8.2	8.3
Indicators that increased during a crisis																	
Government bond yields, %	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.0	3.2	2.7	2.6	1.5	1.6	1.2	0.5	0.1	0.3
Unemployment, % of active population	7.8	8.6	9.7	10.4	11.2	10.1	8.5	7.4	7.6	7.0	5.8	5.4	5.2	5.0	4.6	4.1	3.8

The data presented in Table 4-5 show that the dynamics for the return on commercial property (0.04%), gross domestic product (-5.6% change on the previous period), taxes per capita (3.5 EUR thousand), gross domestic product at market prices per capita (30.0 EUR thousand) and unemployment (7.6%), mirrors the decline in the capital and market rental value growth rates in 2009. At the same time, the number of employed persons (47.6% of population in 2010), environmental taxes per capita (0.7 EUR thousand in 2004–2010), and government bond yields (1.1% in 2011), reacted later, after 2009. The data on inward FDI per capita show this indicator to have grown evenly, the capital and market rental value growth after the crisis, reaching its peak in 2017. International trade (1.1 - export/import ratio) was on the decrease in 2010–2011, whereas capital growth and one of the market rental value growth rates was lowest in 2009. Social protection expenditure per capita grew across the period evenly.

4.1.4. Sweden

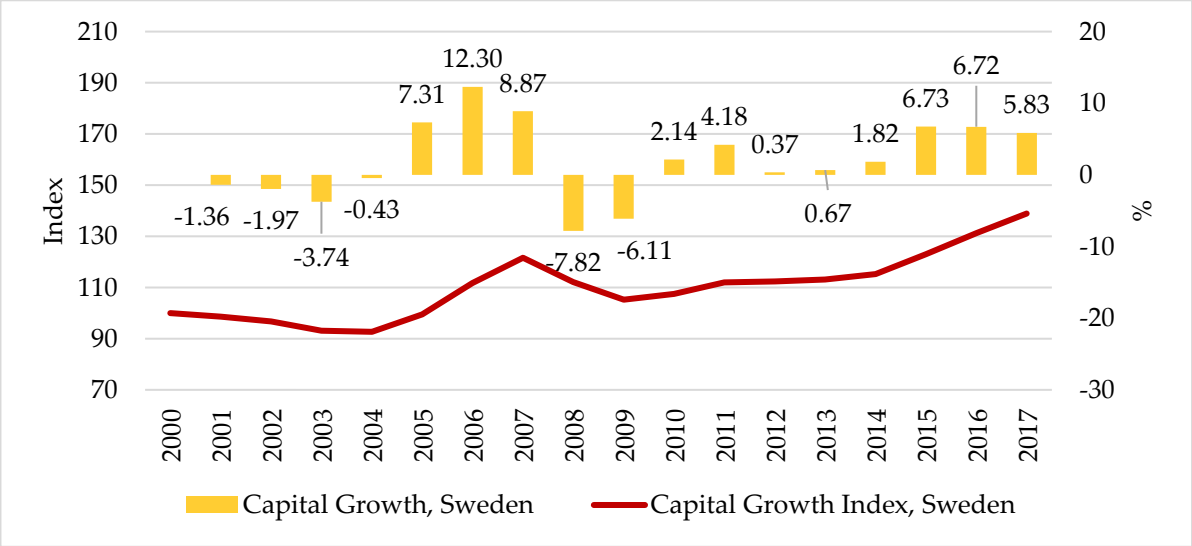


Figure 4-13. The Dynamics of Sweden`s Capital Growth and its Index

Figure 4-13 displays the dynamics of commercial property capital growth and its index in Sweden. The data presented in Figure 4-13 show a visible drop in capital growth in 2008–2009. Negative growth of the indicators is observed between 2001 and 2005. In 2005–2007, capital growth became positive, the 2006 growth figure (12.3%) the highest growth rate in the period covered by this analysis. The highest post-crisis growth rate was observed in 2015–2016 (6.7%). Capital growth rate was at its lowest in 2008 (-7.8%). In Sweden, the growth index of commercial property capital varies within the range +38.9% to -7.3%, compared to the 2000 baseline. The largest increase can be observed in 2017, the smallest in 2004. A minor decline was observed in 2009.

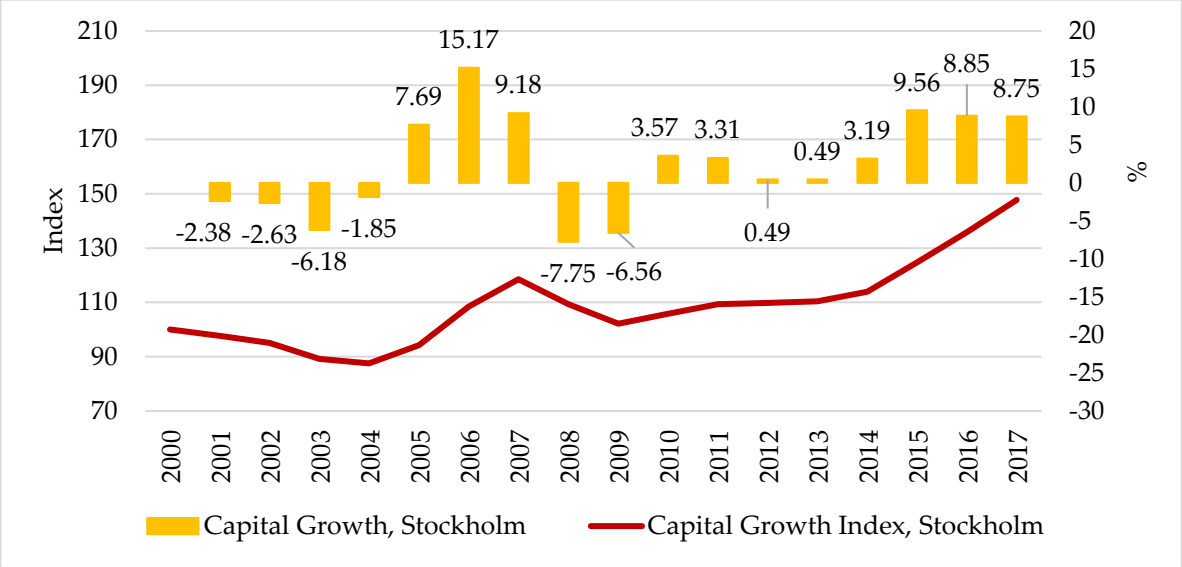


Figure 4-14. The Dynamics of Stockholm`s Capital Growth and its Index

Figure 4-14 displays the dynamics for commercial property capital growth and its index in Stockholm where it can be seen that capital dynamics followed a similar pattern, with negative indicator growth observed from 2001 until 2005. In 2005–2007, the capital growth rate became a positive figure, peaking in 2006 (15.2%). The highest post-crisis growth rate was registered in 2015 (9.6%), the lowest capital growth rate in 2008 (-7.7%). The growth index of commercial property capital in Stockholm varies within the range +47.7 % and -12.5 %, compared to the 2000 baseline.

The largest increase was observed in 2017, the smallest in 2004. Since 2006, the dynamics of growth index have been positive, peaking in 2017. A decline was observed in 2009 and in 2014, neither dipping below the 2000 baseline figure.

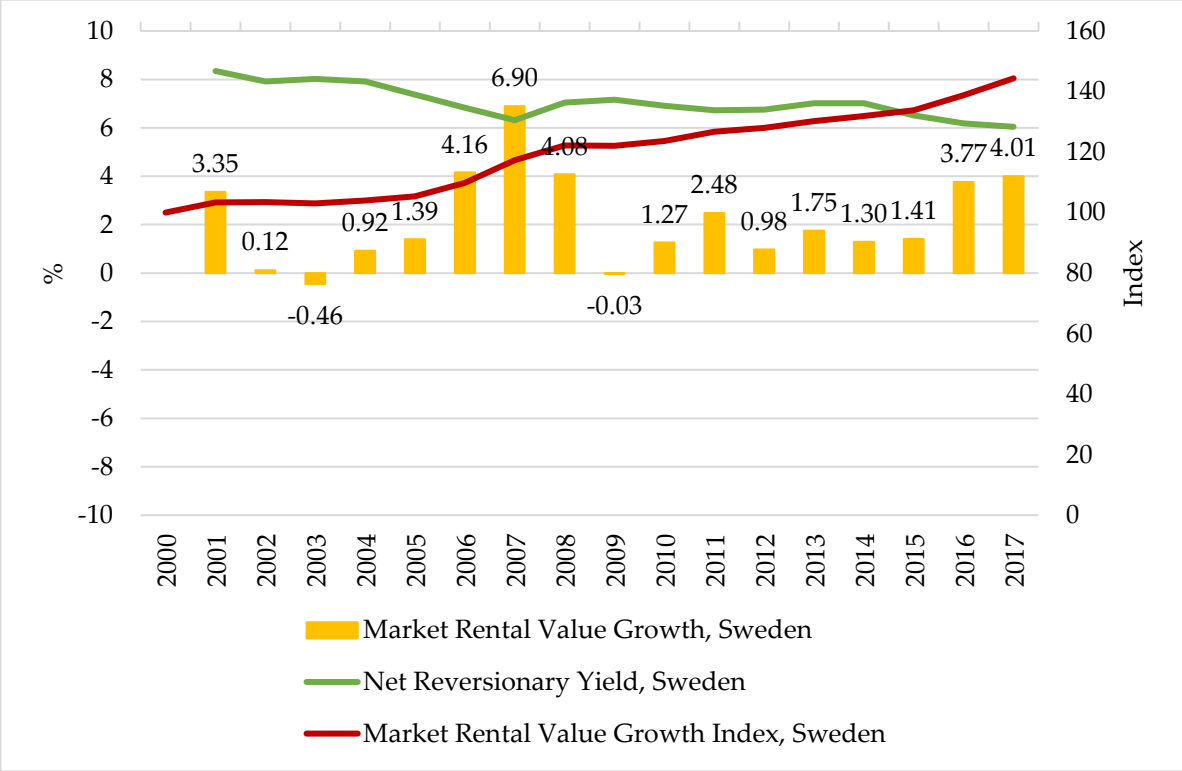


Figure 4-15. The Dynamics of Sweden`s Market Rental Value Growth, its Index and Net Reversionary Yield

Figure 4-15 displays the dynamics of commercial property market rental value growth, its index and yield in Sweden. The growth of market rental value indicators has been inconsistent since 2001. In 2003, market rental value growth was negative (-0.5%), yield also on the decline until 2007, standing at 6.3%. Market rental value growth became negative in 2009 (-0.03%). The market rental value growth rate was at its lowest in 2003, its highest in 2007 (6.9%), yield reaching its peak in 2001 (8.3%). The highest post-crisis market rental value growth rate was observed in 2017 (4.0%). In contrast, yield was at its lowest in 2017 (6.0%).

According to the indices, the growth index of commercial property rentals in Sweden was positive throughout the period of analysis, shifting within a range of +3.0 % in 2003 and +44.3 % in 2017, compared to the 2000 baseline. There was also an upsurge in 2008 (22.1 %).

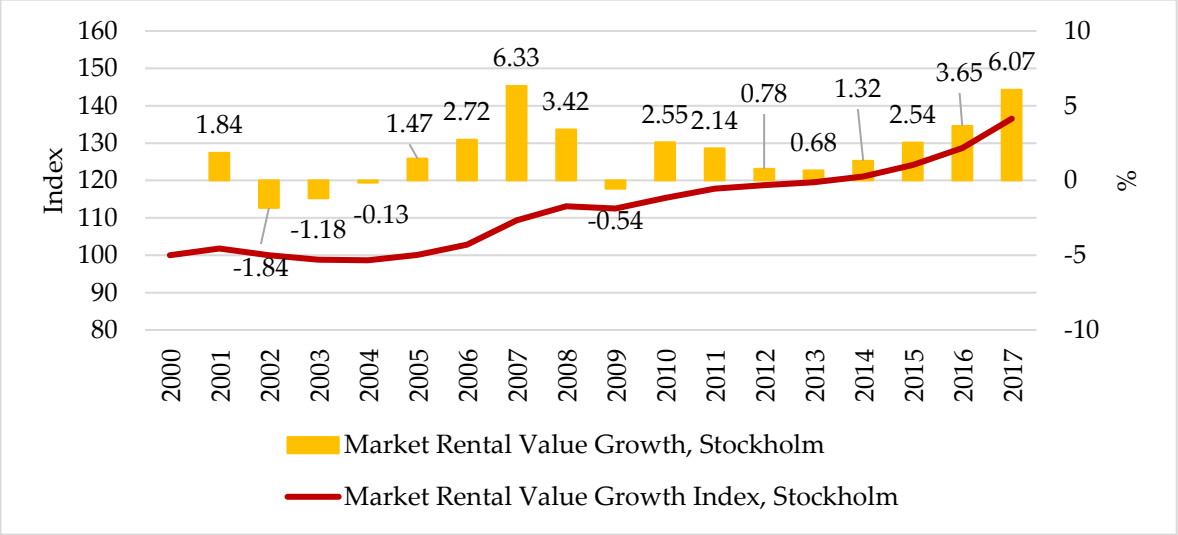


Figure 4-16. The Dynamics of Stockholm `s Market Rental Value Growth and its Index

Figure 4-16 displays the dynamics of commercial property market rental growth and its index in Stockholm. The data presented in Figure 4-16, point to a significant drop in market rental growth in 2002–2004. In 2002, this dip amounted to -1.8%. In 2005–2008, market rental growth became positive, reaching its peak in 2007 (6.3%). The highest post-crisis growth rate was observed in 2017 (6.1%). During the crisis, market rental growth stood at -0.5% in 2009.

The growth index of commercial property rental market values in Stockholm shifts within the range +36.5 % and -1.3 %, compared to the 2000 baseline. The largest increase was observed in 2017, the smallest in 2004. Since 2006, the dynamics of growth have been positive, peaking in 2017. There was a dip observed in 2009, down to 12.5 % growth compared to 2000.

A description of economic condition indicators is given below. During the crisis, Sweden's capital growth rate was negative in 2008, its market rental growth rate also negative in 2009.

Table 4-5. The Dynamics of Sweden`s Economic Indicators

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Indicators that decreased during a crisis																	
Return on commercial property, %	4.8	4.3	2.4	6.1	14.3	19.0	14.7	-2.6	-0.4	8.3	10.2	6.4	6.8	7.8	12.6	12.1	11.1
Gross domestic product (GDP) at market prices, % change on the previous period	1.6	2.1	2.4	4.3	2.8	4.7	3.4	-0.6	-5.2	6.0	2.7	-0.3	1.2	2.6	4.5	2.7	2.1
Number of employed persons, % of population	48.4	48.5	48.6	48.5	49.1	49.5	49.8	49.8	49.6	49.5	49.8	49.9	50.0	50.0	49.9	50.0	50.1
International trade (Export/Import ratio)	N/A	N/A	N/A	N/A	N/A	N/A	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Taxes per Capita, EUR thousand	8.5	8.6	9.0	9.4	10.0	10.7	11.2	10.5	9.1	10.8	11.5	11.8	12.1	11.9	12.6	13.2	13.4
Inward FDI per Capita, EUR thousand	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	29.8	27.4	29.4	29.0	29.6
Environmental taxes per capita, EUR thousand	0.8	0.9	0.9	0.9	0.9	1.0	1.0	1.0	0.9	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0

Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross domestic product at market prices per capita, EUR thousand	30.2	31.5	32.9	34.3	34.8	37.1	39.2	38.4	33.5	39.6	43.1	44.7	45.6	44.9	46.1	47.0	47.5
Social protection expenditure per capita, EUR thousand	6.6	7.0	7.6	7.7	7.7	7.9	7.9	7.7	7.3	8.2	8.6	9.3	9.7	9.3	9.4	9.7	9.6
Indicators that increased during a crisis																	
Government bond yields, %	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.9	3.3	2.9	2.6	1.6	2.1	1.7	0.7	0.5	0.7
Unemployment, % of active population	5.8	6.0	6.6	7.4	7.7	7.1	6.1	6.2	8.3	8.6	7.8	8.0	8.0	7.9	7.4	6.9	6.7

The data presented in Table 4-5 show that the dynamics for the return on commercial property (-2.6%), international trade (1.1 - Export/Import ratio) and government bond yields (3.9%), mirror the 2008 decline in capital growth. The dynamics of gross domestic product (-5.2% change on the previous period in 2009), taxes per capita (9.1 EUR thousand in 2009), environmental taxes per capita (0.9 EUR thousand in 2009), gross domestic product at market prices per capita (33.5 EUR thousand in 2009) and social protection expenditure per capita (7.3 EUR thousand in 2009), also follow the decrease in market rental value growth that took place in 2009. The number of employed (49.5% of the population) and unemployed persons (8.6% in 2010) shifted later, after 2008–2009. Inward FDI data are available for periods after 2013. This indicator was also slower to react (27.4 EUR thousand in 2014), the growth of capital during the 2013–2017 period was at its peak in 2015.

4.3. Chapter Summary

With reference to the descriptive analysis carried out above, the following summaries can be made about commercial property markets:

1. An analysis of the dynamics of the growth of commercial property capital in the UK, France, Germany and Sweden, has shown the UK market to vary over a wider range compared to the other countries.
2. French and Swedish commercial property capital growth dynamics share some similarities.
3. The dynamics of commercial property capital growth in Germany, is completely different to that of the other countries, due to a decline in growth throughout the period of analysis.
4. The analysis of the dynamics of the growth of commercial property rental market values in the UK, France, Germany and Sweden has shown the UK market to vary over a wider range compared to the other countries.
5. There were no major drops in commercial property rental market values in either France or Sweden during the global recession of 2007–2009.
6. In Germany, the dynamics of commercial property rental market value growth are completely different to those of the other countries, with growth declining throughout the period of analysis.
7. The analysis of the differences in commercial property market dynamics in the UK, France, Germany and Sweden on a capital cities basis, has revealed that the dynamics in capital cities have a higher amplitude of dynamic, from negative to positive growth, compared with property dynamics of countries as a whole.

8. An analysis of the net reversionary yield in the UK, France, Germany and Sweden, has shown that the UK commercial property market yield was at its lowest point in 2006 and in France, Germany and Sweden, in 2007. During the crisis period 2008-2009, the highest yield was in 2008 in the UK, and in 2009 in France and Sweden. The dynamics of commercial property yield in Germany was different to that of the other countries, due to a decline in growth throughout the period of analysis, reaching its highest point in 2011-2013.

With reference to the descriptive analysis carried out above, the following summaries can be made for the economic condition of the target countries:

1. Gross domestic product, gross domestic product per capita and taxes, were at their lowest points across all four countries in 2009.
2. Government bond yields were at their peak in 2008.
3. Returns on commercial property were at their lowest point in the UK and Sweden in 2008, reaching that point in France and Germany in 2009.
4. The number of employed persons was lowest in the UK, Germany and Sweden in 2010. This was reached in France in 2011.
5. The international trade ratio was at its lowest point in the UK in 2010, and in France, Germany and Sweden in 2011.
6. Environmental taxes per capita were at their lowest in the UK and France in 2009, and in Germany, in 2010. In contrast, in Sweden, this indicator followed a consistent, upward trend throughout the period of analysis.
7. Social protection expenditure per capita was at its lowest point in the UK and Sweden in 2009. In France and Germany, this indicator followed a consistent, upward trend throughout the period of analysis.
8. Unemployment was at its peak in Germany in 2009, and in France and Sweden, in 2010. In the UK, this indicator only grew in 2011.

4.4. Outcomes

Analyses of the economic downturn and the historic variations of the dynamics of national economic conditions and commercial property, suggest that an economic downturn, a crisis, has a significant effect on the sale prices and rental rates of commercial property. Analysis of developments in the commercial property market reveal that periods of economic downturn (global crisis), happened at roughly the same time across all countries: in 2008–2009. However, not all of the economic conditions' indicators followed

a procyclic shift in line with the commercial property market, as unemployment and government bond yields changed in the opposite direction, indicating that the dynamics of these two indicators were countercyclic.

Chapter 5. Data Collection and Results Discussion stage 2: Quantitative Analysis of Questionnaire Survey

5.1. Introduction

This chapter contains a description of the structure and contents of the questionnaires used in the survey as well as an analysis of the data collected during the survey. The survey itself aimed to investigate the relevance of criteria for the development of commercial property transactions prices and rentals, the goal being to confirm the relevance of the criteria that affect the dynamics of the commercial property transactions and rentals markets and to measure their weights.

To determine the respondents' opinions on particular matters or statements, elements of the Likert scale were employed. Likert scale type data are ordinal, meaning that the use of this scale presupposes that one result is higher / lower than the other without it being possible to identify the extent of the distance between two scores

Since the respondents' opinions are expressed in the survey in digits, a quantitative analysis was used to analyse the data. In addition to the data analysis, a reliability test of the questionnaires was performed. As the object of the study was the dynamics of the transactions, prices and rentals, each of the segments was subjected to a separate analysis. The chapter begins with a description of the questionnaire and the participants in the survey, followed by a description of the adjustments made on the basis of the pilot survey and analysis of literature. Respondents' answers are then tested and analysed separately; this analysis carried out through a comparison of different countries. The final stage consists of identification of the underlying trends of criterion relevance and criterion weights. The results of the questionnaire pertaining to the relevance of criteria to the transactions prices of commercial property are analysed first; this is followed by an analysis of the data of their relevance to rentals. Chapter summary and outcomes are presented at the end.

5.2. Description of Questionnaire Survey

This section describes the structure of the questionnaire, dealing with amendments made following an analysis of the pilot survey results and other modifications applied after a review of the questionnaire. It also presents the results of the distribution of the final questionnaire, the respondent mix and structure.

5.2.1. Pilot Survey

The pilot survey resulted in changes to the time required to fill in answers to the questionnaire (the pilot questions are presented in Appendix I). The respondents recommended extending the time allowed to

answer questions from 5–10 minutes to 10–15 minutes. Another recommendation was to remove the criterion of 'inflation' from the survey on the grounds that inflation is a consequence of national monetary and fiscal policy, and that the questionnaire already included criteria to that effect, such as regulation of the amount of cash through interest rates on money loaned and taxes. The scope of the criteria suggested to the respondents for evaluation was also reviewed. Globalisation-driven criteria such as 'International Trade' and 'Foreign Direct Investments' were added while criteria such as 'Size of Population', 'Inflation Rate', and 'Unemployment Level' were removed from the group of economic criteria. The social criteria group had items 'GDP Per Capita', 'Unemployment', and 'Number of Employed People' added to it. Copies of the pilot survey and final survey are presented in Appendices I and II.

5.2.2. Final Survey

Respondents were asked to rate the significance of the criteria on a scale from zero to five, answering questions about the influence of the criteria on the dynamics of commercial property transactions prices and rentals. As the survey covered two types of compensation – transactions prices and rentals – the respondents were asked to complete two questionnaires. Both questionnaires were designed to assess the impact of the same set of criteria on the dynamics of commercial property transactions prices and rentals. The assessment of the criteria relevant to the dynamics of commercial property transactions prices was carried out on the basis of the following questions:

How important are the following criteria to the dynamics of commercial property transactions prices?

The assessment of the criteria relevant to the dynamics of commercial property rentals was carried out on the basis of the following questions:

How important are the following criteria to the dynamics of commercial property rentals?

The choices of answers to these questions were plotted on a Likert rating scale as follows:

(0) Irrelevant

(1) Relevant (slightly)

(2) Relevant (2 – Relevant is more relevant than Relevant (slightly) and less relevant than 3 – Relevant)

(3) Relevant (3 – Relevant is more relevant than 2 – Relevant and less relevant than 4 – Relevant)

(4) Relevant (4 – Relevant is more relevant than 3 – Relevant and less relevant than 5 – Relevant (very))

(5) Relevant (very)

In addition to the above questions, the respondents were also asked to answer questions in relation to the location and sphere of their business and professional experience:

Please indicate the country that the answers to the questions about the commercial property situation will relate to: (1) the United Kingdom, (2) France, (3) Germany, (4) Sweden.

Your type of organisation: (1) a private company, (2) a public institution, (3) other.

Your profession: (1) planner, (2) investor, (3) architect, (4) lawyer, (5) banker, (6) developer, (7) property analyst, (8) property adviser, (9) property appraiser, (10) property agent, (11) other.

Your professional experience (in years): (1) less than 1 year, (2) 1–4 years, (3) 5–10 years, (4) over 10 years.

Bristol Online Survey has been used for the creation of the questionnaire and spreading it to the respondents online. A total of 9,510 commercial property professionals from the United Kingdom, France, Germany, and Sweden were invited to take part in the survey. The rate of answers received was 3.63%: 345 commercial property professionals answered and returned the questionnaires, 135 of these as paper copies. The number of respondents in each country is shown in the figure below.

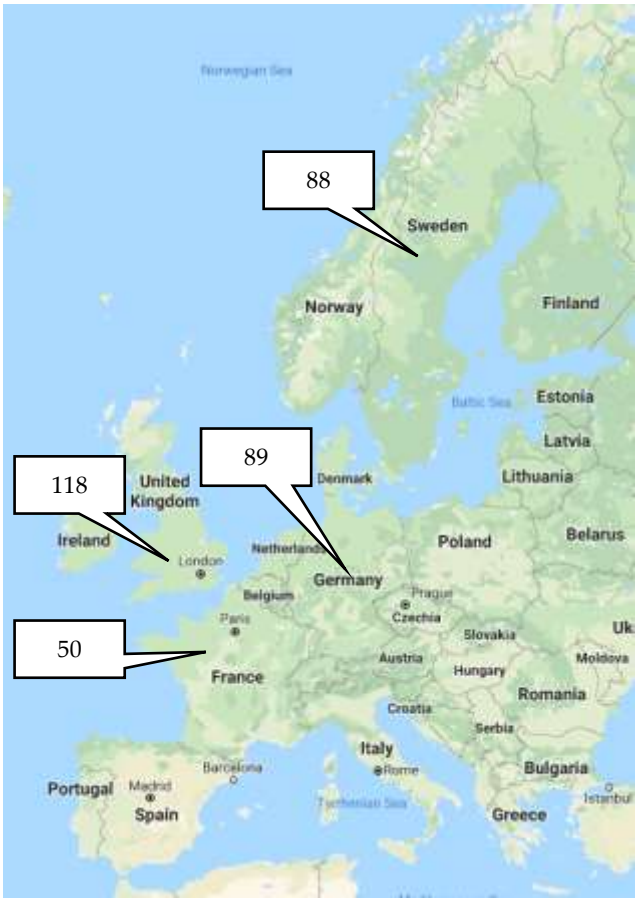


Figure 5-1. The number of respondent answers by country (Source: Self study)

Map source: https://www.google.co.uk/maps/place/Europe.

Answers from the UK account for 34%, France 14%, Germany and Sweden, 26% each of the total number of respondent answers.

The number of completed questionnaires about the dynamics of commercial property transactions prices and rentals was 166 and 179, respectively. Figure 5-2 shows the number of responses by country.

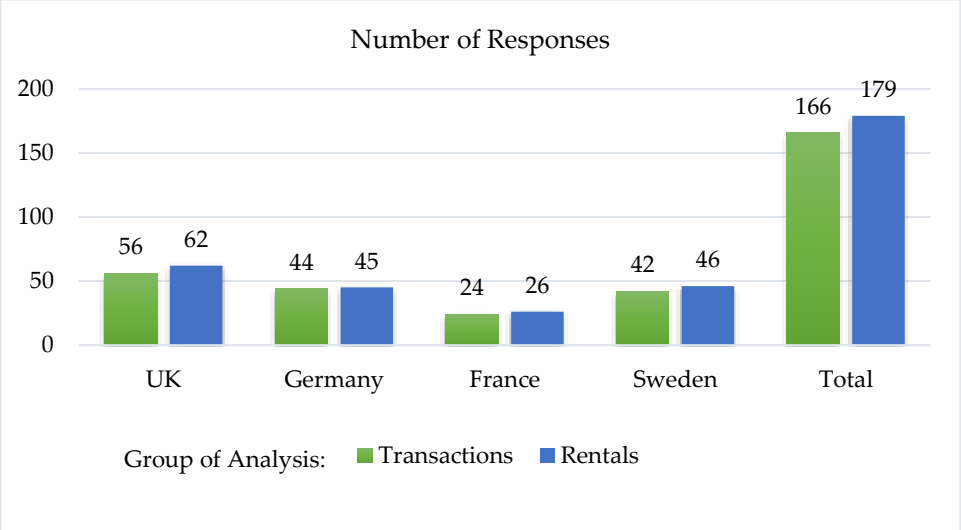


Figure 5-2. The number of respondent responses by country and groups (transactions or rentals) of the subject commercial property market.

Participants in the survey were representatives of different professions, whose business related to commercial property (

Table 5-1).

Table 5-1. Description of the survey respondents' occupations

No	Type of professional occupation	No. of respondents (dynamics of transactions prices)	%	No. of respondents (dynamics of rentals)	%	Total	%
1	Planner	5	3%	5	3%	10	3%
2	Investor	1	1%	2	1%	3	1%
3	Architect	2	1%	3	2%	5	1%
4	Lawyer	3	2%	3	2%	6	2%
5	Banker	5	3%	4	2%	9	3%
6	Developer	2	1%	2	1%	4	1%

No	Type of professional occupation	No. of respondents (dynamics of transactions prices)	%	No. of respondents (dynamics of rentals)	%	Total	%
7	Property market analyst	32	19%	41	23%	73	21%
8	Property adviser	25	15%	28	16%	53	15%
9	Property appraiser	29	17%	25	14%	54	16%
10	Property brokers	37	22%	37	21%	74	21%
11	Other (scientist, surveyor, lecturer, educator, property manager)	25	15%	29	16%	54	16%
	Total	166	100%	179	100%	345	100 %

Property brokers and market analysts made up the largest group of professionals in the survey. The type of organisation respondents belonged to, is shown in

Table 5-2, the number of years in the profession of respondents in

Table 5-3.

Table 5-2. Type of respondent organisation

Type of organisation	No. of respondents	Structural share, %
Private organisation	279	81%
Public organisation	35	10%
Other (association)	31	9%
Total	345	100%

Most (81%) of the respondents are employed in private organisations. This leaves 10% of the respondents working for public organisations and 9%, for other organisations such as associations.

Table 5-3. Respondent professional experience

Duration of professional experience	No. of respondents	Structural share, %
Less than 1 year	18	5%
1–4 years	93	27%
5–10 years	83	24%
More than 10 years	151	44%
Total	345	100%

Most (44%) of the respondents have more than 10 years of professional experience, with those whose professional experience is less than 1 year accounting for 5%, 1–4 years, 27%, 5–10 years, 24%.

The analysis of the survey results revealed a close connection between three of the criteria: Commercial Property Value Maximisation (C7) in the questionnaire), Social Responsibility of Commercial Property Business (C23), and Contradiction Between Commercial Property Value Maximisation and Social Responsibility (C8). When it comes to estimating the effect these criteria have on the growth of commercial property, Commercial Property Value Maximisation was found to have a positive impact, while Social Responsibility of Commercial Property Business was observed to impact the growth of commercial property transactions prices and rentals. This creates a contradiction between the effects of these two criteria on the prices of commercial property during a growth phase. It renders Contradiction Between Commercial Property Value Maximisation and Social Responsibility irrelevant. Therefore, this criterion was taken out from the list of criteria, prior to conducting the statistical analyses, resulting in 30 criteria analysed instead of the original 31 (thirty-one). The 0-to-5 scale of responses was replaced with one that went from 1 to 6 to avoid confusion that zero might bring into the analysis.

5.3. Tests of the study

This section details what tests were applied to analyse the respondents' answers.

Cronbach`s Alpha Test was employed to check the reliability of the respondents' replies, to see if there is a concord among all respondents.

The Mann-Whitney U Test was used to determine whether there were any significant differences in the opinions of the two groups on the relevance of the criteria. To reduce Type I errors the Bonferroni corrections were applied.

A central tendency test was used to identify the means of relevance of the criteria and to estimate the weight of the criteria later.

The analysis of the results was carried out on the data obtained from the final questionnaire.

The reliability of the respondents' marks can be measured with the Cronbach Alpha test (Pinto et al., 2014), because it 'is a special application of what is called the intraclass correlation' (Cronbach and Shavelson, 2004, p. 396). According to Cronbach and Shavelson (2004, p. 392), 'this formula was designed to be applied to a two-way table of data where rows represent persons (p) and columns represent scores assigned to the person under two or more conditions (i)'. However, Cronbach and Shavelson (2004, p. 391) go on to cast doubt on the idea that 'the coefficient was the best way of judging the reliability of an instrument to which it was applied'. In contrast, McGraw and Wong (1996), Hallgren (2012); Prochorskaite et al. (2016) and Pinto et al. (2014) argue that intraclass coefficients of correlation, the Cronbach Alpha coefficient being one of them, can be used to measure the reliability of respondents' responses. Cronbach`s Alpha coefficient measures similarities of respondents' marks indicating the marks that deviate from the rest of the group.

The Mann–Whitney U Test is suitable for comparing countries in pairs. This method allows a comparison of data that vary in non-parametric statistics as for example, when the commercial property experts polled differed in number. It was applied to compare the responses of two independent groups of respondents overturning or confirming hypothesis zero (H_0). To prove H_0, a z test and a p value were calculated.

In this analysis, the UK was compared to other countries, each pair contrasted individually to address the question: 'Are there any differences in the relevance of the criteria in the UK compared to other countries?' Since 30 pairs (hypotheses) were tested, the risk of false conclusions is 79% (1- (1-0.05) 30 = 0.79) (Olsson et al, 2007). The large number of comparative samples in making a comparison creates a problem of significance. Therefore, a significance level (α) of 5% is not acceptable. In addition, the questionnaire consists of five sets of specific criteria. Therefore, it was appropriate to adjust the significance level, just not for the full set of criteria (30 units) but rather for each group individually (Bland and Altman, 1995). The Bonferroni test was performed to answer the question of what the new level of significance must be. The Bonferroni test provides a pairwise comparison of the means. To determine which means are significantly different, the significance level has to be corrected at the level of α/k, where k is the number of pairwise comparisons.

Therefore, for the purpose of comparing the criteria of two countries in the five groups, Bonferroni corrections are calculated for each group of pairs under the following categories: (1) economic (14 pairs); (2) environmental (3 pairs); (3) social (5 pairs); (4) emotional (4 pairs); and (5) legal and regulatory (4 pairs) criteria. At the level α/k, the significance level corrected using the Bonferroni method for each group is as follows:

(1) 0.05/14 = 0.004; (2) 0.05/3 = 0.017; (3) 0.05/5 = 0.010; (4) 0.05/4 = 0.013; (5) 0.05/4 = 0.013.

This reduces the risk of a Type I error to:

(1) 5% (1- (1-0.004) 14 = 0.05); (2) 21% (1- (1-0.017) 3 = 0.21); (3) 13% (1- (1-0.010) 5 = 0.13); (4) 16% (1- (1-0.013) 4 = 0.16); (5) 16% (1- (1-0.013) 4 = 0.16).

The full results of the Mann Whitney U tests are listed in Appendix X.

A mean was selected to calculate a central tendency in this study, the mean for each criterion estimated, this allowing determination of criteria weightings. The weight of the criteria is calculated on the basis of the average data. In addition, in order to check the strength of the central tendency, a standard deviation was calculated, showing the degree of variation (dispersion) in the set of grades. The lower the standard deviation, the more representative the mean. A large standard deviation is indicative of a large degree of difference in grades. This analysis showcases the mean of the grades of relevance and the standard deviation of each criterion. This indicator is necessary to allow reflection on the relevance of the criteria and to facilitate the application of MCDM methods. To estimate the weights of the criteria, the mean rating of relevance of each criterion (based on the final survey) was divided by the sum of the mean of grades, thus ensuring that the amount of all weights was 1.

5.4. Commercial Property Transaction Price Dynamics Survey Tests

This section contains the results of the tests of commercial property transactions price dynamics. The test of compatibility of participants in the survey is introduced first.

5.4.1. Cronbach`s Alpha Test

Cronbach's Alpha coefficient was chosen to assess the internal compatibility of the scale used in the survey, aiming to determine the relevance of the criteria for the dynamics of commercial property transactions prices (from 1 = 'totally irrelevant' to 6 = 'the most relevant'). The values of Cronbach's Alpha coefficient range between 0 and 1, a bigger value pointing to a higher degree of reliability of the scale. Reliability is considered acceptable when the Cronbach Alpha value is 0.60 or more (Pinto et al., 2014; Flynn et al., 1990). According to Mitchell and Jolley (2009), the values of the Alpha coefficient are considered acceptable when they are above 0.70, this meaning that the respondents are giving similar answers. Cronbach's Alpha coefficient was estimated as 0.89. This value is higher than 0.7, pointing to a high degree of internal compatibility, which means that the scale employed for the assessment of the relevance of the criteria can be considered reliable for the purposes of the study.

5.4.2. Mann-Whitney U Test results for Differences between the UK and Each Country

To answer the question of 'Are there any differences in the relevance of the criteria in the UK compared to other countries?', the answers by the respondents from each country regarding the relevance of the criteria were taken and compared according to the following scheme:

1) UK and France
2) UK and Germany
3) UK and Sweden

The results of the UK–France comparison

Comparing the UK and France, significant differences were observed in the following criteria:
C1, C2, C3, C9, C15, C16, C18, C20, C23, C25, C26, and C29. This means that less than half (12 out of 30) of the criteria were given a different rating in terms of relevance by the specialists from the countries of comparison.

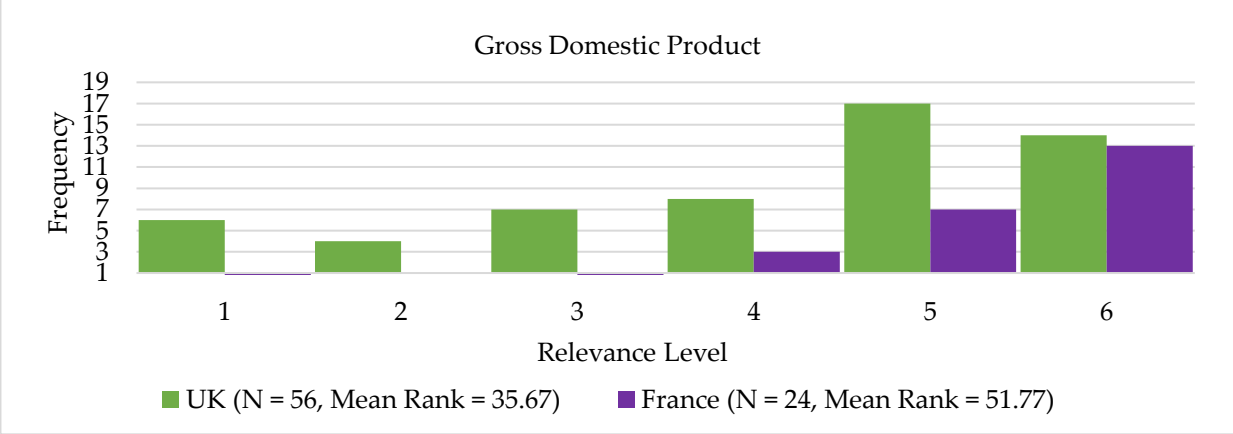


Figure 5-3. Independent - Samples Mann - Whitney U Test of the Relevance of C1 (Gross Domestic Product) for Commercial Property Transactions Dynamics.

Regarding C1, Gross Domestic Product, there is a substantial difference in the ratings by the respondents from the UK (N = 56, Mean Rank = 35.67) and France (N = 24, Mean Rank = 51.77). The respondents operating in France as commercial property experts gave a statistically significantly higher rating to the relevance of Gross Domestic Product compared to the respondents from the UK, U = 401.50, z = -2.94, p = .003, two tailed.

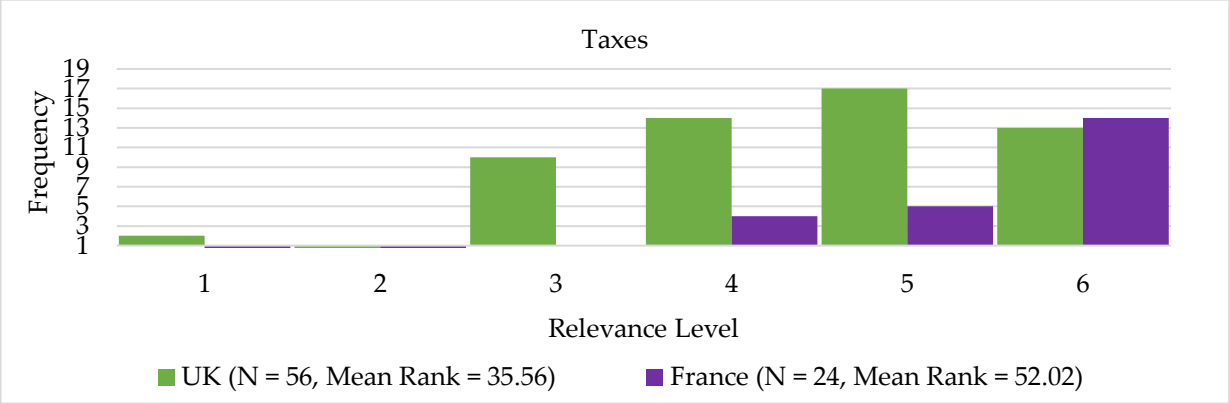


Figure 5-4. Independent - Samples Mann - Whitney U Test of the Relevance of C2 (Taxes) for Commercial Property Transactions Dynamics.

According to the Mann Whitney U test results, it can be concluded that the relevance of Taxes for the respondents from France (N = 24, Mean Rank = 52.02), was statistically significantly higher than those from the UK (N = 56, Mean Rank = 35.56), U = 395.50, z = -3.01, p = .003, two tailed.

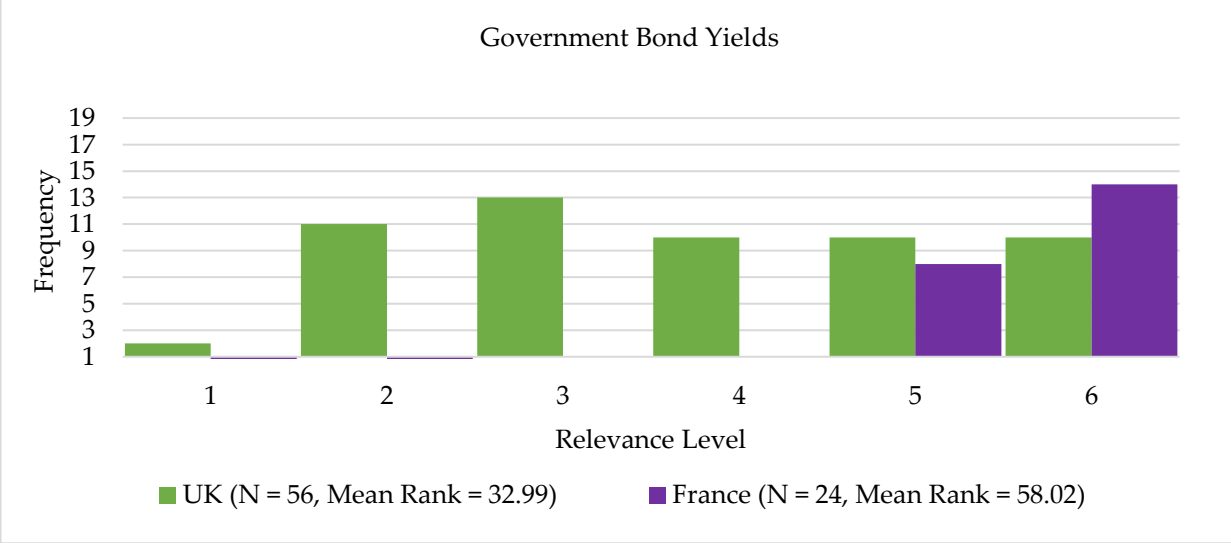


Figure 5-5. Independent - Samples Mann - Whitney U Test of the Relevance of C3 (Government Bond Yields) for Commercial Property Transactions Dynamics.

French respondents (N = 24, Mean Rank = 58.02), gave a statistically significantly higher rating to the relevance of Government Bond Yields compared to the respondents from the UK (N = 56, Mean Rank = 32.99), U = 251.50, z = -4.53, p = .000, two tailed.

Figure 5-6. Independent - Samples Mann - Whitney U Test of the Relevance of C9 (Debt Interest Rates) for Commercial Property Transactions Dynamics.

Regarding C9 (Debt Interest Rates), there is a substantial difference in the ratings (UK: N = 56, Mean Rank = 35.15 and France: N = 24, Mean Rank = 52.98). The respondents operating in France gave a statistically significantly higher rating to the relevance of Debt Interest Rates compared to the respondents from the UK, U = 372.50, z = -3.27, p = .001, two tailed.

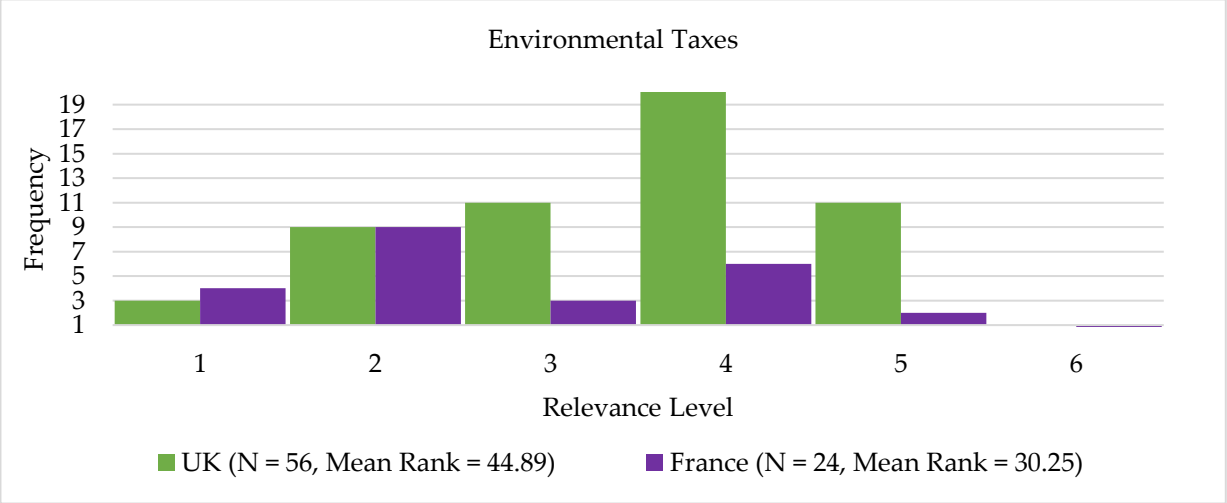


Figure 5-7. Independent - Samples Mann - Whitney U Test of the Relevance of C15 (Environmental Taxes) for Commercial Property Transactions Dynamics.

Regarding C15 (Environmental Taxes), there is a substantial difference in the ratings from respondents in the UK (N = 56, Mean Rank = 44.89) and France (N = 24, Mean Rank = 30.25). The respondents operating

in the UK gave a statistically significantly higher mark to the relevance of Environmental Taxes compared to the respondents from France, U = 426.00, z = -2.66, p = .008, two tailed.

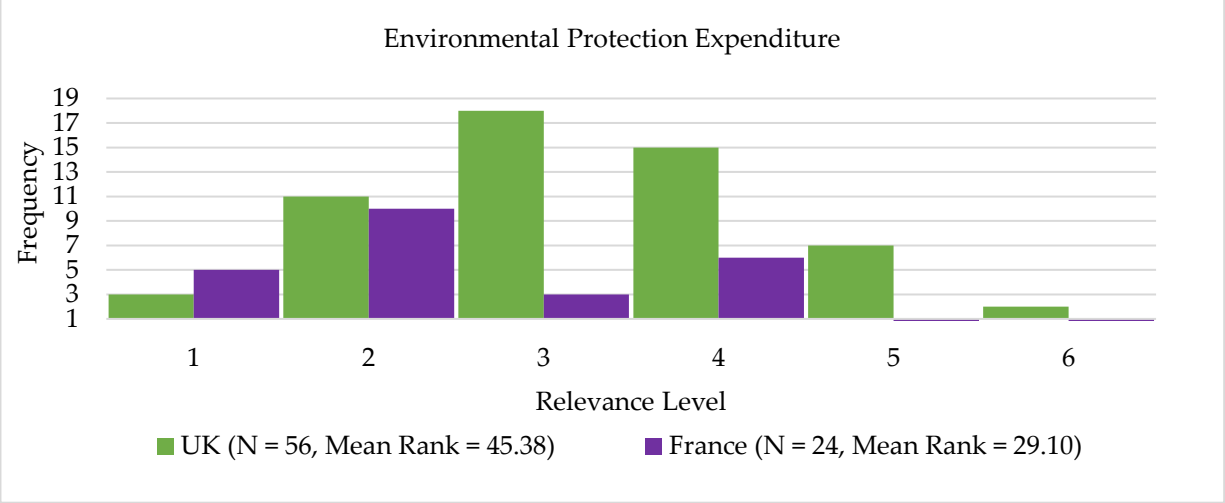


Figure 5-8. Independent - Samples Mann - Whitney U Test of C16 (Relevance of Environmental Protection Expenditure) for Commercial Property Transactions Dynamics.

Regarding C16 (Environmental Protection Expenditure), there is a substantial difference in the ratings by respondents from the UK (N = 56, Mean Rank = 45.38) and France (N = 24, Mean Rank = 29.10). The respondents operating in the UK gave a statistically significantly higher mark to the relevance of Environmental Protection Expenditure compared to the respondents from France, U = 398.50, z = -2.95, p = .003, two tailed.

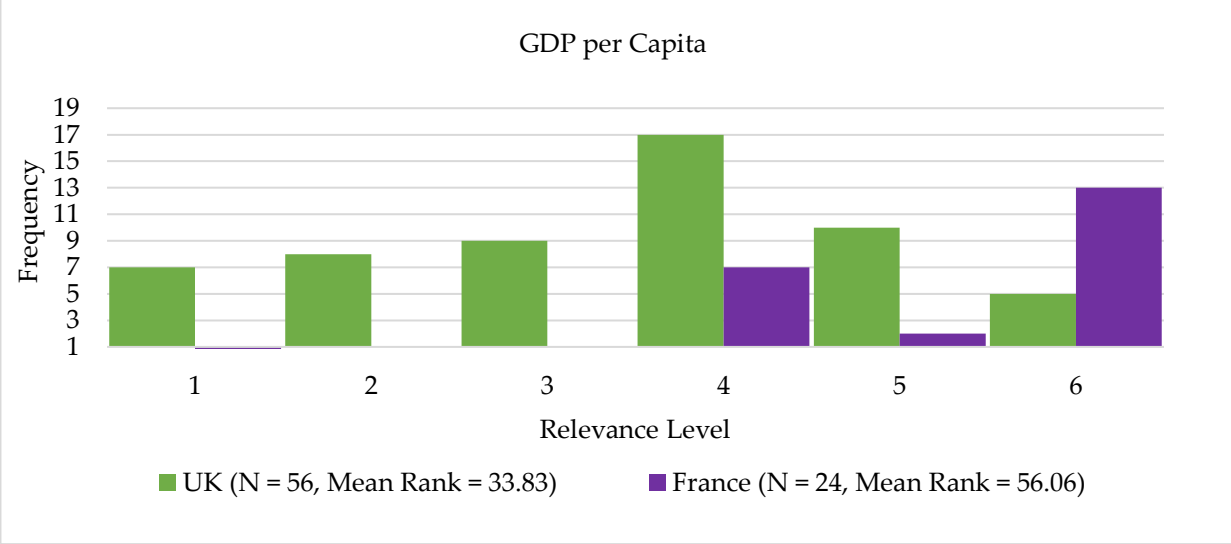


Figure 5-9. Independent - Samples Mann - Whitney U Test of the Relevance of C18 (GDP per Capita) for

Commercial Property Transactions Dynamics.

The Mann Whitney U test indicated, that ratings of the relevance of C18 (GDP per Capita), by the respondents from France (N = 24, Mean Rank = 56.06) significantly exceed ratings given by respondents from the UK (N = 56, Mean Rank = 33.83), U = 298.50, z = -4.01, p = .000, two tailed.

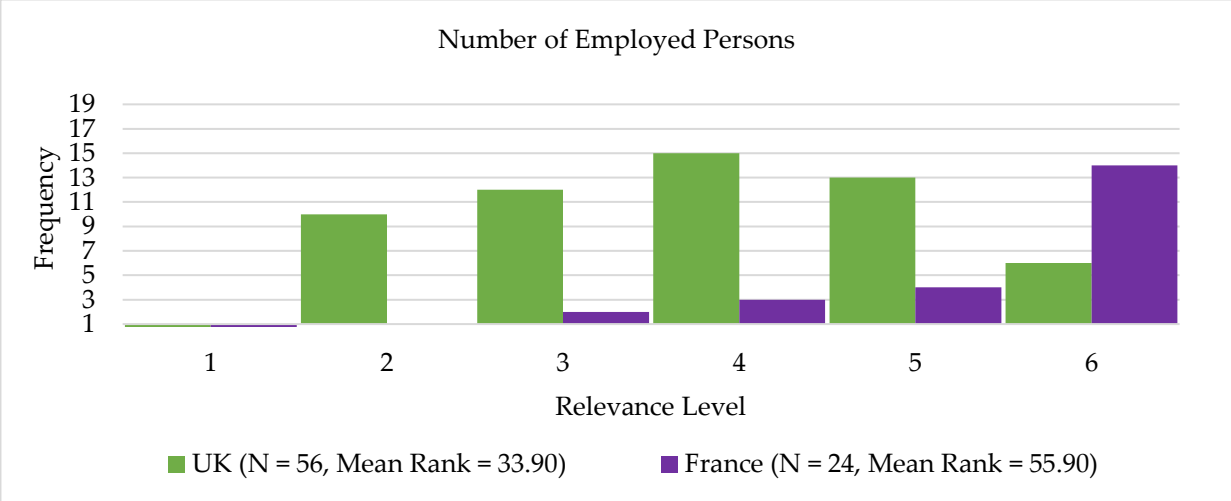


Figure 5-10. Independent - Samples Mann - Whitney U Test of the Relevance of C20 (Number of Employed Persons) for Commercial Property Transactions Dynamics.

Regarding C20 (Number of Employed Persons), the respondents operating in France (N = 24, Mean Rank = 55.90) gave a statistically significantly higher rating to the relevance of Number of Employed Persons compared to respondents from the UK, (N = 56, Mean Rank = 33.90), U = 302.50, z = -3.97, p = .000, two tailed.

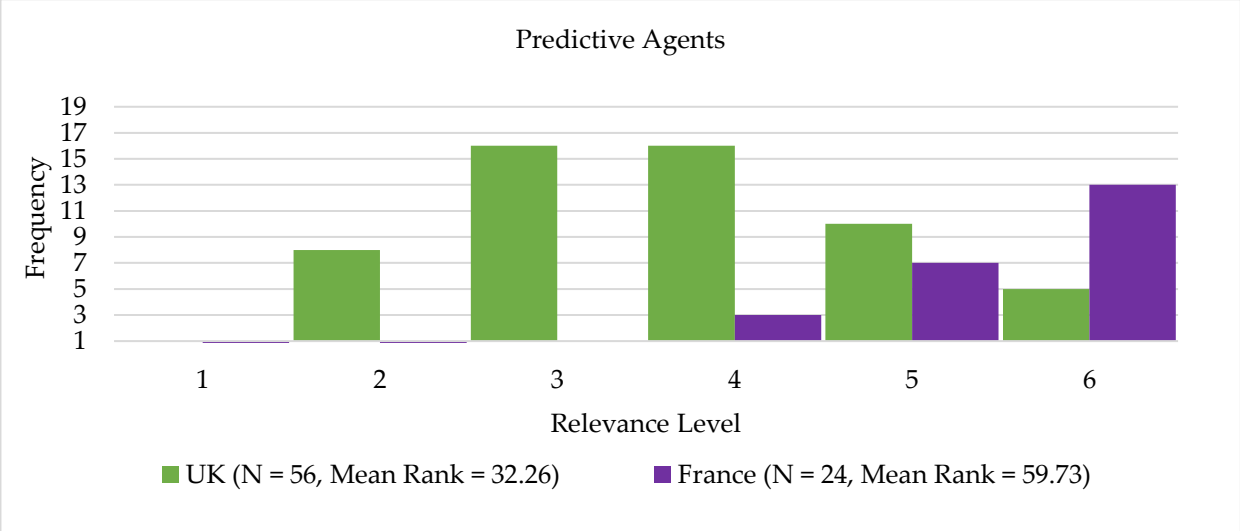


Figure 5-11. Independent - Samples Mann - Whitney U Test of the Relevance of C23 (Predictive Agents) for Commercial Property Transactions Dynamics.

Regarding C23 (Predictive Agents), there is a substantial difference in ratings by the respondents from the UK (N = 56, Mean Rank = 32.26) and France (N = 24, Mean Rank = 59.73). The respondents operating in France gave a statistically significantly higher rating to the relevance of Predictive Agents compared to the respondents from the UK, U = 210.50, z = -4.96, p = .000, two tailed.

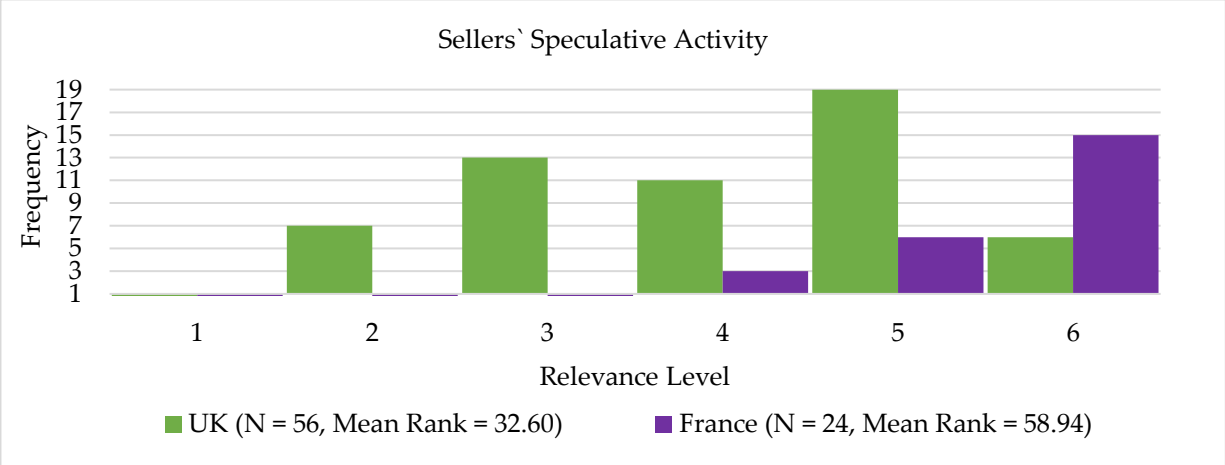


Figure 5-12. Independent - Samples Mann - Whitney U Test of the Relevance of C25 (Sellers` Speculative Activity) for Commercial Property Transactions Dynamics.

Regarding C25 (Sellers` Speculative Activity), a statistically significantly difference was observed between the UK`s experts in commercial property and their counterparts in France. The Mann Whitney U test indicated that ratings of the relevance of this by respondents from France (N = 24, Mean Rank = 58.94) significantly exceed ratings given by those in the UK (N = 56, Mean Rank = 32.60), U = 229.50, z = -4.79, p = .000, two tailed.

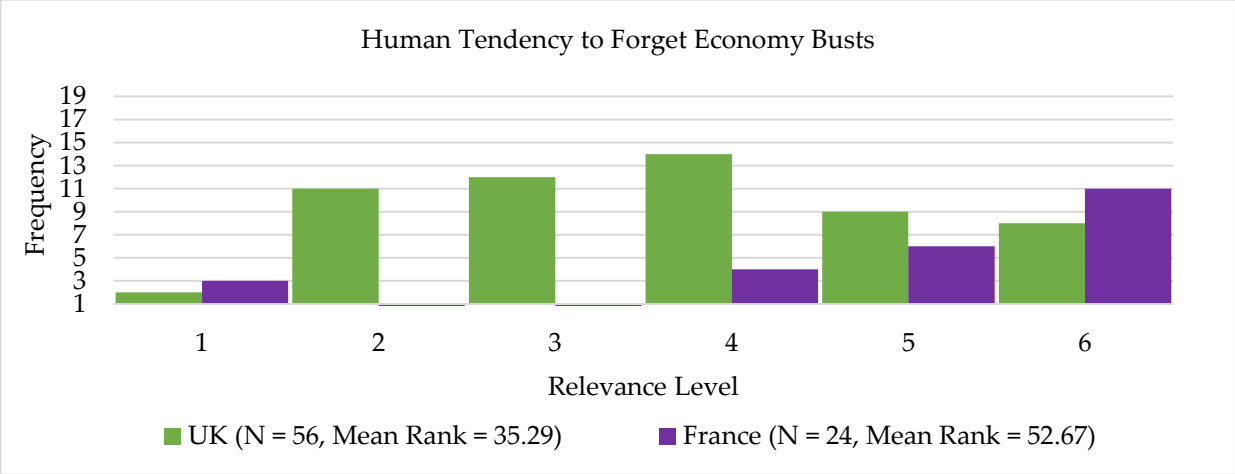


Figure 5-13. Independent - Samples Mann - Whitney U Test of the Relevance of C26 (Human Tendency to Forget Economy Busts) for Commercial Property Transactions Dynamics.

According to the Mann Whitney U test results, it can be concluded that the relevance of C26 (Human Tendency to Forget Economy Busts), for respondents from France (N = 24, Mean Rank = 52.67), was statistically significantly higher than for those in the UK (N = 56, Mean Rank = 35.29), U = 380.00, z = -3.12, p = .002, two tailed.

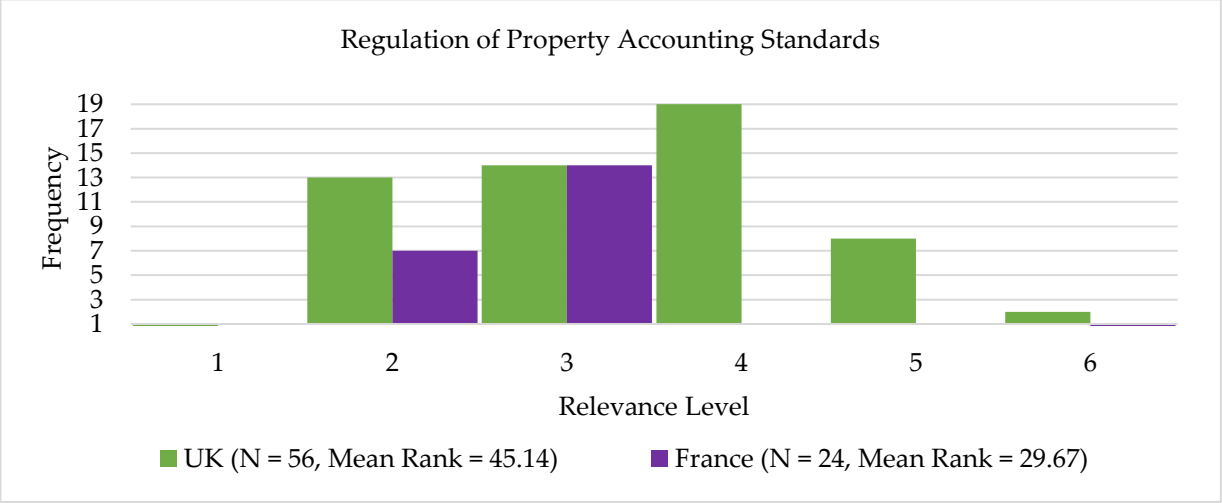


Figure 5-14. Independent - Samples Mann - Whitney U Test of the Relevance of C29 (Regulation of Property Accounting Standards) for Commercial Property Transactions Dynamics.

Regarding C29 (Regulation of Property Accounting Standards), there is a substantial difference in the ratings by the respondents from the UK (N = 56, Mean Rank = 45.14) and France (N = 24, Mean Rank = 29.67). The experts in France gave a statistically significantly lower rating to the relevance of Regulation

of Property Accounting Standards compared to the respondents from the UK, U = 412.00, z = -2.84, p = .005, two tailed.

The results of the UK–Germany comparison with the most significant level of difference

Comparing the UK and Germany, significant differences were observed in the following criteria: C8, 1 criterion out of a total 30 criteria.

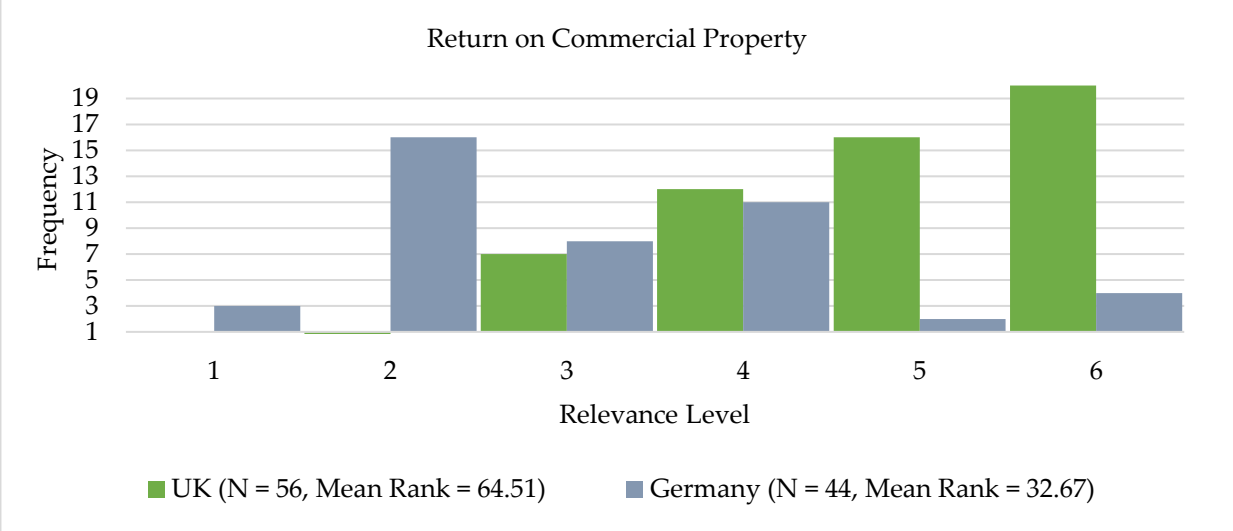


Figure 5-15. Independent - Samples Mann - Whitney U Test of the Relevance of C8 (Return on Commercial Property) for Commercial Property Transactions Dynamics.

According to the Mann Whitney U test results, it can be concluded that the relevance of Return on Commercial Property for respondents from the UK (N = 56, Mean Rank = 64.51) was statistically significantly higher than for those in Germany (N = 44, Mean Rank = 32.67), U = 447.50, z = -5.56, p = .000, two tailed.

The results of the UK–Sweden comparison with the most significant level of difference

Comparing the UK and Sweden, significant differences were observed in the following criteria: C2, C3, C9, C18, C20, C23, C25 and C26, 8 criteria out of a total 30 criteria.

Figure 5-16. Independent - Samples Mann - Whitney U Test of the Relevance of C2 (Taxes) for Commercial Property Transactions Dynamics.

The respondents operating in Sweden (N = 42, Mean Rank = 59.77) gave a statistically significantly higher mark to the relevance of C2 (Taxes), compared to the respondents from the UK (N = 56, Mean Rank = 41.79). The Mann Whitney U test results are U = 744.50, z = -3.23, p = .001, two tailed.

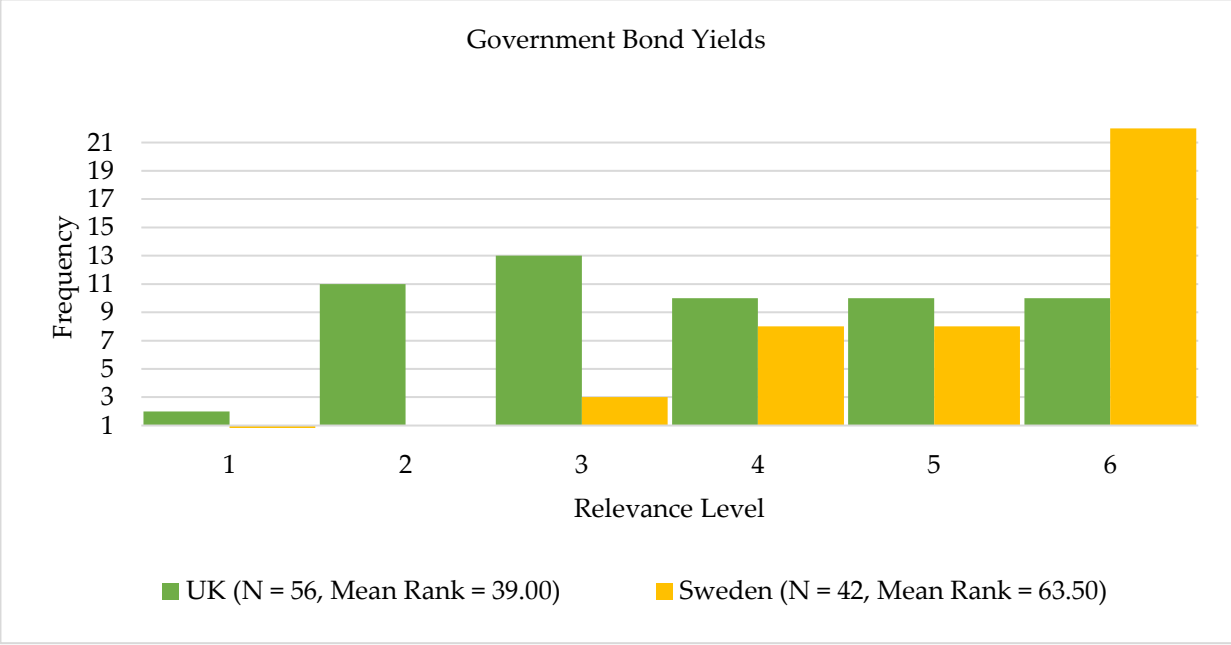


Figure 5-17. Independent - Samples Mann - Whitney U Test of the Relevance of C3 (Government Bond Yields) for Commercial Property Transactions Dynamics.

Regarding C3 (Government Bond Yields), there is a substantial difference in the ratings by the respondents from the UK (N = 56, Mean Rank = 39.00) and Sweden (N = 42, Mean Rank = 63.50). The respondents operating in Sweden gave a statistically significantly higher rating compared to the respondents from the UK, U = 588.00, z = -4.34, p = .000, two tailed.

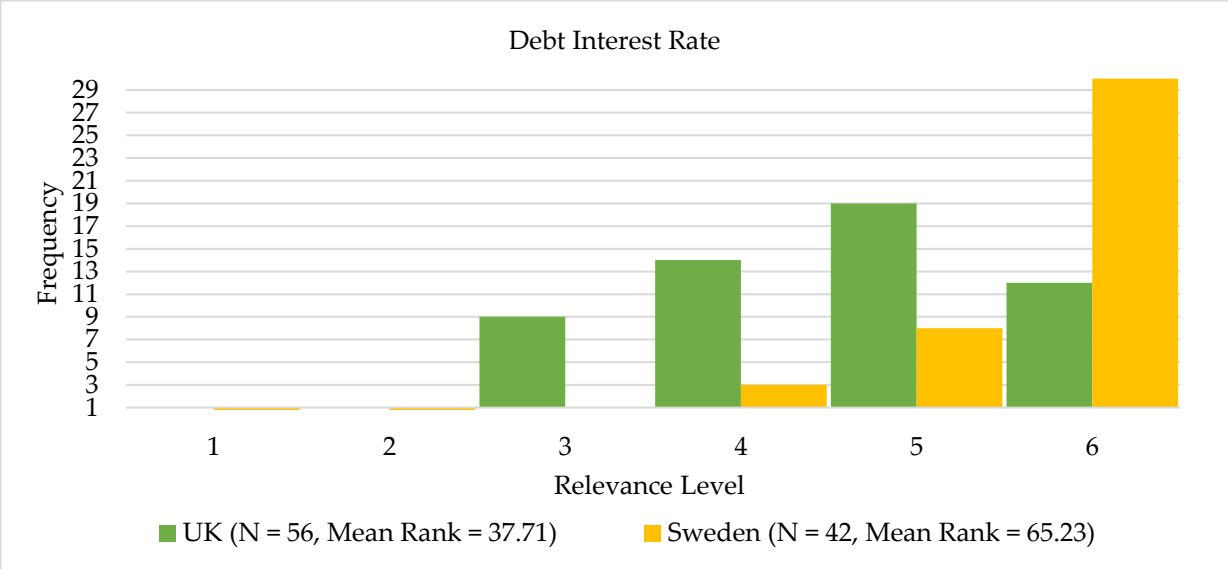


Figure 5-18. Independent - Samples Mann - Whitney U Test of the Relevance of C9 (Debt Interest Rate) for Commercial Property Transactions Dynamics.

The respondents operating in Sweden (N = 42 Mean Rank = 65.23) gave statistically significantly higher ratings to the relevance of C9 (Debt Interest Rate), compared to respondents from the UK ((N = 56, Mean Rank = 37.71), U = 515.50, z = -5.01, p = .000, two tailed).

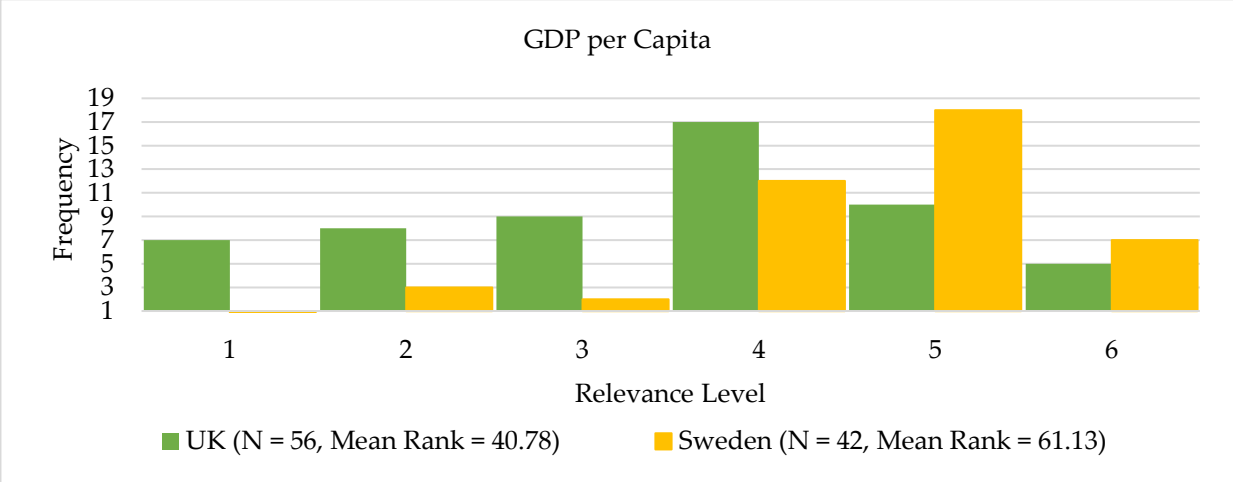


Figure 5-19. Independent - Samples Mann - Whitney U Test of the Relevance of C18 (GDP per Capita) for Commercial Property Transactions Dynamics.

Regarding C18 (GDP per Capita), there is a substantial difference in the ratings given by respondents from the UK (N = 56, Mean Rank = 40.78) and Sweden (N = 42, Mean Rank = 61.13). The respondents operating in Sweden gave a statistically significantly higher rating compared to the respondents from the UK, U = 687.50, z = -3.61, p = .000, two tailed.

Figure 5-20. Independent - Samples Mann - Whitney U Test of the Relevance of C20 (Number of Employed Persons) for Commercial Property Transactions Dynamics.

Regarding C20 (Number of Employed Persons), there is a substantial difference in the ratings by respondents from the UK (N = 56, Mean Rank = 40.52) and Sweden (N = 42, Mean Rank = 61.48). The respondents operating in Sweden gave a statistically significantly higher rating compared to the respondents from the UK, U = 673.00, z = -3.70, p = .000, two tailed.

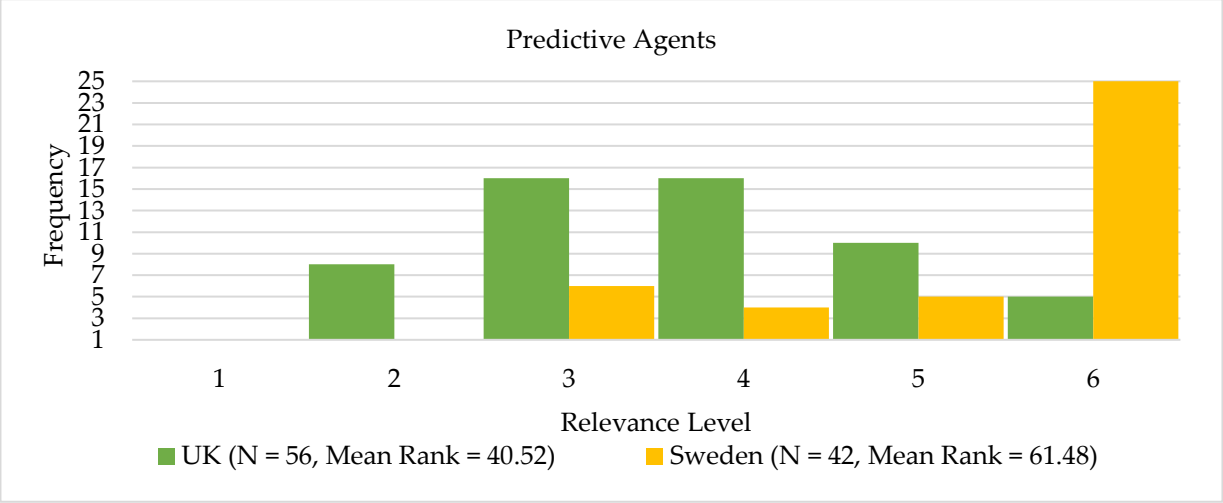


Figure 5-21. Independent - Samples Mann - Whitney U Test of the Relevance of C23 (Predictive Agents)

for Commercial Property Transactions Dynamics.

According to the Mann Whitney U test results, it can be concluded that the relevance of C23 (Predictive Agents) for those in Sweden (N = 42, Mean Rank = 61.48) was statistically significantly higher than the UK (N = 56, Mean Rank = 40.52), U = 545.00, z = -4.65, p = .000, two tailed.

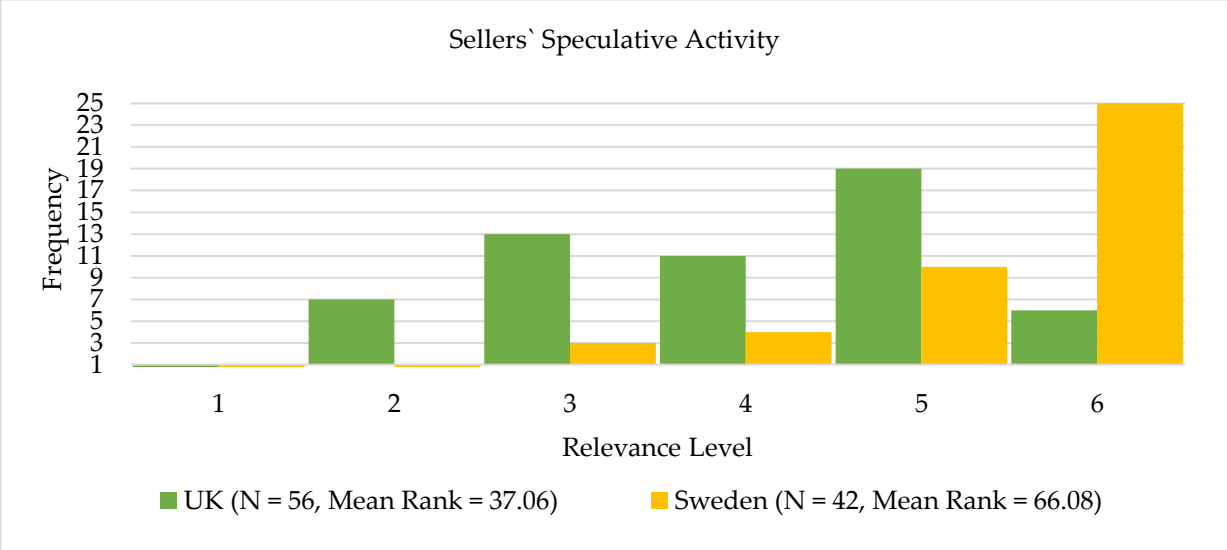


Figure 5-22. Independent - Samples Mann - Whitney U Test of the Relevance of C25 (Sellers` Speculative Activity) for Commercial Property Transactions Dynamics.

Regarding C25 (Sellers` Speculative Activity), there is a substantial difference in the ratings by respondents from the UK (N = 56, Mean Rank = 37.06) and Sweden (N = 42, Mean Rank = 66.08). The respondents operating in Sweden gave a statistically significantly higher rating compared to the respondents from the UK, U = 479.50, z = -5.17, p = .000, two tailed.

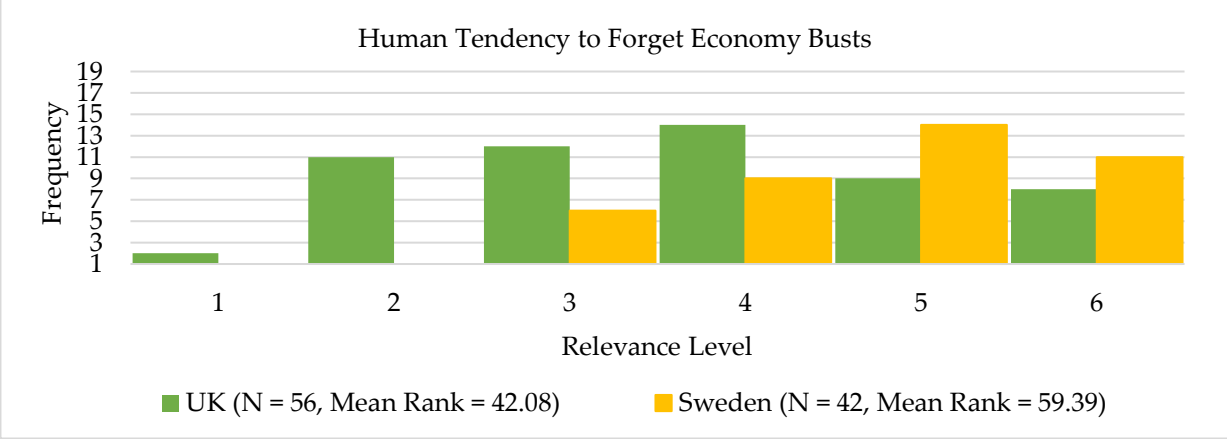


Figure 5-23. Independent - Samples Mann - Whitney U Test of the Relevance of C26 (Human Tendency to

Forget Economy Busts) for Commercial Property Transactions Dynamics.

The Mann Whitney U test indicated that ratings on the relevance of C26 (Human Tendency to Forget Economy Busts), by the respondents from Sweden (N = 42, Mean Rank = 59.39) significantly exceeded ratings from the respondents from the UK (N = 56, Mean Rank = 42.08), U = 760.50, z = -3.05, p = .002, two tailed.

5.4.3. Central tendency Test

The table below contains the descriptive statistics of the criteria. In most cases, the descriptive analysis covers the mean, median, mode, standard deviation, dispersion and interval calculation. An interval and dispersion are used to estimate the standard deviation. For the purposes of this study, no median is calculated as that is the midpoint value of data and is not suitable for data analysis when the data are measured on a scale from 1 to 6. The mode is calculated by determining the highest grade in a data set, but with a scale of 1 to 6, some criteria will be given comparable grades even despite their potentially varying influence. As a result, the tendency of relevance of each criterion was measured based on an average.

Table 5-4. The mean and standard deviation.

No	Criterion	N	Mean (M)	Std. deviation (SD)
1	Investors' expectations (C24)	166	4.94	1.007
2	Debt interest rate (C9)	166	4.93	1.137
3	Taxes (C2)	166	4.88	1.154
4	Sellers` speculative activity (C25)	166	4.71	1.241
5	Built environment planning policy (C27)	166	4.55	1.248
6	Commercial property value maximisation (C7)	166	4.49	1.239
7	Interaction between commercial property market cycle and development cycle (C11)	166	4.45	1.224
8	Predictive agents (C23)	166	4.43	1.364
9	Interaction between commercial property market cycle and credit cycle (C10)	166	4.41	1.340
10	Return on commercial property (C8)	166	4.37	1.487

No	Criterion	N	Mean (M)	Std. deviation (SD)
11	Gross domestic product (C1)	166	4.36	1.518
12	Government bond yields (C3)	166	4.32	1.481
13	Number of employed persons (C20)	166	4.30	1.355
14	Human tendency to forget economy busts (C26)	166	4.13	1.432
15	GDP per capita (C18)	166	4.01	1.459
16	Alternative investments (C4)	166	3.99	1.216
17	Foreign direct investment (C6)	166	3.88	1.254
18	Commercial building time frame (C12)	166	3.81	1.230
19	Regulation of properties valuation standards (C28)	166	3.80	1.261
20	Commercial property capital renewals (C13)	166	3.65	1.195
21	Environmental benefits of sustainable building (C17)	166	3.61	1.283
22	Unemployment (C19)	166	3.61	1.244
23	International trade (C5)	166	3.49	1.254
24	Regulation of property accounting standards (C29)	166	3.39	1.229
25	Environmental taxes (C15)	166	3.37	1.328
26	Environmental protection expenditure (C16)	166	3.14	1.250
27	Green leases regulation (C30)	166	2.99	1.115
28	Social responsibility of commercial property business (C22)	166	2.89	1.155
29	Social protection expenditure (C21)	166	2.80	1.178
30	Renewable resources (C14)	166	2.58	1.151

Fifteen out of thirty criteria fell into a group with an average grade between 4.01 and 4.94. Experts from the commercial property market identified Investors' Expectations (C24) as the most important criterion affecting the dynamics of commercial property transactions, giving it the highest grade (M), 4.94, with a standard deviation (SD) at 1.007. This criterion has the smallest standard deviation. Another criterion, Debt Interest Rate (C9) is not far behind at 4.93 with a standard deviation (SD) of 1.137. In third place comes Taxes (C2) (M = 4.88, SD = 1.154), in fourth, Sellers` Speculative Activity (C25) (M = 4.71, SD = 1.241),

in fifth, Built Environment Planning Policy (C27) (M = 4.55, SD = 1.248), in sixth, Commercial Property Value Maximisation (C7) (M = 4.88, SD = 1.154), and in seventh, Interaction between Commercial Property Market Cycle and Development Cycle (C11) (M = 4.45, SD = 1.224).

These are followed by Predictive Agents (C23) (M = 4.42, SD = 1.364), its average grade placing this criterion eighth by relevance for the dynamics of commercial property transactions. In ninth is Interaction between Commercial Property Market Cycle and Credit Cycle (C10) (M = 4.41, SD = 1.340), in tenth, Return on Commercial Property (C8) (M = 4.37, SD = 1.487) and in eleventh, Gross Domestic Product (C1) (M = 4.36, SD = 1.518). This criterion has the largest standard deviation value compared to the standard deviation indicators of grades for other criteria. In the twelfth place, there are Government Bond Yields (C3) (M = 4.32, SD = 1.481) and in thirteenth, Number of Employed Persons (C20) (M = 4.30, SD = 1.355). Human Tendency to Forget Economy Busts (C26) (M = 4.13, SD = 1.432) and GDP per Capita (C18) (M = 4.01, SD = 1.459) are placed fourteenth and fifteenth, respectively.

Another group of criteria that had their relevance rated between 3.14 and 3.99 on a scale of six, consists of eleven criteria. In sixteenth place is Alternative Investments (C4) (M = 3.99, SD = 1.216) and in seventeenth, Foreign Direct Investment (C6) (M = 3.88, SD = 1.254). The following two positions are quite similar in terms of their rating: Commercial Building Time Frame (C12) (M = 3.81, SD = 1.230) and Regulation of Properties Valuation Standards (C28) (M = 3.80, SD = 1.261), placed eighteenth and nineteenth, respectively. In twentieth position is Commercial Property Capital Renewals (C13) (M = 3.65, SD = 1.195). Environmental Benefits of Sustainable Building (C17) (M = 3.61, SD = 1.283) and Unemployment (C19) (M = 3.61, SD = 1.244) have the same average values, these criteria twenty-first and on twenty-second, respectively. International Trade (C5) (M = 3.49, SN = 1.254) is twenty third on the list, Regulation of Property Accounting Standards (C29) (M = 3.39, SD = 1.229) twenty fourth. In twenty-fifth and twenty-sixth places are two criteria that fall into the group of environmental criteria: Environmental Taxes (C15) (M = 3.37, SD = 1.328) and Environmental Protection Expenditure (C16) (M = 3.14, SD = 1.250).

The remaining criteria are within the range of 2.58–2.99 points. In twenty-seventh position, there is Green Leases Regulation (C30) (M = 2.99, SD = 1.115). In twenty-eighth and twenty-ninth places, two criteria from the social criteria group: Social Responsibility of Commercial Property Business (C22) (M = 2.89, SD = 1.155) and Social Protection Expenditure (C21) (M = 2.80, SD = 1.178). Finally, in the experts' opinion, the criterion that is of least relevance for the dynamics of commercial property transactions is Renewable Resources (C14) (M = 2.58, SD = 1.151).

5.4.4. Criteria weighting

The 30 criteria identified by conducting an analysis of scientific literature on the study of the dynamics of commercial property transactions prices, differ in their relevance. As such it is necessary to weight the criteria if we are to reflect this relevance and to facilitate the application of MCDM methods. To estimate the weight of the criteria, the mean rating of relevance of each criterion was divided by the sum of the mean of grades, thus ensuring that the amount of all weights is one.

The mean and weight of each criterion is shown in

Table 5-5.

Table 5-5. The means and weights of the criteria affecting the dynamics of commercial property transactions prices.

No	Criterion	Mean	Weight
1	Gross domestic product	4.36	0.0369
2	Taxes	4.88	0.0413
3	Government bond yields	4.32	0.0365
4	Alternative investments	3.99	0.0337
5	International trade	3.49	0.0295
6	Foreign direct investment	3.88	0.0328
7	Commercial property value maximisation	4.49	0.0380
8	Return on commercial property	4.37	0.0370
9	Debt interest rate	4.93	0.0417
10	Interaction between commercial property market cycle and credit cycle	4.41	0.0373
11	Interaction between commercial property market cycle and development cycle	4.45	0.0376
12	Commercial building time frame	3.81	0.0322
13	Commercial property capital renewals	3.65	0.0309
14	Renewable resources	2.58	0.0218
15	Environmental taxes	3.37	0.0285
16	Environmental protection expenditure	3.14	0.0265
17	Environmental benefits of sustainable building	3.61	0.0305

No	Criterion	Mean	Weight
18	GDP per capita	4.01	0.0339
19	Unemployment	3.61	0.0305
20	Number of employed persons	4.30	0.0364
21	Social protection expenditure	2.80	0.0236
22	Social responsibility of commercial property business	2.89	0.0244
23	Predictive agents	4.43	0.0375
24	Investors' expectations	4.94	0.0418
25	Sellers` speculative activity	4.71	0.0398
26	Human tendency to forget economy busts	4.13	0.0349
27	Built environment planning policy	4.55	0.0385
28	Regulation of properties valuation standards	3.80	0.0321
29	Regulation of property accounting standards	3.39	0.0286
30	Green leases regulation	2.99	0.0253
Total			1.0000

5.5. Commercial Property Rental Price Dynamics Survey Tests

This section deals with the tests of reliability, a comparison of the criteria's relevance by country, and gives the tendencies and weights of each criterion for the commercial property rentals market.

5.5.1. Cronbach`s Alpha Test

Cronbach's Alpha coefficient was chosen to assess the internal compatibility of the scale used in the survey, aiming to determine the relevance of the criteria for the dynamics of commercial property rental prices (rated from 1 = 'totally irrelevant' to 6 = 'the most relevant'). The values of Cronbach's Alpha coefficient range between 0 and 1, a bigger value pointing to a higher degree of reliability of the scale.

Cronbach's Alpha coefficient was estimated as 0.895. This value is higher than 0.7, pointing to a high degree of internal compatibility, which means that the scale employed for the assessment of the relevance of the criteria can be considered reliable for the purposes of the study.

5.5.2. Mann-Whitney U Test Results for Differences between the UK and Each Country

To answer the question of 'Are there any differences in the relevance of the criteria in the UK compared to other countries?', the answers by the respondents from each country regarding the relevance of the criteria were taken and compared according to the following scheme:

1. UK and France
2. UK and Germany
3. UK and Sweden

The mean rank and the sum of ranks were calculated based on the Mann-Whitney test, the same as was carried out for the commercial property transactions dynamics analysis. The mean rank of the Mann-Whitney test allowed determination of the differences between criteria rankings.

The results of the UK–France comparison with the most significant level of difference

Comparing the UK and France, significant differences were observed in the following criteria: C20, C23, C24, C25, C27, C28 and C29. This means that 7 out of 30 criteria were given a completely different rating in terms of relevance by the specialists from the countries of comparison.

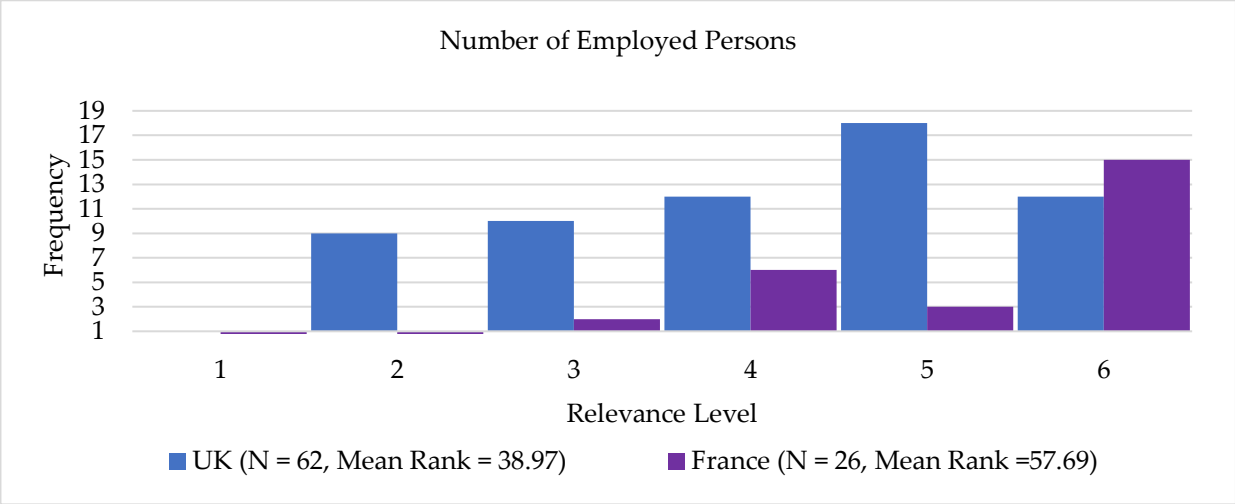


Figure 5-24. Independent - Samples Mann - Whitney U Test of the Relevance of C20 (Number of Employed Persons) for Commercial Property Rentals Dynamics.

The Mann Whitney U test indicated that ratings of the relevance of C20 (Number of Employed Persons) by the respondents from France (N = 26, Mean Rank = 57.69) were significantly higher compared to ratings from respondents in the UK (N = 62, Mean Rank = 38.97), U = 463.00, z = -3.23, p = 0.001, two tailed.

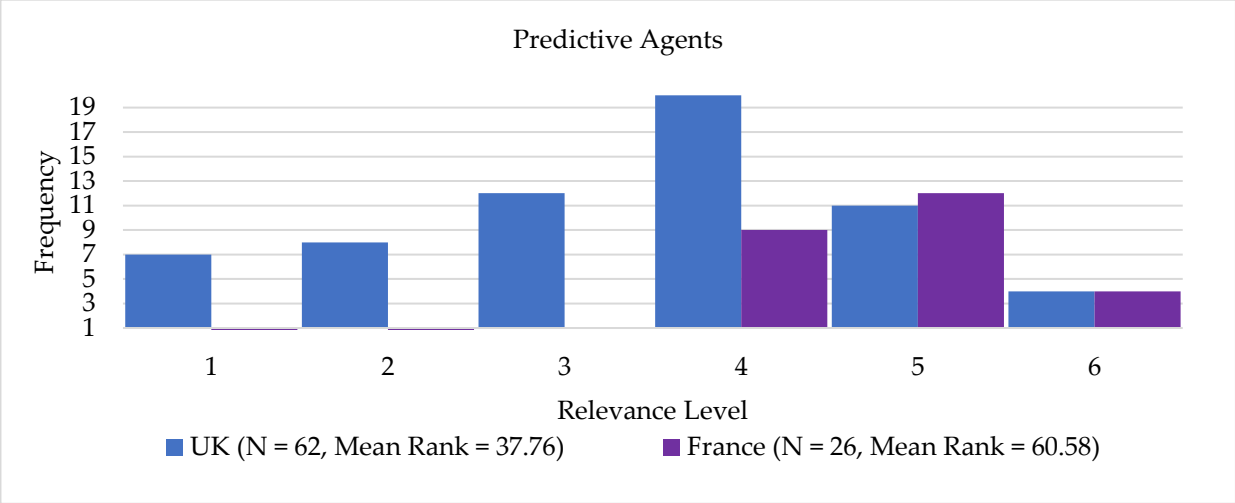


Figure 5-25. Independent - Samples Mann - Whitney U Test of the Relevance of C23 (Predictive Agents) for Commercial Property Rentals Dynamics.

The results of the Mann Whitney U test reveal that the relevance of C23 (Predictive Agents), was rated as significantly more important by respondents from France (N = 26, Mean Rank = 60.58) in comparison to those from the UK (N = 62, Mean Rank = 37.76), U = 388.00, z = -3.94, p = .000, two tailed.

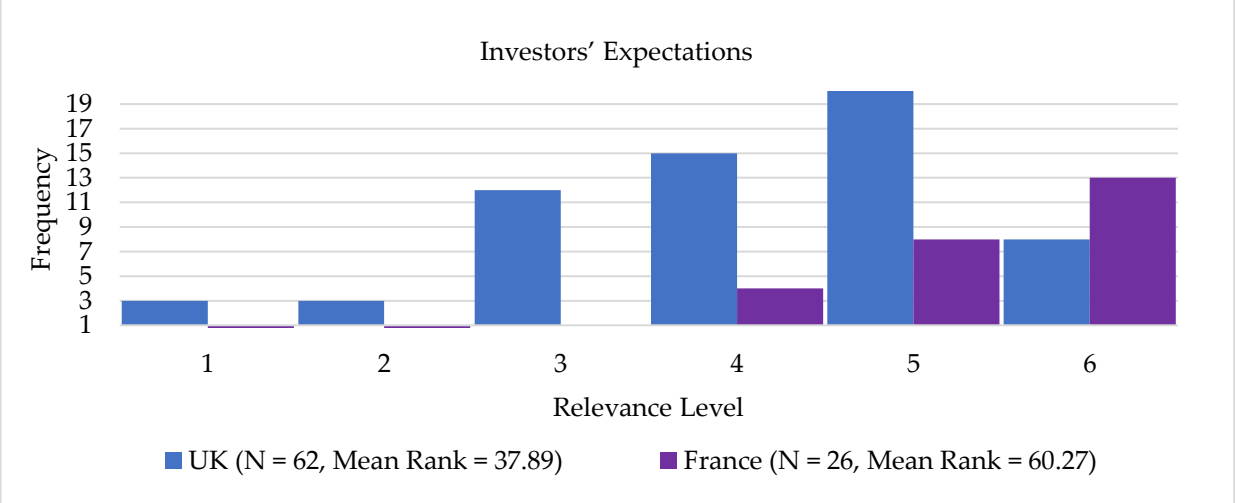


Figure 5-26. Independent - Samples Mann - Whitney U Test of the Relevance of C24 (Investors' Expectations) for Commercial Property Rentals Dynamics.

The Mann Whitney U test indicated that the ratings given to Investors' Expectations by the respondents from France (N = 26, Mean Rank = 60.27) were significantly higher compared to those from the UK (N = 62, Mean Rank = 37.89), U = 396.00, z = -3.87, p = .000, two tailed.

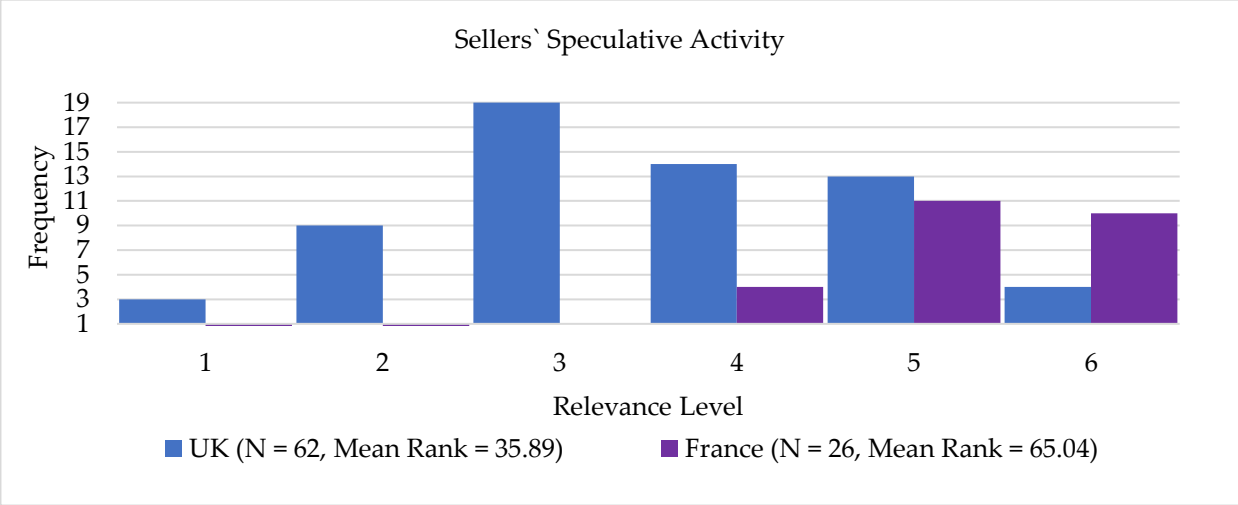


Figure 5-27. Independent - Samples Mann - Whitney U Test of the Relevance of C25 (Sellers` Speculative Activity) for Commercial Property Rentals Dynamics.

The respondents' ratings of C25 (Sellers` Speculative Activity), are significantly different in the UK (N = 62, Mean Rank = 35.89) and France (N = 26, Mean Rank = 65.04). The relevance of Sellers` Speculative Activity was rated as statistically significantly higher by commercial property experts in France compared to the experts from the UK, U = 272.00, z = -4.99, p = .000, two tailed.

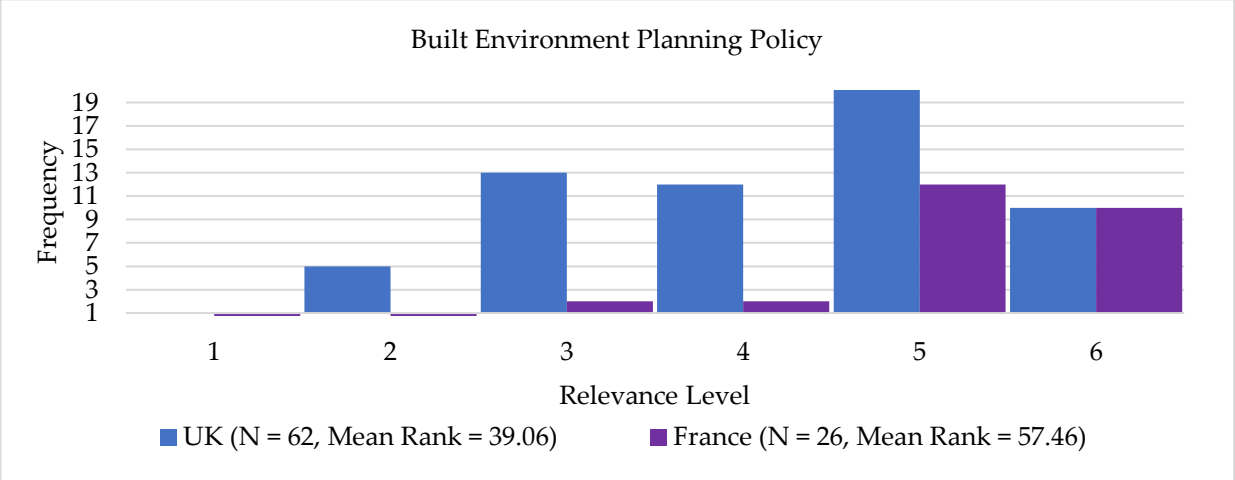


Figure 5-28. Independent - Samples Mann - Whitney U Test of the Relevance of C27 (Built Environment Planning Policy) for Commercial Property Rentals Dynamics.

Regarding C27 (Built Environment Planning Policy), there is a substantial difference in the ratings given by the respondents from the UK (N = 62, Mean Rank = 39.06) and France (N = 26, Mean Rank = 57.46). The respondents operating in France gave a statistically significantly higher rating to the relevance of Built

Environment Planning Policy compared to respondents from the UK, U = 469.00, z = -3.20, p = .001, two tailed.

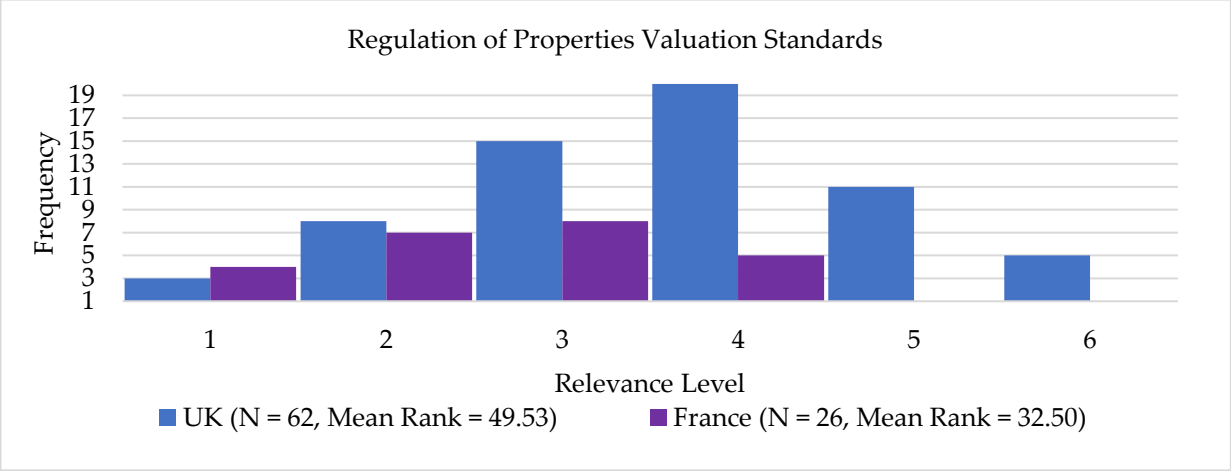


Figure 5-29. Independent - Samples Mann - Whitney U Test of the Relevance of C28 (Regulation of Properties Valuation Standards) for Commercial Property Rentals Dynamics.

The respondents' ratings of C28 (Regulation of Properties Valuation Standard), are significantly different in the UK (N = 62, Mean Rank = 49.53) and France (N = 26, Mean Rank = 32.50). The relevance of Regulation of Properties Valuation Standards was rated as statistically significantly higher by commercial property experts in the UK compared to the experts in France, U = 494.00, z = -2.93, p = .003, two tailed.

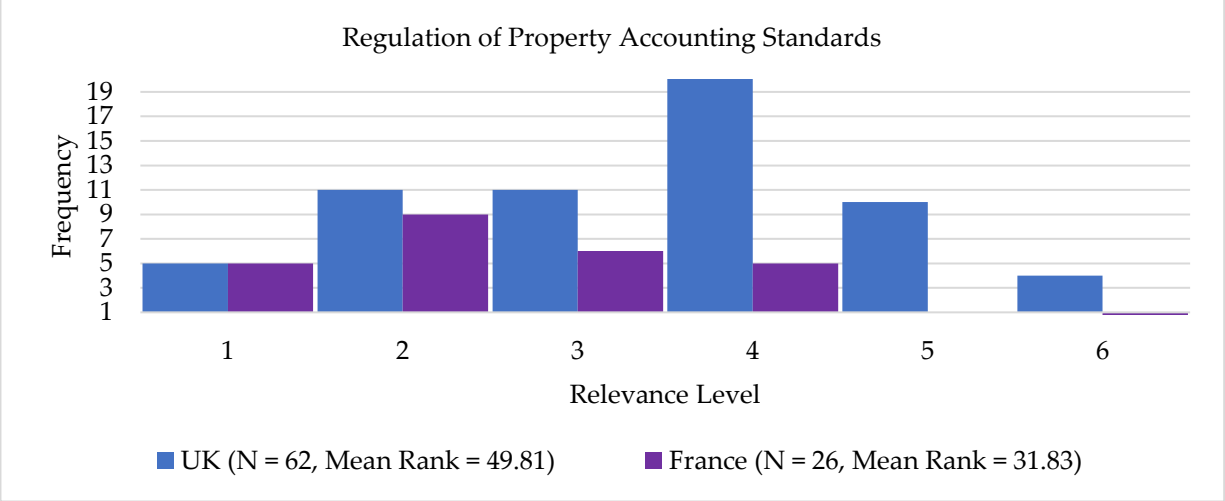


Figure 5-30. Independent - Samples Mann - Whitney U Test of the Relevance of C29 (Regulation of Property Accounting Standards) for Commercial Property Rentals Dynamics.

The results of the Mann Whitney U test revealed that the relevance of C29 (Regulation of Property Accounting Standards), was rated as statistically significantly lower by respondents from France (N = 26, Mean Rank = 31.83) in comparison to those in the UK (N = 62, Mean Rank = 49.81), U = 476.50, z = -3.09, p = .002, two tailed.

The results of the UK–Germany comparison with the most significant level of difference

Comparing the UK and Germany, significant differences were observed in the following criteria: C8, C25 and C27. These are 3 criteria out of 30.

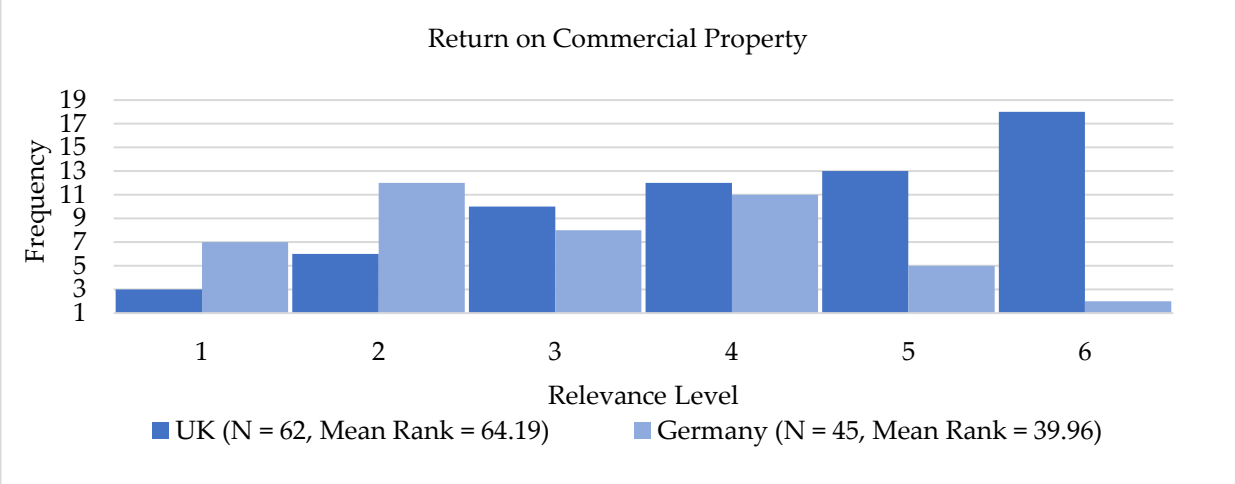


Figure 5-31. Independent - Samples Mann - Whitney U Test of the Relevance of C8 (Return on Commercial Property) for Commercial Property Rentals Dynamics.

Regarding C8 (Return on Commercial Property), there is a substantial difference in ratings by the experts from the UK (N = 62, Mean Rank = 64.19) and Germany (N = 45, Mean Rank = 39.96). The respondents operating in the UK gave a statistically significantly higher rating to the relevance of Return on Commercial Property compared to the respondents from Germany, U = 763.00, z = -4.05, p = .000, two tailed.

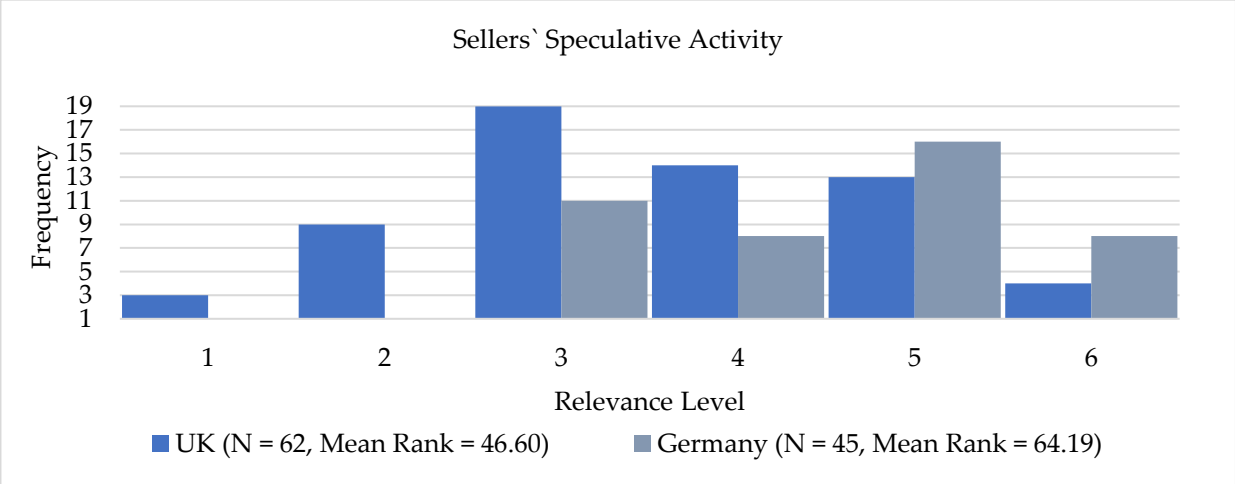


Figure 5-32. Independent - Samples Mann - Whitney U Test of the Relevance of C25 (Sellers` Speculative Activity) for Commercial Property Rentals Dynamics.

The respondents' ratings of C25 (Sellers` Speculative Activity), are significantly different in the UK (N = 62, Mean Rank = 46.60) compared to Germany (N = 45, Mean Rank = 64.19). The relevance of Sellers` Speculative Activity was rated statistically significantly higher by commercial property experts in Germany compared to respondents from the UK, U = 936.50, z = -2.97, p = .003, two tailed.

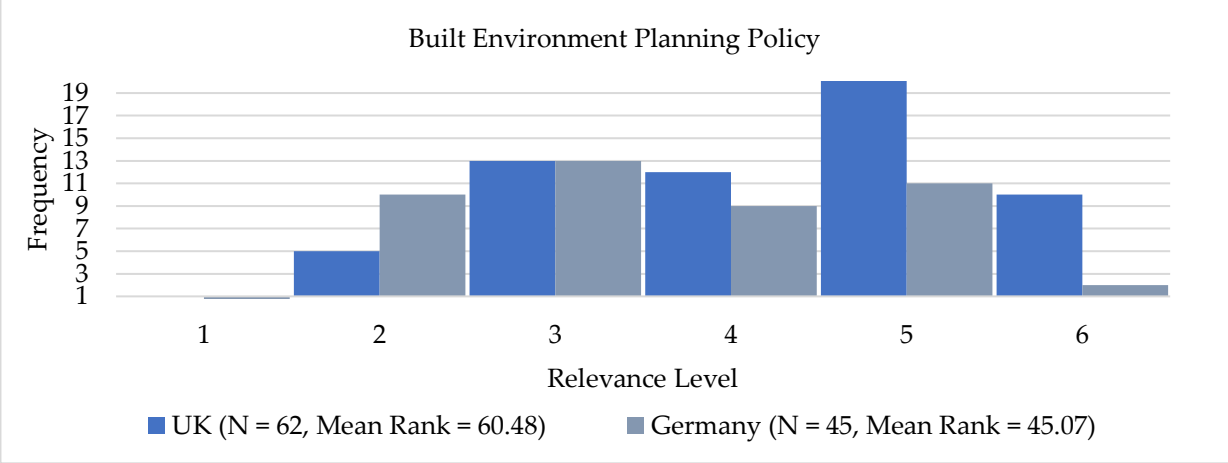


Figure 5-33. Independent - Samples Mann - Whitney U Test of the Relevance of C27 (Built Environment Planning Policy) for Commercial Property Rentals Dynamics.

Regarding C27 (Built Environment Planning Policy), there is a substantial difference in the ratings by the respondents from the UK (N = 62, Mean Rank = 60.48) in comparison to those in Germany (N = 45, Mean Rank = 45.07). The respondents operating in the UK gave a statistically significantly higher rating to the

relevance of Built Environment Planning Policy compared to the respondents from Germany, U = 993.000, z = -2.61, p = .009, two tailed.

The results of the UK–Sweden comparison with the most significant level of difference

Comparing the UK and Sweden, significant differences were observed in the following criteria: C12, C20 and C30. That is 3 criteria out of a total of 30.

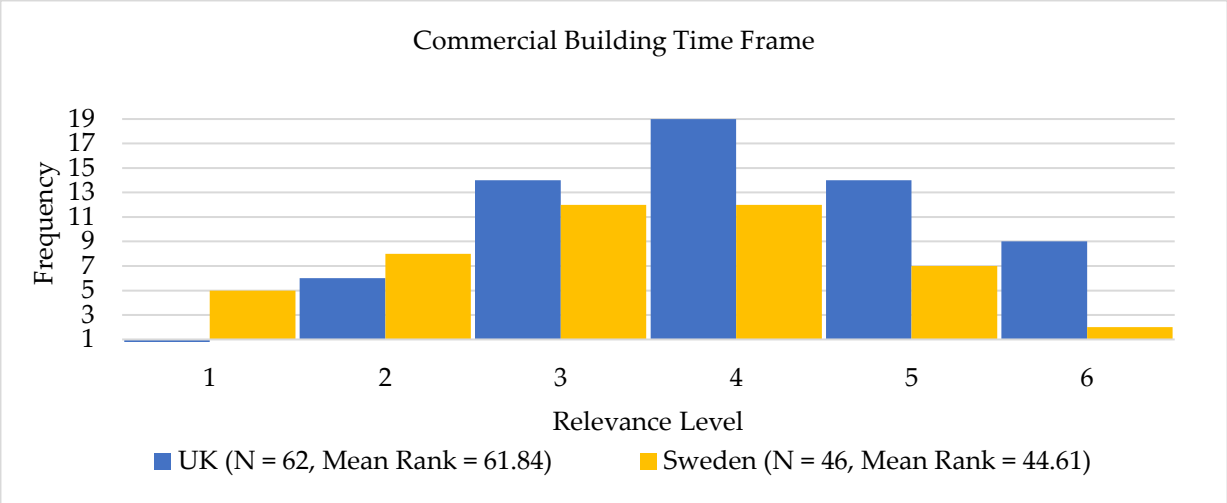


Figure 5-34. Independent - Samples Mann - Whitney U Test of the Relevance of C12 (Commercial Building Time Frame) for Commercial Property Rentals Dynamics.

There is a substantial difference in the ratings by the respondents from the UK and Sweden. The Mann Whitney U test indicated that respondents from the UK (N = 62, Mean Rank = 61.84), gave significantly higher ratings to the relevance of C12 (Commercial Building Time Frame) compared to respondents from Sweden (N = 46, Mean Rank = 44.61), U = 971.00, z = -2.90, p = 0.004, two tailed.

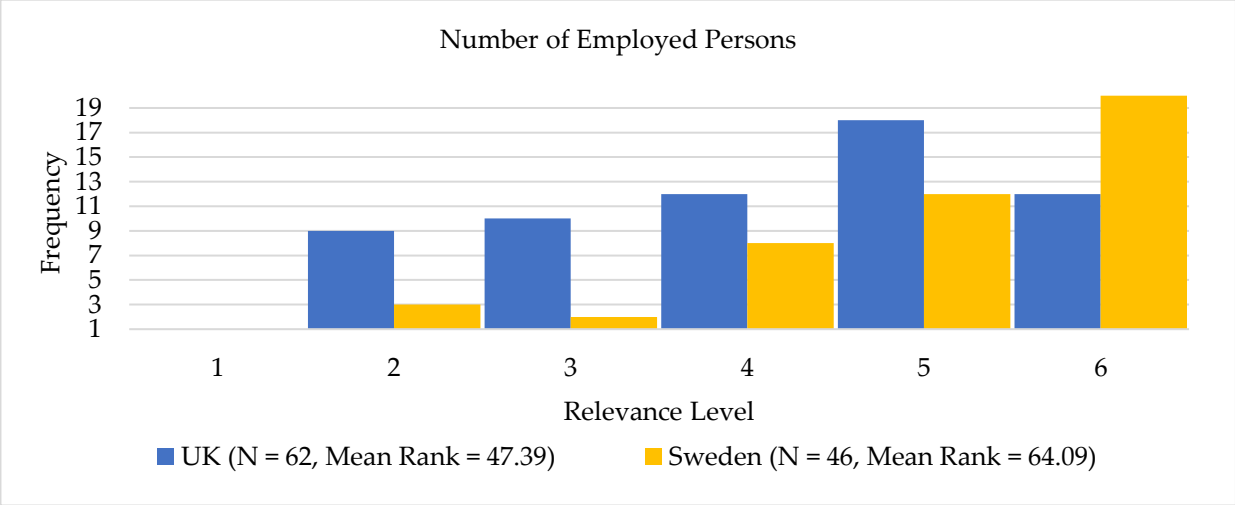


Figure 5-35. Independent - Samples Mann - Whitney U Test of the Relevance of C20 (Number of Employed Persons) for Commercial Property Rentals Dynamics.

According to the Mann Whitney U test results, it can be concluded that C20 (Number of Employed Persons), was rated significantly higher by respondents from Sweden (N = 46, Mean Rank = 64.09) in comparison to those from the UK (N = 62, Mean Rank = 47.39), U = 985.00, z = -2.82, p = .005, two tailed.

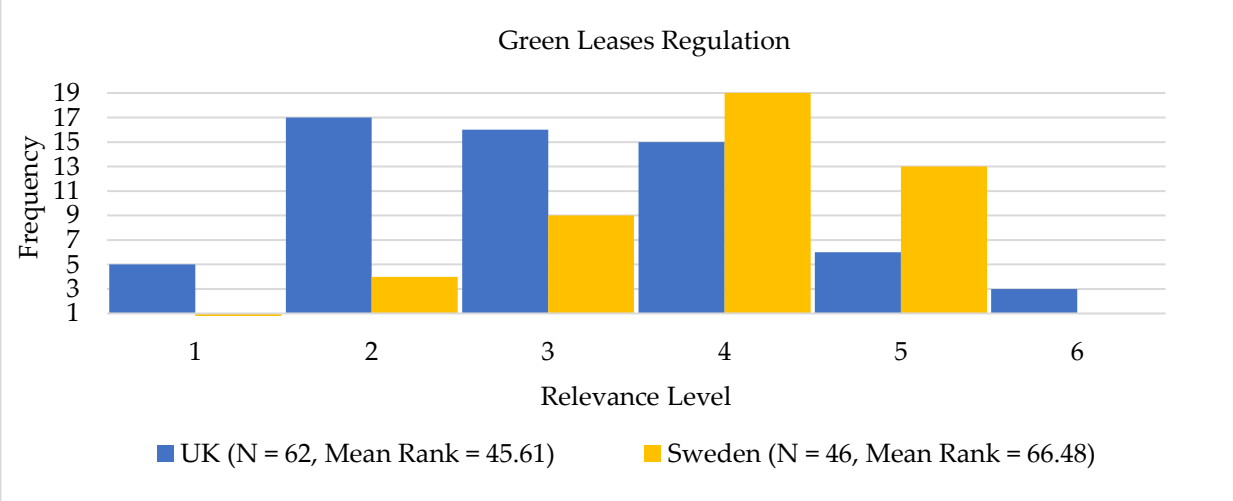


Figure 5-36. Independent - Samples Mann - Whitney U Test of the Relevance of C30 (Green Leases Regulation) for Commercial Property Rentals Dynamics.

The results of the Mann Whitney U test indicate that the relevance of C30 (Green Leases Regulation) was rated significantly higher by respondents from Sweden (N = 46, Mean Rank = 66.48) in comparison to those from the UK (N = 62, Mean Rank = 45.61), U = 875.00, z = -3.52, p = .000, two tailed.

5.5.3. Central Tendency Test

The table below details the descriptive statistics for all the criteria. In most cases, the descriptive analysis covers the mean, median, mode, standard deviation, dispersion and interval calculations. The interval and dispersion are used to estimate the standard deviation. For the purposes of this study, no median is calculated as that is the midpoint value of data and not suitable for data analysis when the data are measured on a scale from 1 to 6. The mode is calculated by determining the highest grade in a data set. With a scale of 1 to 6, some criteria would be given comparable grades despite their potential variance. As a result, the tendency of relevance of each criterion, was measured based on an average.

Table 5-6. The mean and standard deviation.

No	Criterion	N	Mean (M)	Std. deviation (SD)
1	Investors' expectations (C24)	179	4.51	1.350
2	Number of employed persons (C20)	179	4.41	1.242
3	Taxes (C2)	179	4.37	1.444
4	Built environment planning policy (C27)	179	4.35	1.214
5	Gross domestic product (C1)	179	4.34	1.242
6	Interaction between commercial property market cycle and development cycle (C11)	179	4.25	1.340
7	Sellers` speculative activity (C25)	179	4.12	1.329
8	Commercial property value maximisation (C7)	179	4.10	1.346
9	GDP per capita (C18)	179	4.02	1.304
10	Interaction between commercial property market cycle and credit cycle (C10)	179	3.97	1.302
11	Unemployment (C19)	179	3.91	1.210
12	Predictive agents (C23)	179	3.90	1.224
13	Return on commercial property (C8)	179	3.85	1.354
14	Debt interest rate (C9)	179	3.72	1.430
15	Human tendency to forget economy busts (C26)	179	3.68	1.305
16	Commercial building time frame (C12)	179	3.66	1.399
17	Foreign direct investment (C6)	179	3.56	1.221

No	Criterion	N	Mean (M)	Std. deviation (SD)
18	Environmental benefits of sustainable building (C17)	179	3.53	1.311
19	Commercial property capital renewals (C13)	179	3.51	1.442
20	International trade (C5)	179	3.50	1.426
21	Regulation of properties valuation standards (C28)	179	3.36	1.215
22	Government bond yields (C3)	179	3.31	1.298
23	Green leases regulation (C30)	179	3.28	1.224
24	Alternative investments (C4)	179	3.16	1.283
25	Regulation of property accounting standards (C29)	179	3.12	1.142
26	Environmental taxes (C15)	179	3.07	1.486
27	Environmental protection expenditure (C16)	179	2.85	1.285
28	Social protection expenditure (C21)	179	2.85	1.373
29	Social responsibility of commercial property business (C22)	179	2.80	1.370
30	Renewable resources (C14)	179	2.50	1.333

Nine out of thirty criteria fell into a group with a mean grade between 4.02 and 4.51. The experts identified Investors' Expectations (C24) as the most important criterion affecting the dynamics of commercial property rentals, giving it the highest grade (M), 4.51, with a standard deviation (SD) at 1.350. Number of employed persons (C20) is not far behind at 4.41 with a standard deviation (SN) of 1.242. In the third place, is Taxes (C2) (M = 4.37, SD = 1.444), in fourth, Built environment planning policy (C27) (M = 4.35, SD = 1.214), in fifth, Gross domestic product (C1) (M = 4.34, SD = 1.242), in sixth, Interaction between commercial property market cycle and development cycle (C11) (M = 4.25, SD = 1.340), and in seventh, Sellers` speculative activity (C25) (M = 4.12, SD = 1.329). Regarding Commercial property value maximisation (C7) (M = 4.10, SD = 1.346), its mean grade placed it in eighth position. In fourteenth is Debt interest rate (C9) (M = 4.02, SD = 1.430), in ninth position is GDP per capita (C18) (M = 4.02, SD = 1.304).

The next group of criteria had their relevance rated between 3.07 and 3.97, this group comprising seventeen criteria. In tenth place, is Interaction between commercial property market cycle and credit cycle (C10) (M = 3.97, SD = 1.302). In eleventh is Unemployment (C19) (M = 3.91, SD = 1.210). Predictive

agents (C23) (M = 3.90, SD = 1.224) is in twelfth place and in the thirteenth place is Return on commercial property (C8) (M = 3.85, SD = 1.354). In fourteenth place is Debt interest rate (C9) (M = 3.72, SD = 1.430), in fifteenth place is Human tendency to forget economy busts (C26) (M = 3.68, SD = 1.305). In sixteenth place is Commercial building time frame (C12) (M = 3.66, SD = 1.399), in seventeenth, Foreign Direct Investment (C6) (M = 3.56, SD = 1.221). The Environmental benefits of sustainable building (C17) (M = 3.53, SD = 1.311), is in eighteenth place. The following two positions are quite similar in terms of their rating. These are Commercial property capital renewals (C13) (M = 3.51, SD = 1.442) and International trade (C5) (M = 3.50, SD = 1.426), placed nineteenth and twentieth, respectively. in the twenty-first position, is Regulation of properties valuation standards (C28) (M = 3.36, SD = 1.215). Government bond yields (C3) (M = 3.31, SD = 1.298) has the mean of 3.31 and Standard deviation of 1.298 and took the twenty-second place. The Green leases regulation (C30) (M = 3.28, SN = 1.224) is in twenty-third place and in twenty-fourth is Alternative investments (C4) (M = 3.16, SD = 1.283). in twenty-fifth and twenty-sixth positions, are two criteria: Regulation of property accounting standards (C29) (M = 3.12, SD = 1.142) and Environmental Taxes (C15) (M = 3.07, SD = 1.486).

The final group of criteria were rated within the range 2.50–2.85. Environmental protection expenditure (C16) (M = 2.85, SD = 1.285) and Social protection expenditure (C21) (M = 2.85, SD = 1.373) have the same mean values. These criteria were placed twenty-seventh and on twenty-eighth, respectively. In twenty-ninth position is Social responsibility of commercial property business (C22) (M = 2.80, SD = 1.370). Finally, in the experts' opinion, the criterion that is the least relevant for the dynamics of commercial property transactions prices is Renewable Resources (C14) (M = 2.50, SD = 1.333).

5.5.4. Criteria Weighting

The 30 criteria identified through an analysis of scientific literature, differ in their relevance for the dynamics of commercial property rentals prices. As with transactions dynamics, in order to estimate the weight of the criteria, the mean rating of relevance of each criterion was divided by the sum of the mean of grades ensuring that weights are one. The mean and weight of each criterion is shown in Table 5-7.

Table 5-7. The means and weights of the criteria affecting the dynamics of commercial property transactions prices.

No	Criterion	Mean	Weight
1	Gross domestic product (C1)	179	0.0396
2	Taxes (C2)	179	0.0399
3	Government bond yields (C3)	179	0.0302

No	Criterion	Mean	Weight
4	Alternative investments (C4)	179	0.0289
5	International trade (C5)	179	0.0320
6	Foreign direct investment (C6)	179	0.0325
7	Commercial property value maximisation (C7)	179	0.0374
8	Return on commercial property (C8)	179	0.0352
9	Debt interest rate (C9)	179	0.0339
10	Interaction between commercial property market cycle and credit cycle (C10)	179	0.0362
11	Interaction between commercial property market cycle and development cycle (C11)	179	0.0387
12	Commercial building time frame (C12)	179	0.0334
13	Commercial property capital renewals (C13)	179	0.0321
14	Renewable resources (C14)	179	0.0228
15	Environmental taxes (C15)	179	0.0280
16	Environmental protection expenditure (C16)	179	0.0261
17	Environmental benefits of sustainable building (C17)	179	0.0322
18	GDP per capita (C18)	179	0.0367
19	Unemployment (C19)	179	0.0356
20	Number of employed persons (C20)	179	0.0403
21	Social protection expenditure (C21)	179	0.0260
22	Social responsibility of commercial property business (C22)	179	0.0256
23	Predictive agents (C23)	179	0.0356
24	Investors' expectations (C24)	179	0.0411
25	Sellers` speculative activity (C25)	179	0.0376
26	Human tendency to forget economy busts (C26)	179	0.0336
27	Built environment planning policy (C27)	179	0.0397
28	Regulation of properties valuation standards (C28)	179	0.0307
29	Regulation of property accounting standards (C29)	179	0.0284
30	Green leases regulation (C30)	179	0.0300
Total			1.0000

5.6. Chapter Summary

This chapter comprised a quantitative analysis of the survey data. The goal of the analysis was to confirm and evaluate 30 criteria identified as affecting the dynamics of commercial property transaction and rental prices and rentals. Cronbach's Alpha coefficients were estimated at 0.89 and 0.895, respectively. These values are higher than 0.7, pointing to a high degree of internal compatibility meaning that the scale used to rate the relevance of the criteria can be considered reliable.

The analysis also aimed to determine whether there were any differences in the opinions on the relevance of the criteria of experts from different countries. Ratings were measured on a scale from 1 to 6, where 1 is 'irrelevant' and 6 is 'most relevant'. The criteria were then arranged by degree of relevance.

Further analysis of the questionnaire data was performed using non-parametric statistics (Mann-Whitney) to identify any potential statistically significant differences in the ratings of the relevance of criteria by experts from the UK and each of the other countries. Experts ratings were analysed for two groups within the commercial property market: transactions and rentals. The analysis of criteria that impact commercial property transactions prices dynamics were summarised first (Table 5-4 - Table 5-5), the rentals were summarised second (Table 5-10 - Table 5-12). The results showing that all 30 criteria are relevant for the dynamics of commercial property transactions prices or rentals, to some extent.

According to central tendency (mean value) test it was furthermore established that all 30 rating criteria differ in their relative relevance and affect the dynamics of commercial property transactions prices or rentals to a different degree, with the exception of two: Environmental Benefits of Sustainable Building (C17) and Unemployment (C19). These criteria have the same mean values.

This table contains a summary of data identifying significantly different criteria typical to both France and Sweden, each of the countries compared to the UK (

Table 5-8); significantly different criteria with significant weight differences in only one country compared to the UK (

Table 5-9).

Table 5-8. A summary of the results for the criteria with significant differences in weight in France and in Sweden compared to the UK.

Comparing Countries	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Taxes (C2)	395.500	-3.015	0.003
UK/Sweden		744.500	-3.232	0.001
UK/France	Government Bond Yields (C3)	251.500	-4.527	0.000
UK/Sweden		588.000	-4.338	0.000
UK/France	Debt Interest Rate (C9)	372.500	-3.271	0.001
UK/Sweden		515.500	-5.014	0.000
UK/France	GDP per Capita (C18)	298.500	-4.014	0.000
UK/Sweden		687.500	-3.606	0.000
UK/France	Number of Employed Persons (C20)	302.500	-3.969	0.000
UK/Sweden		673.000	-3.701	0.000
UK/France	Predictive Agents (C23)	210.500	-4.958	0.000
UK/Sweden		545.000	-4.654	0.000
UK/France	Sellers` Speculative Activity (C25)	229.500	-4.789	0.000
UK/Sweden		479.500	-5.173	0.000
UK/France	Human Tendency to Forget Economy Busts (C26)	380.000	-3.125	0.002
UK/Sweden		760.500	-3.046	0.002

Both French and Swedish commercial property experts assigned a higher degree of relevance to criteria C2, C3, C9, C18, C20, C23, C25, and C26 compared to their counterparts in the UK.

Table 5-9. A summary of the results for the criteria with significant differences in weight in only one country compared to the UK.

Comparing Country	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Gross Domestic Product (C1)	401.500	-2.944	0.003
UK/Germany	Return on commercial property (C8)	447.500	-5.558	0.000
UK/France	Environmental Taxes (C15)	426.000	-2.664	0.008

Comparing Country	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Environmental Protection Expenditure (C16)	398.500	-2.955	0.003
UK/France	Regulation of Property Accounting Standards (C29)	412.000	-2.839	0.005

German commercial property experts assigned a lower degree of relevance to criterion C8 compared to their counterparts in the UK. However, there is a degree of disparity between these criteria when comparing the weights attached to them by commercial property experts from France and the UK. The French commercial property experts give more weight to criteria C1 compared to their UK counterparts whereas the UK experts rated criteria C15, C16 and C29 as having more relevance for the dynamics of commercial property transactions prices than experts from France.

The analysis of the results of criteria that impact commercial property rentals dynamics are summarised below. According to central tendency estimation results it was furthermore established that all 30 rating criteria differ in their relative relevance, affecting the dynamics of commercial property rentals to a different degree, with the exception of two: Environmental protection expenditure (C16) and Social protection expenditure (C21), these criteria having the same mean values.

This part of the chapter summary contains a summary of data identifying significantly different criteria typical to both France and Germany, each of the countries compared to the UK (Table 5-10); significantly different criteria typical to both France and Sweden, each of the countries compared to the UK (Table 5-11); significantly different criteria with significant weight differences in only one country compared to the UK (

Table 5-12).

Table 5-10. A summary of the results of the tests of the criteria with significant differences in weight in France and in Germany compared to the UK.

Comparing Countries	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Sellers` speculative activity (C25)	272.000	-4.999	0.000
UK/Germany		936.500	-2.973	0.003

Comparing Countries	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Built environment planning policy (C27)	469.000	-3.202	0.001
UK/Germany		993.000	-2.607	0.009

The French and German commercial property experts assigned a higher degree of relevance to criterion C25 compared to their counterparts in the UK. Also, the French commercial property experts assigned a higher degree of relevance to criteria C27. The UK`s commercial property experts rated criterion C27 as having more relevance than Germany`s experts. This rating is reversed with French experts.

Table 5-11. A summary of the results for the criteria with significant differences in weight in France and in Sweden, compared to the UK.

Comparing Countries	Criterion	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
UK/France	Number of employed persons (C20)	463.000	-3.226	0.001
UK/Sweden		985.000	-2.821	0.005

Both French and Swedish commercial property experts assigned a higher degree of relevance to criterion C20 compared to their counterparts in the UK.

Table 5-12. A summary of the results for the criteria with significant differences in weight was found in only one country compared to the UK.

Criterion	Comparing Country	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Return on commercial property (C8)	UK/Germany	763.000	-4.053	0.000
Commercial building time frame (C12)	UK/Sweden	971.000	-2.898	0.004
Predictive agents (C23)	UK/France	388.000	-3.940	0.000
Investors' expectations (C24)	UK/France	396.000	-3.873	0.000

Regulation of properties valuation standards (C28)	UK/France	494.000	-2.926	0.003
Regulation of property accounting standards (C29)	UK/France	476.500	-3.089	0.002
Green leases regulation (C30)	UK/Sweden	875.000	-3.524	0.000

French commercial property experts gave more weight to C23, C24 and C29 compared to their UK counterparts while UK experts rated C28 as having more relevance for the dynamics of commercial property rental prices than experts from France. There is a significant degree of difference in the weighting of criterion C8 between UK and German specialists, the UK giving it more weight. Regarding C12 and C30, the weight attached by the UK and Swedish specialists differs significantly, Sweden`s experts considering C12 criterion to have less weight. However, Swedish commercial property experts assigned a higher degree of relevance to criterion C30.

For the purposes of this research, a calculation of the mean of responses to both questionnaires was considered appropriate. The standard deviation is low indicating that the mean is representative for this study.

5.7. Outcomes

Among the five groups of criteria affecting the dynamics of commercial property, the group of emotional criteria was measured to have the largest weight. Its average relevance for the dynamics of the transactions of commercial property is 4.55, and on the dynamics of rentals, 4.05.

Ergo, it may be concluded that emotional criteria like the forward-looking optimism of property sale and lease brokers towards growing prices, investors' expectations, sellers' speculative activity, and the human tendency to forget economic crises affect the dynamics of property transactions and rentals the most.

The group of economic criteria comes in second by relevance. This group covers the largest number of criteria (14). The average relevance of this group for the dynamics of commercial property transactions is 4.11, rentals dynamics, 3.70.

Next in terms of average relevance is the group of social criteria. It consists of the gross domestic product per capita, the unemployment rate, the number of employed persons, spending on social security, and the social responsibility of commercial property business. The average relevance rate of this group for the dynamics of commercial property transactions is 3.52, rentals dynamics, 3.60.

The last but one group is the one that covers legal and regulation criteria. This group consists of the criteria of spatial planning and green lease regulation, accounting, and property valuation standards. This group's average relevance for the dynamics of commercial property transactions is 3.68, rentals dynamics, 3.53.

Environmental criteria were measured as the least impactful in terms of commercial property transactions and rentals dynamics. The average relevance rate of this group for the dynamics of commercial property transactions is 3.37, rentals dynamics, 3.15.

Environmental taxes, environmental spending, and the environmental benefits of sustainable buildings are becoming increasingly relevant owing to the climate change. Developed countries are trying to impose tax on activities that directly or indirectly contribute to this phenomenon. However, experts in commercial property believe these criteria have the least effect on the dynamics of commercial property transactions and rentals.

The fact that the opinions of experts from different countries vary significantly in terms of the relevance of certain criteria could be seen as a prospective point to investigate. However, in order to avoid the mistakes related to those differences for the estimations, the sensitivity of the weights changes has been made in Chapter 7.

Chapter 6. Data Collection and Results Discussion stage 3: Measurement Tools of the Criteria

6.1. Introduction

This chapter contains data collected for the purposes of building a decision-making model. Decisionmaking is connected to the dynamics of commercial property transactions and rentals. This model is designed and deployed using MCDM methods. These methods are grounded on decision making based on calculations, where the best alternative out of a set of solutions to a problem offered is calculated by way of comparison. The goal of this thesis is to build a model that would allow the making of different decisions in the dynamic environment of the commercial property transactions and rentals markets.

The model is based on the choice of the best alternative. The best alternatives are the commercial property markets of four countries: the UK, France, Germany and Sweden. The dynamics of these markets are defined by economic, environmental, social, emotional, and legal and regulatory factors. As a result, these factors can be used as criteria for making various decisions. The versatility of decisions is tied to the fact that this model empowers investors, property owners and tenants, as well as credit institutions and governments, to address matters pertaining to the cyclic environment in which the commercial property market exists.

First of all, information about criteria is collected. Criteria constitute a group of various factors and indicators directly and indirectly affecting the dynamics of commercial property transactions and rentals and potentially serving as a basis for making decisions. The decision depends on which criterion has the greater and the lesser impact on the above dynamics. On top of that, all these criteria could affect different commercial property markets differently. This quality of the criteria allows the decision-maker to choose the right market for investment or development of their own market based on comparison. This chapter describes the influence each of the collected criteria has on the dynamics of commercial property transactions and rentals and offers a calculation of their numeric values.

There follows a description of the effects of 30 criteria on the dynamics of commercial property transactions and rentals and a description of criteria measurement tools by country.

6.2. The Impact of the Criteria and a Description of Criteria Measurement Tools

The study has identified 30 criteria affecting the dynamics of commercial property transaction prices and rentals, which are as follows:

Gross domestic product (C1) is an indicator of the annual growth of the gross domestic product in per centage terms – the increase or decrease in the country's actual GDP compared to the same period of the previous year. For the purposes of this study and of country comparison, the GDP indicator from the Eurostat statistical database was used.

The growth of the gross domestic product (C1) has a positive effect, meaning that a bigger percentage change results in higher commercial property transaction prices and rentals (see Chapter 4).

Taxes (C2) are a specific amount of money paid to the state as a duty; the amount depends on the goods made and services provided. For the purposes of this study and of country comparison, this amount was estimated as the per-capita amount of tax paid to the state on the goods made and services provided. The data was taken from the Eurostat statistical database.

The growth of taxes (C2) has a positive effect, meaning that a larger amount of taxes per capita drives the growth of consumption and prices, including the transaction prices and rentals of commercial property (see Chapter 4).

Government bond yields (C3) are the yield rate of long-term government bonds (with maturity of over 10 years) calculated as the gross monthly average on the secondary market. The indicator used for the purposes of this study was taken from the Eurostat statistical database.

The growth of government bond yields (C3) has a negative effect on commercial property transaction prices and rentals, meaning that a higher yield drives the growth of equity prices on the market, reducing the transaction prices and rentals of commercial property at the same time (see Chapter 4).

Alternative investments (C4) constitute investments in assets other than commercial property. Such assets include real estate other than commercial property, electrical energy, hedge funds, infrastructure, commodities, gold, and active currency. For the purposes of country comparison, this study uses criteria significance data on a scale from 1 to 6 obtained through a questionnaire.

The growth of alternative investments (C4) has a negative impact on the transaction prices and rentals of commercial property, meaning that if an investor has a choice and chooses to invest elsewhere rather than

in commercial property, the supply of commercial property will go up. This drives both the rentals and the transaction prices down.

International trade (C5) is an indicator of trade balance among countries, one that shows the differences in the value of the exports and imports of a country's goods and services. This difference has been calculated as a ratio between the export value of goods and services and the import value thereof. A value above one points to a positive trade balance, while a value below one is indicative of a negative trade balance. This indicator was obtained from the Eurostat statistical database.

A positive balance of international trade (C5) has a positive effect on the growth of commercial property transaction prices and rentals. That way, growing exports of a country's goods and services will drive an increase in the demand for manufacture and trade and the amount of money that can be utilised for investment purposes (see Chapter 4).

Foreign direct investment (C6) is an international investment made by a resident undertaking aiming to purchase long-term equity of an economic entity operating outside of the economic space of the investor. Direct investments include both primary transactions between two entities and subsequent capital transactions between the said entities and subsidiaries, both incorporated and not. For the purposes of country comparison, this study uses the amount of income from inward non-resident investments per capita. The data are obtained from the Eurostat statistical database.

The growth of foreign direct investments (C6) has a positive effect on the development of commercial property transaction prices and rentals in the country because, with foreign investments growing, the supply of commercial property grows as well (see Chapter 4).

Commercial property value maximisation (C7) is the intention to maximise the benefits derived from rentals or transactions of commercial property. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The effect of commercial property value maximisation (C7) drives the transaction prices and rentals of commercial property upwards, which means that this criterion has a positive influence on the growth of property values.

Return on commercial property (C8) is the key indicator of the overall performance of the investment; it is used to compare different property over a particular period of time. It covers the capital of commercial property. For the purposes of this study, this value is estimated as the average return on retail, office, and industrial property. The data were obtained from the MSCI (2018) property database.

The growth of the return on commercial property (C8) is indicative of a positive effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

The debt interest rate (C9) is the price of borrowed capital. The change in the price of borrowed capital affects the supply and demand of money available to loan. The lower the interest on borrowed capital, the higher the income from the return on investment into commercial property for the investor. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The growth of the debt interest rate (C9) has a negative effect on the demand for commercial property and its transaction prices and rentals.

The interaction between commercial property market cycle and credit cycle (C10) is the action that takes place when two or more properties affect one another or create a mutual relationship through their cyclic movement. The commercial property market is tied to the borrowing market. These two markets have their own movement cycles and affect one another. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The interaction between commercial property market cycle and credit cycle (C10) boosts one another's effect and hence has a positive effect on the growth of commercial property transaction prices when the cycles are on the upturn. That way, with the amount of capital available to loan growing, the structure of own and borrowed capital changes: the amount of own capital drops and the share of borrowed capital goes up.

The interaction between commercial property market cycle and development cycle (C11) has an effect comparable to that of C10. The development of commercial property directly affects the market of this

property. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The interaction between commercial property market cycle and development cycle (C11) has a positive effect when both the cycle of commercial property and the development cycle go up due to rapidly increasing demand.

The commercial building timeframe (C12) depends on the condition of the building. The more up to date the building, the longer its timeframe. However, the cost to maintain the building's condition increases over time, and then the building has to be refurbished or demolished. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

That way, the commercial building timeframe (C12) has a negative effect on the growth of commercial property transaction prices and rentals.

Commercial property capital renewals (C13) are connected to constant costs to maintain the condition of the building. During an economic upturn, these costs may go up, driven by the general increase in prices. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

That way, commercial property capital renewals (C13) have a negative effect on the growth of commercial property transaction prices and rentals.

The use of renewable resources (C14) affects the dynamics of commercial property prices. As the demand for energy and the world's population increases, renewable sources of energy become increasingly important. There is a need to use renewable energy resources with property, and the demand for such property is growing. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Renewable resources (C14) have a positive effect on the growth of commercial property transaction prices and rentals.

Environmental taxes (C15) aim to promote responsible property business. These taxes are a specific amount of money paid to the state. For the purposes of country comparison, in this study this value is estimated as a per-capita amount of money paid to the state. The data were obtained from the Eurostat statistical database.

Just like any other taxes, environmental taxes (C15), too, drive consumption in an economic sense and therefore have a positive effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

The purpose of environmental protection expenditure (C16) is to prevent, minimise, and eliminate pollution or any other type of environmental deterioration. For the purposes of country comparison, in this study this value is estimated as the per-capita amount of expenditure for sewerage, solid waste management, exhaust gas processing, and protection of natural landscapes, among other things. The data were obtained from the Eurostat statistical database.

From the economic standpoint, environmental protection expenditure (C16) contributes to environmental protection and improves the quality of the environment, and therefore has a positive effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

The environmental benefits of sustainable buildings (C17) is a criterion defining the rational use of resources at all stages of a building's life cycle. As new buildings are being constructed, efforts are made to make sure that future generations will be able to use them effectively. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The criterion of environmental benefits of sustainable buildings (C17) has a positive effect on the growth of commercial property transaction prices and rentals.

GDP per capita (C18) shows the amount of gross domestic product per one resident. It is an economic indicator that demonstrates the level of economic development of the country. For the purposes of country

comparison, in this study this value was estimated as the annual share of GDP per capita. The data were obtained from the Eurostat statistical database.

The growth of GDP per capita (C18) has a positive effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

Unemployment (C19) is the percentage of unemployed people and job-seekers in the total number of employable people. For the purposes of country comparison, in this study this value is the average annual unemployment level as a percentage. The data were obtained from the Eurostat statistical database.

The growth of unemployment (C19) has a negative effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

The number of employed persons (C20) is the total number of employed persons of employable age in the country. For the purposes of country comparison, in this study this value is the number of employed persons as a percentage of the total population. The data were obtained from the Eurostat statistical database.

The growth of the number of employed persons (C20) has a positive effect on the growth of commercial property transaction prices and rentals (see Chapter 4).

Social protection expenditure (C21) includes social benefits consisting of benefits in cash or in kind to households and persons to alleviate the burden of their needs, as well as the costs of administration of social protection consisting of various expenditure under social protection schemes. For the purposes of country comparison, in this study this value is estimated as the per-capita share of this expenditure. The data were obtained from the Eurostat statistical database.

The growth of social protection expenditure (C21) has a positive effect on the growth of commercial property transaction prices and rentals by driving consumption (see Chapter 4).

The social responsibility of commercial property business (C22) is the corporate responsibility such as providing charity to community programmes, pledging to carry out projects of environmental

sustainability, and efforts to foster a diverse and safe work environment, as well as contribution to solving the problem of population ageing. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The social responsibility of the commercial property business (C22) has a negative effect on the growth of commercial property transaction prices and rentals by causing the spending of this business to go up.

Predictive property agents (C23) are property agents predicting future prices. As the market prices of commercial property grow, these agents carry out sales offering prices above the market level as of the offering date. They believe that the prices will continue to grow in the future. That way, they sell or lease property at prices or rates above the market level, creating a bubble effect. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Predictive property agents (C23) have a positive effect on the growth of commercial property transaction prices and rentals by driving consumption.

Investors' expectations (C24) shift depending on their priorities. Investors find it important to diversify their portfolios to maximise the profit and minimise the risks. They look for opportunities to invest in more recent commercial property business models tied to the use of new technologies on commercial property markets. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Investors' expectations (C24) have a positive effect on the growth of commercial property transaction prices and rentals.

Sellers' speculative activity (C25) is a virtually inevitable phenomenon in any market defined by a high degree of price volatility. Speculative activity in the commercial property market aims to find a possibility to maximise profit over the shortest period of time possible, regardless of the long view. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Sellers' speculative activity (C25) has a positive effect on the growth of commercial property transaction prices and rentals.

The human tendency to forget economy busts (C26) is an object of behavioural economics. Humankind tends to forget the consequences of an economic crisis and therefore repeats its behaviour of trying to maximise profits during every boom, which leads to a deeper crisis, something that people are then completely unprepared for. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The human tendency to forget economy busts (C26) has a positive effect on the growth of commercial property transaction prices and rentals.

The built environment planning policy (C27) has some effect on the construction business. The sectors of spatial planning and construction are subject to tight regulation. Growing construction drives an increase in the supply of commercial property, resulting in tighter development regulation and a drop in investments in such territories. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The built environment planning policy (C27) has a negative effect on the growth of commercial property transaction prices and rentals.

The regulation of property valuation standards (C28) may indirectly obstruct the development of commercial property. For instance, when a valuation is performed for mortgage purposes in order to obtain a loan for property development, the banks will have a set of rigid requirements for the valuation. The amount of funding depends on the estimated value of the property. That way, a strict enforcement of the valuation standards may inhibit impulsive property development. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Regulation of property valuation standards (C28) has a negative effect on the growth of commercial property transaction prices and rentals.

The regulation of property accounting standards (C29) may also indirectly halt the growth of commercial property prices. The accounting standards are the main instrument used to harmonise the accounts and they have the power to effectively organise the activity of commercial property companies. However, such companies have problems when it comes to reflecting commercial property in their balance sheets at fair value. This is especially the case when the property was purchased for a very high price above its fair value. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

The regulation of property accounting standards (C29) has a negative effect on the growth of commercial property transaction prices and rentals.

Green leases regulation (C30) constitutes requirements for property owners and tenants aiming to minimise the environmental impact of the building and improve environmental sustainability. Green lease requirements share the same purpose of ensuring that everything is carried out in the most environment-friendly and efficient way possible. This creates a need for property owners and tenants alike to be aware of these questions and to solve them to ensure that the dynamics of the commercial property market are sustainable. For the purposes of country comparison, this study uses data on criteria significance on a scale from 1 to 6, obtained via a questionnaire.

Green leases regulation (C30) has a negative effect on the growth of commercial property transaction prices and rentals.

6.3. Summary of Criteria Measurement Tools

To be able to explain this model in theory and apply it in practice, it is critical that the criteria measurement tools be clearly defined. In practice, criteria significances are determined by specialist experts (Gudiene, 2014). However, that is a subjective assessment. That is why quantitative measurement tools were chosen for criteria that are qualitative in nature.

A summary average of the assessments by experts in each country was used for the purposes of measuring the significance of all qualitative criteria and some of the quantitative criteria with no measurement tools for all countries of comparison available from one source. The rest of the data were obtained from Eurostat, the European statistical database. The averages of return on commercial property were obtained

from the database of Morgan Stanley Capital International (MSCI), an international property information provider.

Table 6-1. Summary of the Measurement Tools of 30 Criteria to be Used in Designing a Decision-Making Model.

Code	Criterion	+/-	Unit of measurement	Source
C1	Gross domestic product	+	GDP growth (annual %)	Eurostat Database
C2	Taxes	+	Euros per capita	Calculated as Taxes to Population ratio. Eurostat Database
C3	Government bond yields	-	Percentage	Eurostat Database
C4	Alternative investments	-	Experts' ranking	Questionnaire
C5	International trade	+	Export to import ratio	Eurostat Database
C6	Foreign direct investment	+	Inward, euros per capita	Calculated as Inward to Population ratio. Eurostat Database
C7	Commercial property value maximisation	+	Experts' ranking	Questionnaire
C8	Return on commercial property	+	Percentage	MSCI
C9	Debt interest rate	-	Experts' ranking	Questionnaire
C10	Interaction between commercial property market cycle and credit cycle	+	Experts' ranking	Questionnaire
C11	Interaction between commercial property market cycle and development cycle	+	Experts' ranking	Questionnaire
C12	Commercial building time frame	-	Experts' ranking	Questionnaire
C13	Commercial property capital renewals	-	Experts' ranking	Questionnaire

Code	Criterion	+/-	Unit of measurement	Source
C14	Renewable resources	+	Experts' ranking	Questionnaire
C15	Environmental taxes	+	Euros per capita	Calculated as Environmental taxes to Population ratio. Eurostat Database
C16	Environmental protection expenditure	+	Euros per capita	Questionnaire
C17	Environmental benefits of sustainable building	+	Experts' ranking	Questionnaire
C18	GDP per capita	+	Euros per capita	Calculated as GDP to Population ratio. Eurostat Database
C19	Unemployment	-	Percentage of active population	Eurostat Database
C20	Number of employed persons	+	Percentage of population	Calculated as Number of employed persons to Population ratio. Database of Eurostat
C21	Social protection expenditure	+	Euros per capita	Calculated as Social protection expenditure to Population ratio. Eurostat Database
C22	Social responsibility of commercial property business	-	Experts' ranking	Questionnaire
C23	Predictive agents	+	Experts' ranking	Questionnaire
C24	Investors' expectations	+	Experts' ranking	Questionnaire
C25	Sellers' speculative activity	+	Experts' ranking	Questionnaire
C26	Human tendency to forget economy busts	+	Experts' ranking	Questionnaire

Code	Criterion	+/-	Unit of measurement	Source
C27	Built environment planning policy	-	Experts' ranking	Questionnaire
C28	Regulation of property valuation standards	-	Experts' ranking	Questionnaire
C29	Regulation of property accounting standards	-	Experts' ranking	Questionnaire
C30	Green leases regulation	-	Experts' ranking	Questionnaire

The (+/-) sign shows whether, as commercial property transaction prices and rentals grow, the criteria promote or inhibit that growth.

6.4. Criteria Measurement Tools of the Dynamics of Commercial Property Transaction Prices and Rentals

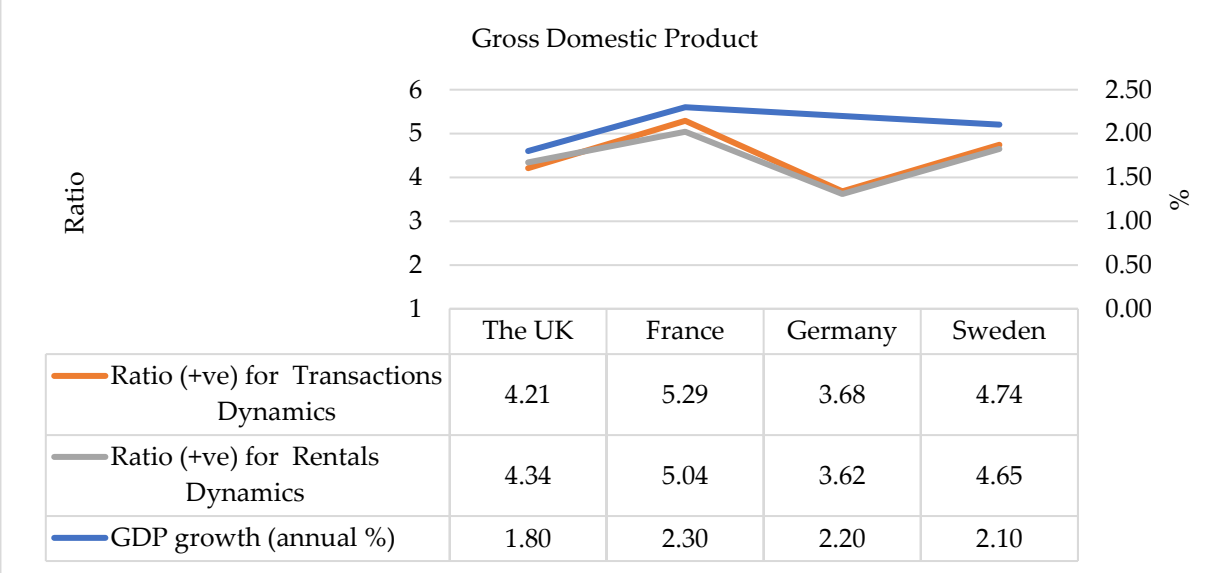
The assessment of qualitative criteria is based on the specialist expert opinions provided in the questionnaires. Their measurement tools were obtained by deriving the average of the expert assessments for each country. The quantitative indicators were obtained from databases for each country. The measurement tools for these criteria are the same both in terms of the criteria that affect the dynamics of transaction prices and those that influence the dynamics of rentals.

This section presents a list and descriptions of all criteria indicators for each alternative (country). The data on the indicators of quality criteria are for the year 2017, it being the most recent data when this study was written. To test the validity of the model designed, this paper also used historical quantitative data. To that end, data from 2015 and 2016 are analysed in Chapter 8. The results of the criteria measurement tools are shown in Table 6-1.

Within the group of economic criteria, the scope of the assessment consisted of 14 criteria (Table 2-2, Chapter 2). The first criterion, C1 Gross domestic product, is quantitative in nature. The figure below shows the factual statistical figure and the average significances as estimated by experts for the year 2017. The data for all four alternatives (countries) are presented in the table below. The highest average of the significance of this criterion, based on the measurement tools derived by experts, was in France. The same tendency can be observed in the 2017 statistical calculations. Based on these calculations, the highest annual gross domestic product growth was reported in France (2.30%), the lowest, in the United Kingdom

(1.80%). The GDP growth in Germany (2.20%) and Sweden (2.10%) is in the second and third places respectively. However, the lowest indicator of significance of this criterion was established by German experts, standing at 3.68 for the dynamics of commercial property transaction prices and at 3.62 for commercial property rentals. They were followed by the UK (where the value is 4.21 for the dynamics of commercial property transaction prices and 4.34. for commercial property rentals) and Sweden (4.74 for the dynamics of commercial property transaction prices and 4.65. for commercial property rentals), in second and third places respectively.

This study uses the annual change in the gross domestic product expressed as a percentage.



	The UK	France	Germany	Sweden
Ratio (+ve) for Transactions Dynamics	4.21	5.29	3.68	4.74
Ratio (+ve) for Rentals Dynamics	4.34	5.04	3.62	4.65
GDP growth (annual %)	1.80	2.30	2.20	2.10

Figure 6-1. The Factual Measurement Tools of Gross Domestic Product (C1) and the Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

The second criterion is Taxes (C2). It is also quantitative in nature. Table 6-2 shows the 2017 indicator obtained by dividing the absolute amount of taxes paid by the total number of population. The statistical data are presented in euros, which makes it possible to compare all countries. The primary data of all four alternatives (countries) for calculations and the average significances as determined by experts are shown in Figure 6-2. Based on the measurement tools determined by experts, the highest average significance of this criterion was in France, standing at 5.33 for the dynamics of commercial property transaction prices and 5.11 for commercial property rentals. It was followed by Sweden (5.24 and 4.41 respectively), Germany (4.80 and 4.24 respectively), and the UK (4.48 and 4.18 respectively). However, on the basis of statistical data, the lowest per-capita tax indicator was in Germany (EUR 4.370.95), the highest, in Sweden,

with the UK placing second (EUR 12,057.85), and France l third, with EUR 5.889.53 of taxes per capita in 2017.

Table 6-2. Taxes Per Capita Estimation.

Country	Taxes, million euros	Population, million persons	Taxes, euros per capita
1. The UK	793,938.80	65.84	12,057.85
2. France	393,445.00	66.80	5,889.53
3. Germany	360,698.00	82.52	4,370.95
4. Sweden	129,988.00	10.00	13,005.10

Sources: Eurostat Database

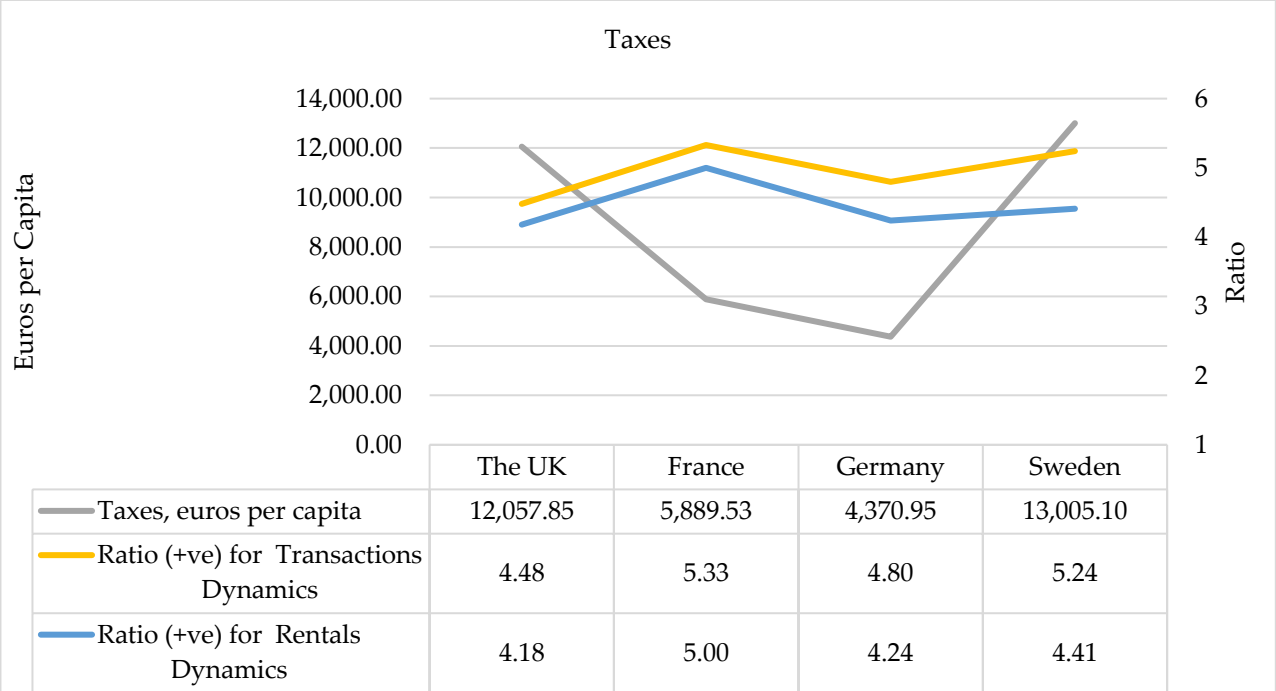
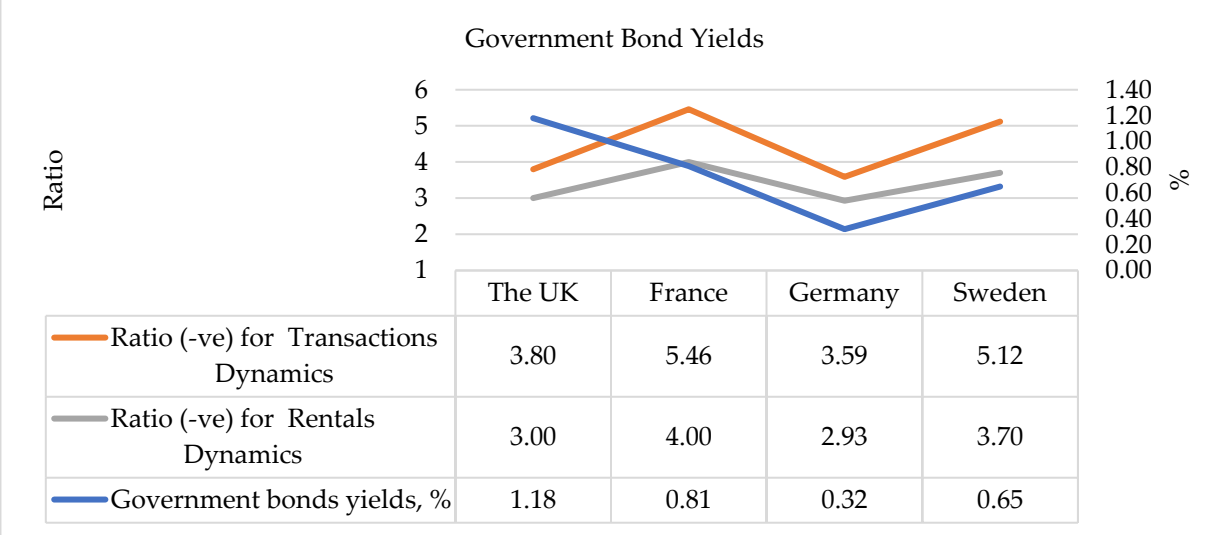


Figure 6-2. The Factual Measurement Tools of Taxes (C2) and the Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

The third criterion is Government bond yields (C3). It is also a quantitative criterion. Figure 6-3 shows the 2017 indicator. This indicator was obtained from the European statistical database and constitutes the interest rate of long-term government bonds. The statistical data are presented as percentages. According to the data, the lowest indicator of government bond interest rate in 2017 was in Germany (0.32%), the

highest, in the UK (1.18%), with France (0.81%) and Sweden (0.65%) in between.

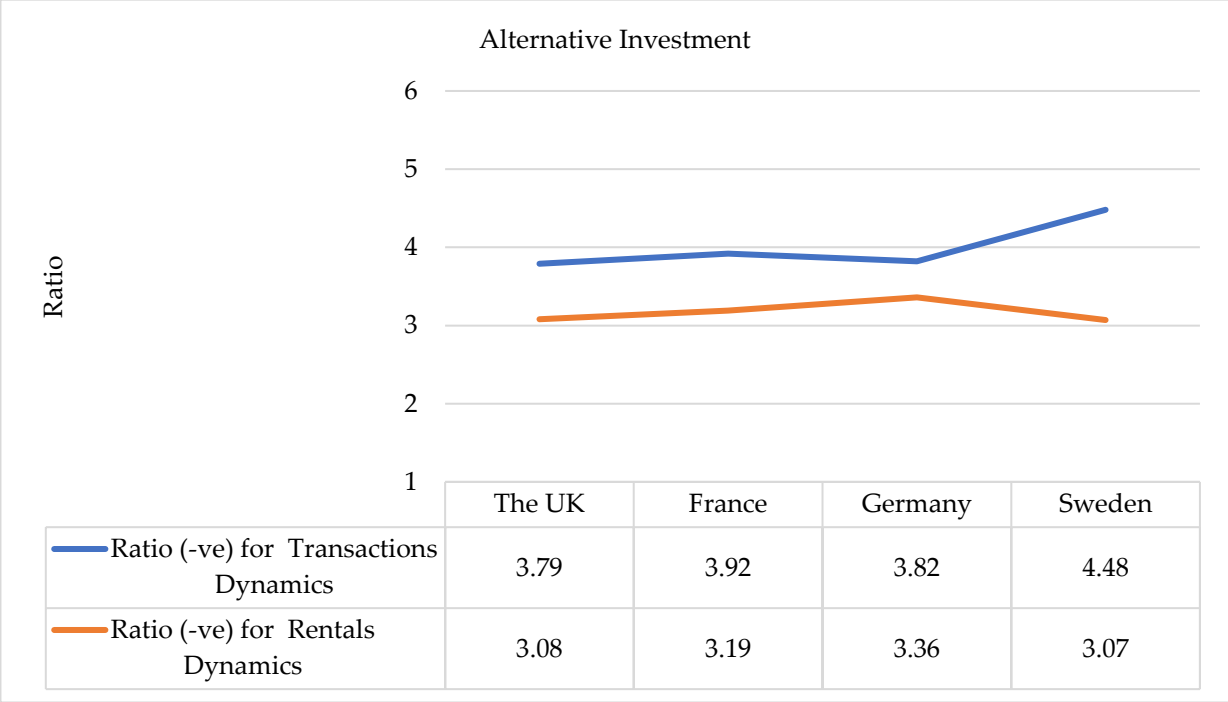
In their assessment, the experts gave the lowest grades to the significance of this criterion in Germany, where it stands at 3.59 for the dynamics of commercial property transaction prices and at 2.93 for that of rentals. The UK (where this indicator stands at 3.80 for the dynamics of commercial property transaction prices and at 3.00 for that of rentals), France (5.46 for the dynamics of transaction prices and 4.00, rentals), and Sweden (5.12 for the dynamics of transaction prices and 3.70, rentals) all rank above it.



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.80	5.46	3.59	5.12
Ratio (-ve) for Rentals Dynamics	3.00	4.00	2.93	3.70
Government bonds yields, %	1.18	0.81	0.32	0.65

Figure 6-3. The Factual Measurement Tools of Government Bond Yields (C3) and the Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

Criterion number four is Alternative investment (C4). It is a qualitative indicator. The experts diverged in their assessment of the commercial property sector that this criterion affects, from country to country (Figure 6-4). Within the context of the dynamics of commercial property transaction prices, the significance of this criterion was considered to be the biggest in Sweden (4.48), with France in second (3.92), followed by Germany in third (3.82), and the UK coming last (3.79). When it comes to analysing the dynamics of commercial property rentals, the highest marks went to Germany (3.36), followed by France in second (3.19), and the UK in third (3.08). The lowest significance rating was given to Sweden (3.07).

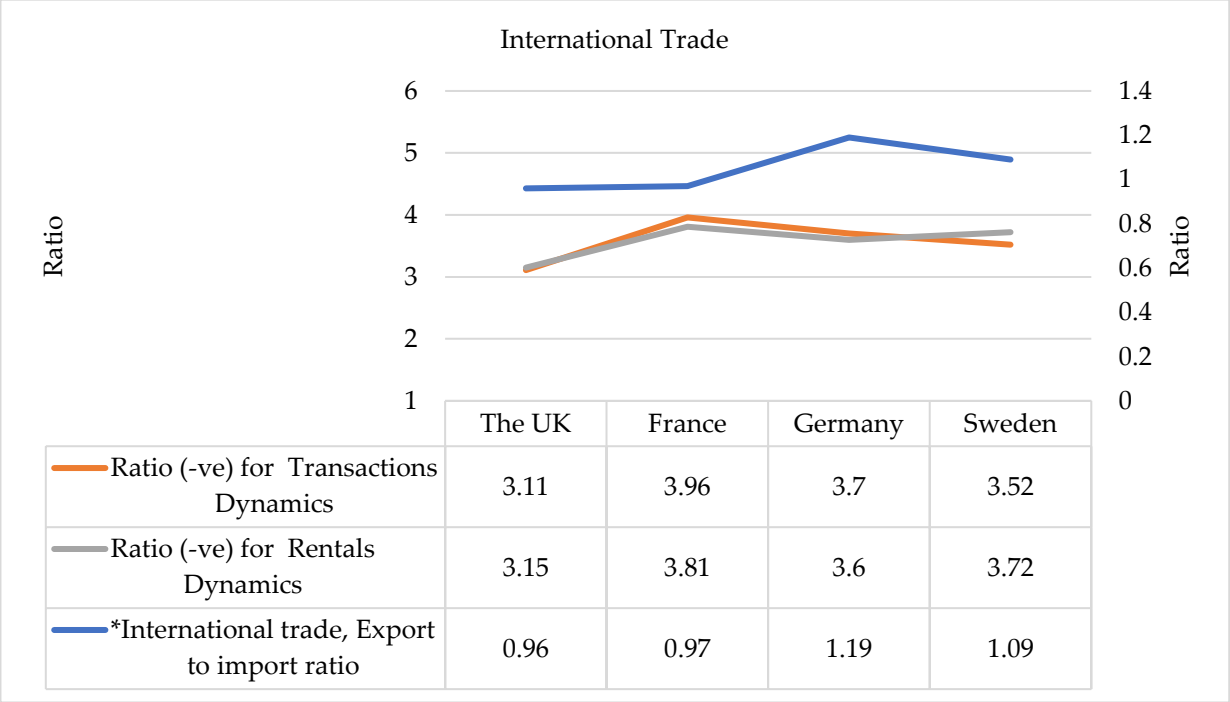


	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.79	3.92	3.82	4.48
Ratio (-ve) for Rentals Dynamics	3.08	3.19	3.36	3.07

Figure 6-4. The Alternative Investment (C4) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

The fifth criterion is International trade (C5). Figure 6-5 shows the 2017 indicator. This indicator was obtained from the European statistical database. The indicator shows the ratio between the exports and imports. The statistical data are presented as a relative ratio (export to import ratio). According to the data, in 2017 the international trade indicator was the lowest in the UK (0.76), the highest in Germany (1.19), with Sweden (1.09) and France (0.97) ranking in between.

Based on the expert assessment, the significance of this criterion was the lowest in the UK, standing at 3.11 for the dynamics of commercial property transaction prices and 3.15 for that of rentals. The indicator's effect on the transactions dynamics was bigger in Sweden (3.52) and Germany (3.70), and biggest in France (3.96). In terms of the impact on the dynamics of rentals, Germany (3.60) and Sweden (3.70) have high marks, with France having the highest score (3.81).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.11	3.96	3.7	3.52
Ratio (-ve) for Rentals Dynamics	3.15	3.81	3.6	3.72
*International trade, Export to import ratio	0.96	0.97	1.19	1.09

Figure 6-5. The Factual Measurement Tools of International Trade (C5) and the Central Tendencies (Sources: Eurostat Database, Central Tendency of Criteria).

Criterion number six, Foreign direct investment (C6), was estimated using primary data such as the percentage of foreign direct investments within the gross domestic product, the gross product, and the country's population. Inward foreign direct investment per capita was calculated in the following phases: (1) the percentage of foreign direct investments within the gross domestic product is calculated in euros by multiplying this percentage by the annual value of the gross domestic product in euros; (2) the product (the share of foreign direct investments) is divided by the number of the country's population.

Table 6-3. Inward FDI Estimation.

Country	GDP, million euros (current prices)	Inward FDI stocks, In percentage of GDP	Inward FDI, million euros
The UK	2,337,971.00	57.50	1,344,333.33
France	2,295,063.00	31.80	729,830.03
Germany	3.277,340.00	24.20	793,116.28
Sweden	475,224.20	62.30	296,064.68

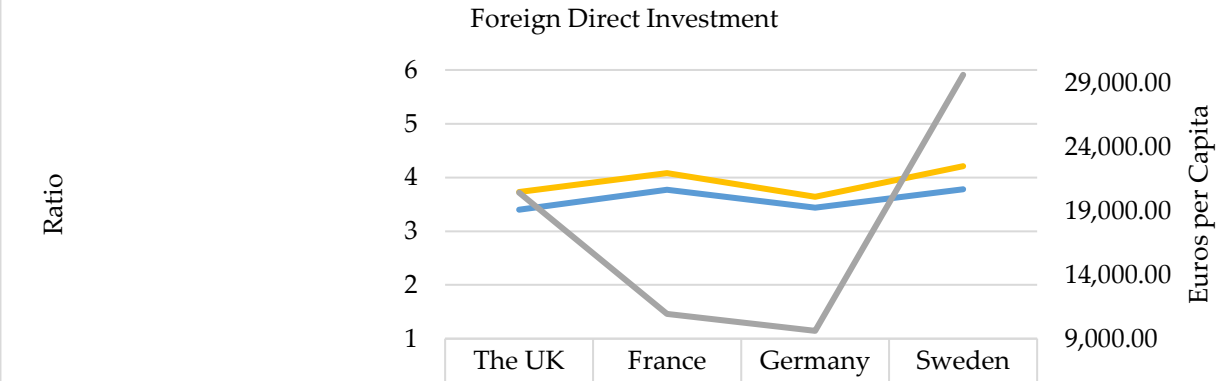
Sources: Eurostat Database

Criterion number six, Foreign direct investment (C6). Inward foreign direct investments per capita are shown in Figure 6-6. It is the 2017 indicator estimated as the absolute amount of inward foreign direct investments divided by the population total. The statistical data are presented in euros. The primary data of all four countries for calculations and the average significances as determined by the experts are shown in Table 6-4 below. The highest average of the experts' estimates of the significance of the criterion was in Sweden, standing at 4.21 for the dynamics of commercial property transaction prices and 3.78, for that of rentals. It was followed by France (4.08 and 3.77 respectively). The breakdown of significances in the UK and Germany was bumpy. Within the context of the dynamics of commercial property transaction prices, the UK is placed third with the criterion significance of 3.73, while Germany has the lowest significance value of 3.64. In terms of the dynamics of commercial property rentals, Germany comes in third (3.44), and the UK has the lowest significance level (3.40). However, based on statistical data, the lowest indicator of inward foreign direct investment per capita in 2017 was in Germany (EUR 9,611.01), followed by France (EUR 10,924.93), the UK (EUR 20,416.90), and Sweden in fourth (EUR 29,620.82).

Table 6-4. Foreign Direct Investment Measurement Tools.

Country	Inward of Foreign direct investment, million euros	Population, million persons	Inward of Foreign direct investment, euros per capita
The UK	1,344,333.33	65.84	20,416.90
France	729,830.03	66.80	10,924.93
Germany	793,116.28	82.52	9,611.01
Sweden	296,064.68	10.00	29,620.82

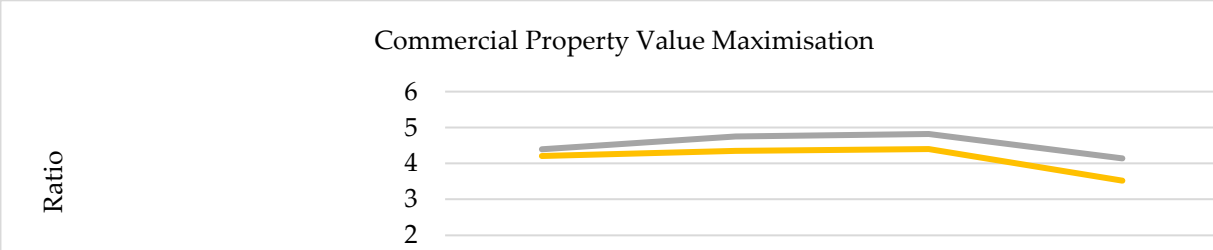
Sources: Eurostat Database



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.73	4.08	3.64	4.21
Ratio (-ve) for Rentals Dynamics	3.40	3.77	3.44	3.78
Inward of FDI	20,416.90	10,924.93	9,611.01	29,620.82

Figure 6-6. The Factual Measurement Tools of Foreign Direct Investment (C6) and the Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

The seventh criterion is Commercial property value maximisation (C7). It is a qualitative indicator. The experts concurred in their assessment of the commercial property sector that this criterion affects, from country to country (Figure 6-7). German experts ranked this criterion as the most significant (4.82 in terms of transactions and 4.40 in terms of rentals), with France placing second (4.75 in terms of transactions and 4.35 in terms of rentals), the UK, third (4.39 in terms of transactions and 4.21 in terms of rentals), and Sweden's experts rating this criterion as having the least amount of significance (4.14 in terms of transactions and 3.52 in terms of rentals).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	4.39	4.75	4.82	4.14
Ratio (-ve) for Rentals Dynamics	4.21	4.35	4.40	3.52

Figure 6-7. The Commercial Property Value Maximisation (C7) Central Tendencies of the Significances

Assigned by Experts (Source: Central Tendency of Criteria).

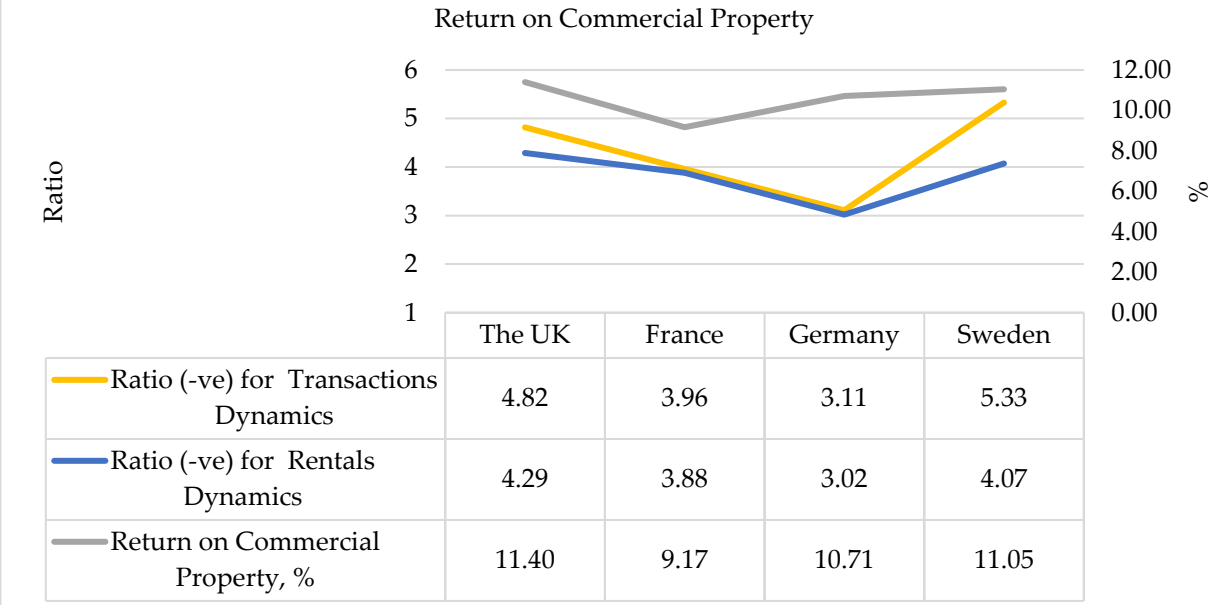
Criterion number eight, Return on commercial property (C8), was estimated as the annual average of return on retail, office, and industrial buildings (see the table below).

Table 6-5. Return on Commercial Property.

Type	The UK	France	Germany	Sweden
Retail, %	6.28	7.31	9.51	8.83
Office, %	7.88	8.36	10.33	12.69
Industrial, %	20.02	11.82	12.30	11.64
Average, %	11.40	9.17	10.71	11.05

Sources: the results estimated according to MSCI information

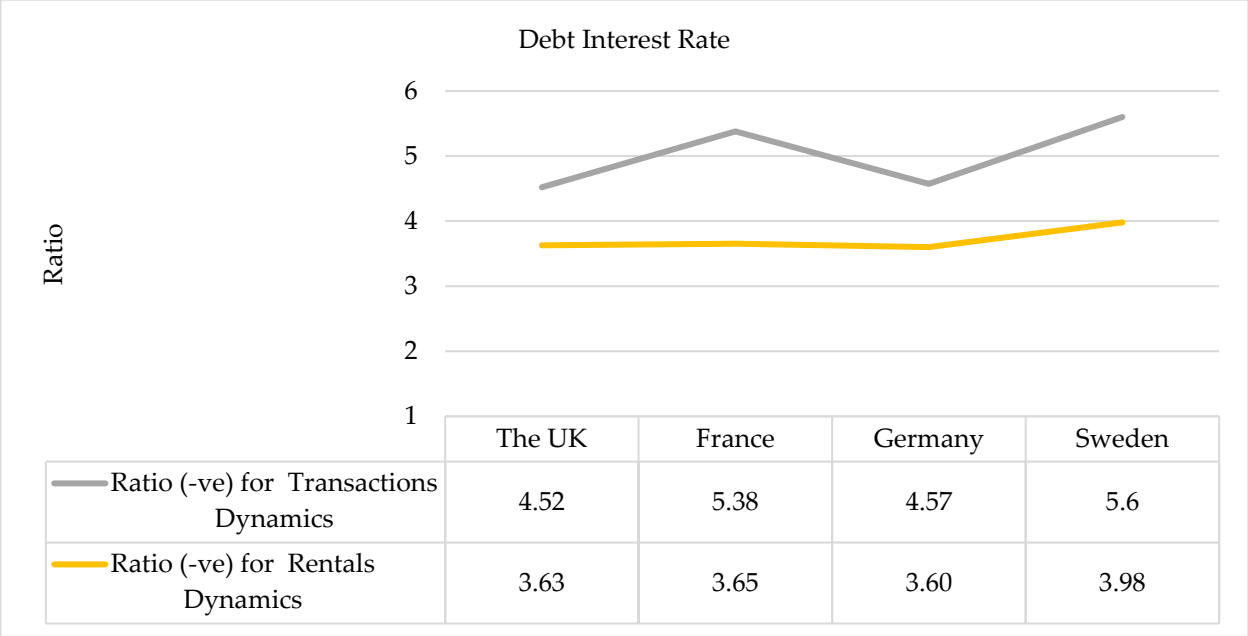
Figure 6-8 shows the indicator for 2017 obtained from the MSCI database (MSCI, 2018). According to the data, the indicator of return on commercial property in 2017 was the lowest in France (9.17%), and the highest in the UK (11.40%), with Sweden being placed second (11.05%), and Germany third (10.71%). The experts from two countries concurred in their assessment of the impact this criterion has on both commercial property sectors, while there was a certain amount of disparity in the opinions regarding the measurement tools of this criterion of the experts from the other two countries. Germany is at the bottom in terms of the significance of the criterion (3.11 for transactions and 3.02 for rentals), with France in third place (3.96 for transactions and 3.88 for rentals). Within the context of the dynamics of commercial property transaction prices, the highest marks go to Sweden (4.82), which is followed by the UK (4.82). And, within the context of the dynamics of commercial property rentals, Sweden is second (4.07), while the UK has the highest degree of significance (4.29).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	4.82	3.96	3.11	5.33
Ratio (-ve) for Rentals Dynamics	4.29	3.88	3.02	4.07
Return on Commercial Property, %	11.40	9.17	10.71	11.05

Figure 6-8. The Factual Return on Commercial Property (C8) and Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

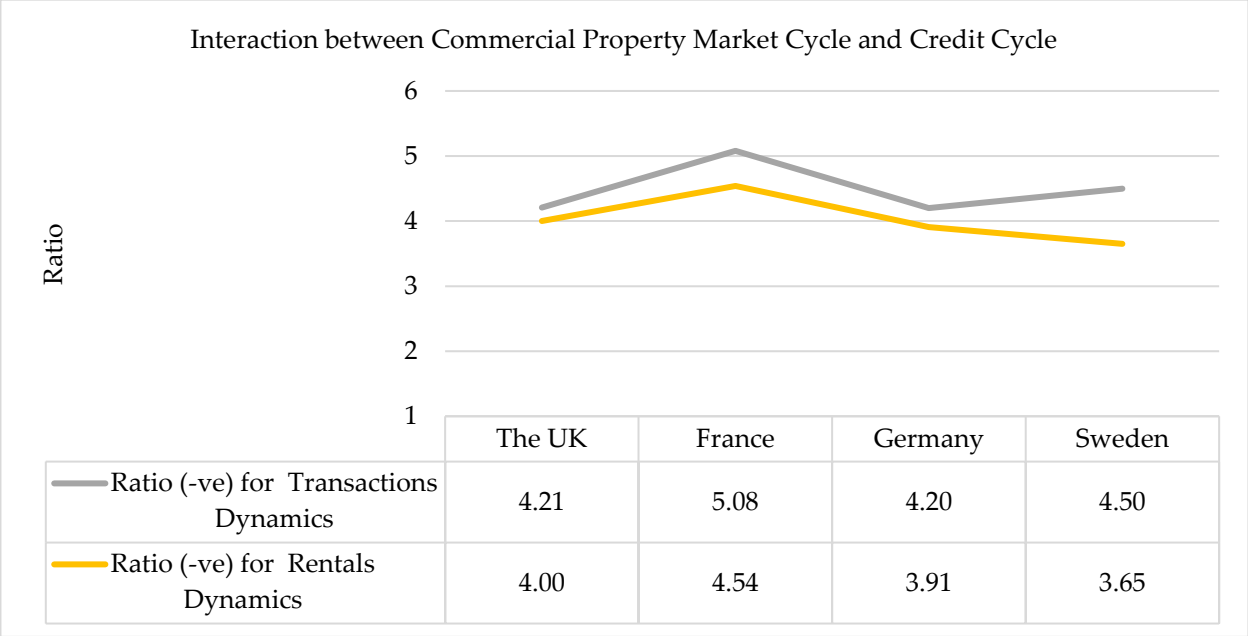
Criterion number nine is Debt interest rate (C9). For the purposes of this paper, its measurement tools are determined in reliance on expert assessment (Figure 6-9). Sweden has the highest significance of this criterion (5.60 for transactions and 3.98 for rentals), followed by France (5.38 for transactions and 3.65 for rentals). Within the context of the dynamics of commercial property transaction prices, the third-highest significance of this criterion is in Germany (4.57), while the significance in the UK is the lowest (4.52). Within the context of the dynamics of commercial property rentals, the UK is third (3.63), and the degree of significance is the lowest in Germany (3.60).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	4.52	5.38	4.57	5.6
Ratio (-ve) for Rentals Dynamics	3.63	3.65	3.60	3.98

Figure 6-9. The Debt Interest Rate (C8) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

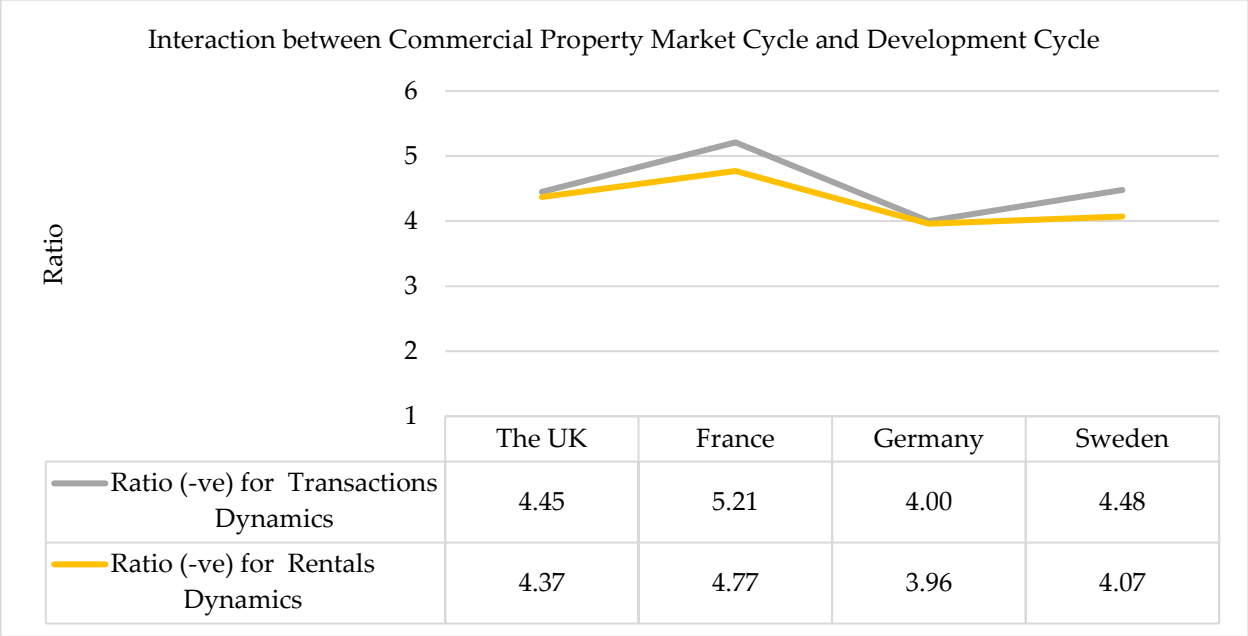
Criterion number 10 is Interaction between commercial property market cycle and credit cycle (C10). Its measurement tools are determined based on expert assessments (Figure 6-10). France ranks at the top in terms of the significance of this criterion (5.08 for transactions and 4.54 for rentals). Within the context of the dynamics of commercial property transaction prices, Sweden is placed second by the significance of the criterion (4.50), followed by the UK (4.21), while the lowest significance rating goes to Germany (4.20). Within the context of the dynamics of commercial property rentals, the UK ranks second (4.00), Germany third (3.91), and Sweden last (3.65).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	4.21	5.08	4.20	4.50
Ratio (-ve) for Rentals Dynamics	4.00	4.54	3.91	3.65

Figure 6-10. The Interaction between Commercial Property Market Cycle and Credit Cycle (C10) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

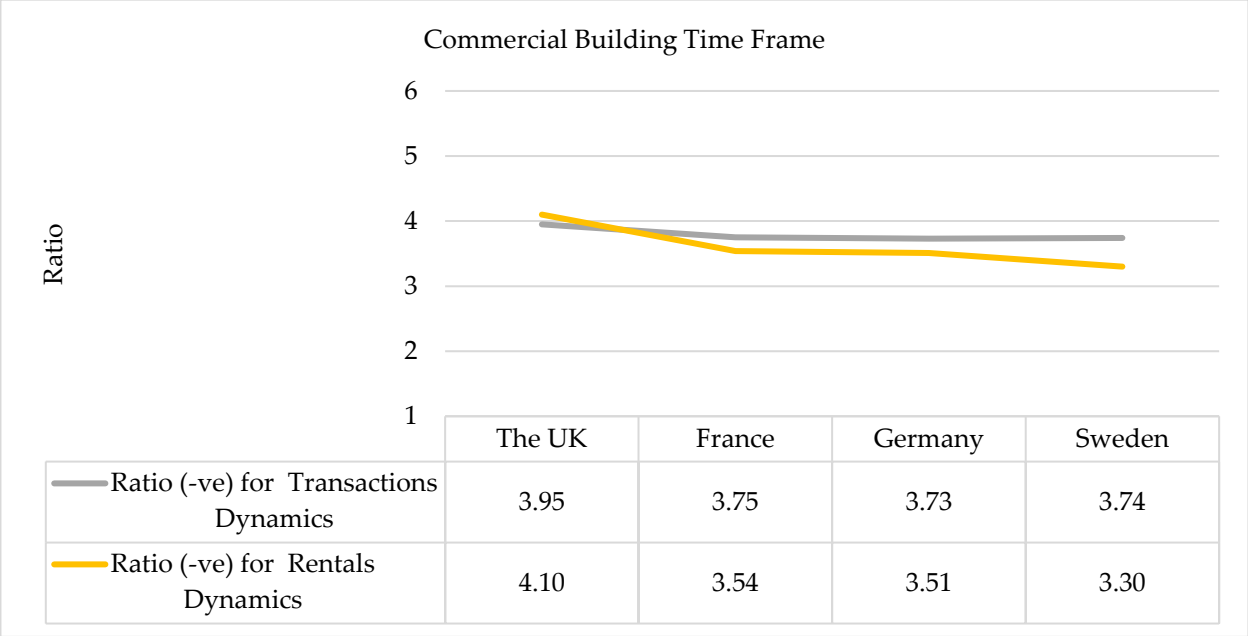
The eleventh criterion is Interaction between commercial property market cycle and development cycle (C11). Its measurement tools are determined based on expert opinions (Figure 6-11). Within the context of the dynamics of commercial property transaction prices, the highest mark goes to France (5.21), with Sweden being placed second (4.48), followed by the UK (4.45), and Germany trailing in the last place (4.00). Within the context of the dynamics of commercial property rentals, France is in first place (4.77), with the UK as the runner-up (4.37), followed by Sweden in third (4.07), and Germany in fourth (4.07).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	4.45	5.21	4.00	4.48
Ratio (-ve) for Rentals Dynamics	4.37	4.77	3.96	4.07

Figure 6-11. The Interaction between Commercial Property Market Cycle and Development Cycle (C11) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

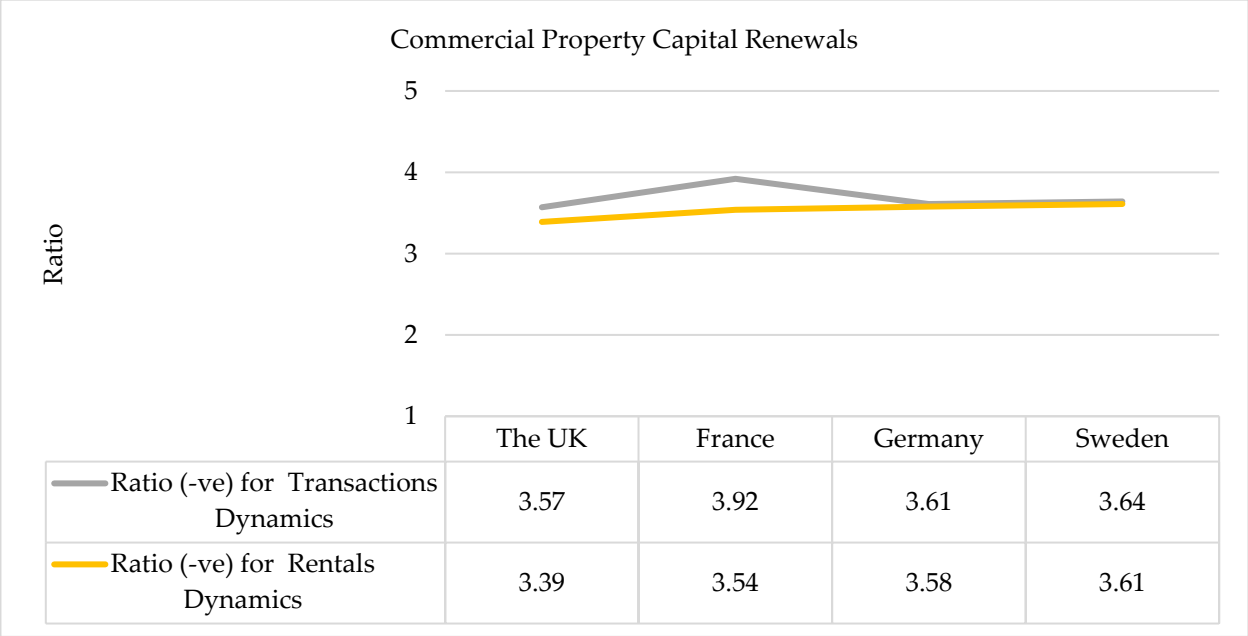
Criterion number 12 is Commercial building time frame (C12). Its measurement tools are also determined on the basis of expert assessments (Figure 6-12). The UK experts gave the significance of this criterion their highest marks (3.95 for transactions and 4.10 for rentals); France came in second (3.75 for transactions and 3.54 for rentals). Within the context of the dynamics of commercial property transaction prices, the significance of this criterion in Sweden places it third (3.74), followed by Germany (3.73). Within the context of the dynamics of commercial property rentals, Germany is third (3.51), and Sweden is last (3.30).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.95	3.75	3.73	3.74
Ratio (-ve) for Rentals Dynamics	4.10	3.54	3.51	3.30

Figure 6-12. The Commercial Building Time Frame (C12) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

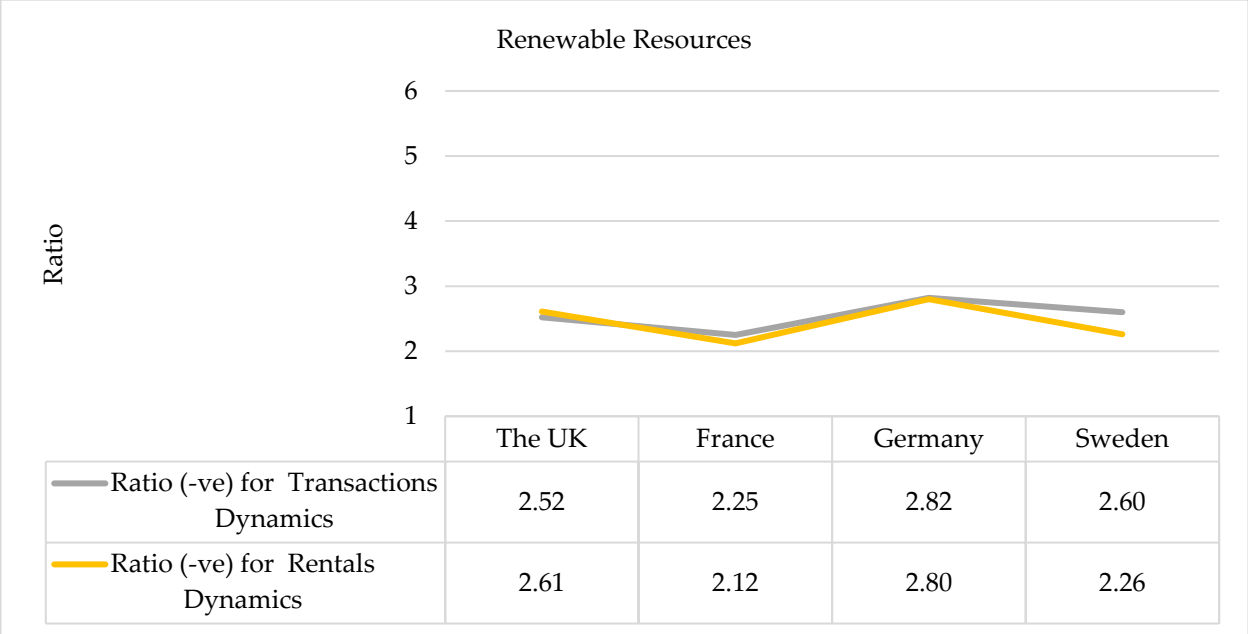
Criterion number 13 is Commercial property capital renewals (C13). Its measurement tools are determined based on expert opinions (Figure 6-13). Within the context of the dynamics of commercial property transaction prices, France was ranked first in terms of the significance of the criterion (3.92), with Sweden in second (3.64), Germany in third (3.61), and the UK being placed last (3.57). Within the context of the dynamics of commercial property transaction prices, the significance of the criterion in Sweden ranks first (3.61), followed by Germany (3.58), then France (3.54), and the UK is last (3.39).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	3.57	3.92	3.61	3.64
Ratio (-ve) for Rentals Dynamics	3.39	3.54	3.58	3.61

Figure 6-13. The Commercial Property Capital Renewals (C14) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

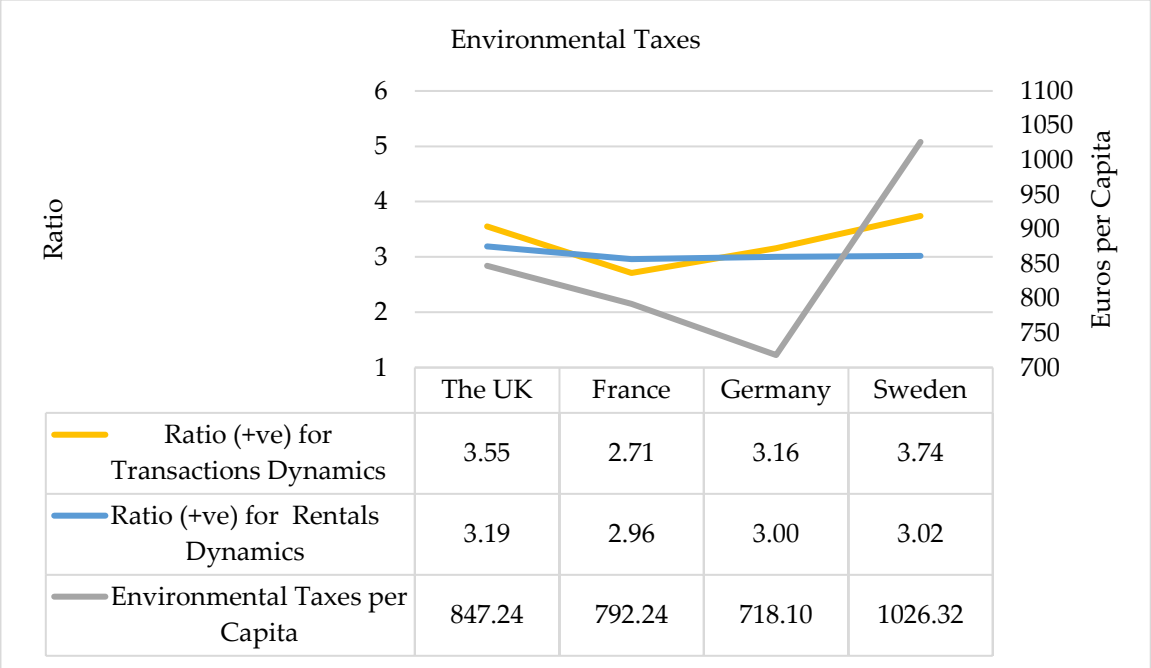
Criterion number 14 is Renewable resources (C14). Its measurement tools are also determined based on expert assessments (Figure 6-14). The German experts gave their highest marks to this criterion (2.82 for transactions and 2.80 for rentals), while the score from the French experts was the lowest (2.25 for transactions and 2.12 for rentals). The experts from the other countries had different opinions regarding this criterion. Within the context of the dynamics of commercial property transaction prices, Sweden is second (2.60), followed by the UK (2.52). Within the context of the dynamics of commercial property rentals, the UK is second (2.61), with Sweden trailing behind (2.26).



	The UK	France	Germany	Sweden
Ratio (-ve) for Transactions Dynamics	2.52	2.25	2.82	2.60
Ratio (-ve) for Rentals Dynamics	2.61	2.12	2.80	2.26

Figure 6-14. The Renewable Resources (C14) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

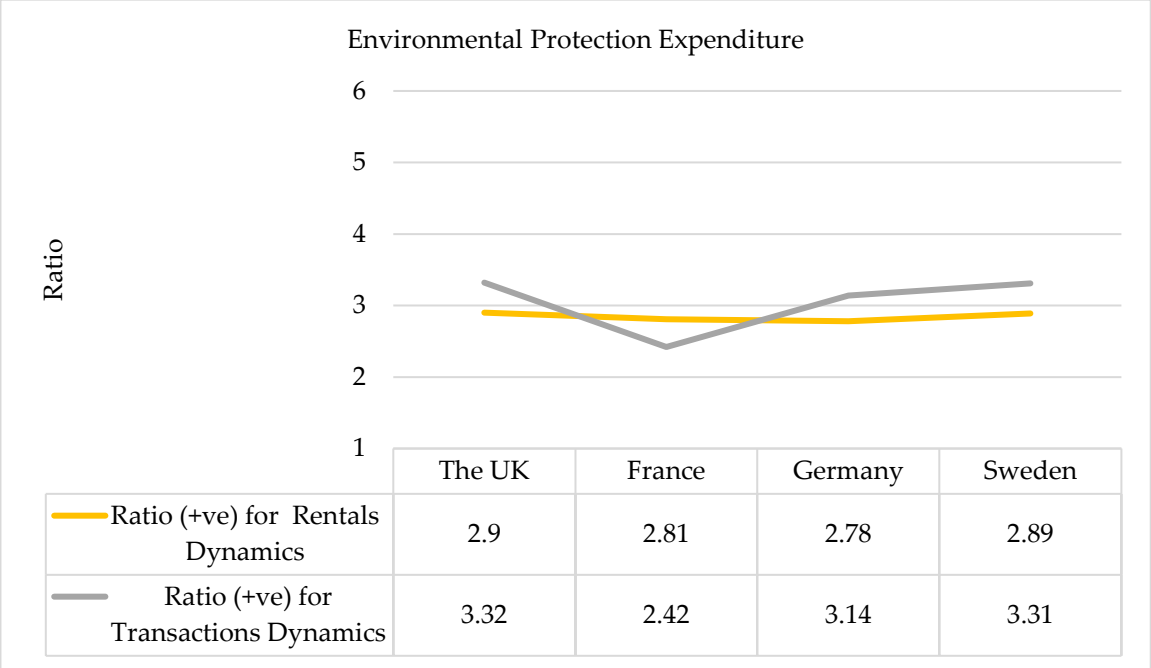
Three criteria were evaluated in the environmental criteria group (Table 2-3, Chapter 2). The fifteenth criterion is Environmental taxes (C15) (Figure 6-15). It is the indicator from 2017 estimated as an absolute amount of environmental taxes in euros divided by the population total. The statistical data are presented in euros. The primary data of all four countries for calculations and the average significances determined by the experts are shown in the table below. Analysing the criteria that determine the dynamics of commercial property transaction prices, the UK is in first place (3.19), followed by Sweden (3.02). Within the context of the dynamics of commercial property rentals, Sweden is first (3.74) with the UK as the runner-up (3.55). For the third and the fourth places, the breakdown of criteria significances was even between the countries. The experts' assessments placed Germany third (3.16 for transactions and 3.00 for rentals), and France fourth (2.71 for transactions and 2.96 for rentals). However, judging by the statistical data, the lowest indicator of environmental taxes per capita in 2017 was in Germany (EUR 718.10), followed by France (EUR 792.24), the UK (EUR 847.24), and Sweden with the largest amount of this type of spending (EUR 1,026.32).



	The UK	France	Germany	Sweden
Ratio (+ve) for Transactions Dynamics	3.55	2.71	3.16	3.74
Ratio (+ve) for Rentals Dynamics	3.19	2.96	3.00	3.02
Environmental Taxes per Capita	847.24	792.24	718.10	1026.32

Figure 6-15. The Factual Environmental Taxes (C15) and Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

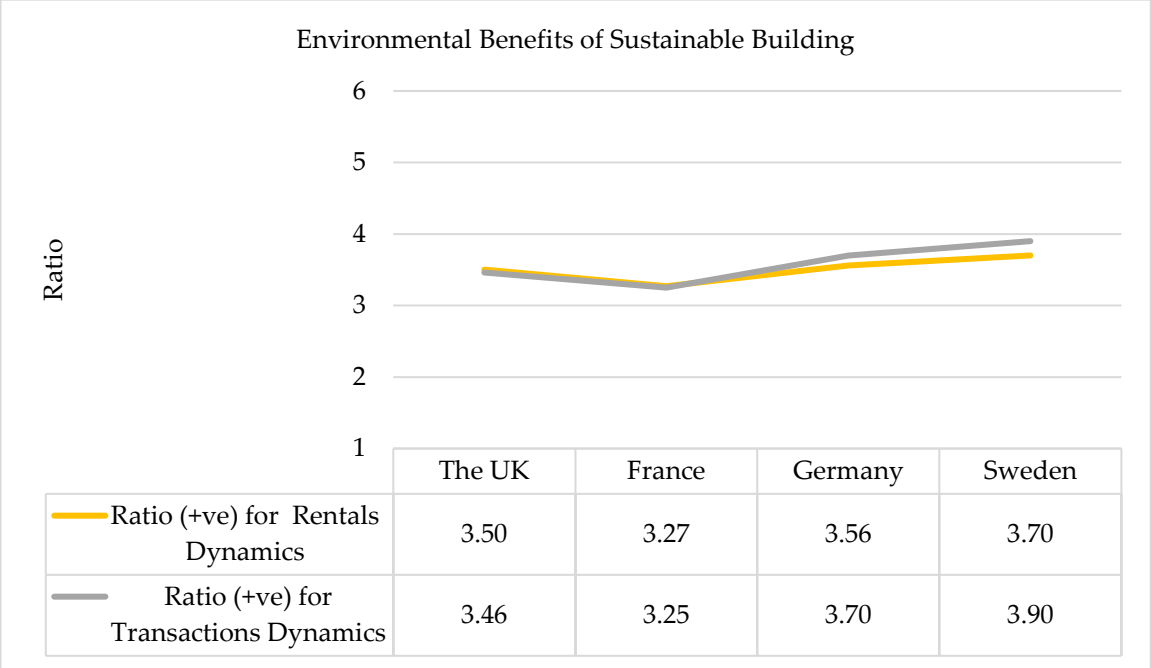
Criterion number 16 is Environmental protection expenditure (C16). Its measurement tools are also determined based on expert assessments (Figure 6-15). The experts estimated this criterion to have the highest degree of significance in the UK (3.32 for transactions and 2.90 for rentals), with Sweden in second place (3.31 for transactions and 2.89 for rentals). Then the ratings diverged for the rest of the countries. Within the context of the dynamics of commercial property transaction prices, Germany is third (3.14), followed by France (2.42). Within the context of the dynamics of commercial property rentals, France is third (2.81), followed by Germany (2.78).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	2.9	2.81	2.78	2.89
Ratio (+ve) for Transactions Dynamics	3.32	2.42	3.14	3.31

Figure 6-16. Environmental Protection Expenditure (C16) Central Tendencies of the Significances Assigned by Experts (Sources: Central Tendency of Criteria).

Criterion number 17 is Environmental benefits of sustainable building (C17). The experts were rather unanimous in their estimations of the commercial property sector affected by this criterion in each of the countries (Figure 6-17). The highest degree of significance was attached to this criterion in Sweden (3.90 for transactions and 3.70 for rentals), followed by Germany (3.70 for transactions and 3.56 for rentals), the UK (3.46 for transactions and 3.50 for rentals), and France coming in last with the lowest significance level (3.25 for transactions and 3.27 for rentals).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.50	3.27	3.56	3.70
Ratio (+ve) for Transactions Dynamics	3.46	3.25	3.70	3.90

Figure 6-17. Environmental Benefits of Sustainable Building (C17) Central Tendencies of the Significances Assigned by Experts (Sources: Central Tendency of Criteria).

There were five criteria assessed in the social criteria group (Table 2-4, Chapter 2).

Criterion number 18 is GDP per capita (C18). It is the indicator from 2017 estimated as an absolute gross domestic product (GDP) amount in euros divided by the population total. The data of all four countries for calculations are shown in the table below, and the average significances determined by the experts are presented in Figure 6-18. Factual GDP per Capita (C18) and Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria). The highest degree of significance was attached to this criterion in France (5.04 for transactions and 4.85 for rentals), followed by Sweden (4.57 for transactions and 4.22 for rentals), the UK (3.54 for transactions and 3.94 for rentals), and Germany coming in last with the lowest rating (3.50 for transactions and 3.47 for rentals). However, based on the statistical data, the lowest per-capita GDP indicator in 2017 was in France (EUR 34,355.11), trailing behind the UK (EUR 35,507.65) and Germany (EUR 39,714.91). The largest amount of GDP per capita was reported in Sweden (EUR 47,545.47).

Table 6-6. GDP per Capita Measurement Tools.

Country	GDP, million euros (current prices)	Population, million persons	GDP per Capita, euros
The UK	2,337,971.00	65.84	35,507.65
France	2,295,063.00	66.80	34,355.11
Germany	3,277,340.00	82.52	39,714.91
Sweden	475,224.20	10.00	47,545.47

Source: the Eurostat statistical database.

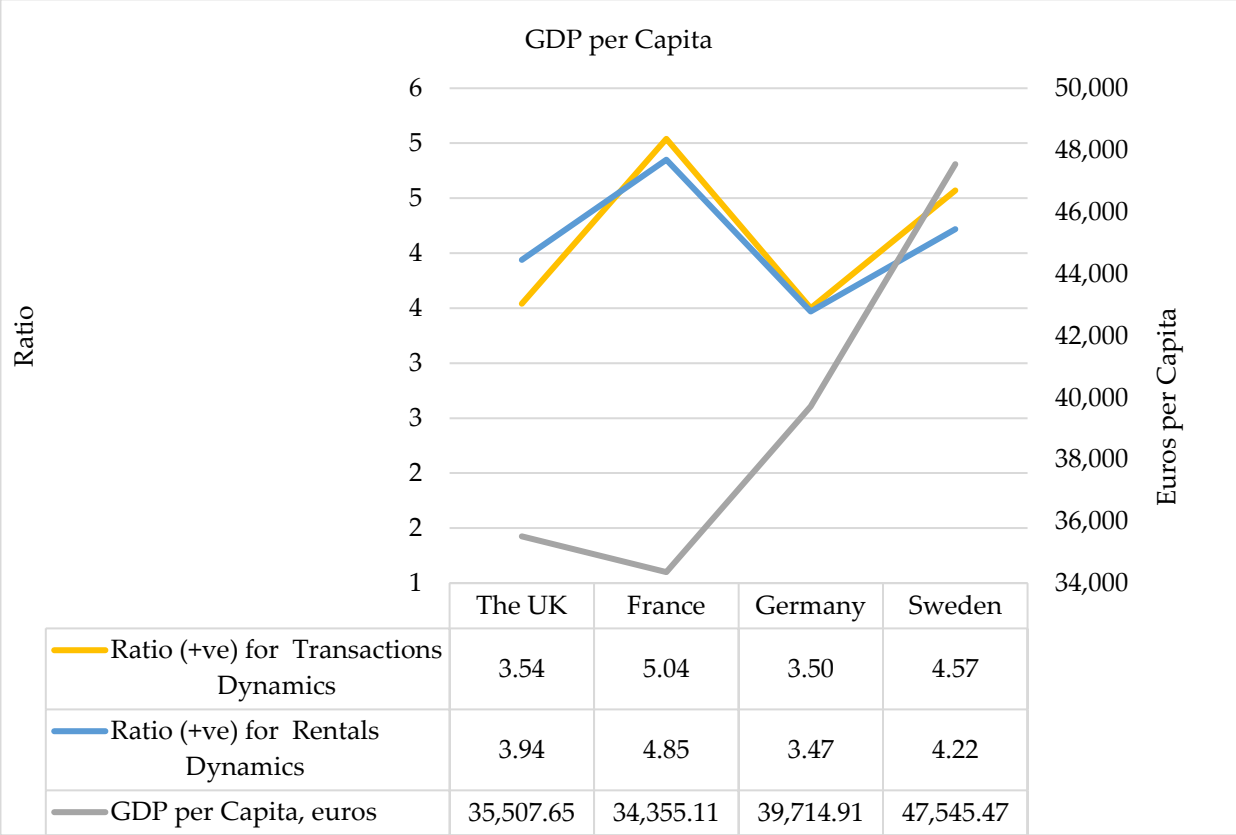
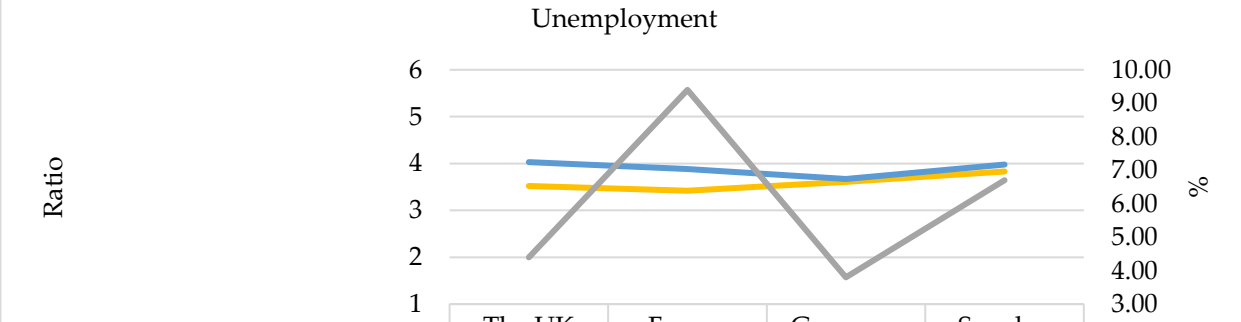


Figure 6-18. Factual GDP per Capita (C18) and Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

Criterion number 19 is Unemployment (C19); its data were obtained from the Eurostat database (Figure 6-19). According to the data, the lowest level of unemployment in 2017 was in Germany (3.80%), the highest, in France (9.40%), with Sweden placing second (6.70%), and the UK third (4.40%). Analysing the

effects of the unemployment criterion on the dynamics of commercial property transaction prices, the experts gave their highest marks to Sweden (3.83), followed by Germany (3.61), with the UK third (3.52), and France coming in last (3.52). Analysing the impact of unemployment on the dynamics of commercial property rentals, the UK was rated first (4.03), followed by Sweden (3.98), with France in third place (3.88), and Germany trailing behind (3.67).



	The UK	France	Germany	Sweden
Ratio (+ve) for Transactions Dynamics	3.52	3.42	3.61	3.83
Ratio (+ve) for Rentals Dynamics	4.03	3.88	3.67	3.98
Unemployment, Percentage of active population	4.40	9.40	3.80	6.70

Figure 6-19. Factual Unemployment (C19) and Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

Criterion number 20 is Number of employed persons (C20). It is the indicator from 2017, estimated as the ratio between employed persons and the population total (Table 6-7). The data of all four countries for calculations and the average significances determined by the experts are presented in Figure 6-20. The measurement tools of this criterion are the highest in France (5.17 for transactions and 5.19 for rentals), followed by Sweden (4.83 for transactions and 4.89 for rentals), the UK (3.88 for transactions and 4.18 for rentals), and Germany coming in last (3.86 for transactions and 3.80 for rentals). Yet, in terms of the statistical data, the lowest per-capita GDP figure in 2017 was reported in France (41.93%), with the UK placed third (47.00%), and Germany second (49.56%). The number of employed persons was the largest in Sweden (50.08%).

Table 6-7. The Measurement Tools of the Number of Employed Persons Criterion.

Country	Population, thousand	Number of employed persons, population thousand	Number of employed persons, percentage of population
The UK	65,844.14	30,944.00	47.00
France	66,804.12	28,013.00	41.93
Germany	82,521.65	40,900.00	49.56
Sweden	9,995.15	5,006.00	50.08

Source: the Eurostat statistical database.

Figure 6-20. Factual Number of Employed Persons (C20) and Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

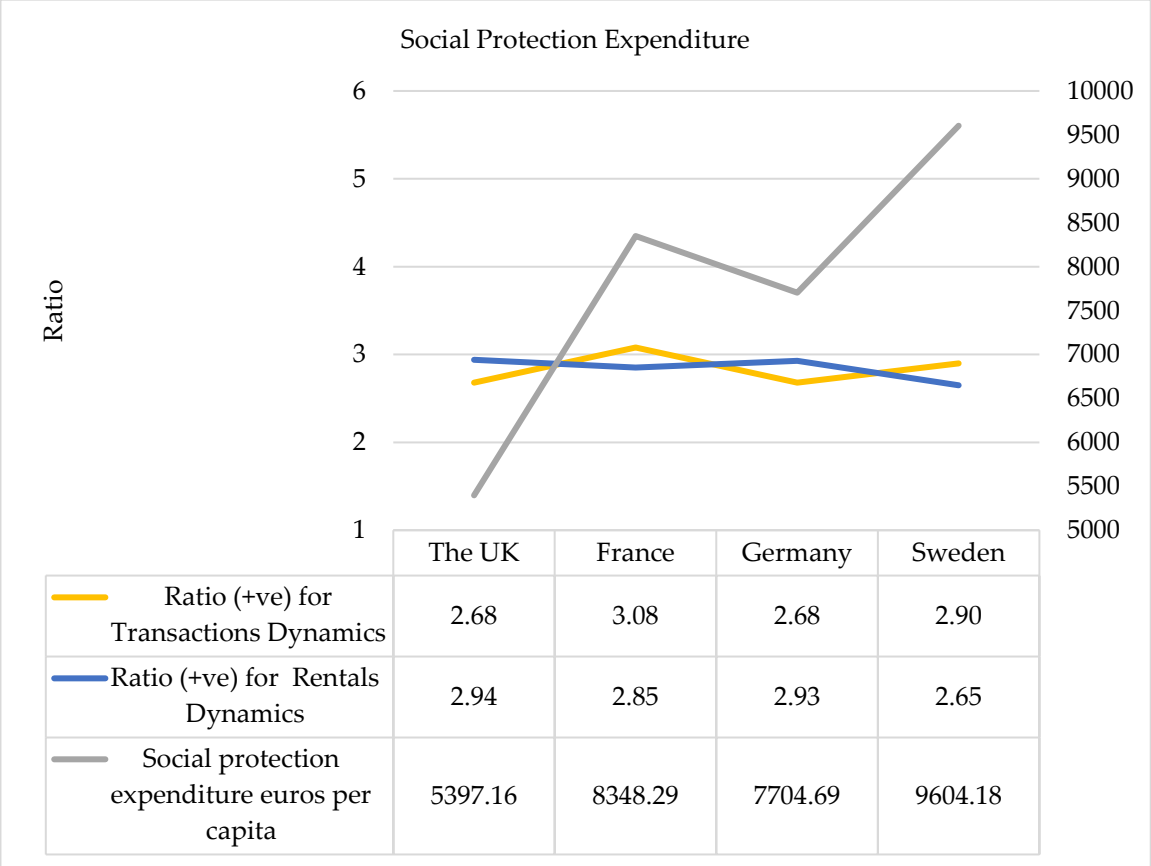
The twenty-first criterion is Social protection expenditure (C21). It is the indicator from 2017 estimated as an absolute amount of social protection expenditure in euros divided by the population total (Table 6-8).

The statistical data are presented in euros. The primary data of all four countries for calculations and the average significances as established by the experts are shown in Figure 6-21 below. Analysing the criteria that affect the dynamics of commercial property transaction prices, the highest average score was obtained in France (3.08), followed by Sweden (2.90), with the UK and Germany in joint third in terms of the significance of this criterion (2.68). Within the context of the dynamics of commercial property rentals, the UK is in the lead with the highest significance score (2.94), followed by Germany (2.93), with France in third (2.85), and Sweden coming in last with the lowest significance rating (2.65). Based on the statistical data, in 2017, the UK had the lowest indicator of social protection expenditure per capita (EUR 5,397.16); the rating was higher in Germany (EUR 7,704.69 Eur), and France (EUR 8,348.29), and Sweden placed at the top (EUR 9,604.18).

Table 6-8. The Measurement Tools of the Social Protection Expenditure Criterion.

Country	Social protection expenditure, million euros	Population, million persons	Social protection expenditure euros per capita
1. The UK	355,371.59	65.84	5,397.16
2. France	557,700.31	66.80	8,348.29
3. Germany	635,803.96	82.52	7,704.69
4. Sweden	95,995.29	10.00	9,604.18

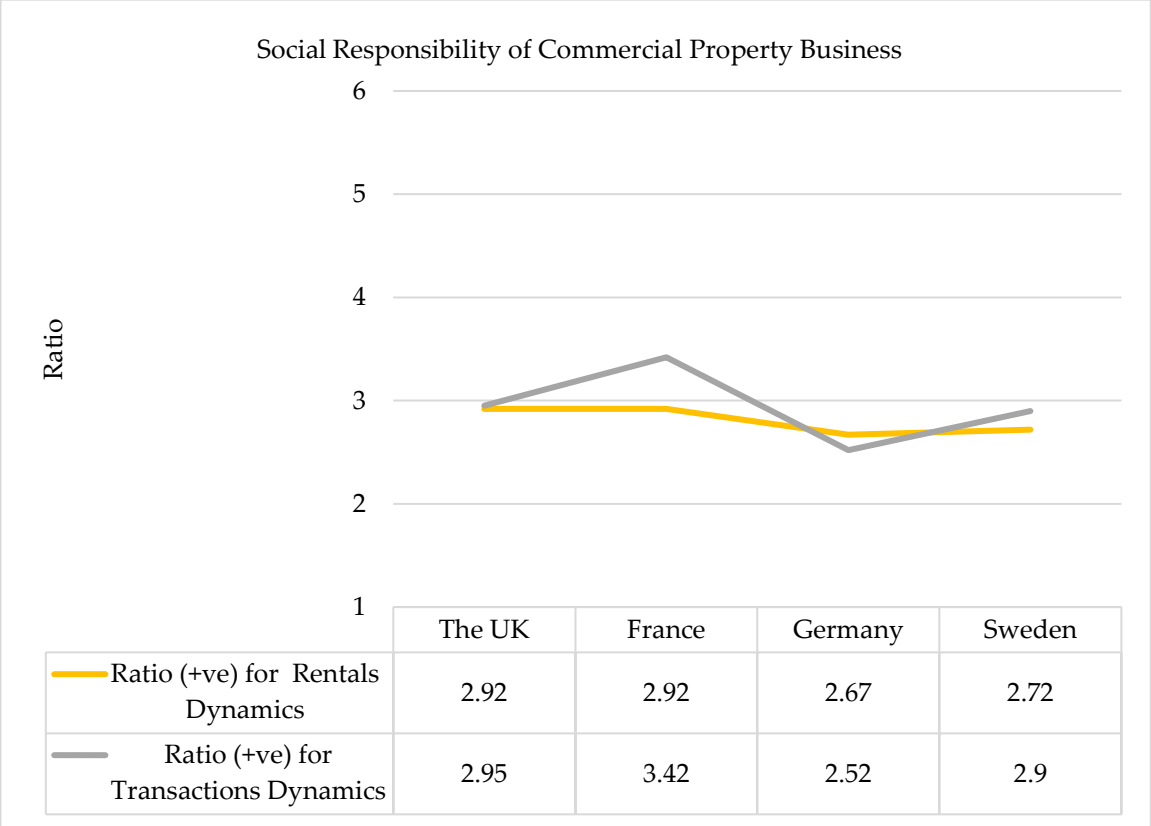
Source: the Eurostat statistical database.



	The UK	France	Germany	Sweden
Ratio (+ve) for Transactions Dynamics	2.68	3.08	2.68	2.90
Ratio (+ve) for Rentals Dynamics	2.94	2.85	2.93	2.65
Social protection expenditure euros per capita	5397.16	8348.29	7704.69	9604.18

Figure 6-21. Factual Social Protection Expenditure (C21) and Central Tendencies of the Significances Assigned by Experts (Sources: Eurostat Database, Central Tendency of Criteria).

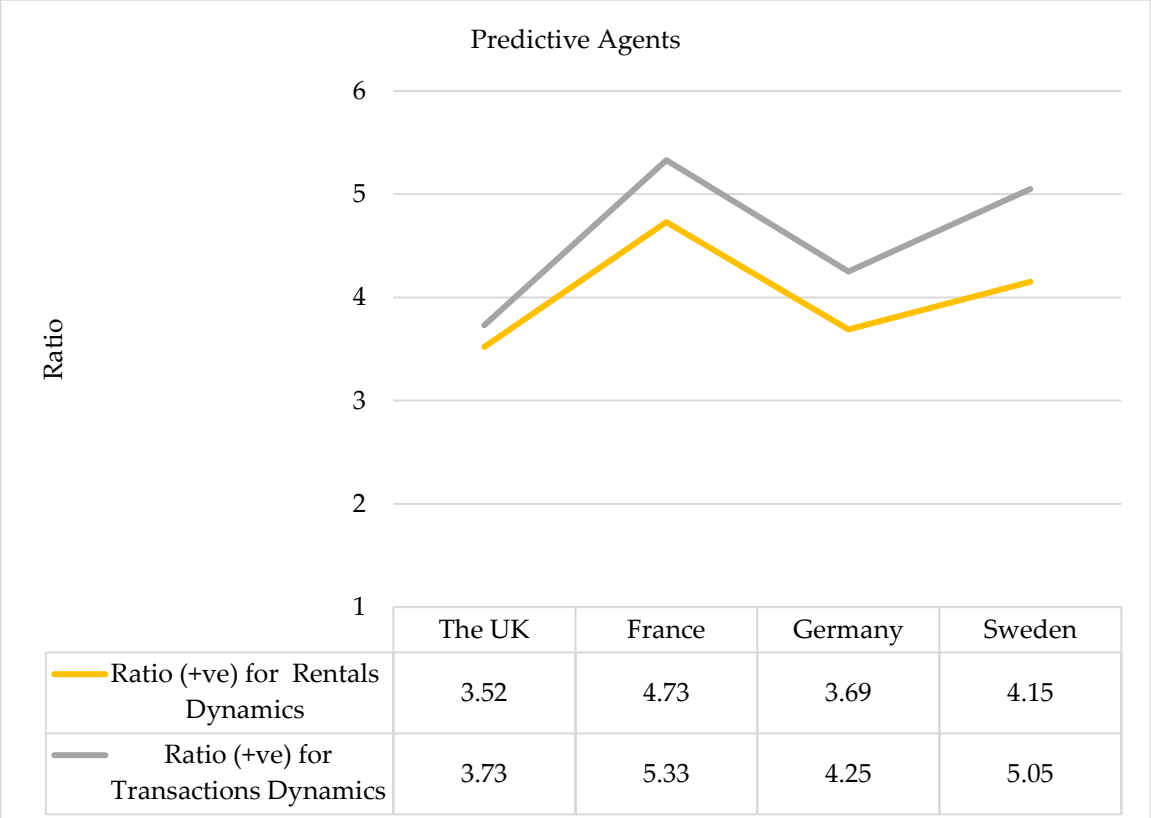
Criterion number 22 is Social responsibility of commercial property business (C22). In their estimates, the French experts assigned the highest degree of significance to this criterion (3.42 for transactions and 2.92 for rentals), with the UK as the runner-up (2.95 for transactions and 2.92 for rentals), Sweden in third (2.90 for transactions and 2.72 for rentals), and Germany placed last with the lowest score (2.52 for transactions and 2.67 for rentals). The dynamics of the criteria are shown in Figure 6-22.



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	2.92	2.92	2.67	2.72
Ratio (+ve) for Transactions Dynamics	2.95	3.42	2.52	2.9

Figure 6-22. Social Responsibility of Commercial Property Business (C22) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

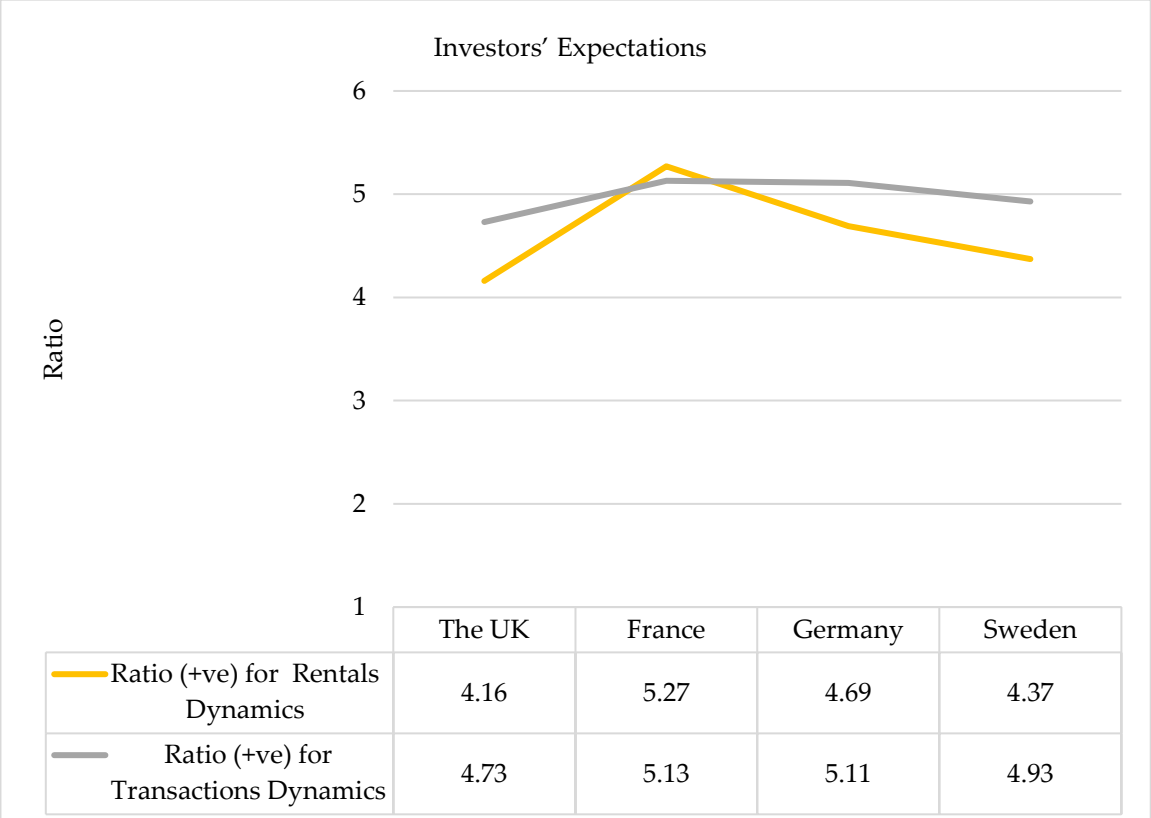
Four criteria were assessed in the emotional criteria group. The twenty-third criterion is C23, Predictive agents. The French experts suggested the highest degree of significance for this criterion (5.33 for transactions and 4.73 for rentals), with Sweden placed second (5.05 for transactions and 4.15 for rentals), Germany third (4.25 for transactions and 3.69 for rentals), and the UK trailing behind (3.73 for transactions and 3.52 for rentals). The dynamics of the criteria are shown in Figure 6-23.



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.52	4.73	3.69	4.15
Ratio (+ve) for Transactions Dynamics	3.73	5.33	4.25	5.05

Figure 6-23. Predictive Agents (C23) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

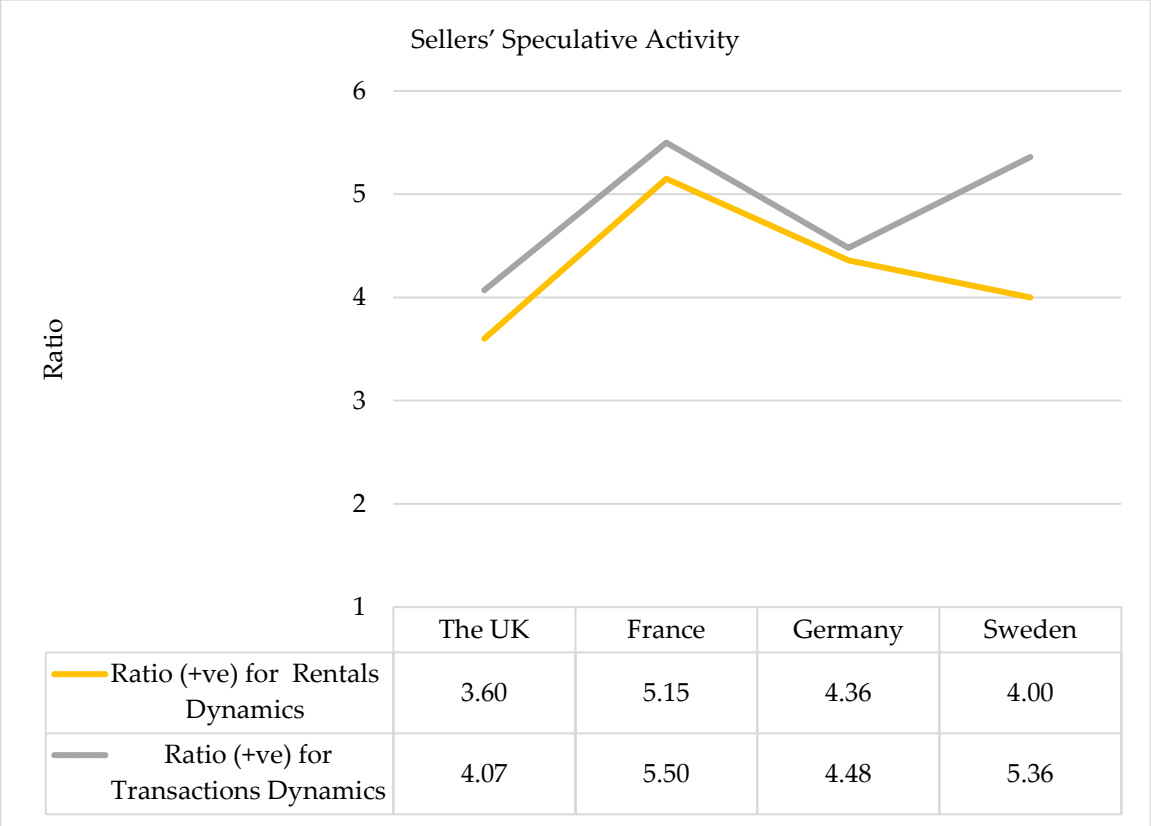
Criterion twenty-four is C24, Investors' expectations (Figure 6-24). In their estimates, the French experts ranked this criterion as the most significant (5.13 for transactions and 5.27 for rentals), with Germany in second (5.11 for transactions and 4.69 for rentals), Sweden in third (4.93 for transactions and 4.37 for rentals), and the UK placed last with the lowest score (4.73 for transactions and 4.16 for rentals).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	4.16	5.27	4.69	4.37
Ratio (+ve) for Transactions Dynamics	4.73	5.13	5.11	4.93

Figure 6-24. Investors' Expectations (C24) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

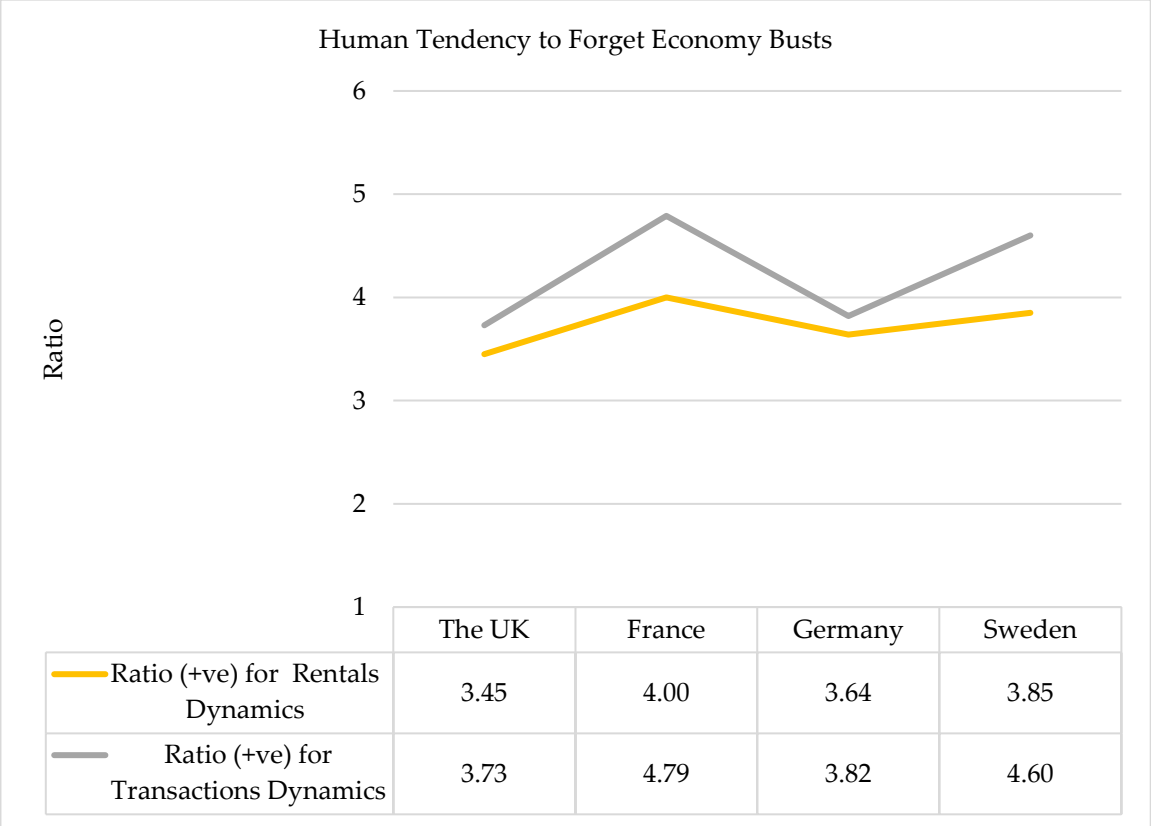
Criterion twenty-five is C25, Sellers' speculative activity. Its measurement tools are determined on the basis of expert estimates and are shown in Figure 6-25. In their assessments, the French experts ranked this criterion as the most significant (5.50 for transactions and 5.15 for rentals), with the UK placing last (4.07 for transactions and 3.60 for rentals). The rest of the estimates varied from country to country. Within the context of the dynamics of commercial property transaction prices, Sweden is second (5.36), and Germany, third (4.48). Within the context of the dynamics of commercial property rentals, Germany is placed second (4.36), followed by Sweden in third (4.00).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.60	5.15	4.36	4.00
Ratio (+ve) for Transactions Dynamics	4.07	5.50	4.48	5.36

Figure 6-25. Sellers' Speculative Activity (C25) Central Tendencies of the Significances Assigned by Experts (Sources: Central Tendency of Criteria).

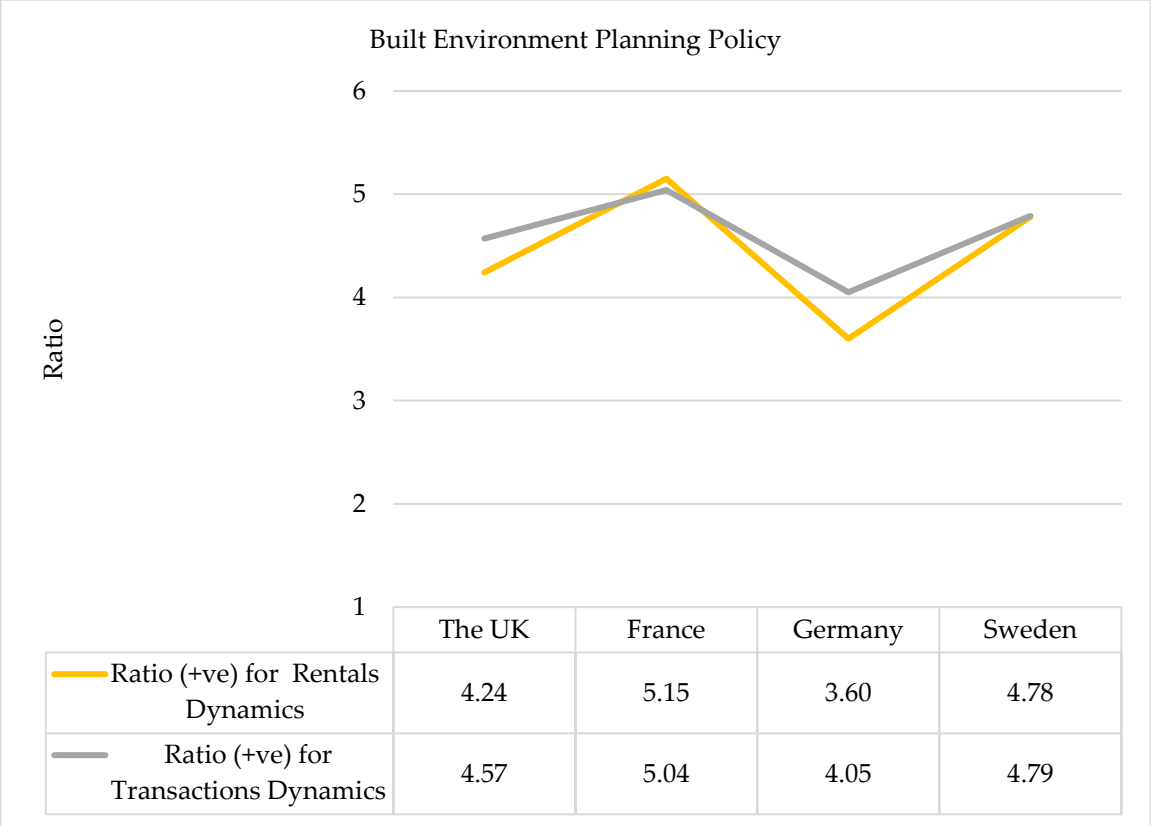
Criterion 26 is Human tendency to forget economy busts (C26) (Figure 6-26). In their assessments, the French experts considered this criterion to be the most significant (4.79 for transactions and 4.00 for rentals), with Sweden placed second (4.60 for transactions and 3.85 for rentals), followed by Germany (3.82 for transactions and 3.64 for rentals), and the UK with the lowest score (3.73 for transactions and 3.45 for rentals).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.45	4.00	3.64	3.85
Ratio (+ve) for Transactions Dynamics	3.73	4.79	3.82	4.60

Figure 6-26. Human Tendency to Forget Economy Busts (C26) Central Tendencies of the Significances Assigned by Experts (Sources: Central Tendency of Criteria).

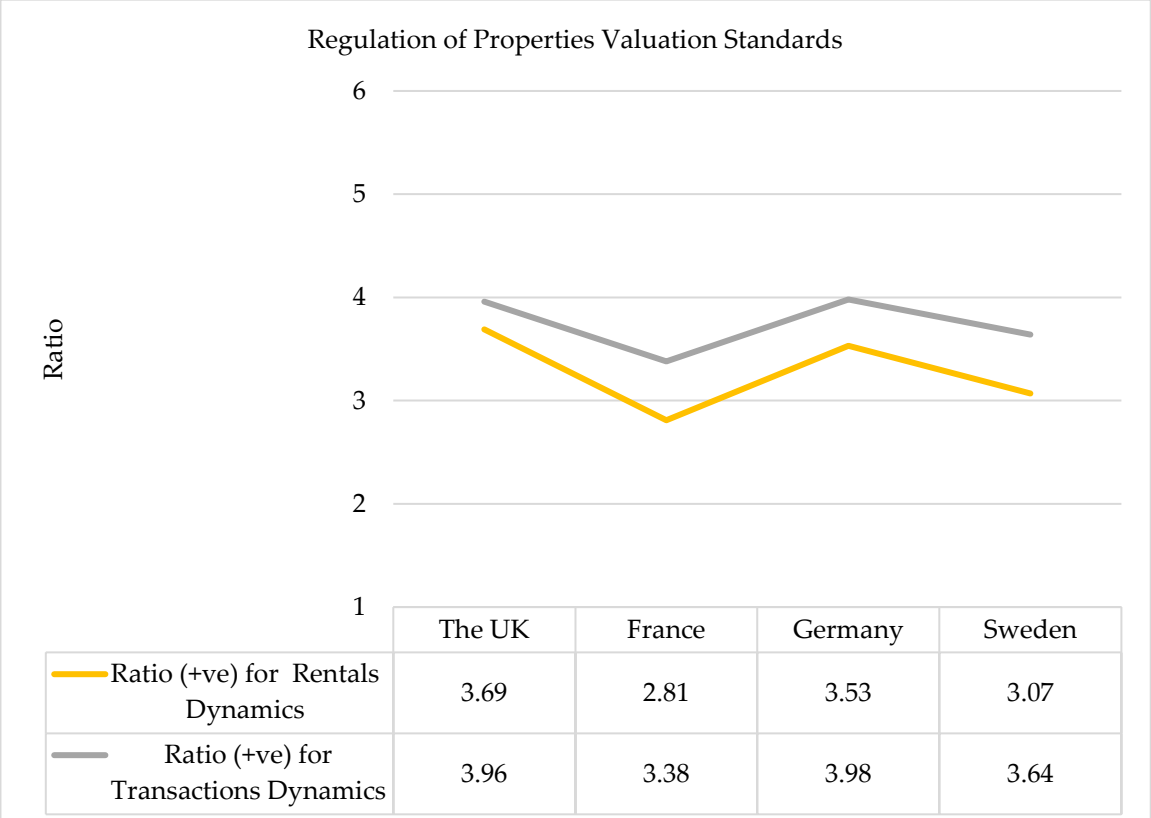
Four criteria were assessed in the group of legal and regulatory criteria. Criterion number 27 is C27, Built environment planning policy (Figure 6-27). In their assessments, the French experts rated this criterion as the most significant (5.04 for transactions and 5.15 for rentals); Sweden came in second (4.79 for transactions and 4.78 for rentals), followed by the UK (4.57 for transactions and 4.24 for rentals), and Germany was last with the lowest score (4.05 for transactions and 3.60 for rentals).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	4.24	5.15	3.60	4.78
Ratio (+ve) for Transactions Dynamics	4.57	5.04	4.05	4.79

Figure 6-27. Built Environment Planning Policy (C27) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

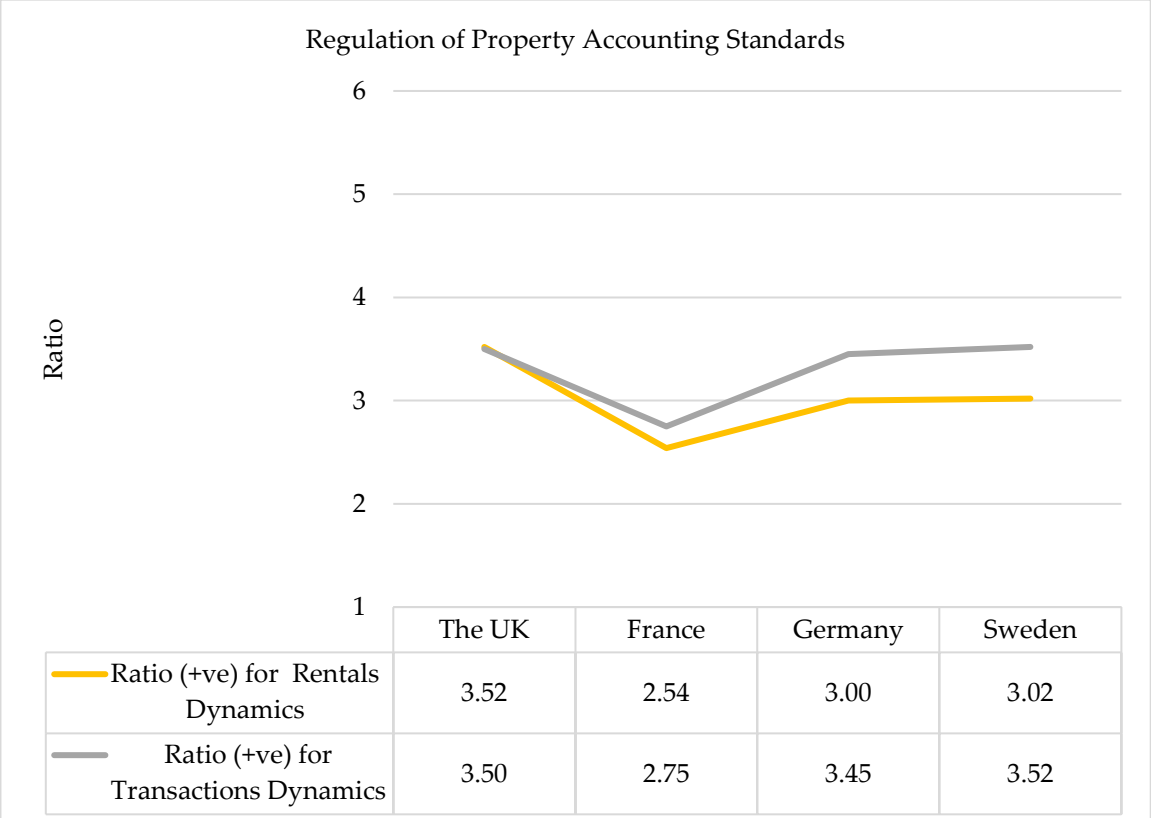
Criterion 28 is Regulation of properties valuation standards (C28). In their assessments, the French experts rated this criterion as the least significant (3.38 for transactions and 2.81 for rentals). The rest of the estimations diverged from country to country. Within the context of the dynamics of commercial property transaction prices, Germany is placed first (3.98), followed by the UK (3.96), with Sweden coming in third (3.64). Within the context of the dynamics of commercial property rentals, the UK is first (3.69), Germany second (3.53), and Sweden third (3.07). The dynamics of the criteria are shown in Figure 6-28.



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.69	2.81	3.53	3.07
Ratio (+ve) for Transactions Dynamics	3.96	3.38	3.98	3.64

Figure 6-28. Regulation of Properties Valuation Standards (C28) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

Criterion 29 is C29, Regulation of property accounting standards (Figure 6-29). The experts' assessments place Germany third both in terms of transactions and rentals (3.45 and 3.00 respectively), with France placed fourth (2.75 for transactions and 2.54 for rentals). The rest of the estimations diverged from country to country. Within the context of the dynamics of commercial property transaction prices, Sweden is number one (3.52), followed by the UK in second place (3.50). Within the context of the dynamics of commercial property rentals, the UK is first (3.52), and Sweden is second (3.02).



	The UK	France	Germany	Sweden
Ratio (+ve) for Rentals Dynamics	3.52	2.54	3.00	3.02
Ratio (+ve) for Transactions Dynamics	3.50	2.75	3.45	3.52

Figure 6-29. Regulation of Property Accounting Standards (C29) Central Tendencies of the Significances Assigned by Experts (Sources: Central Tendency of Criteria).

The thirtieth criterion is C30, Green leases regulation (Figure 6-30). Sweden obtained the highest score in the experts' assessments (3.12 for transactions and 3.96 for rentals). The rest of the estimations varied from one group of dynamics to the other. Within the context of the dynamics of commercial property transaction prices, the UK is placed second (3.02), followed by Germany (2.95), with France obtaining the lowest score (2.79). Within the context of the dynamics of commercial property rentals, France is second (3.38), the UK third (3.15), and Germany fourth (2.73).

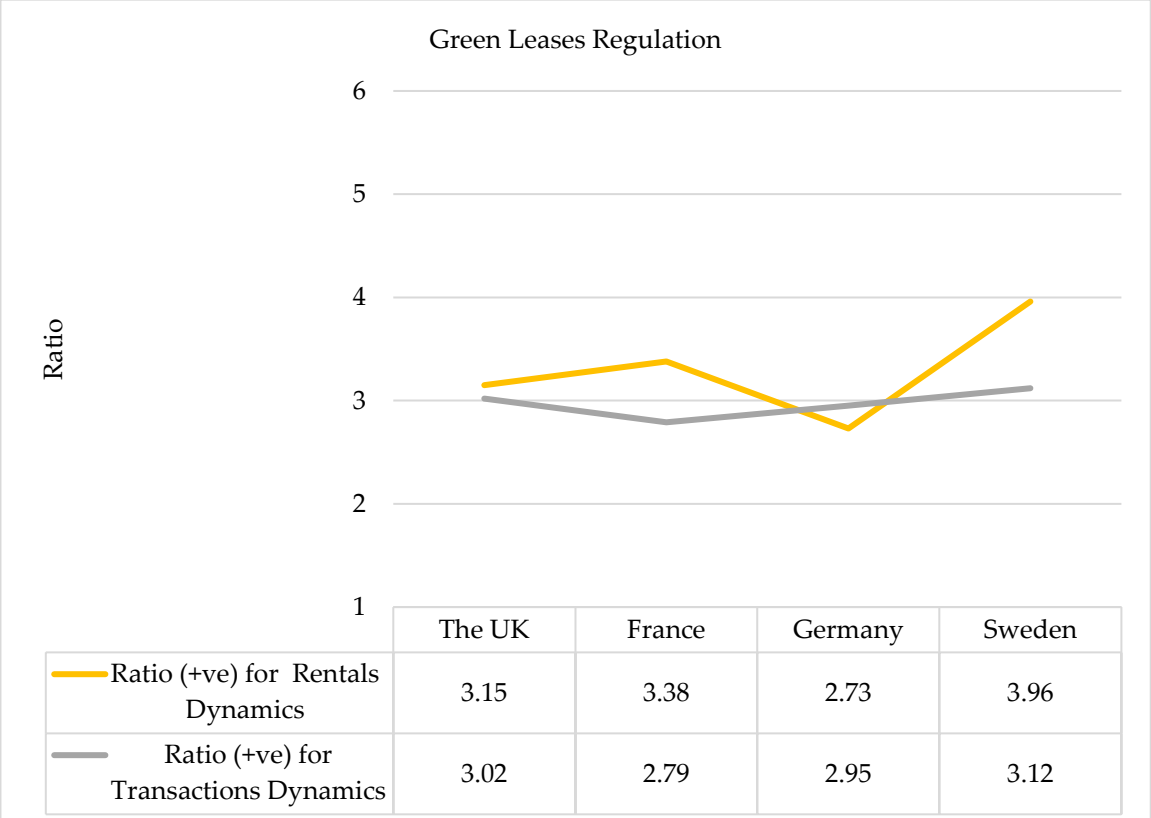


Figure 6-30. Green Leases Regulation (C30) Central Tendencies of the Significances Assigned by Experts (Source: Central Tendency of Criteria).

The quantitative criteria that had their measurement tools obtained from the Eurostat and MSCI databases are the same for the commercial property transaction price and rentals models. To be able to observe if a model is suitable for the purposes of assessing cyclic nature, the calculations were based on historical data of quantitative criteria covering the span of 2015–2017. The 2015–2016 quantitative criteria data are presented in

Table 6-9 and Table 6-10 below.

Table 6-9. The Measurement Tools of Quantitative Criteria for 2015.

Years	2015				Units of measurement	Sources
Countries/Criteria	UK	France	Germany	Sweden		
Gross domestic product (C1)	2.3	1.1	1.7	4.5	GDP growth (annual %)	Eurostat Database

Years	2015				Units of measurement	Sources
Countries/Criteria	UK	France	Germany	Sweden		
Taxes (C2)	11,306	5.712	4.227	11,809	Euros per capita	Calculated
Government bond yields (C3)	1.79	0.84	0.5	0.72	Percentage	Eurostat Database
International trade (C5)	0.95	0.98	1.21	1.12	Export to import ratio	Eurostat Database
Foreign direct investment (C6)	21,707.84	9,493.94	8,861.49	29,401.43	Inward, euros per capita	Calculated
Return on commercial property (C8)	14.66%	11.25%	9.68%	12.64%	Percentage	MSCI
Environmental taxes (C15)	983	715	715	1,019	Euros per capita	Calculated
GDP per capita (C18)	40,274	33.080	37,549	46,084	Euros per capita	Calculated
Unemployment (C19)	5.30%	10.40%	4.60%	7.40%	Percentage of active population	Eurostat Database
Number of employed persons (C20)	46.85%	42.00%	49.26%	49.91%	Percentage of population	Calculated
Social protection expenditure (C21)	6,484.16	8,038.43	7,134.25	9,401.09	Euros per capita	Calculated

Table 6-10. The Measurement Tools of Quantitative Criteria for 2016.

Years	2016				Units of measurement	Sources
Countries/Criteria	UK	France	Germany	Sweden		
Gross domestic product (C1)	1.8	1.1	2.2	2.7	GDP growth (annual %)	Eurostat Database
Taxes (C2)	12,974	5,846	4,294	12,436	Euros per capita	Calculated
Government bond yields (C3)	1.22	0.47	0.09	0.54	Percentage	Eurostat Database
International trade (C5)	0.95	0.97	1.20	1.11	Export to import ratio	Eurostat Database
Foreign direct investment (C6)	21,431.52	10,057.85	8,920.67	28,961.36	Inward in Euros per capita	Calculated
Return on commercial property (C8)	4.14%	8.19%	7.86%	12.14%	Percentage	MSCI
Environmental taxes (C15)	891	752	711	1,053	Euros per capita	Calculated
GDP per capita (C18)	36,761	33.526	38,451	47,015	Euros per capita	Calculated
Unemployment (C19)	4.90%	10.10%	4.10%	6.90%	Percentage of active population	Eurostat Database
Number of employed persons (C20)	46.98%	41.92%	49.58%	49.97%	Percentage of population	Calculated
Social protection expenditure (C21)	5,808.20	8,213.91	7,421.07	9,732.15	Euros per capita	Calculated

6.5. Chapter Summary

This summary contains two tables with data that were used for the purposes of calculation. The first table presents criteria measurement tools to be applied with the model of the dynamics of commercial property

transaction prices, whilst the second one presents tools to be applied with the model of the dynamics of commercial property rentals.

Table 6-11. The measurement tools of the criteria of the dynamics of commercial property transaction prices.

Code of Criteria	Transaction Criteria	Alternatives			
		UK	France	Germany	Sweden
		A1	A2	A3	A4
C1	Gross domestic product	1.80	2.30	2.20	2.10
C2	Taxes	12,057.85	5,889.53	4,370.95	13,005.10
C3	Government bond yields	1.18	0.81	0.32	0.65
C4	Alternative investments	3.79	3.92	3.82	4.48
C5	International trade	0.96	0.97	1.19	1.09
C6	Foreign direct investment	20,416.90	10,924.93	9,611.01	29,620.82
C7	Commercial property value maximisation	4.39	4.75	4.82	4.14
C8	Return on commercial property	0.11	0.09	0.11	0.11
C9	Debt interest rate	4.52	5.38	4.57	5.60
C10	Interaction between commercial property market cycle and credit cycle	4.21	5.08	4.20	4.50
C11	Interaction between commercial property market cycle and development cycle	4.45	5.21	4.00	4.48
C12	Commercial building time frame	3.95	3.75	3.73	3.74
C13	Commercial property capital renewals	3.57	3.92	3.61	3.64
C14	Renewable resources	2.52	2.25	2.82	2.60
C15	Environmental taxes	847.24	792.24	718.10	1,026.32
C16	Environmental protection expenditure	3.32	2.42	3.14	3.31
C17	Environmental benefits of sustainable building	3.46	3.25	3.70	3.90
C18	GDP per capita	35,507.65	34,355.11	39,714.91	47,545.47
C19	Unemployment	0.04	0.09	0.04	0.07
C20	Number of employed persons	0.47	0.42	0.50	0.50

Code of Criteria	Transaction Criteria	Alternatives			
		UK	France	Germany	Sweden
		A1	A2	A3	A4
C21	Social protection expenditure	5,397.16	8,348.29	7,704.69	9,604.18
C22	Social responsibility of commercial property business	2.95	3.42	2.52	2.90
C23	Predictive agents	3.73	5.33	4.25	5.05
C24	Investors' expectations	4.73	5.13	5.11	4.93
C25	Sellers' speculative activity	4.07	5.50	4.48	5.36
C26	Human tendency to forget economy busts	3.73	4.79	3.82	4.60
C27	Built environment planning policy	4.57	5.04	4.05	4.79
C28	Regulation of property valuation standards	3.96	3.38	3.98	3.64
C29	Regulation of property accounting standards	3.50	2.75	3.45	3.52
C30	Green leases regulation	3.02	2.79	2.95	3.12

Table 6-12. The measurement tools of the criteria of the dynamics of commercial property rentals.

Code of Criteria	Transaction Criteria	Alternatives			
		UK	France	Germany	Sweden
		A1	A2	A3	A4
C1	Gross domestic product	1.80	2.30	2.20	2.10
C2	Taxes	12,057.85	5,889.53	4,370.95	13,005.10
C3	Government bond yields	1.18	0.81	0.32	0.65
C4	Alternative investments	3.08	3.19	3.36	3.07
C5	International trade	0.96	0.97	1.19	1.09
C6	Foreign direct investment	20,416.90	10,924.93	9,611.01	29,620.82
C7	Commercial property value maximisation	4.21	4.35	4.40	3.52
C8	Return on commercial property	0.11	0.09	0.11	0.11
C9	Debt interest rate	3.63	3.65	3.60	3.98
C10	Interaction between commercial property market cycle and credit cycle	4.00	4.54	3.91	3.65

Code of Criteria	Transaction Criteria	Alternatives			
		UK	France	Germany	Sweden
		A1	A2	A3	A4
C11	Interaction between commercial property market cycle and development cycle	4.37	4.77	3.96	4.07
C12	Commercial building time frame	4.10	3.54	3.51	3.30
C13	Commercial property capital renewals	3.39	3.54	3.58	3.61
C14	Renewable resources	2.61	2.12	2.80	2.26
C15	Environmental taxes	847.24	792.24	718.10	1026.32
C16	Environmental protection expenditure	2.90	2.81	2.78	2.89
C17	Environmental benefits of sustainable building	3.50	3.27	3.56	3.70
C18	GDP per capita	35,507.65	34,355.11	39,714.91	47,545.47
C19	Unemployment	0.04	0.09	0.04	0.07
C20	Number of employed persons	0.47	0.42	0.50	0.50
C21	Social protection expenditure	5,397.16	8,348.29	7,704.69	9,604.18
C22	Social responsibility of commercial property business	2.92	2.92	2.67	2.72
C23	Predictive agents	3.52	4.73	3.69	4.15
C24	Investors' expectations	4.16	5.27	4.69	4.37
C25	Sellers' speculative activity	3.60	5.15	4.36	4.00
C26	Human tendency to forget economy busts	3.45	4.00	3.64	3.85
C27	Built environment planning policy	4.24	5.15	3.60	4.78
C28	Regulation of property valuation standards	3.69	2.81	3.53	3.07
C29	Regulation of property accounting standards	3.52	2.54	3.00	3.02
C30	Green leases regulation	3.15	3.38	2.73	3.96

6.6. Outcomes

Based on the results of the study, it can be argued that the average significances of the criteria that apply to the models have flaws. A comparison of the average weights as assigned by experts and quantitative

indicators shows that the dynamics of the quantitative indicators sometimes tend to go in the opposite direction. This opposite tendency can be observed in the dynamics if one is to compare one country with another for the purposes of transaction price and rentals analysis for the following criteria: the UK – C2, C3, and C21; France – C5, C6, C18, C19, and C20; Germany – C1, C5, C6, C8, C15, C19; and Sweden – C2 and C21.

The opposite tendency of measurement tools that are only characteristic of the commercial property rentals dynamics is: France – C 15 and C21; Germany – C21.

Ergo, the measurement tools of the qualitative criteria to the dynamics of commercial property transactions and rentals can be not very accurate for the comparison analysis. The development of more accurate measurement tools for the qualitative criteria are expected to be an objective for future research.

Chapter 7. The Development of a Framework for the Assessment of Commercial Property Market Dynamics

7.1. Introduction

This chapter presents the process used to identify the better country to use to inform the development of the framework using the three MCDM methods; SAW, TOPSIS and COPRAS, which were described in Chapter 3. As the purpose of this paper is to build a model to allow multifunctional, strategic decisionmaking in relation to the cyclical growth of the commercial property market, MCDM techniques are the most appropriate.

In order to apply MCDM techniques, the criteria measurement tools described in Chapter 6 were used. Based on this approach, the determination of criteria measurement tools can be either objective or subjective as both methods have their strengths and weaknesses. This research includes both subjective and objective values of the criteria that impact the growth of commercial property positively and negatively. The subjective significance of criteria reflects the perceptions of experts about the relevance of those criteria. The significance of objective criteria are determined on the basis of objective information on the criteria measurement tools. The significance of objective criteria is grounded in factual measurement tools. The values of this significance are completely unaffected by personal views of the relevance of the criteria. A positive impact makes the property market procyclical while a negative impact makes it countercyclical. For some of the criteria, measurement tools were not available, therefore, the averages of the experts` relevance for criteria have been used as subjective measurement tools (Chapter 6). The rest of the data were obtained from the European statistical database and used as objective information. These tools allowed commercial property experts to make subjective estimates on a range of issues, using a scale of discretional figures and objective quantitative data (Mulliner et al., 2016).

Decision making is a process that uses information to determine potential options. The process of decision making concludes by choosing a specific alternative based on the established criteria. To do this, decision matrices for the criteria were created, and the best alternatives selected to solve various issues. The columns of a decision matrix identify the alternatives at hand where m represents countries. The rows identify the criteria indicators, where n represents the criteria measurement tools used in the assessment of the countries.

A description of the transformed decision matrices and related outcomes re choice of best decision, are presented next. The implementation of this model, a standard for making decisions, and a sensitivity

analysis of the priority sequence of the criteria and alternatives, are also explained. The most important criteria for the commercial property market growth were thereby selected.

7.2. Calculation using the Simple Additive Weight (SAW) method

Simple additive weight (SAW) is one of the easier and most accepted methods. It begins by making a decision matrix grounded on indicator values. The next steps include normalisation of the decision matrix and multiplication of the value of each criterion (jth) for each country (ith), by the appropriate weight (wj). The weight of the criterion is the percentage of the average of the specific criterion within the sum of all criterion averages. The multiplied results for each criterion are added together, the sum of the products giving a score for each individual country. The country with the highest score, represents the most rational decision.

When it comes to normalising the matrix, it is initially important to maximise the criteria with positive effects (x_j^max), and to minimise those that have negative effects (x_j^min). The minimised negative impact of criteria makes them comparable with a positive criteria as if they are not negative entities. This transformation is done by applying equations (3) and (4), as described in Chapter 3 of this paper. The values of every criterion are multiplied by the appropriate weight using equation (5), this also defined in Chapter 3. The transformed and normalised matrix tables are shown in Appendix III, the results shown in section 7.5. Transformed decision matrix maps are presented below. Using the SAW method, the higher the numeric score of the criterion, both positive and negative, the higher its significance for the choice of decision: the higher, the better.

7.2.1. Criteria Maps for Commercial Property Transaction Dynamics

This section presents the decision matrix for criteria affecting the dynamics of commercial property sale prices. Maps of criteria indicators in a normalised and weighted matrix, are presented below (Figures 7-1 – 7-4).

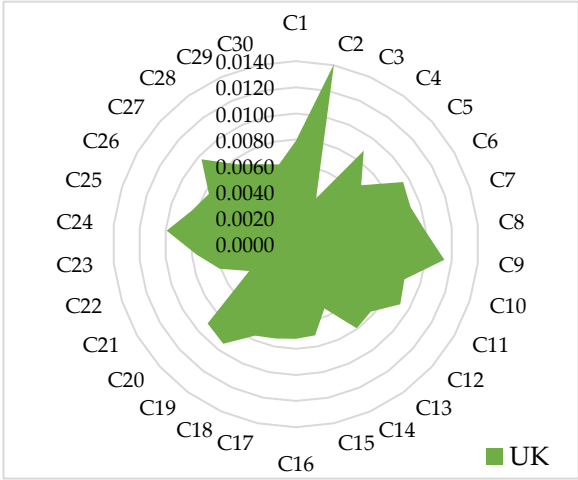


Figure 7-1. A map of the impact of the criteria on transactions in the UK (SAW method).

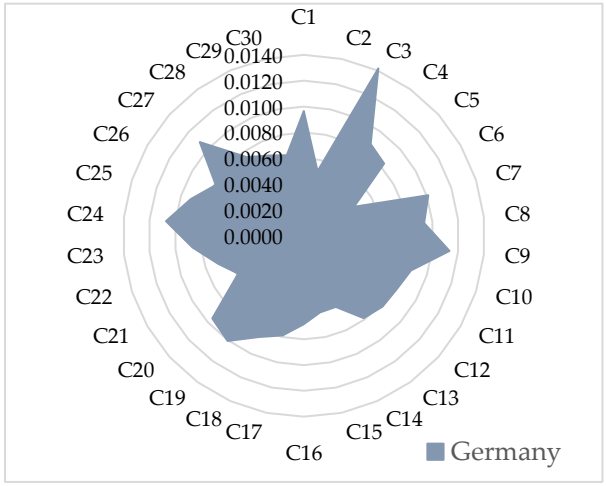


Figure 7-3. A map of the impact of the criteria on transactions in Germany (SAW method).

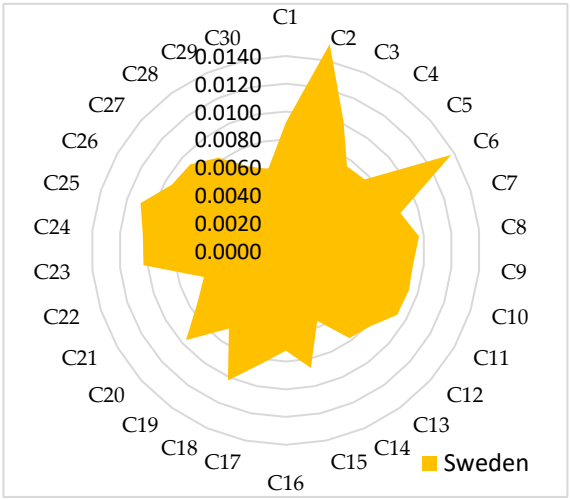


Figure 7-2. A map of the impact of the criteria on transactions in Sweden (SAW method)

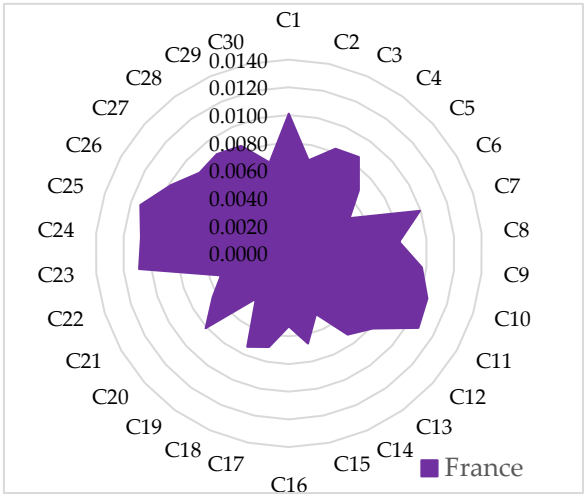


Figure 7-4. A map of the impact of the criteria on transactions in France (SAW method).

Based on calculations using the SAW method, the dynamics of commercial property sale prices in the UK and Sweden, are primarily affected by the criterion Taxes (C2), those in Germany, by the criterion Government bond yields (C3). In France, dynamics of commercial property transactions are largely affected by the criterion Sellers` speculative activity (C25).

7.2.2. Criteria Maps for Commercial Property Rental Dynamics

This section presents the decision matrix for criteria affecting the dynamics of commercial property rental rates. Maps of criteria indicators in a normalised and weighted matrix, are presented below (Figures 7-5 – 7-8).

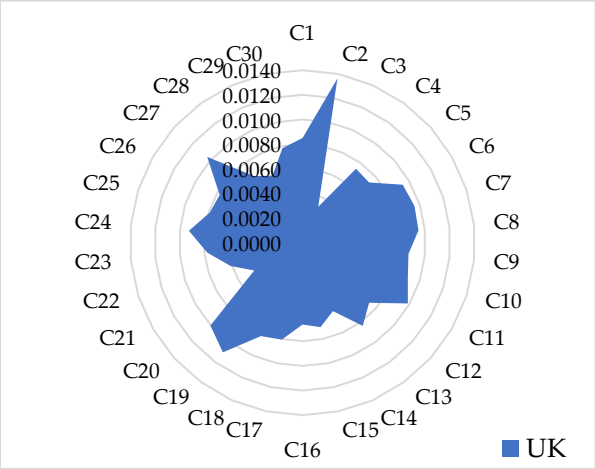


Figure 7-5. A map of the impact of the criteria on rentals in the UK (SAW method).

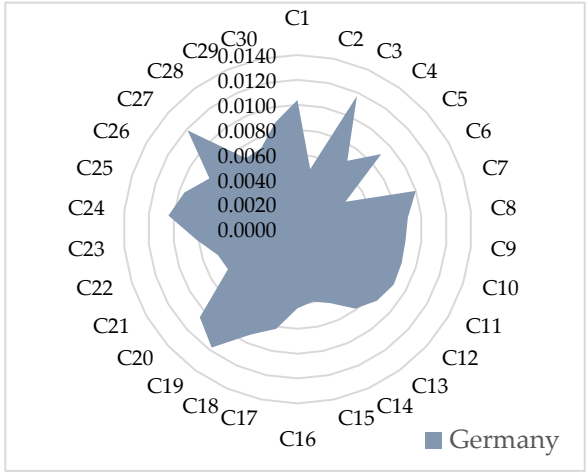


Figure 7-7. A map of the impact of the criteria on rentals in France (SAW method).

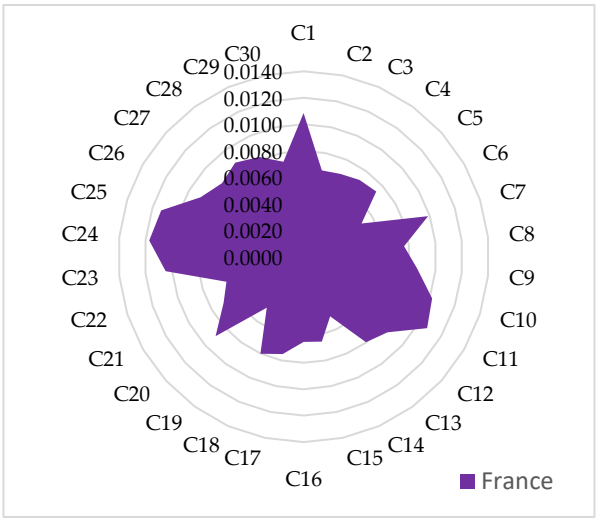


Figure 7-6. A map of the impact of the criteria on rentals in Germany (SAW method).

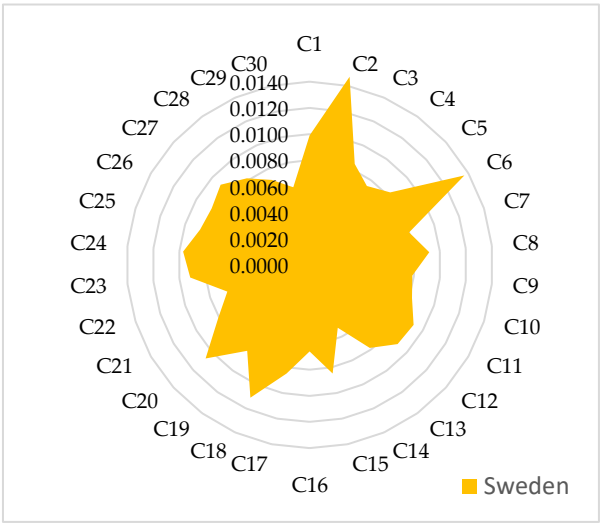


Figure 7-8. A map of the impact of the criteria on rentals in Sweden (SAW method).

Based on calculations using SAW, the dynamics of commercial property rental rates in the UK and Sweden, are primarily affected by Taxes (C2). The emotional criterion Investor`s expectations (C24) carry a lot of weight in France while in Germany, the biggest relative significance is attached to Built environment planning policy (C27).

7.3. Calculations using the COmplex PRoportional ASsessment (COPRAS) method

The COmplex PRoportional ASsessment (COPRAS) method allows the use of both negative and positive values for criteria meaning there is no need to transform negative values to positive as this is achieved using SAW. The underlying principle of COPRAS is that the relative significance of the alternatives, the countries (Q_i), are determined using their positive (S_{+i}) and negative (S_{-i}) characteristics. The process begins by making a decision matrix, its columns denoting the alternatives at hand (m being the number of countries), its rows showing the criteria measurement tools (n being the number of criteria measurement tools). The decision matrix is normalised using equation (13) as seen in Chapter 3. In stage three, elements (d_{ij}) of the normalised decision matrix are multiplied by the relevant values of indicator significance to obtain a leveraged, normalised, decision matrix. The next step is to calculate the i^{th} alternatives in a leveraged, normalised, decision matrix, the amounts of maximised and minimised indicators, (S_i^+ and S_i^-), as appropriate. These are calculated using equations (14) and (15), which are presented in Chapter 3. The relative significance of the alternatives, (Qi (A_i^{COPRAS})), is determined using equation (16), alternative priority lines calculated using equation (17). The higher the Q_i value, the more the alternative matches the needs of the person making the decision. Transformed matrix tables are shown in Appendix IV, transformed decision matrix maps presented below. Regarding the COPRAS method, a numerical score for criteria involved in the final decision making is not calculated for every individual criterion. Based on the negative and positive impact of the criterion, this score is determined by separately weighting the criteria which have a positive impact and those which have a negative effect. The scores of criteria not weighted by impact and the results of their weights, are presented below.

7.3.1. Criteria Maps for Commercial Property Transactions Dynamics

This section describes the criteria weighted by relevance, that affect the dynamics of commercial property sale prices. Maps of criteria indicators are presented below (Figures 7-9 – 7-12).

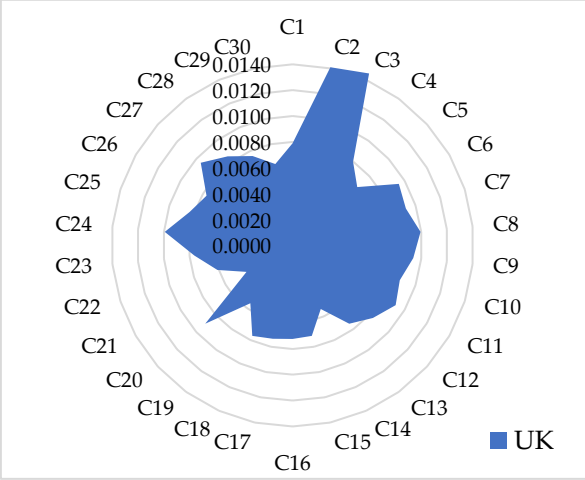


Figure 7-9. A map of the impact of the criteria on transactions in the UK (COPRAS method).

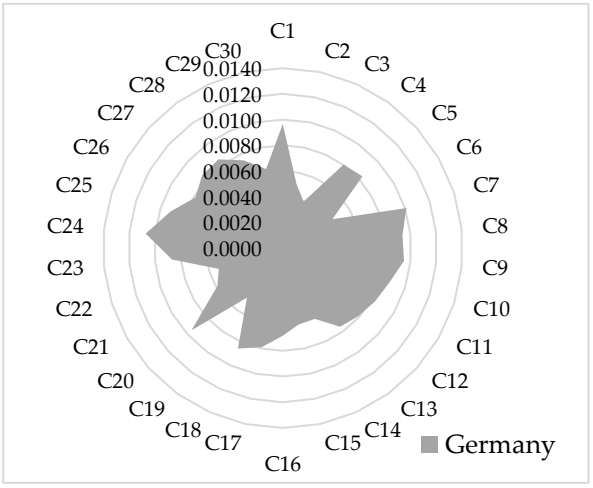


Figure 7-11. A map of the impact of the criteria on transactions in France (COPRAS method).

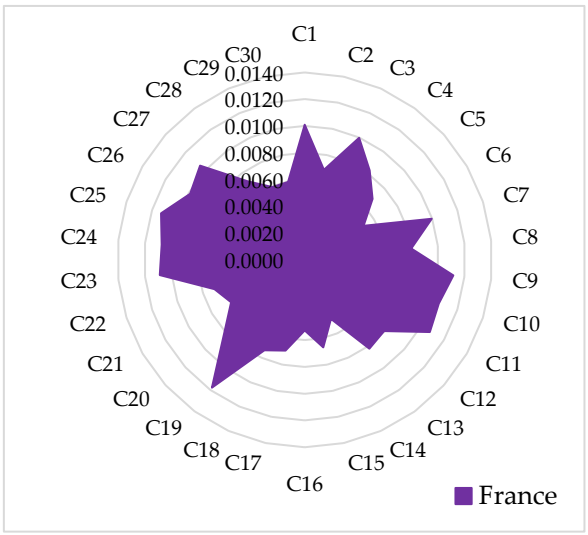


Figure 7-10. A map of the impact of the criteria on transactions in Germany (COPRAS method).

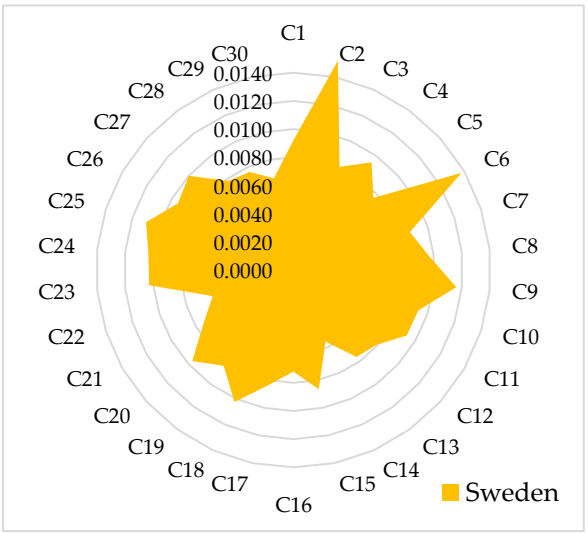


Figure 7-12. A map of the impact of the criteria on transactions in Sweden (COPRAS method).

The biggest impact on the dynamics of commercial property transactions comes from Taxes (C2) in Sweden, from Government bond yields (C3) in the UK, Unemployment (C19) in France and Investors' expectations (C24) in Germany.

7.3.2. Criteria Maps for Commercial Property Rentals Dynamics

This section describes criteria weighted by country that effect the dynamics of the commercial property transactions market. Maps of criteria indicators are presented below (Figures 7-13 to 7-16).

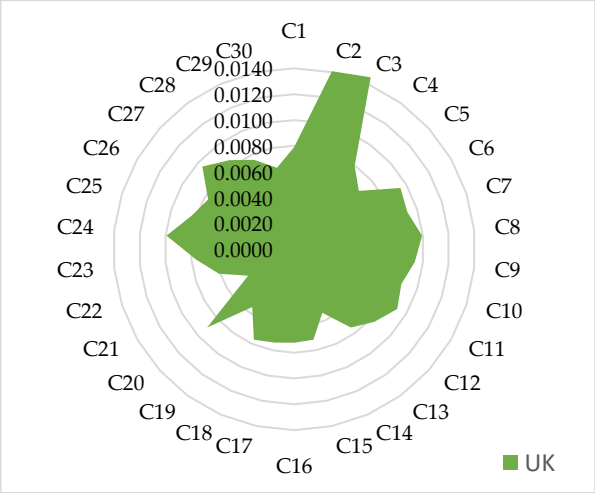


Figure 7-13. A map of the impact of the criteria on rentals in the UK (COPRAS method).

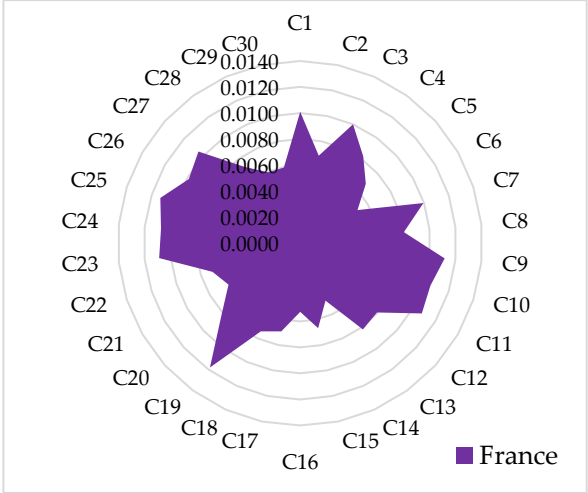


Figure 7-15. A map of the impact of the criteria on rentals in France (COPRAS method).

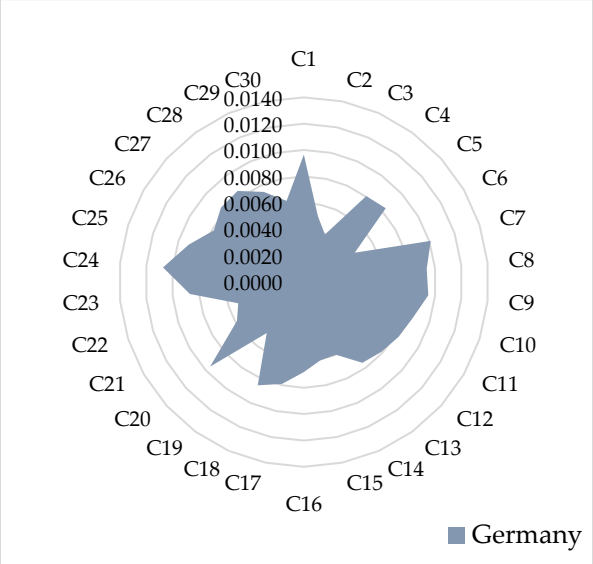


Figure 7-14. A map of the impact of the criteria on rentals in Germany (COPRAS method).

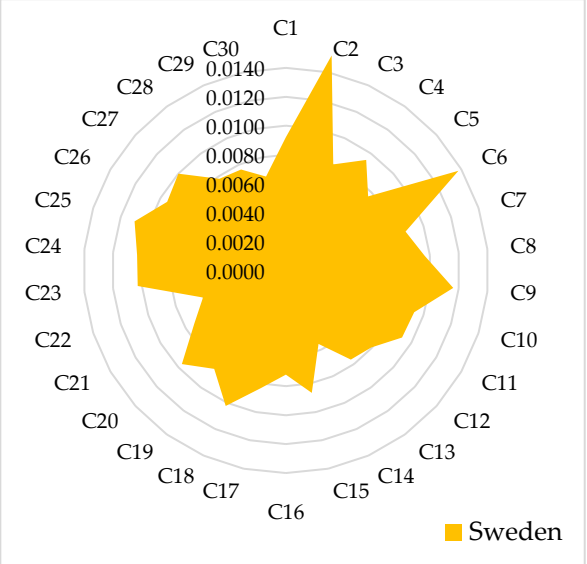


Figure 7-16. A map of the impact of the criteria on rentals in Sweden (COPRAS method).

Based on calculations using COPRAS, the dynamics of commercial property rentals in the UK and Sweden are primarily affected by Taxes (C2). The social criterion Unemployment (C19) is significant in France while in Germany, the biggest relative significance is attached to Number of employed persons (C20).

7.4. Calculations using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

This method is called the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) where it is assumed that the values of each criterion increase or decrease constantly. In this case, the ideal solution can be identified, consisting of the best criteria measurement tools, as well as the negative ideal solution, consisting of the worst criteria measurement tools. This is achieved by ranking proximity to the ideal solution. It is a process whereby the distance between two points is used for normalisation purposes. This maximises / minimises criteria measurement tools. The final step involves estimating the relative distance between each alternative and the positive or negative ideal solution. TOPSIS begins with the normalisation of the criteria measurement tools, with every criteria measurement tool divided by its norm in the decision matrix. The norm is estimated as the square root of the sum of the squares of the criteria measurement tools of all countries. The next step is to build a normalised decision matrix (V_{ij}) (Appendix V). This is done by multiplying each value of the normalised matrix by its assigned weight (wj). The distance (measure of separation) from the ideal (S_I^+) solution and the distance from the negative ideal (S_I^-) solution are then calculated (Appendix V). The best option is the one closest to the ideal point. These stages are estimated using the equations presented in section 3 of Chapter 3. Using TOPSIS, the decision matrix is normalised through vector normalisation based on equation (6). The product is a normalised matrix where all values of effectiveness are dimension-free quantities. Equation (7) is used to design a leveraged normalised matrix (V_{ij}). The positive ideal option (alternative), is defined using equation (8), the negative ideal, using equation (9). The distance between the comparable (i^{th}) and the positive ideal(S_I^+) option, is determined by measuring the distance in the n-dimensional Euclid space using equation (10), and that between the i^{th} and the negative ideal (S_I^-), using equation (11). The final step of the TOPSIS method determines the relative distance between the i^{th} option and the ideal best option (equation (12). All equations can be found in Chapter 3, section 3.4.2.

Criteria are described below on the basis of leveraged (weighted) matrices.

7.4.1. Criteria Maps for Commercial Property Transaction Dynamics

This section describes criteria-weighted data that affect the dynamics of commercial property sale prices. Maps of the distribution of criteria, are presented below (Figures 7-17 to 7-20).

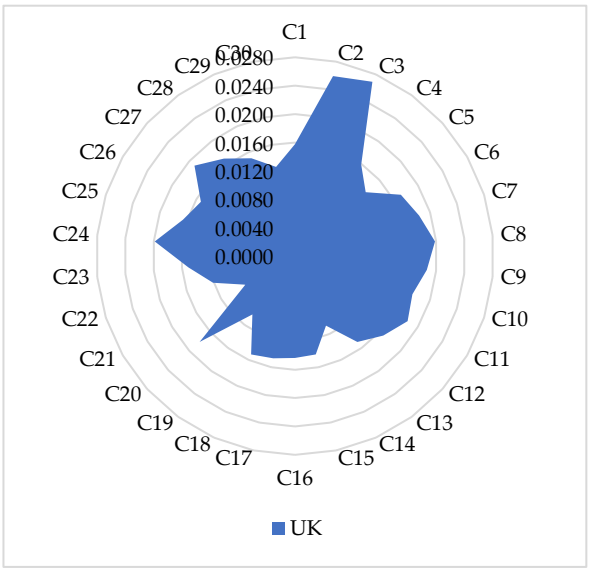


Figure 7-17. A map of the impact of the criteria on transactions in the UK (TOPSIS).

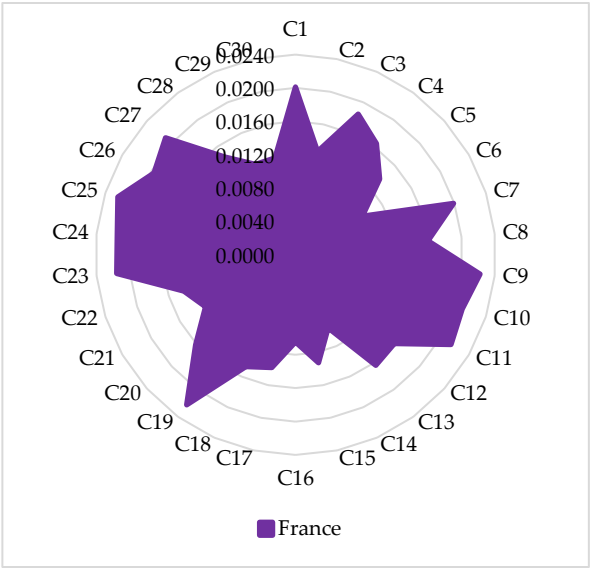


Figure 7-19. A map of the impact of the criteria on transactions in France (TOPSIS).

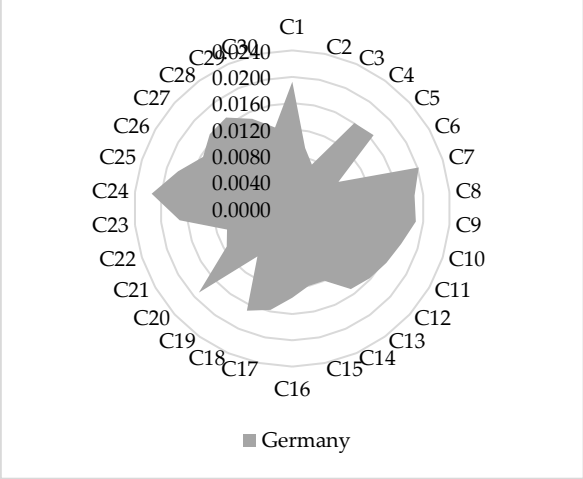


Figure 7-18. A map of the impact of the criteria on transactions in Germany (TOPSIS).

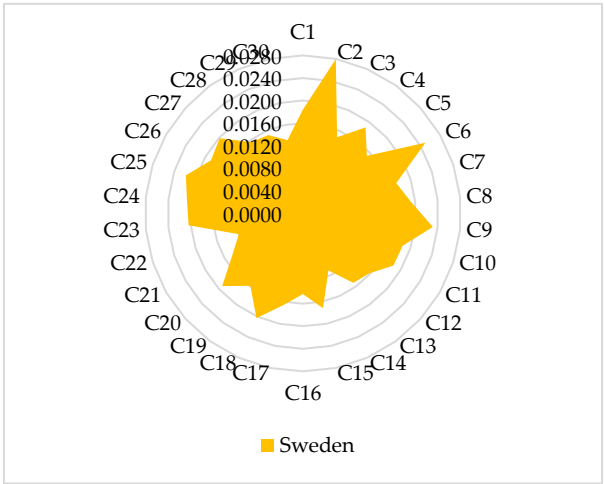


Figure 7-20. A map of the impact of the criteria on transactions in Sweden (TOPSIS).

The highest values can be seen with criteria such as Taxes (C2), Government bond yields (C3), Investors' expectations (C24) and Seller`s speculative activity (C25). However, the influence of these is unevenly distributed across countries. Taxes (C2) make the biggest impact in Sweden, Government bond yields (C3) in the UK, Investors' expectations (C24) in Germany and Seller`s speculative activity (C25) in France.

7.4.2. Criteria Maps for Commercial Property Rentals Dynamics

This section describes the criteria that affect the dynamics of commercial property rentals. Maps of criteria distribution are presented below (Figures 7-22 – 7-25).

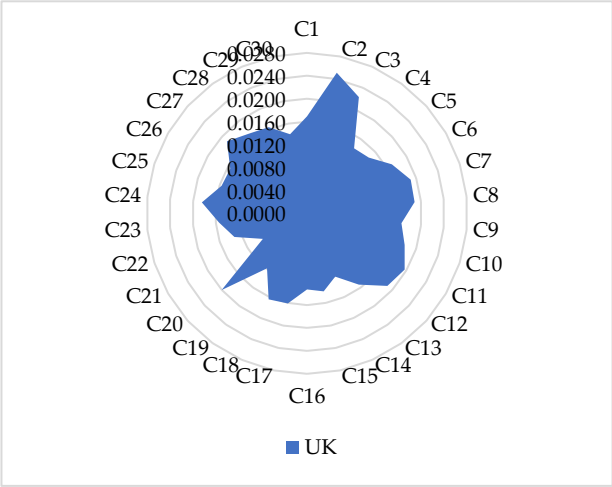


Figure 7-21. A map of the impact of the criteria on rentals in the UK (TOPSIS).

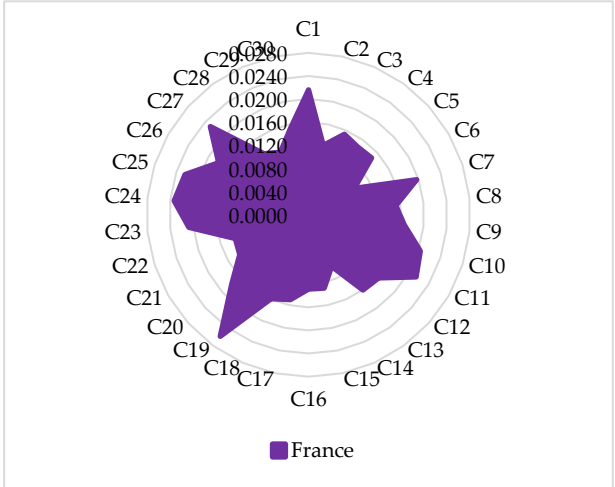
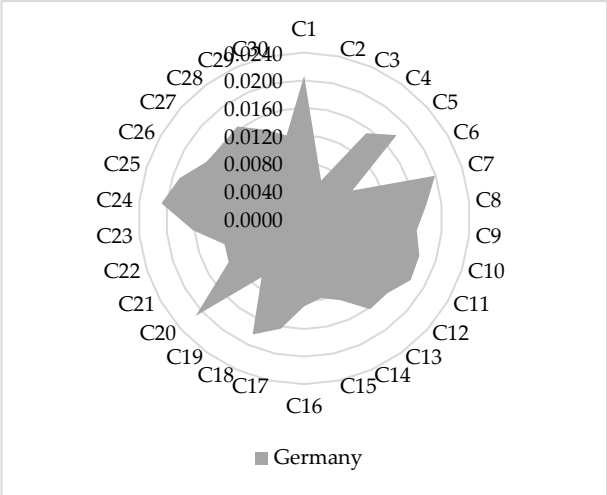
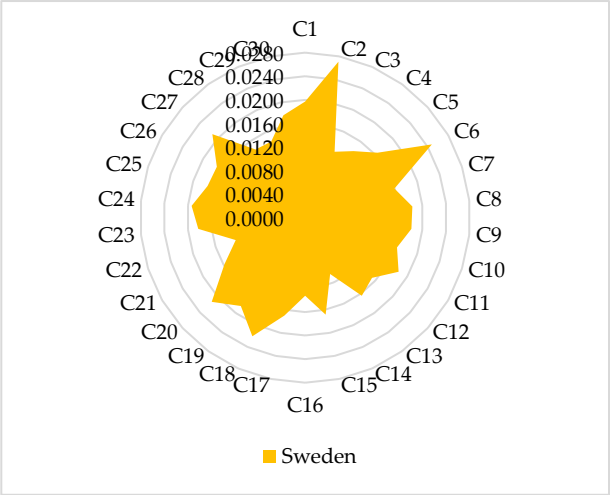


Figure 7-23. Map of the impact of the criteria on rentals in Germany (TOPSIS).

Figure 7-22. A map of the impact of the criteria on rentals in France (TOPSIS).

Figure 7-24. Map of the impact of the criteria on rentals in Sweden (TOPSIS).





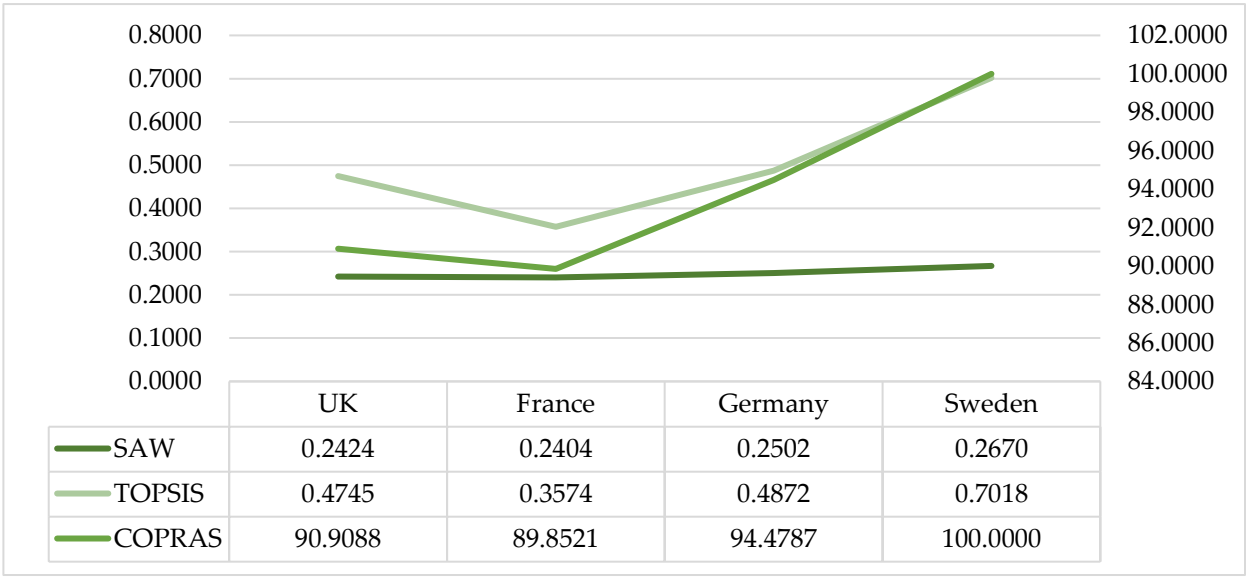
Analysis of the TOPSIS calculations pertaining to the dynamics of commercial property rental rates, reveals three criteria that are relevant. The biggest leveraged values are pertinent to Taxes (C2), Number of employed persons (C20) and Unemployment (C19). However, their influence differs from country to country. Taxes (C2) has the biggest effect in the UK and Sweden, Unemployment (C19) in France and Number of employed persons (C20) in Germany.

7.5. Comparison of MCDM Methods

The following sections of this chapter will present and analyse the results of all three MCDM methods. The results are compared with countries ranked in order of priority as the best alternative (Appendix III-V).

The final results obtained using the three MCDM methods (SAW, COPRAS and TOPSIS), are shown in Figure 7-255 and Figure 7-266. The analysis begins with the results concerning the dynamics of commercial property transactions and then moves on to those related to the dynamics of commercial property rentals.

Figure 7-25. Summary of Results of the MCDM Methods for the Dynamics of Commercial Property Transactions.



	UK	France	Germany	Sweden
SAW	0.2424	0.2404	0.2502	0.2670
TOPSIS	0.4745	0.3574	0.4872	0.7018
COPRAS	90.9088	89.8521	94.4787	100.0000

A summary of the results which formed the basis for decisions regarding which country is the best alternative, are shown in Figure 7-26. The order of priority is estimated with reference to the highest numbers or indicators. The largest sum of indicators estimated using SAW was found for Sweden (0.2670). This indicator shows Sweden to be one of the best examples to rely on when building a framework for the sustainable management of the commercial property market. Germany (0.2502) is in second place, the UK in third (0.2424), with France in last place (0.2404). Looking at order of priority, Sweden is first (100.0000), Germany second (94.4787), the UK third (90.0088), and France last in terms of suitability (89.8521). The indicator estimated using COPRAS shows Sweden (100.0000) to be one of the best examples to rely on

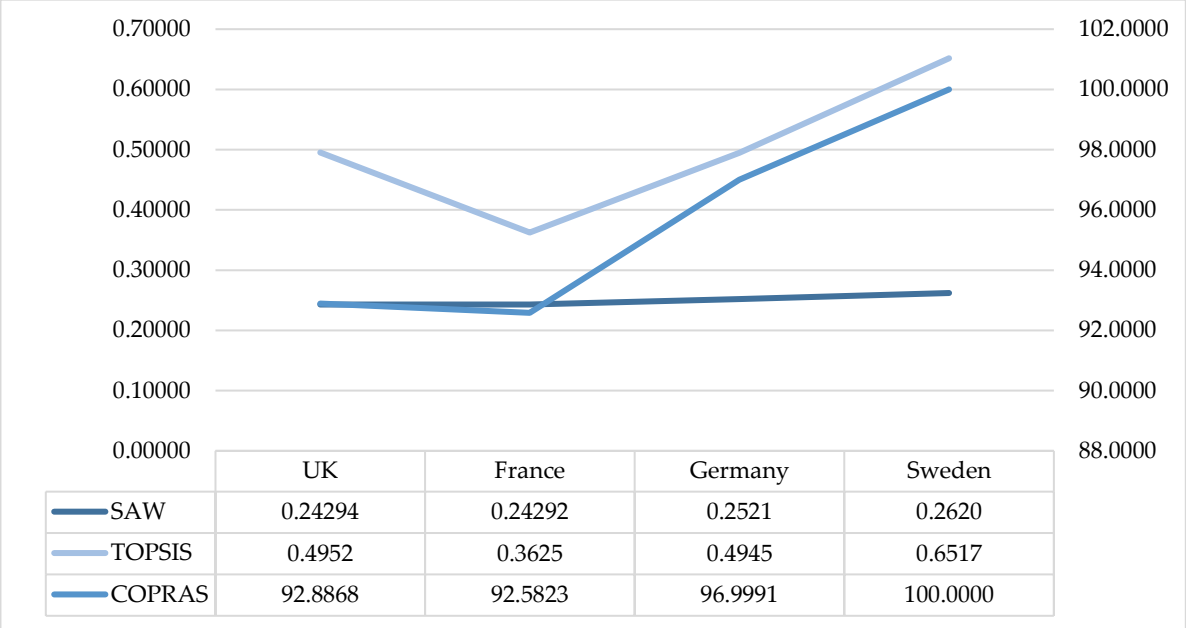
when building a framework for the sustainable management of the commercial property market. The best solution indicator calculated using TOPSIS again ranks Sweden (0.7018) as the better example, followed by Germany (0.4872) then the UK (0.4745) with France placed last (0.3574).

	UK	France	Germany	Sweden
Rank (SAW)	3	4	2	1
Rank (COPRAS)	3	4	2	1
Rank (TOPSIS)	3	4	2	1

Figure 7-26. Summary of the Priorities of the MCDM Methods for the Dynamics of Commercial Property Transactions.

As a result, it can be concluded that Sweden is the optimal alternative followed by Germany, the UK and finally France.

The results pertaining to the dynamics of commercial property rentals are displayed below (Figure 7-27 and Figure 7-28).

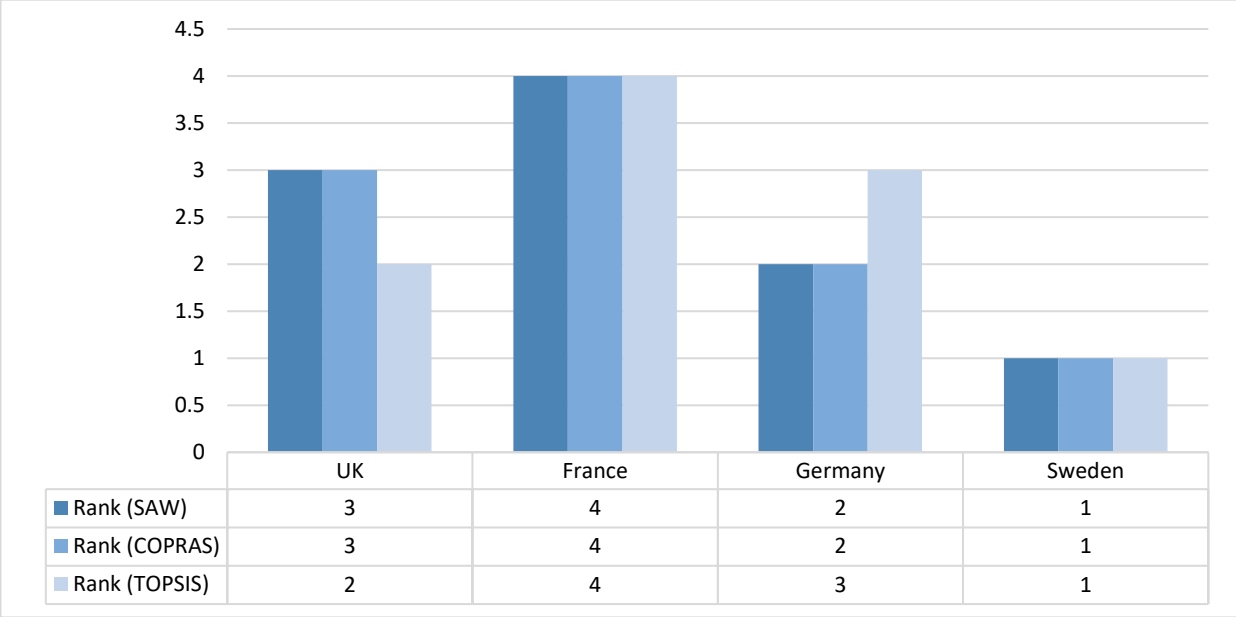


	UK	France	Germany	Sweden
SAW	0.24294	0.24292	0.2521	0.2620
TOPSIS	0.4952	0.3625	0.4945	0.6517
COPRAS	92.8868	92.5823	96.9991	100.0000

Figure 7-27. Summary of the Results of the MCDM Methods for the Dynamics of Commercial Property Rentals.

A summary of the results forming the basis for decision-making is shown in Figure 7-28. The order of priority of countries is shown in descending order of numerical value. The largest total sum of indicators calculated using SAW, was found for Sweden (0.26202). Germany was second (0.25211), the UK third (0.2424), and France last in terms of suitability (0.2404). Estimated using COPRAS, this indicator shows Sweden (100.0000) to be the best example. Germany (96.9991) is in second place followed by the UK (92.8868), with France last in terms of suitability (92.5823). The best solution indicator calculated using TOPSIS was again for Sweden (0.6517), the UK second (0.4952), Germany third (0.4945) and France last (0.3625).

Figure 7-28 shows that the calculations using all methods have placed Sweden in first position by ranking of priorities.



	UK	France	Germany	Sweden
Rank (SAW)	3	4	2	1
Rank (COPRAS)	3	4	2	1
Rank (TOPSIS)	2	4	3	1

Figure 7-28. Summary of Priorities of the MCDM Methods for the Dynamics of Commercial Property Rentals.

Figure 7-28 shows the gap between the results achieved with TOPSIS and those estimated using SAW and COPRAS methods. All methods indicate Sweden as the most optimal alternative to use as an example for building a framework for the sustainable management of the commercial property market. Using SAW and COPRAS, Germany's commercial property rental market was second. The UK was second using TOPSIS, with Germany placed third. All methods place France last in terms of suitability.

7.6. Sensitivity Analysis of the Criteria

This section explains the sensitivity analysis for each of the criteria. The goal of sensitivity analysis is to determine the smallest criteria measurement tool within a group of criteria, as the smallest criteria measurement tool means that this criterion has the largest degree of influence on indicators for the alternatives. One difficulty with this analysis is finding the most sensitive criterion as it is one that may significantly affect the distribution of the weights of the rest of the criteria within the same group in the event of the smallest of changes (Triantaphyllou and Sanchez, 1997). Weight sensitivity is estimated on the basis of equation 18 from Chapter 3, the method of calculation also described in Chapter 3. Detailed sensitivity analysis tables are presented in Appendix VI. The alternatives are compared in pairs: A2 and A1, A3 and A1, A4 and A1, A3 and A2, A4 and A2, and A4 and A3. Changes in criteria weights are calculated, this determining changes in the alternatives, or their ratings, in terms of decision making.

A recalculation of the criteria weights determined the change in alternative values, ranking the values from one to thirty (the total number of the criteria) in sequence, where the biggest change equals one, the smallest change thirty. As such, the lower the value estimated for a criterion, the higher that criterion's sensitivity to the final value of that alternative for decision-making purposes. The following is the sensitivity of criteria using the 2017 calculations for determining the dynamics of commercial property transactions and, separately, rentals. The sensitivity analysis was carried out for calculations using all three MCDM methods (SAW, COPRAS and TOPSIS), the results of the analysis shown in Figures 29 and 30. Both in the context of the dynamics of commercial property transactions and rentals, the criteria with the highest degrees of sensitivity across all three methods are Taxes (C2), Foreign direct investment (C6), Environmental taxes (C15), GDP per Capita (C18) and Social protection expenditure (C21).

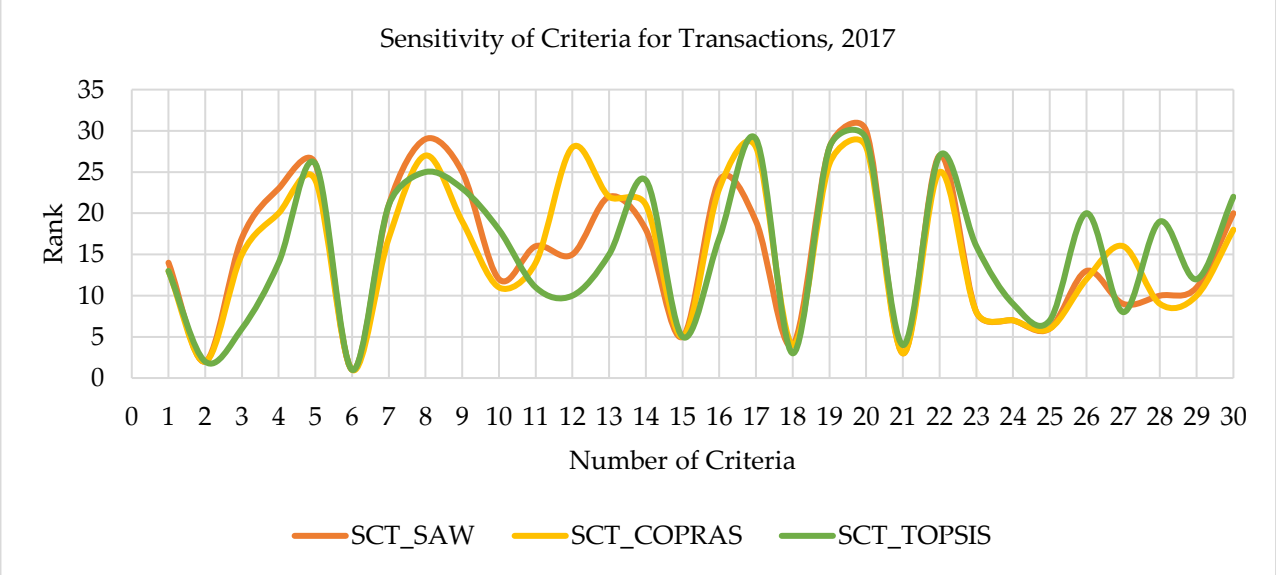


Figure 7-29. A Comparative Sensitivity Analysis of Commercial Property Transaction Dynamics Criteria, 2017.

However, analysis of the sensitivity of the criteria affecting the dynamics of commercial property transactions reveals intrinsic differences from method to method. A change in Commercial building time frame (C12) has a higher degree of influence on values determined with the TOPSIS method than it does on those calculated using COPRAS and SAW. The same tendency is evident regarding the dynamics of Government bond yields (C3) and Alternative investments (C4). By contrast, Human tendency to forget economy busts (C26) and Regulation of properties valuation standards (C28) have more sensitivity using COPRAS and SAW values than TOPSIS values.

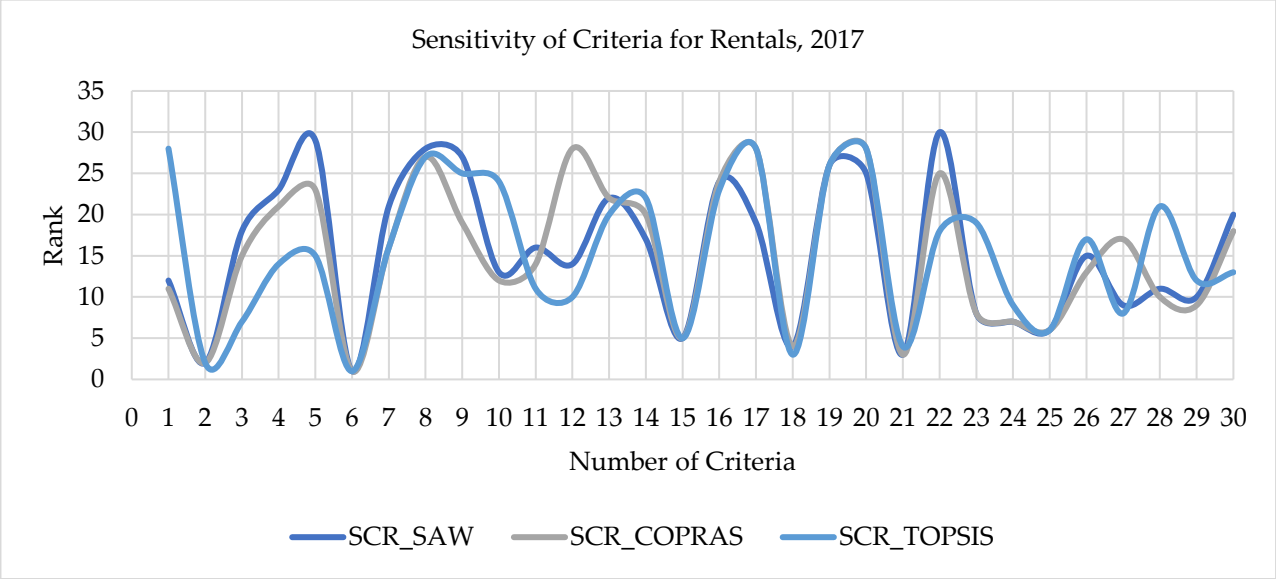


Figure 7-30. A Comparative Sensitivity Analysis of Commercial Property Rental Dynamics Criteria, 2017.

Analysis of the sensitivity of the criteria affecting the dynamics of commercial property rentals reveals intrinsic differences from method to method. A change in International trade (C5), Interaction between commercial property market cycles and development cycles (C11), has a higher degree of influence on values determined using TOPSIS than it does on those calculated using COPRAS and SAW. The same tendency is evident in the dynamics of Predictive agents (C23) and Regulation of property accounting standards (C29). By contrast, Human tendency to forget economy busts (C26) and Regulation of properties valuation standards (C28) have more sensitivity using COPRAS and SAW values than TOPSIS values.

As far as the dynamics of transactions and rentals are concerned, the most sensitive criterion is that of Foreign direct investment (C6).

According to the experts opinions, Investors expectations (24) has the largest weight out of all thirty. However, the sensitivity analysis shows that the smallest changes in Foreign Direct Investment (C6) make the biggest impact on the weight of each criterion in the group. According to MCDM, criteria weights influence the order of priority of the best alternative (country). Ergo, the following calculations show changes in the sequence of priority of alternatives for decision-making purposes, driven by changes in the Foreign direct investment (C6) criterion.

7.7. Sensitivity Analysis of Alternatives

This section contains an alternative weight sensitivity analysis. The alternatives comprise four countries: the UK, France, Germany and Sweden. The determination of the most sensitive criterion is followed by

analysis of change in the sequence of priorities of the alternatives for decision-making purposes, based on the changes in this criterion. Changes in criteria weights may alter the priority sequence of the countries. The most sensitive criterion is Foreign direct investment (C6), a change in the weight of C6 calculated using a scale of -5%, - 50%, 50% and 5 %. The method of calculation is described in Chapter 3 while detailed sensitivity analysis tables are presented in Appendix VI.

The following comprises the 2017 criteria sensitivity calculations to determine the dynamics of commercial property transactions and separately, rentals, using all three MCDM methods (SAW, COPRAS and TOPSIS). The results of the analysis are displayed in Figure 7-31 and Figure 7-32.

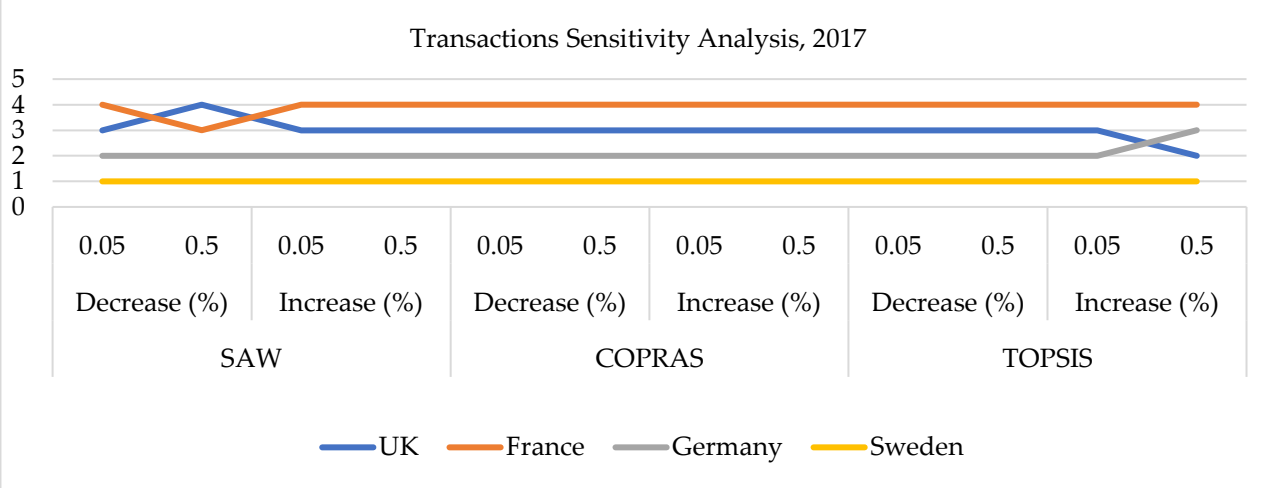


Figure 7-31. Variations in the Sensitivity of the Alternatives for Commercial Property Transaction Dynamics, 2017.

Figure 7-31 shows variations in the sensitivity of the alternatives regarding commercial property transaction dynamics. As criterion C6 shifts, the most sensitive response is observed in the UK, French and German markets. If C6 drops by 50%, the UK falls from third to fourth place in the sequence of priorities, using the SAW method. If C6 increases by 50%, the UK climbs from the third to second place in the sequence of priorities, using the TOPSIS method. A 50% increase in criterion C6, pushes France from fourth to third in the sequence of priorities, using the SAW method. If criterion C6 increases by 50%, Germany drops from second to third place in the sequence of priorities, using the TOPSIS method. No changes were observed in the priority sequence with the COPRAS method, as C6 varied on the scale of -5%, - 50%, 50%, and 5 %.

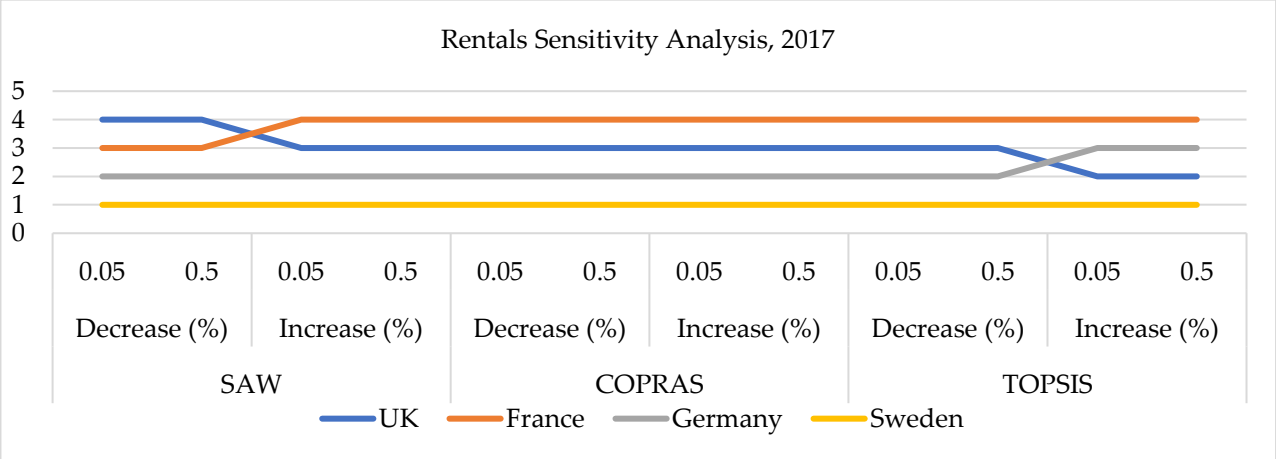


Figure 7-32. Variations in the Sensitivity of the Alternatives relative to Commercial Property Rental Dynamics, 2017.

Figure 7-32 shows variations in the sensitivity of the alternatives for commercial property rental dynamics. As criterion C6 shifts, the most sensitive response is observed in the markets of the UK, France and Germany. A 5% and 50% decrease in C6, causes the UK to drop from third to fourth place in the sequence of priorities, using the SAW method. If criterion C6 goes up by 5% and 50%, the UK's place in the sequence of priorities shifts from third to second, using the TOPSIS method. A 5% and 50% decline in C6, allows France to climb from fourth to third place in the sequence of priorities, using the SAW method. If criterion C6 grows by 5% and 50%, Germany falls from second to third place using the TOPSIS method. No changes were observed in the priority sequence with the COPRAS method as C6 varied on the scale of -5%, - 50%, 50%, and 5 %.

7.8. Chapter Summary

A summary of the results using MCDM methods, reveals a difference in the established priority sequence of countries when it comes to decision making. The results obtained with TOPSIS differ from those calculated using SAW and COPRAS. However, all methods indicate that the optimal alternative is Sweden, meaning that this country can be used as an example to build a framework for the sustainable management of the commercial property market. Germany's commercial property transactions market came second using all methods, the UK second using TOPSIS with Germany placed third for the commercial property rentals market. All methods place France fourth in terms of suitability for both markets.

Criteria sensitivity analysis has revealed that the criteria with the highest degree of sensitivity over all three methods within the context of the dynamics of commercial property transactions and rentals, as Taxes (C2), Foreign direct investment (C6), Environmental taxes (C15), GDP per Capita (C18) and Social Protection Expenditure (C21).

The alternative sensitivity analysis carried out on the basis of a shift of the most sensitive criterion on a scale of -5%, - 50%, 50%, and 5%, has shown that a shift in criterion C6, brings changes to all the weights of all the criteria. This suggests that changes in criteria weights could alter a countries' priority sequence in terms of decision-making. Analysis of the choice of country, in relation to the dynamics of commercial property transactions and rentals, has shown the UK, French and German markets to exhibit the most sensitive response to this change.

7.9. Outcomes

Based on the calculations using SAW, COPRAS and TOPSIS, all the results determined that Sweden was the best option. Sensitivity analyses of the alternatives (countries), revealed that the UK, French and German markets are more sensitive in their response to changes in criteria weights compared to Sweden. Based on a review of commercial property market dynamics (Chapter 4), Germany`s market appeared to be one of the most stable compared with France, the UK and Sweden. However, in Germany, many of the economic indicators dropped sharply between 2008-2009 (Chapter 4). The measurement tools recalculated per capita show that in Swedish citizens have a higher share of GDP, taxes - including environmental taxes, and social protection expenditure.

Regarding criteria impact analysis, the biggest impacts on commercial property transactions market are caused by Taxes (C2), Government bond yields (C3), Return on commercial property (C8), Debt interest rate (C9), Unemployment (C19), Investor`s expectations (C24) and Sellers` speculative activity (C25). Looking at the commercial property rentals market, Taxes (C2), Interaction between commercial property market cycle and development cycle (C11), Unemployment (C19), Number of employed persons (C20), Investor`s expectations (C24) and Built environment planning policy (C27 have the biggest impact. However, sensitivity analysis indicates that Foreign direct investment (C6) is the most sensitive criterion. The smallest change in this criterion caused the highest degree of change in of Taxes (C2), Environmental taxes (C15), GDP per Capita (C18) and Social Protection Expenditure (C21).

The results of the analysis have identified 14 criteria as having the highest degree of significance for the commercial property market. Seven of these affect the dynamics of commercial property sale prices, six

that of the commercial property rental market. The remainder are highly susceptible to changes in foreign direct investments (C6). Taxes (C2), unemployment (C19) and investor`s expectations (C24) are significant both to the sale and rental market.

Taxes (C2) is one of the key criteria identified during the analysis. State budgetary revenues largely consist of taxes paid by taxpayers. These taxes are redistributed across the state budget and affect governmental spending. Afonso and Sousa (2012) noted that, compared to the empirical literature on the effects of monetary policy on levels of economic activity, fiscal policy has been neglected. They explored how governmental spending affects economic conditions in the UK, Germany and Italy, observing that increasing taxes have an impact on property prices and governmental spending, thus affecting GDP and the dynamics of rental rates. They also reported that balancing governmental spending and revenue also influences price levels, including that of property, as well as the governments' need to borrow.

One way for governments to borrow money is by issuing securities. Government bond yields (C3) was also identified as one of the more significant criteria in terms of the dynamics of the commercial property market. Studies by Blundell (2009) and Jones et al. (2015) addressed the concept of risk premium. They stressed that government bond yields affect property investments by virtue of exercising an influence on the size of the investment risk premium. Their analysis revealed the fact that sometimes the risk premium is higher than expected, considering the growth of the risk-free rate (government bond yields). Jones et al. (2015) believes that this gap may be the product of investor expectations regarding the growth of property rental rates.

Regarding the criterion Return on commercial property (C8), Blundell (2009), Jones et al. (2015) and Bruneau and Cherfouh (2018) addressed issues around dynamics of commercial property price growth and related dynamics of returns (section 2.7.1.). Two issues were emphasised, the first that higher liquidity of property could induce higher demand and thus increase prices. Secondly and in relation to this, the investors are likely to expect higher returns on these more expensive properties. his analysis of C6, Foreign direct investment (FDI), Barkham et al. (2017) observed that between 1990 and 2015, there was a pronounced increase in inflows in Asia, South America and Africa compared to Europe and North America. They found that property prices were affected by international investors more so than by their domestic counterparts. Goetzmann and Rouwenhorst (2000) emphasised that investors tend to look for higher return rates, hence their focus on the possibility to invest overseas. Poon (2017) suggested a strong correlation between salaries, residential property, land price and interest rates when comparing FDI to GDP. There have been no studies investigating the impact of FDI on the criteria of Taxes (C2),

Environmental taxes (C15) and Social protection expenditure (C21), something that was identified in the course of the sensitivity analysis carried out here.

The relevance of the criterion Debt interest rate (C9) was emphasised by Jones et al. (2018), Nappi-Choulet (2005) and Davis and Zhu (2009). Jones et al. (2018) stressed that the cost of loan capital, affects investors' decisions, cheaper loans creating a higher return on investment (Nappi-Choulet, 2005). However, Crosby and Hughes (2011) also accentuated the importance of property valuation services as an anchor for making decisions about what to finance. Nappi-Choulet (2005) stressed both the correlation between returns on property and the price of borrowed money, and the impact of borrowed money on property development, highlighting the importance of the interaction between the commercial property market and development. Dabara et al. (2014) analysed the critical process of decision-making in property development noting that the development process involves a whole number of specialists affecting said process. These include architects, engineers and property appraisers. In analysing the demand for office developments, McCartney (2008) observed that the growth of rent rates could be an indicator of demand for development.

Liapis et al. (2013) analysed the impact of taxes on property prices and development, finding that investments in non-efficient, old property could lead to higher environmental taxes. As a result, with the evolution of building technology and the public's view on environmental protection, the environmental taxes criterion has gained additional importance.

All the above aside, many authors including Barras (1994), Davis and Zhu (2009) and Bruneau and Cherfouh (2018) have emphasized that GDP is one of the main criteria influencing property dynamics. This study did not confirm this, however the criterion GDP per capita (C18) had a relatively high degree of sensitivity, responding to the smallest of changes in FDI. Hoskins et al. (2004) addressed the correlation between the rate of return on commercial property and macroeconomic indicators in the US, Canada, Australia and the UK finding a weak correlation between the return on commercial property (C8) and unemployment (C19).

In their article, Hebb at el. (2010) introduced the concept of socially responsible property investment. They emphasised the importance of responsible investment regarding environmental and social factors such as employee comfort in the working environment. The impact that the number of employed persons (C20) has on property prices and built environment planning policy (C27) were not analysed. Ergo, the number of employed persons (C20) and built environment planning policy (C27) criteria have not been subject to detailed analyses. Hebb et al. did state though that important components of responsible property

investment are labour and workplace, Scott (2013) emphasising the importance of spatial planning for the dynamics of commercial property prices.

There is no research dealing with the direct connection between commercial property prices and the social protection expenditure (C21) criterion. However, Roberts and Kimmet (2009) made a comparison of two concepts: social responsibility and sustainable investments in commercial property. The purpose of this study was to investigate the similarities and differences of the two concepts in the context of commercial property, their conclusion that investments in sustainable commercial property, correlated directly with social responsibility.

Marcato and Mushi (2014) addressed the behaviour of commercial property investors noting that investors have inaccurate information at their disposal when they engage in property valuation, because the information used for property valuation purposes (indices estimated based on historical data) deviates from the current situation. The criterion Investors' expectations (C24) has been broadly analysed by researchers, Scott (2013) arguing that many investors perceived the 1974 crisis as a unique event caused by flaws in banking regulations and controls over property development. The crisis of 1990 however, showed that it was a one-of-a-kind phenomenon (Jones et al., 2017). This method of thinking had long-lasting consequences for investors' expectations, Jones et al. stressing that this change in investors' expectations could, to a certain extent, impact long-term changes in demand on the commercial property market.

The criterion Sellers` speculative activity (C25), was addressed in a study by Higgins and Osler (1998), where it was established that changes in the financial market can have a significant effect on the speculative behaviour of property sellers. Lending at higher interest rates where property is used as collateral, should make speculation on the part of commercial property sellers/owners more difficult. It was also argued that tax policy, or any other form of regulation, could be instrumental in preventing a speculative property bubble.

The above review covered articles by researchers and property analysts dealing with criteria that affect the dynamics of property, as well as criteria that have an impact on overall economic dynamics. Scientific papers have not addressed specific social criteria yet matters of social responsibility have been touched upon. There is also a paucity of work on the impact of emotional criteria, an analysis of which could be a valuable addition to the theory of behavioural economics. Researchers have conducted several analyses of the GDP criterion arguing that business correlates with GDP dynamics: the study carried out within the framework of this thesis did not identify GDP as a key criterion.

This work also features a criteria sensitivity analysis, which has revealed for the first time that a wide range of criteria affects the dynamics of commercial property, just as criteria influence one another, and that their dynamics are interrelated. The mutual connection of all criteria is significant in that it shows that any decision or behavioural model of market players, affects both a specific criterion, and an entire group of them. Therefore, the next chapter of the theses introduces a decision-making model to help make decisions in a dynamic commercial property environment and/or to manage the dynamics of the commercial property market. This model uses 30 criteria for nearly all of them have, to a greater or lesser extent, been addressed in the scientific literature (Chapter 2), all of them labelled as important by commercial property experts (Chapter 5).

Chapter 8. Framework and Its Implementation

8.1. Introduction

Chapter 8 comprises a framework for the sustainable management of the commercial property market. It provides a description of the structure of framework and the way to apply it. A substantial section of the chapter is dedicated to implementation of the framework. Finally, the chapter discusses the details and outcomes of implementation of a framework using MCDM methods. After detailing results of the calculation, the chapter concludes with a final summary and outcomes.

8.2. Framework

A framework here is a platform for a supporting structure for decision making. It provides a foundation on which the decision maker can test commercial property market dynamics for a specific country or a specific decision. This study has proposed a framework for the sustainable management of the commercial property market. The framework is grounded on a broader concept of the management of commercial property market fluctuation, one that is better aligned with sustainable dynamics. The effective management is considered as the process by which stakeholder decision making is related with the retention of capital value.

It was designed based on input from participants in the property market who can now use it to achieve their goals or exercise influence on the dynamics of the commercial property market. This framework makes a significant contribution to existing theory. The framework diagram is shown below in Figure 8-1.

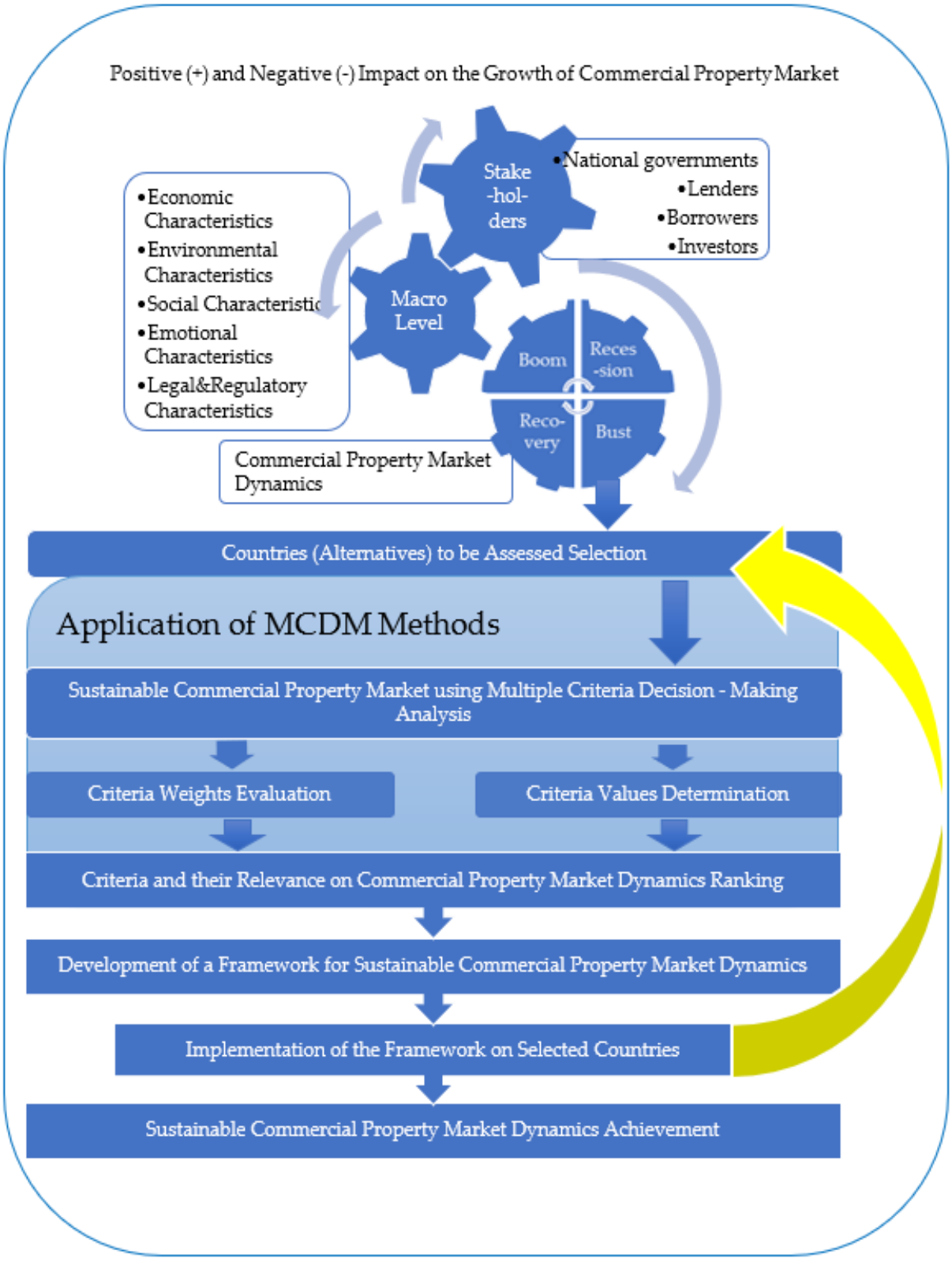


Figure 8-1. A Framework for the Sustainable Management of the Commercial Property Market.

The top of the figure shows the impact of stakeholders on the macro level characteristics that influence property market dynamics. The literature suggested that property cycles from boom to bust depend on the economic behaviour of market participants who make up this market. National governments, lenders, borrowers and investors are defined as the stakeholders for the purposes of this study. National governments pursue the goal of managing the consequences of economic, environmental, climate and political crises. Lenders are concerned with engineering tools to exercise control over the solvency of their clients. Borrowers wish to have a stable cash flow to cover their debts, and for Investors, the most important thing is to invest successfully and to minimise their risks. The behaviour and choices of all these participants affect the sustainability of the dynamics of the analysed market at macro, meso and micro levels. In this study the macro level of criteria has been analysed as this level involves interactions on a large scale, affecting communities, states or countries. The participants in the property market (stakeholders) and the macro criteria, were selected on the basis of an analysis of relevant literature (see Chapter 2 of this thesis).

The stakeholders' have an impact on the macro characteristics and those characteristics influence the commercial property dynamics from boom to bust. The Questionnaire Survey helped to develop criteria according to their relevance to market dynamics and to determine measurement tools for qualitative criteria.

Figure 8-1 shows the steps for analysing the decision-making possibilities using those criteria. It does this by applying MCDM methods for the countries or regions.

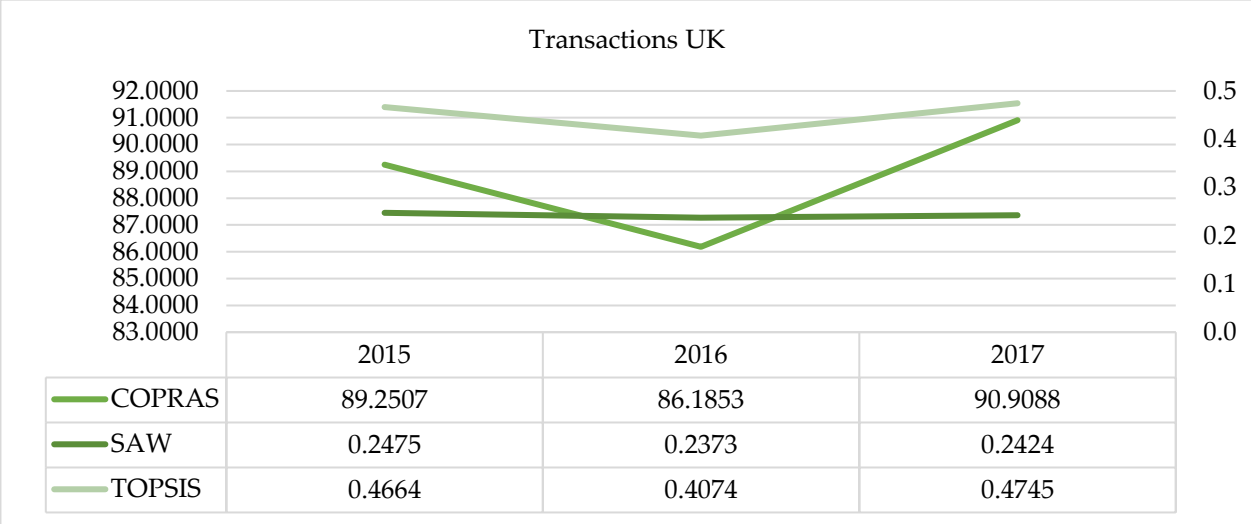
All three, multiple-criteria, decision-making methods – SAW, COPRAS, and TOPSIS – were employed to analyse alternative countries of choice.

8.3. Framework Implementation

The framework was implemented for all four countries. The analysed period was 2015-2017.

8.3.1. The UK Commercial Property Market

Figure 8-2 and Figure 8-3 below contain a summary of the results obtained using MCDM regarding the dynamics of the UK market and the related risks pertinent to the commercial property transactions market.

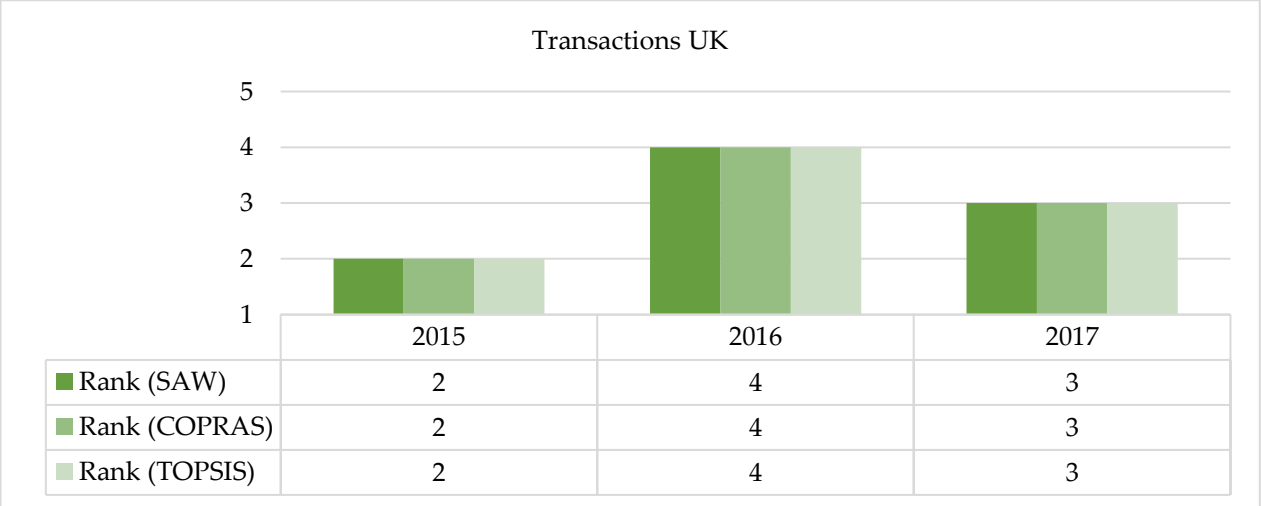


	2015	2016	2017
COPRAS	89.2507	86.1853	90.9088
SAW	0.2475	0.2373	0.2424
TOPSIS	0.4664	0.4074	0.4745

Figure 8-2.The UK Results Calculated using MCDM Methods, Comparing Countries over the Period 2015 to 2017.

The results estimated under the SAW, COPRAS, and TOPSIS methods are displayed in Figure 8-2 by rank. The results of the SAW calculations show that the best indicator was registered in 2015 (0.2475). A decline was observed in 2016 with the lowest result on record (0.2373). However, in 2017 the UK's market started to recover, with the indicator climbing to 0.2424. This tendency was also apparent using COPRAS and TOPSIS methods except that this indicator was higher in 2017 compared to 2015. The indicator estimated using COPRAS was higher in 2017 (90.9088) than it was in 2015 (89.2507). The 2016 result was also the lowest (86.1853). The results estimated using TOPSIS dropped from 0.4664 (2015) to 0.4074 (2016), climbing in 2017 to 0.4745.

Figure 8-3 below shows movements in the UK market over the period of analysis.

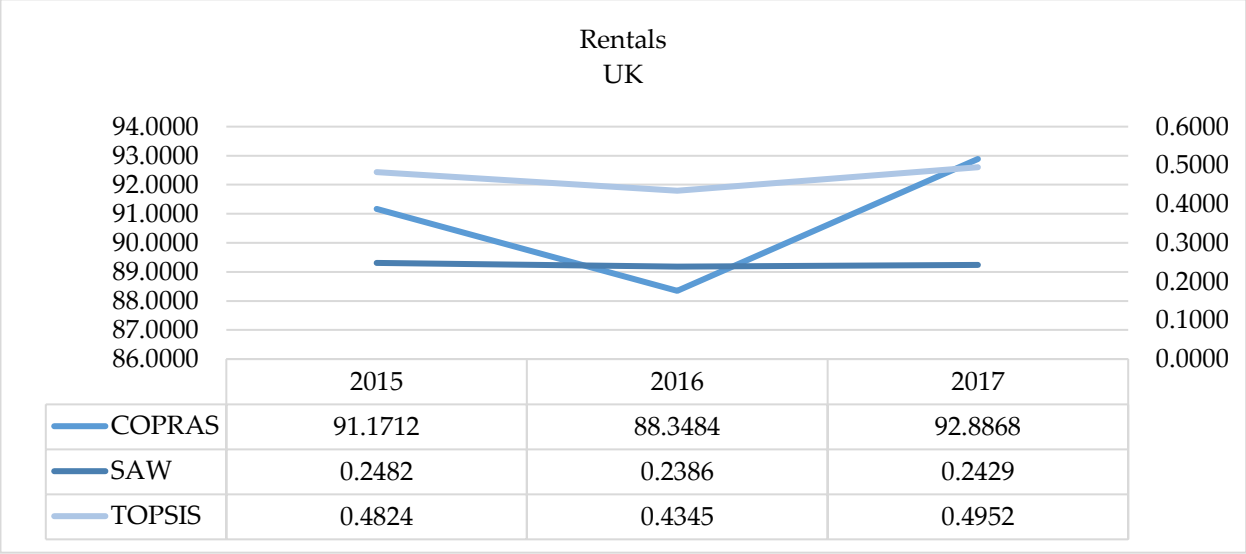


	2015	2016	2017
Rank (SAW)	2	4	3
Rank (COPRAS)	2	4	3
Rank (TOPSIS)	2	4	3

Figure 8-3. The UK's Ranking in Comparison to the other Countries over the Period 2015 and 2017.

Figure 8-3 shows the changes that took place in the UK market. This analysis used 30 criteria and is in comparison to France, Germany and Sweden. The dynamics during this period do not vary across different methods so comparing the above countries, the UK was second in 2015, fourth in 2016 and third in 2017.

Figure 8-4 and Figure 8-5 below show a summary of the results from the MCDM methods, showcasing the dynamics of the UK market and related risks attributable to the commercial property rentals market.

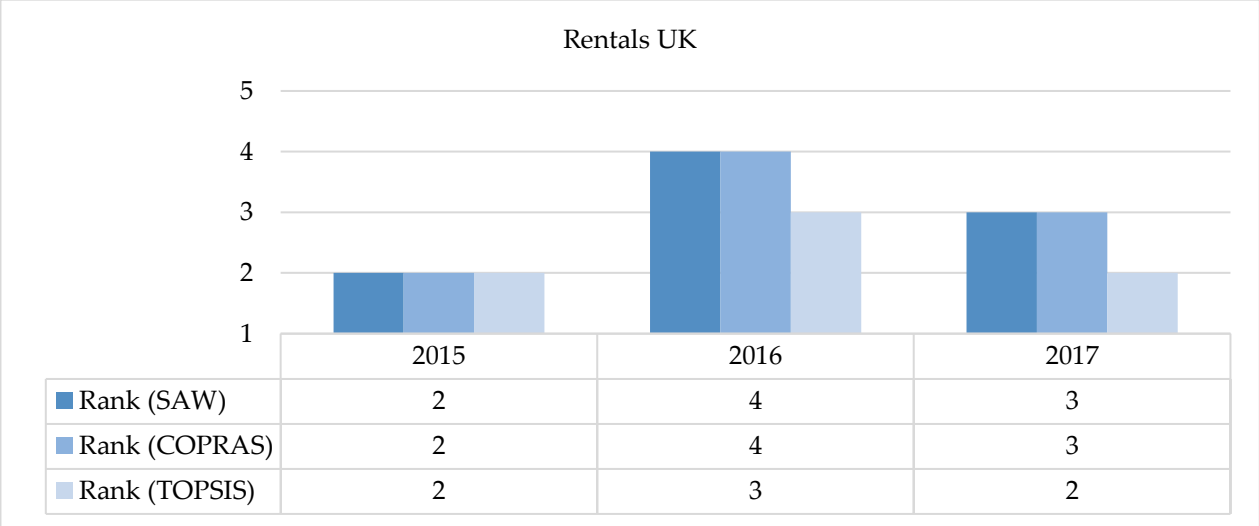


	2015	2016	2017
COPRAS	91.1712	88.3484	92.8868
SAW	0.2482	0.2386	0.2429
TOPSIS	0.4824	0.4345	0.4952

Figure 8-4. The UK Results Calculated using MCDM Methods, Comparing Countries over the Period 2015 to 2017.

The results calculated using SAW, COPRAS and TOPSIS methods, are presented by rank in Figure 8-4. In terms of the SAW calculations, the best result was registered in 2015 (0.2482) followed by a decline in 2016 (0.2386). In 2017, the indicator went up to 0.2429. The same tendency can be observed with COPRAS and TOPSIS methods but with a better result in 2017. The indicator estimated using COPRAS was highest in 2017 (92.8868) dropping to 91.1712 in 2015. In 2016, the lowest result was observed (88.3484). The indicator determined using TOPSIS, dropped from 0.4824 (2015) to 0.4345 (2016) and then rose to 0.4952 (2017).

Figure 8-5 below displays the movements on the UK market over the period of analysis.



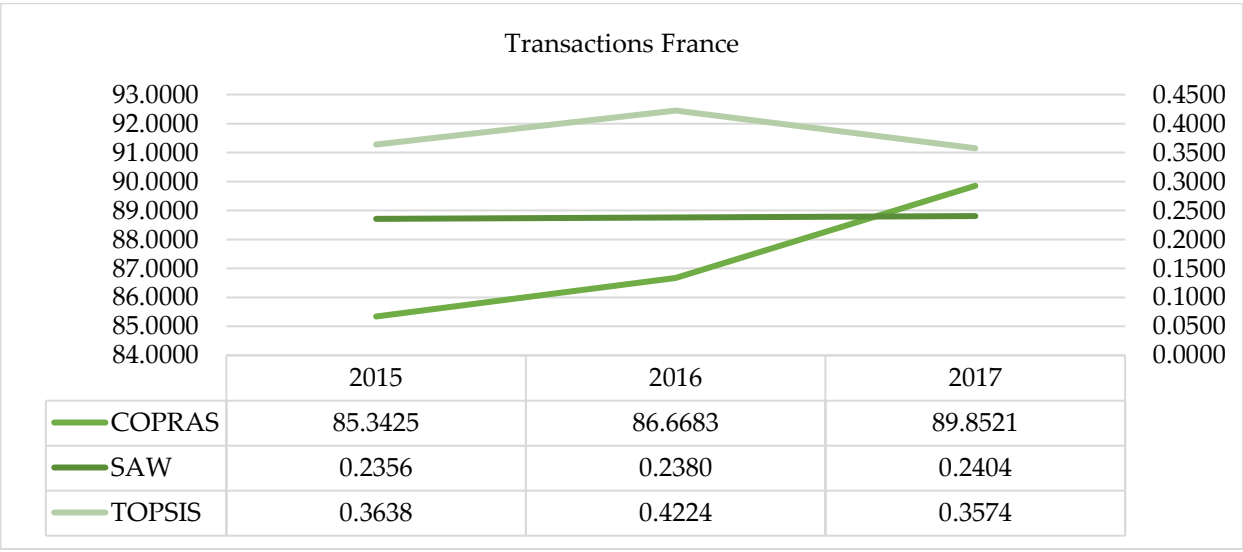
	2015	2016	2017
Rank (SAW)	2	4	3
Rank (COPRAS)	2	4	3
Rank (TOPSIS)	2	3	2

Figure 8-5. The UK's Ranking in Comparison to the other Countries over the Period 2015 and 2017.

Figure 8-5 shows the changes that took place in the UK market with reference to commercial property rentals compared to the other countries included in the analysis between 2015 and 2017. The dynamics of the results during this period vary dependent on the method used. Comparing countries, in 2015, the UK was last with all methods. In 2016, the UK was placed fourth using SAW and COPRAS, and third using TOPSIS. In 2017 and 2015, the UK was second and in a lower place than in 2016.

8.3.2. The French Commercial Property Market

Figure 8-6 and Figure 8-77 below, contain a summary of the results obtained with the MCDM methods, revealing the dynamics of the French market and related risks pertinent to the commercial property transactions market.

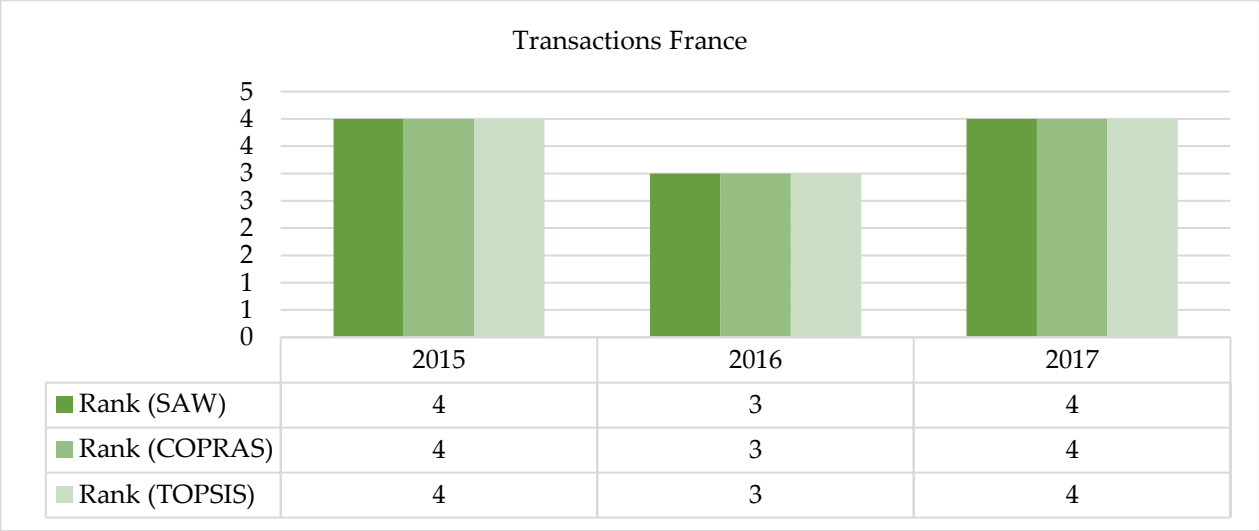


	2015	2016	2017
COPRAS	85.3425	86.6683	89.8521
SAW	0.2356	0.2380	0.2404
TOPSIS	0.3638	0.4224	0.3574

Figure 8-6. France's Results Calculated using the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

The results estimated using SAW, COPRAS and TOPSIS, are displayed in Figure 8-76 where the criteria affecting the dynamics of commercial property transactions in 2015–2017 are listed. The indicators determined using SAW and COPRAS methods grow consistently throughout the period. The results of SAW calculations show that the indicator registered in 2015 was 0.2356, 0.2380 in 2016 and 0.2404 in 2017. The same tendency is observed with the COPRAS method: 85.3425 in 2015, 86.6683 in 2016 and 89.8521 in 2017. The shift in the indicator calculated using TOPSIS is uneven. The lowest figure was in 2017 (0.3574), the highest in 2016 (0.4224) with the 2015 indicator standing at 0.3638.

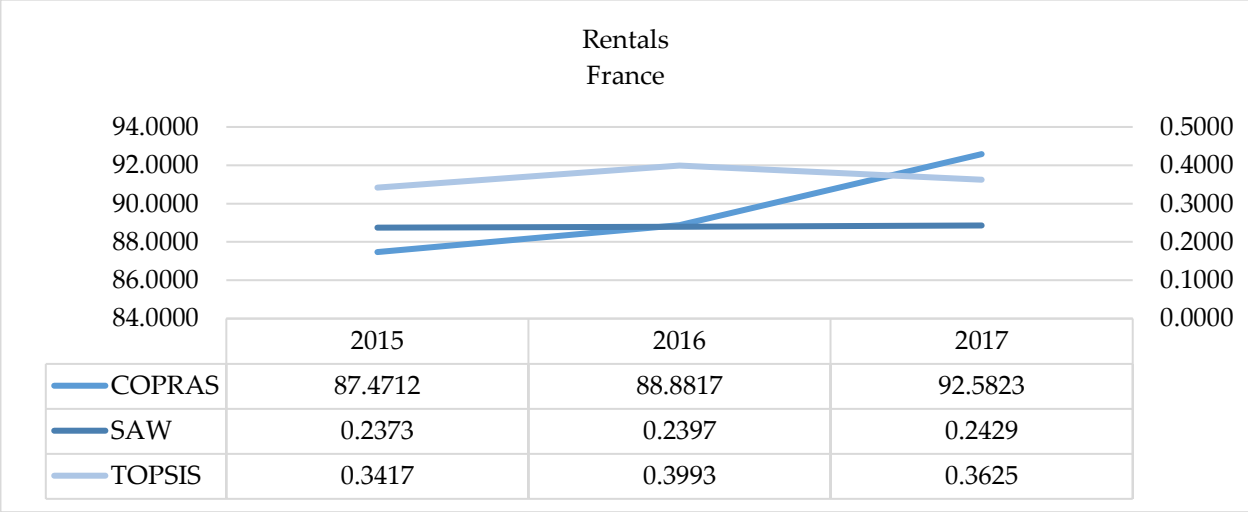
The figure below displays movements in the French market over the period of analysis (Figure 8-77).



	2015	2016	2017
Rank (SAW)	4	3	4
Rank (COPRAS)	4	3	4
Rank (TOPSIS)	4	3	4

Figure 8-7. France's Ranking in the Comparison of the Countries over the Period between 2015 and 2017.

Figure 8-7 shows how France's market affected commercial property transactions in 2015–2017, compared to the other countries in the analysis. The dynamics of the results during this period do not vary across methods. In comparison to the other countries, France was fourth in 2015 and 2017, and third in 2016. Figure 8-8 and Figure 8-9 below give a summary of the results using MCDM methods, showcasing the dynamics of France's market and related risks attributable to the commercial property rentals market.

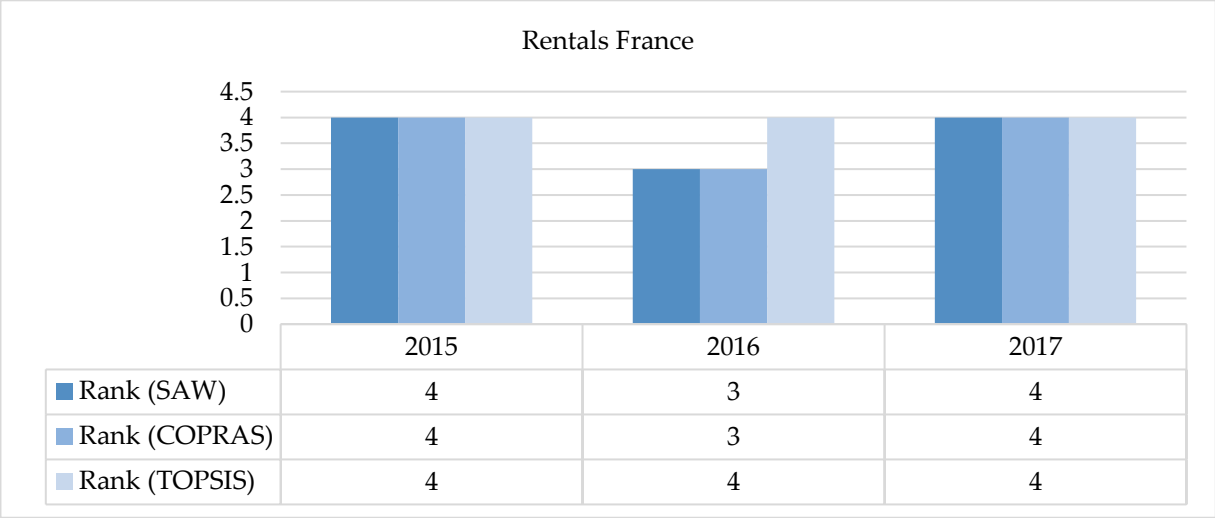


	2015	2016	2017
COPRAS	87.4712	88.8817	92.5823
SAW	0.2373	0.2397	0.2429
TOPSIS	0.3417	0.3993	0.3625

Figure 8-8. France's Results Obtained under the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

The results calculated using SAW, COPRAS and TOPSIS are presented in Figure 8-8. The indicators derived using SAW and COPRAS methods, grow consistently throughout the period. Using SAW, the indicator was 0.2373 in 2015, 0.2397 in 2016 and 0.2429 in 2017. The same tendency can be observed with the COPRAS method: 87.4712 in 2015, 88.8817 in 2016 and 92.5823 in 2017. The shift in the indicator determined with the TOPSIS method is not even. Its lowest value was 0.3417 in 2015, the highest in 2016 (0.3993) with the 2017 figure standing at 0.3625.

Figure 8-9 below displays the movements in France over the period of analysis.



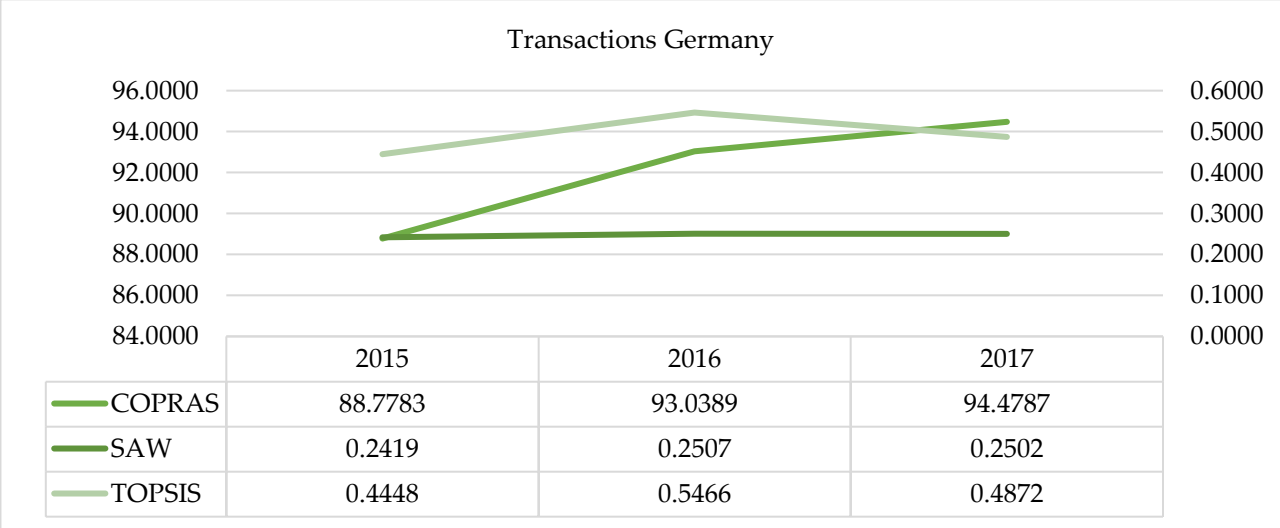
	2015	2016	2017
Rank (SAW)	4	3	4
Rank (COPRAS)	4	3	4
Rank (TOPSIS)	4	4	4

Figure 8-9. France's Ranking Results, Comparing the Countries over the Period between 2015 and 2017.

Figure 8-9 shows the changes that took place in the French market. The analysis is based on 30 criteria and a comparison of their dynamics with the UK, Germany and Sweden, over the period 2015 to 2017. The dynamics of the results during the period do not vary across different methods. Therefore, comparing the above countries, France was fourth in 2015 and 2017, and third in 2016 using SAW and COPRAS. According to TOPSIS the country was fourth in 2015 - 2017.

8.3.3. The German Commercial Property Market

Figure 8-10 and Figure 8-11 below contain a summary of the results obtained using MCDM methods regarding the dynamics of the German market and related risks pertinent to the commercial property transactions market over the period 2015 to 2017.

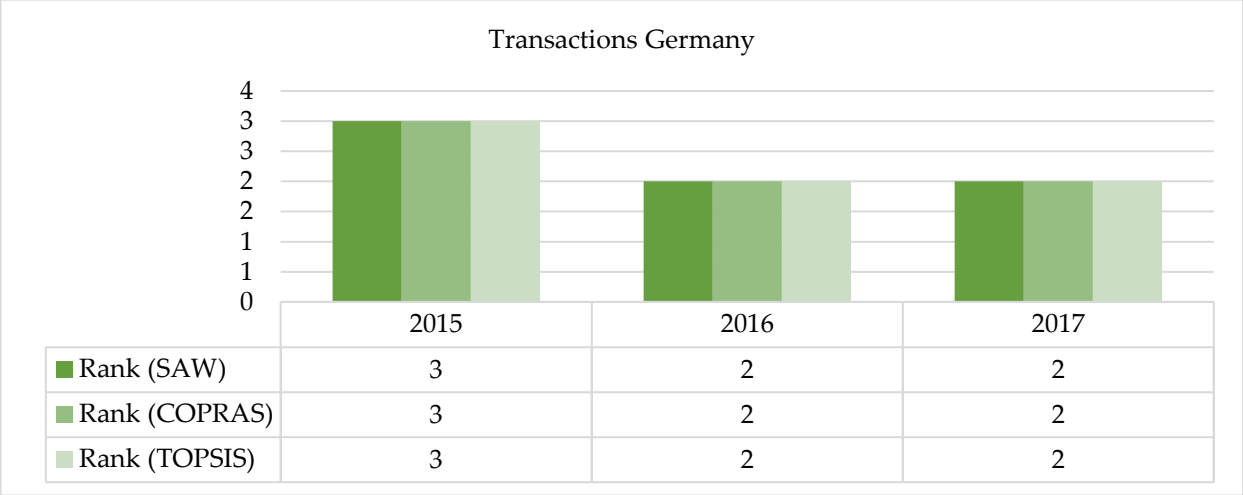


	2015	2016	2017
COPRAS	88.7783	93.0389	94.4787
SAW	0.2419	0.2507	0.2502
TOPSIS	0.4448	0.5466	0.4872

Figure 8-10. Germany's Results Calculated using the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

There is variation between the indicators determined by SAW and TOPSIS over the study period. The results of SAW calculations show that the 2015 indicator was the lowest at 0.2419 while the 2016 figure was the highest at 0.2507. The 2017 indicator was 0.2502. The same tendency was observed with the TOPSIS method: 0.4448 in 2015, 0.5466 in 2016, and 0.4872 in 2017. The indicator estimated using COPRAS, shifts consistently upwards. The lowest figure was recorded in 2015 (88.7783), followed by 2016 (93.0389), the highest indicator observed in 2017 (94.4787).

Figure 8-11 below details movements in the German market over the period of analysis.

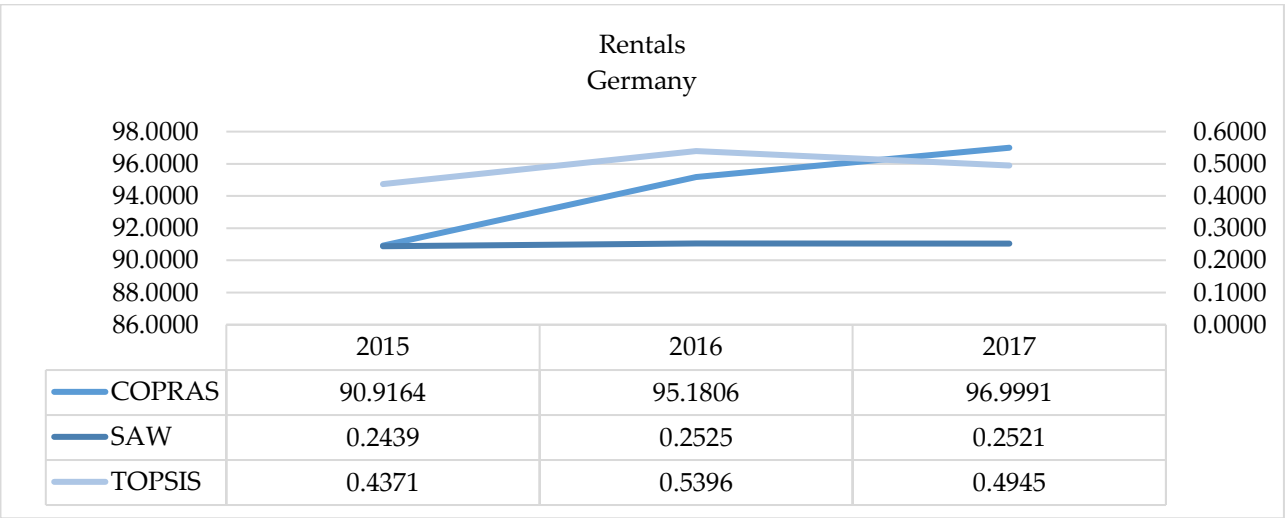


	2015	2016	2017
Rank (SAW)	3	2	2
Rank (COPRAS)	3	2	2
Rank (TOPSIS)	3	2	2

Figure 8-11. Germany's Ranking in the Comparison of the Countries over the Period between 2015 and 2017.

Figure 8-11 shows the development of the German market based on a comparison of criteria between the UK, France, Germany and Sweden. There is no variation in dynamics across the different methods. Germany was second in 2015, fourth in 2016, and third in 2017.

Figure 8-12 and Figure 8-13 below show a summary of the results using MCDM methods, showcasing the dynamics of the German market and related risks attributable to the commercial property rentals market, over the period 2015 to 2017.



	2015	2016	2017
COPRAS	90.9164	95.1806	96.9991
SAW	0.2439	0.2525	0.2521
TOPSIS	0.4371	0.5396	0.4945

Figure 8-12. Germany's Results Obtained under the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

The indicators determined using SAW and TOPSIS, vary throughout the period. In terms of the SAW calculations., the lowest score was registered in 2015 at 0.2439, the highest in 2016 at 0.2525. The 2017 result was 0.2521. The same tendency can be observed with the TOPSIS method: 0.4371 in 2015, 0.5396 in 2016 and 0.4945 in 2017. The indicator estimated using COPRAS shifts consistently upwards: the lowest figure was observed in 2015 (90.9164), followed by 95.1806 in 2016, the highest indicator registered in 2017 (96.9991).

Figure 8-13 below displays movements in the German market over the period of analysis.

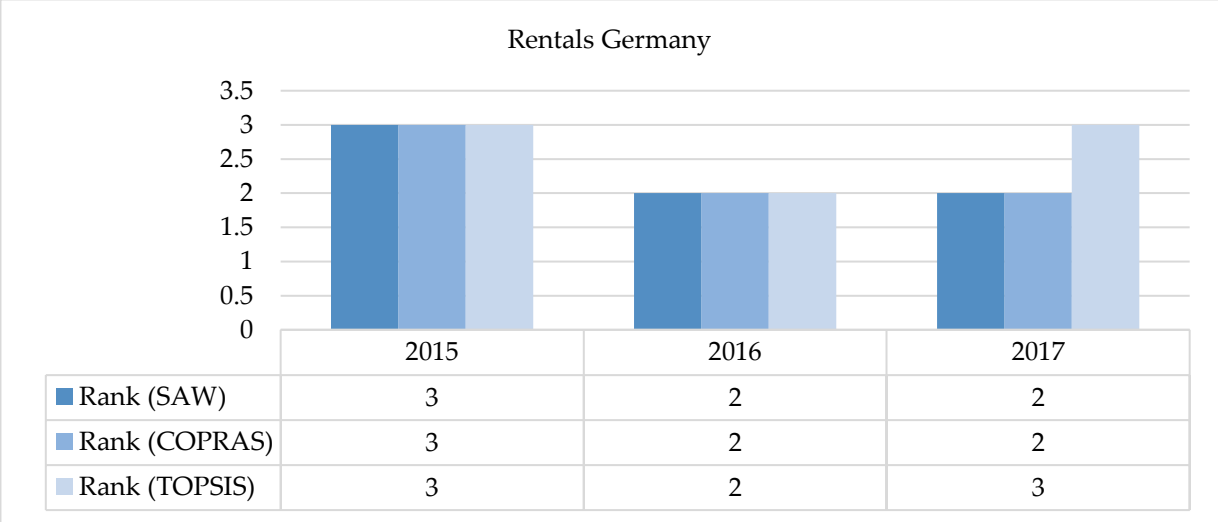
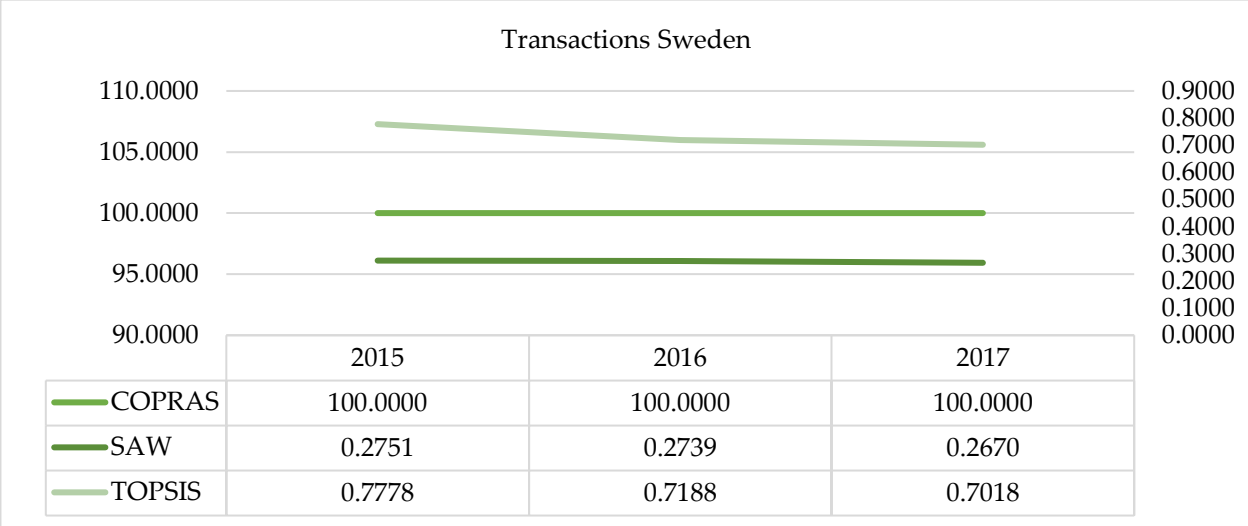


Figure 8-13. Germany's Ranking Results, Comparing the Countries over the Period between 2015 and 2017.

Figure 8-13 shows the changes that took place in the German market, based on a criterion comparison across the UK, France, Germany and Sweden. The observations concern changes in the German market over the period 2015 to 2017. The dynamics of the results during this period do not vary according to SAW and COPRAS. In 2015, Germany was third and second in 2016 and 2017, respectively. Regarding the results obtained with TOPSIS, Germany was third in 2015 and in 2017, and second in 2016.

8.3.4. The Swedish Commercial Property Market

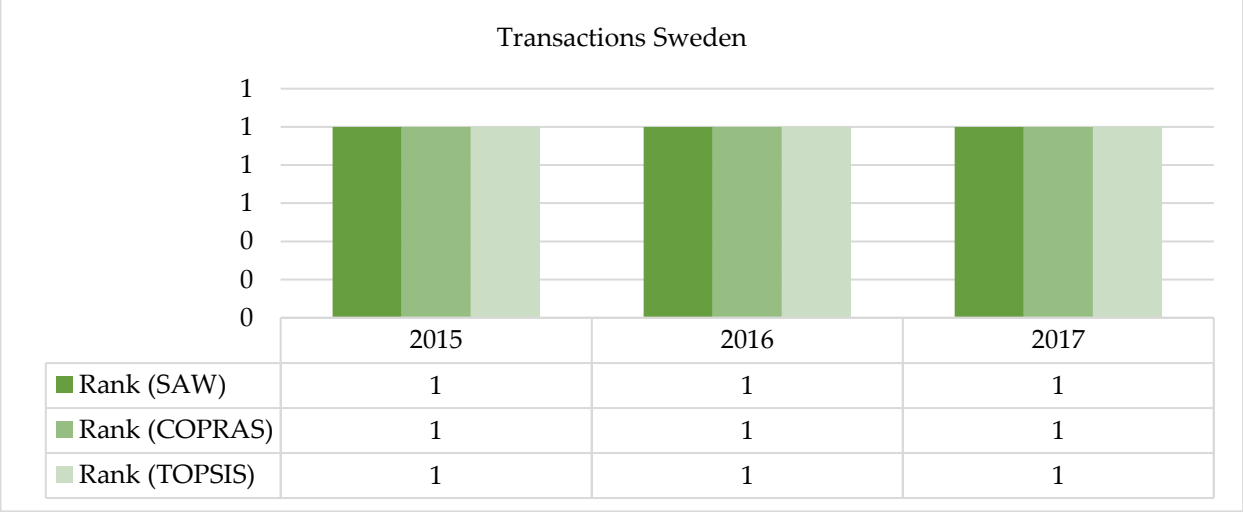
Figure 8-14 and Figure 8-155 below contain a summary of the results obtained using MCDM methods to identify the dynamics of the Swedish market and related risks pertinent to the commercial property transactions market, over the period 2015 to 2017.



	2015	2016	2017
COPRAS	100.0000	100.0000	100.0000
SAW	0.2751	0.2739	0.2670
TOPSIS	0.7778	0.7188	0.7018

Figure 8-14. Sweden's Results Calculated using the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

The shift in the indicators determined using SAW and TOPSIS decreases consistently, the value determined using the COPRAS method 100.000 throughout the 2015–2017 period. The results of SAW calculations revealed a consistent decline: 0.2751 in 2015, 0.2739 in 2016 and 0.2670 in 2017. The same tendency was observed using the TOPSIS method: 0.7778 in 2015, 0.7188 in 2016, and 0.7018 in 2017. Figure 8-15 below illustrates movements in the Swedish market over the period of analysis.

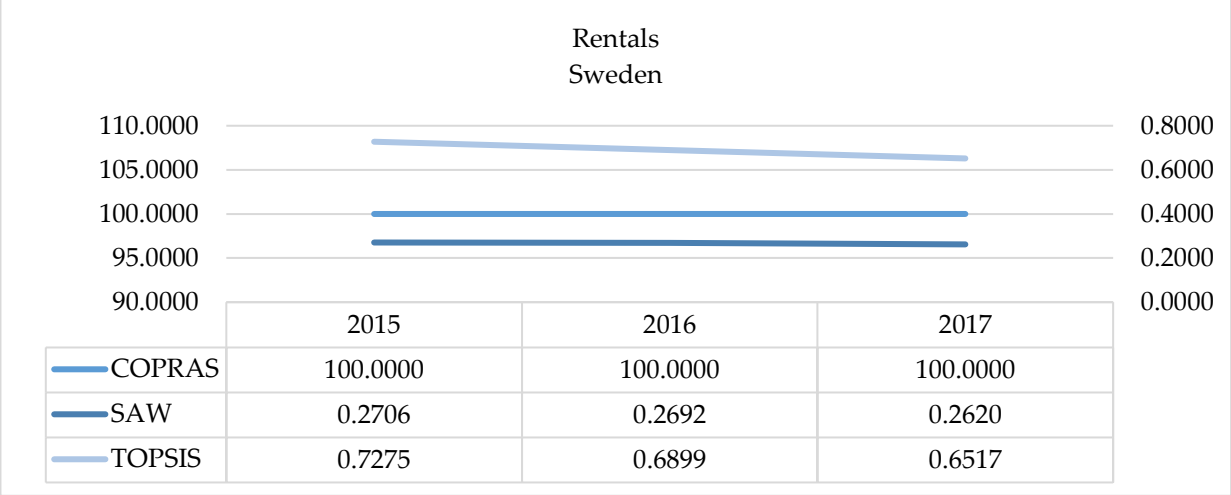


	2015	2016	2017
Rank (SAW)	1	1	1
Rank (COPRAS)	1	1	1
Rank (TOPSIS)	1	1	1

Figure 8-15. Sweden's Ranking in the Comparison of the Countries over the Period between 2015 and 2017.

Figure 8-15 shows that based on a comparison of criteria between the UK, France, Germany and Sweden, the Swedish market was consistently ahead during the entire study period.

Figure 8-16 and Figure 8-17 below show a summary of the results using MCDM methods, showcasing the dynamics of the Swedish market and related risks attributable to the commercial property rentals market, over the period 2015 – 2017.

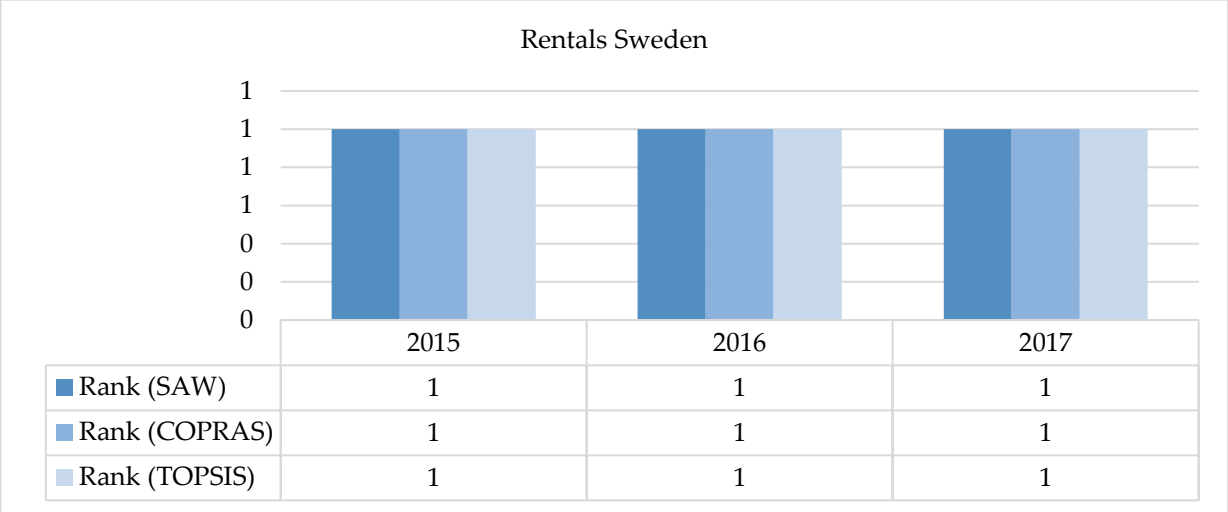


	2015	2016	2017
COPRAS	100.0000	100.0000	100.0000
SAW	0.2706	0.2692	0.2620
TOPSIS	0.7275	0.6899	0.6517

Figure 8-16. Sweden's Results Obtained under the MCDM Methods, Comparing the Countries over the Period between 2015 and 2017.

The indicators determined using SAW and TOPSIS vary, decreasing consistently, while the value determined using COPRAS was 100.000 for the entire 2015–2017 period. The results of SAW calculations show a consistent decline: 0.2706 in 2015, 0.2692 in 2016 and 0.2620 in 2017. The same tendency was observed with TOPSIS: 0.7275 in 2015, 0.6899 in 2016 and 0.6517 in 2017.

Figure 8-17 below displays movements in the Swedish market over the period of analysis.



	2015	2016	2017
Rank (SAW)	1	1	1
Rank (COPRAS)	1	1	1
Rank (TOPSIS)	1	1	1

Figure 8-17. Sweden's Ranking in the Comparison of the Countries over the Period between 2015 and 2017.

Figure 8-17 shows that based on a comparison of criteria between the UK, France, Germany and Sweden, the Swedish market was consistently ahead over the entire period.

8.3.5. Calculation of Dolls

This section presents a choice of alternatives based on criterion distribution by group: economic, social, environmental, emotional, legal and regulatory. This creates so-called 'dolls' that can be cut out and 'dressed' in different criteria groups that belong to different countries. This artificial country can be considered a standard to enable multifunctional strategic decision making regarding the cyclic dynamics of the commercial property market, without being confined to the choice of a single country. Detailed tables of all calculations are presented in Appendices VII-IX.

Calculation of Dolls for Commercial Property Transaction Dynamics

In this case, the criteria weights are recalculated for each group. The weights are presented in Figures 8-18 to 8-25 below.

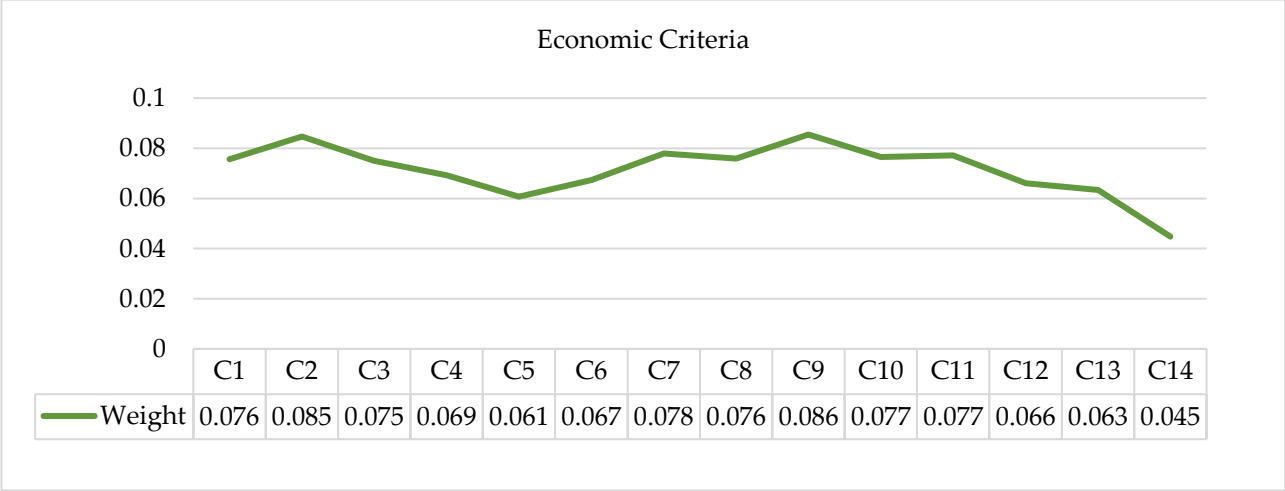


Figure 8-18. The Weights of Economic Criteria within the Group of Commercial Property Transaction Dynamics.

The criteria weights here are within the range 4–9%. The heaviest weight is that of Debt interest rate (C9) (0.0855), the lightest that of Renewable resources (C14: 0.0448).

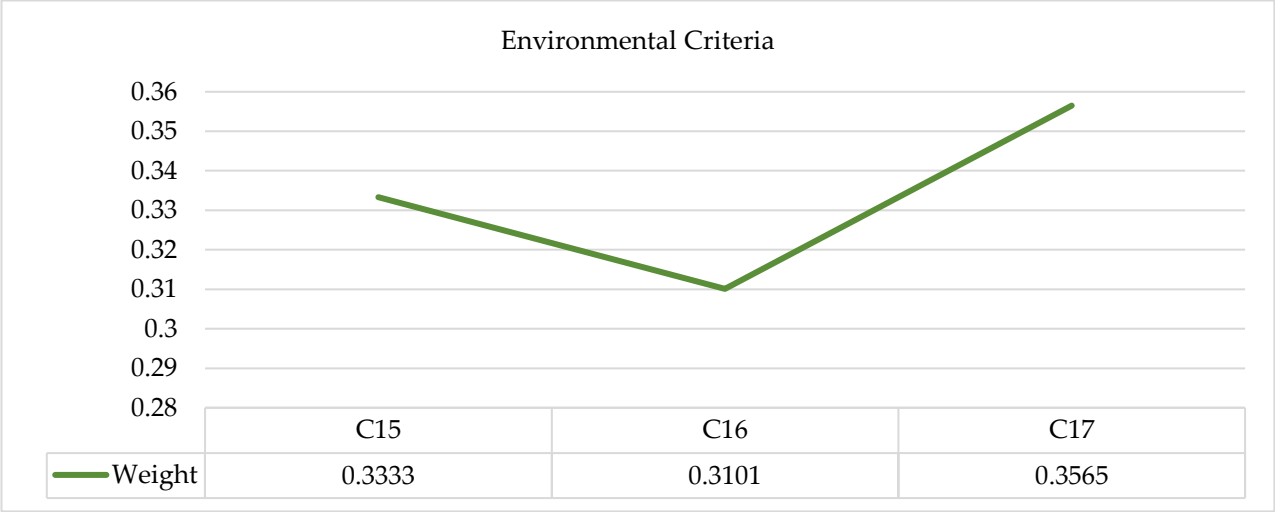


Figure 8-19. The Weights of Environmental Criteria within the Group of Commercial Property Transaction Dynamics.

The criteria weights here are within the range 31–36%. The heaviest weight is that of Environmental benefits of sustainable building (C17:0.3565), the lightest, Environmental protection expenditure (C16: 0.3101).

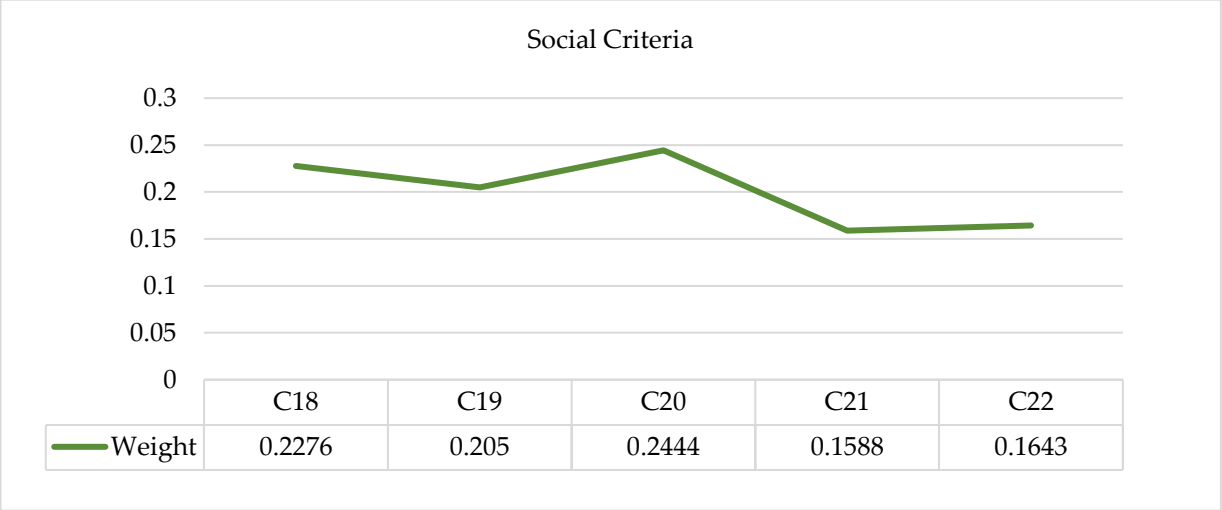


Figure 8-20. The Weights of Social Criteria within the Group of Commercial Property Transaction Dynamics.

The criteria weights here are within the range 15–25%. The heaviest weight is that of Number of employed persons (C20:0.3565), the lightest that of Social protection expenditure (C21: 0.1588).

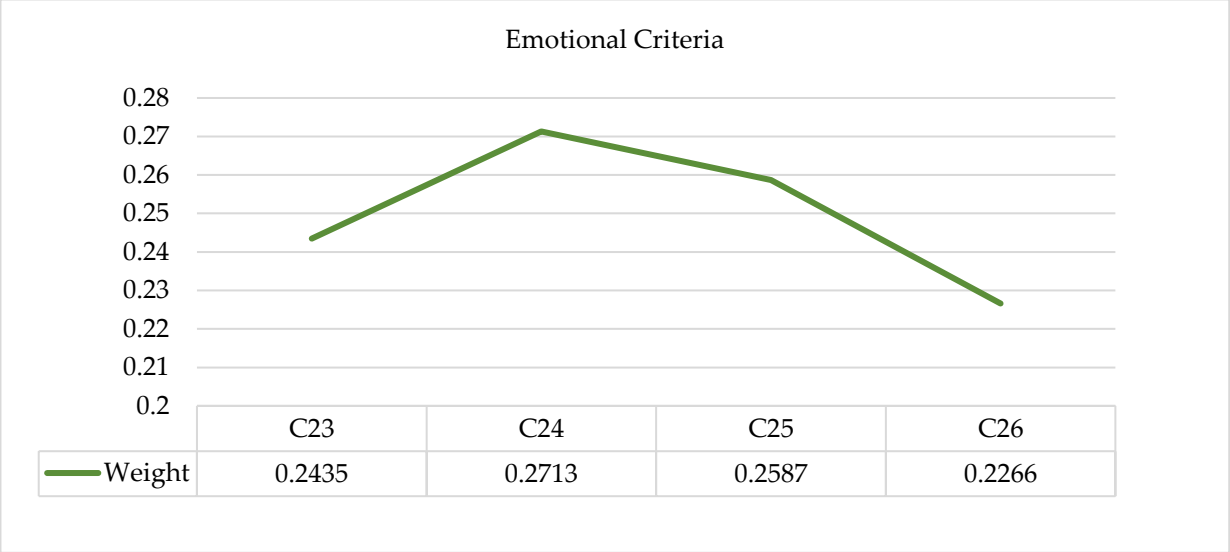


Figure 8-21. The Weights of Emotional Criteria within the Group of Commercial Property Transaction Dynamics.

The criteria weights here are within the range 23–27%. The heaviest weight is that of Investors' expectations (C24: 0.2713), the lightest that of Human tendency to forget economy busts (C26: 0.2266).

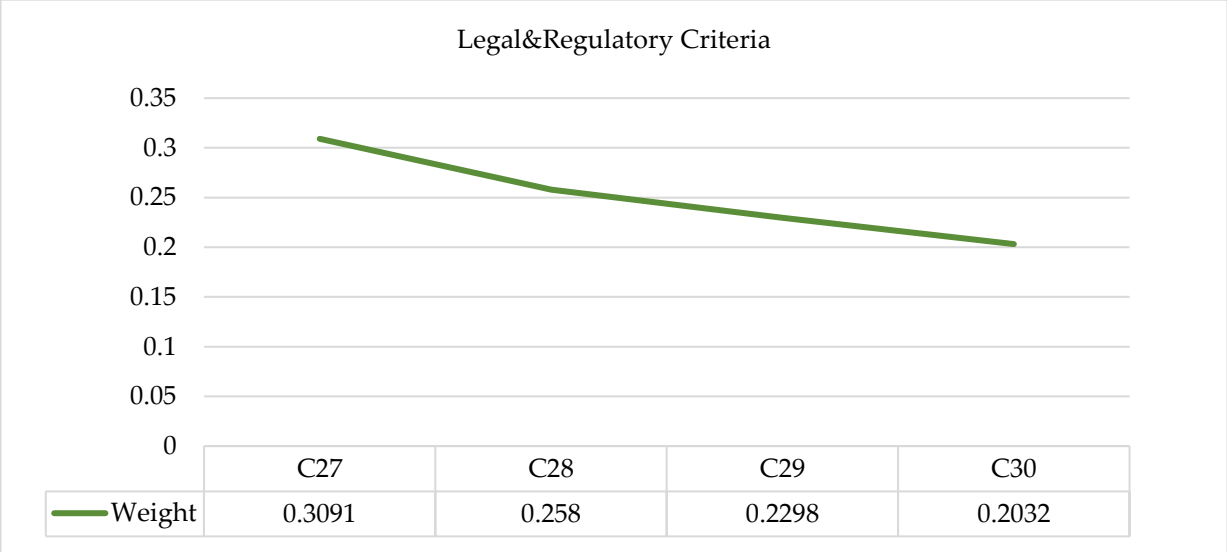
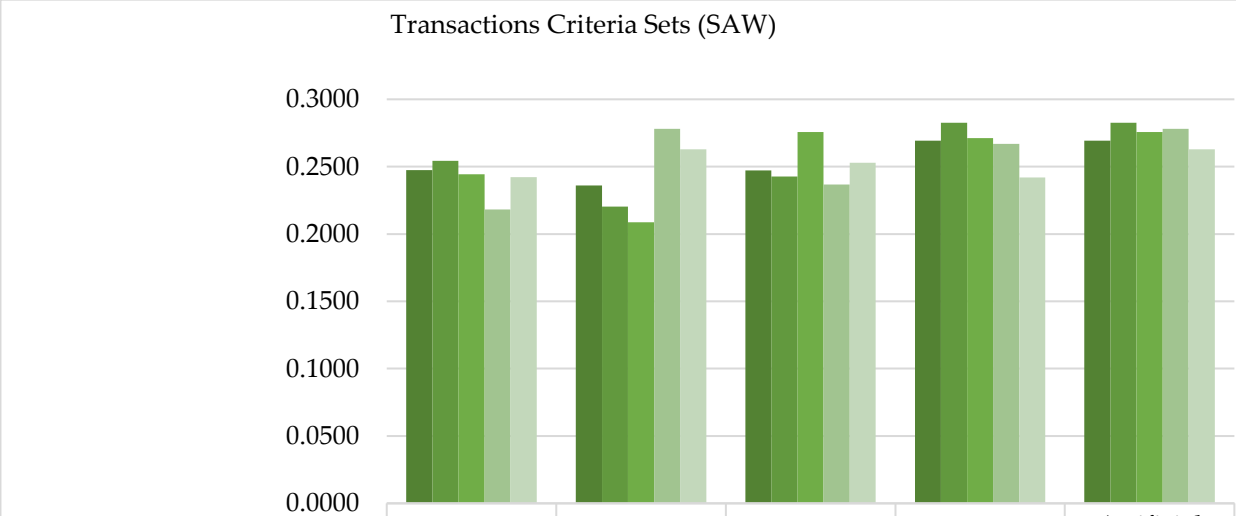


Figure 8-22. The Weights of Legal and Regulatory Criteria within the Group of Commercial Property Transaction Dynamics.

The criteria weights here are within the range 20–31%. The heaviest weight is that of Built environment planning policy (C27: 0.3091), the lightest that of Green leases regulation (C30: 0.2032).

The standard of an 'artificial' country is now detailed, estimated using SAW, COPRAS and TOPSIS methods. Figure 8-23 shows data calculated using SAW.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	0.2474	0.2359	0.2472	0.2694	0.2694
Environmental Criteria	0.2542	0.2205	0.2428	0.2825	0.2825
Social Criteria	0.2443	0.2087	0.2757	0.2713	0.2757
Emotional Criteria	0.2182	0.2780	0.2368	0.2670	0.2780
Legal&Regulatory Criteria	0.2421	0.2630	0.2530	0.2420	0.2630

Figure 8-23. The Artificial Country Standard for the Dynamics of Commercial Property Rentals Estimated using SAW.

A summary of the results providing the basis for the development of an artificial country using SAW, is presented in Figure 8-23. The largest sum of economic indicators is held by Sweden (0.2694). This is followed by the UK in second position (0.2474), Germany in third (0.2472), with France last (0.2359) in terms of suitability. This indicator shows Sweden to be the best example to reference to build an economic foundation for this standard.

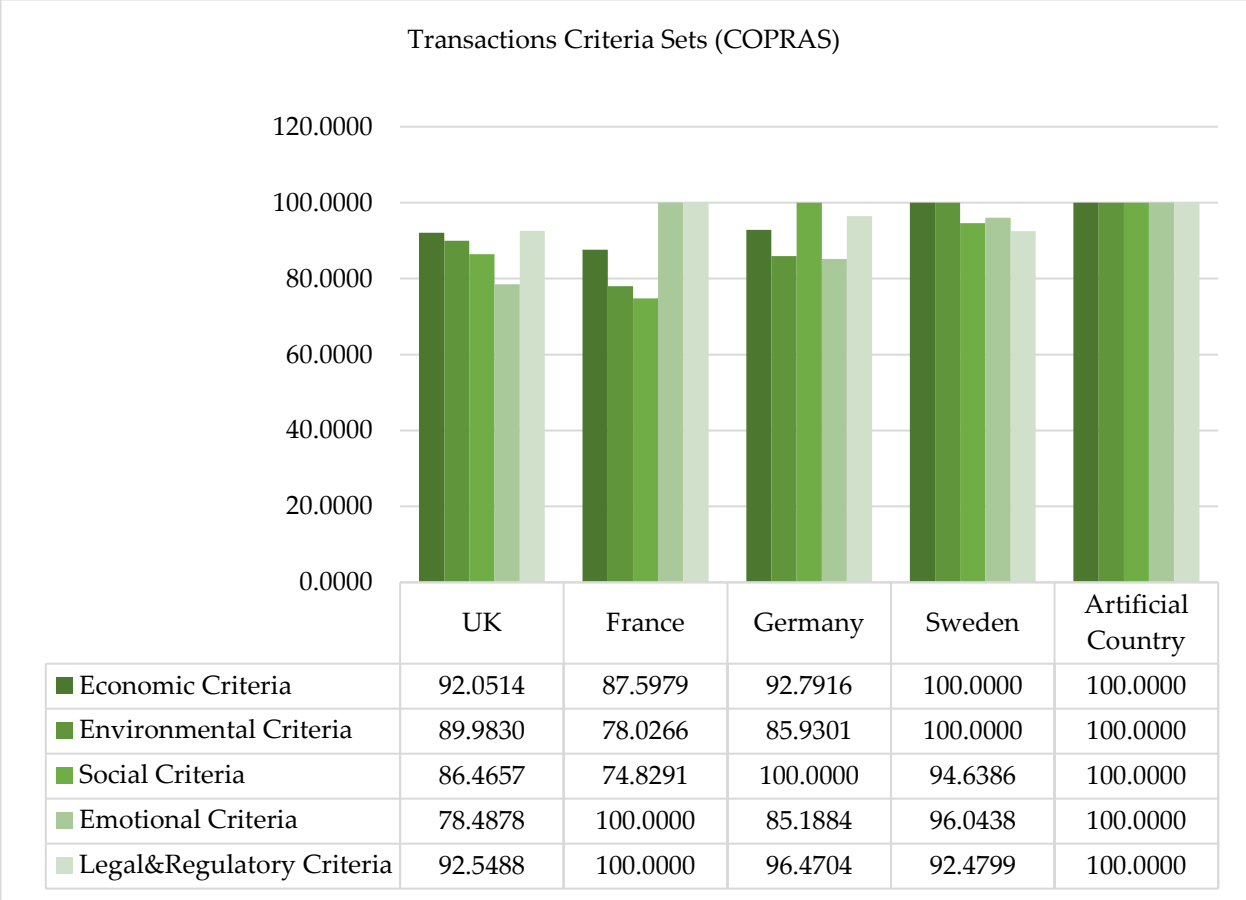
The largest sum of environmental indicators calculated using SAW again goes to Sweden (0.2825). The UK is second (0.2542), Germany third (0.2428), with France placed last (0.2205) in terms of suitability. This indicator shows that, as far as environmental matters are concerned, Sweden is also the best example.

The largest number of social indicators calculated using SAW are found for Germany (0.2757). Sweden is second (0.2713), the UK third (0.2443), followed by France (0.2087). This indicator shows Germany to be the most appropriate option for the standard in terms of social issues.

The largest number of emotional indicators calculated using SAW are found for France (0.2780). Sweden is second (0.2670), Germany third (0.2368), the UK last (0.2182). This indicator shows emotional criteria in France to be the most suitable to establish this standard.

The largest number of legal and regulatory indicators calculated using SAW, are found for France (0.2630). Germany is second (0.2530), the UK third (0.2421), Sweden last (0.2420). This indicator shows the French legal and regulatory criteria covered by the analysis, to be the most suitable for the standard.

Figure 8-24 presents data estimated using COPRAS.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	92.0514	87.5979	92.7916	100.0000	100.0000
Environmental Criteria	89.9830	78.0266	85.9301	100.0000	100.0000
Social Criteria	86.4657	74.8291	100.0000	94.6386	100.0000
Emotional Criteria	78.4878	100.0000	85.1884	96.0438	100.0000
Legal&Regulatory Criteria	92.5488	100.0000	96.4704	92.4799	100.0000

Figure 8-24. The Artificial Country Standard for the Dynamics of Commercial Property Transactions Estimated using COPRAS.

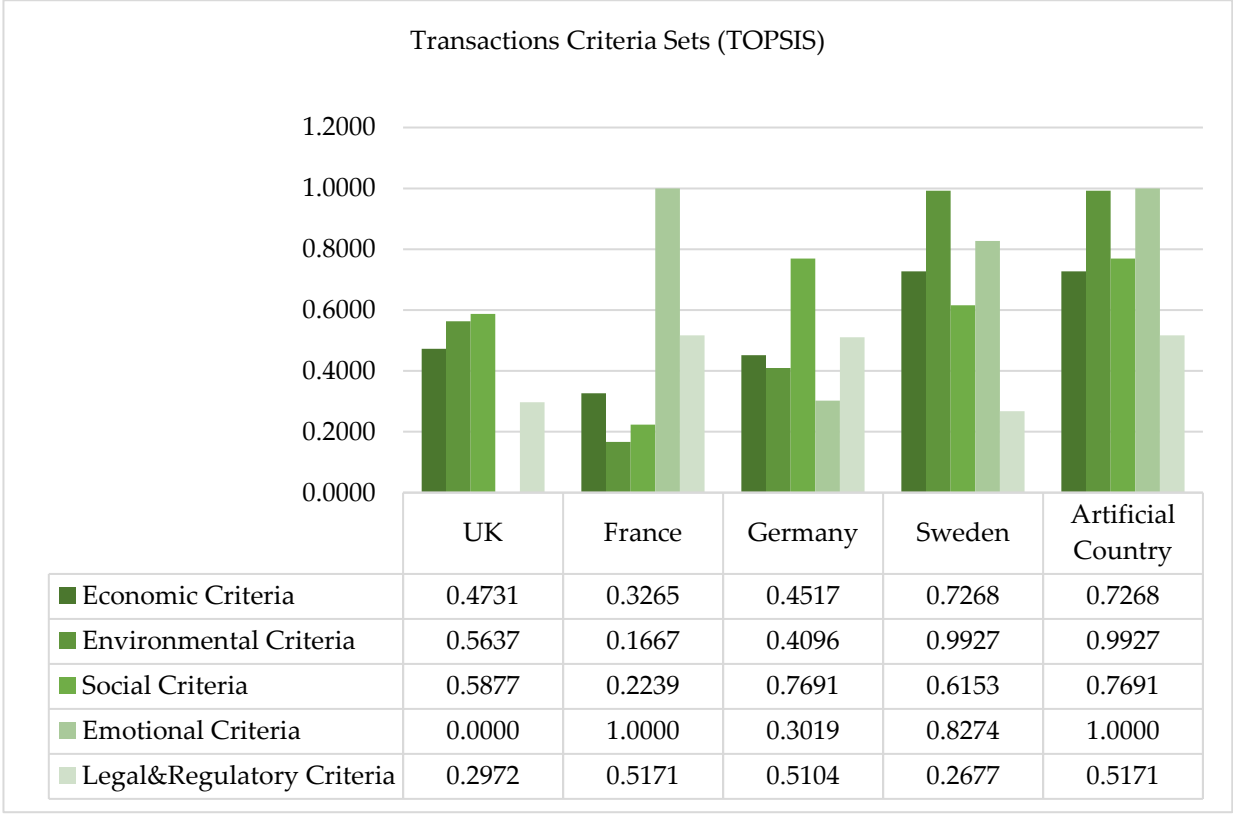
The highest score on the priority line estimated under equation (17) goes to Sweden (100.0000). Germany is second (92.7916), the UK third (92.0514), France coming last (87.5979). This means that Sweden is the best example to rely on when building an economic foundation for the standard.

The highest environmental indicator calculated using COPRAS again goes to Sweden (100.000). The UK is second (89.9830), Germany third (85.9301), with France also again in last place (78.0266). This indicator means that as far as environmental matters are concerned, Sweden is the best example to use.

The highest social criteria indicator calculated using COPRAS goes to Germany (100.0000). Sweden is second (94.6386), the UK third (86.4657), with France coming fourth (74.8291). This indicator shows Germany to be the most suitable for the standard in terms of social issues.

The highest score for social indicators as calculated using COPRAS goes to France (100.0000). Sweden is second (96.0438), Germany third (85.1884) and the UK fourth (78.4878). This indicator shows that France's emotional criteria score is the most suitable for the standard.

The highest score for legal and regulatory indicators calculated using COPRAS goes to France (100.0000). Germany is second (96.4704), the UK third (92.5488) and Sweden fourth (92.4799). This indicator shows that the legal and regulatory criteria addressed in this paper that have an effect on France are the most suitable for the standard.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	0.4731	0.3265	0.4517	0.7268	0.7268
Environmental Criteria	0.5637	0.1667	0.4096	0.9927	0.9927
Social Criteria	0.5877	0.2239	0.7691	0.6153	0.7691
Emotional Criteria	0.0000	1.0000	0.3019	0.8274	1.0000
Legal&Regulatory Criteria	0.2972	0.5171	0.5104	0.2677	0.5171

Figure 8-25. The Artificial Country Standard for the Dynamics of Commercial Property Transactions Estimated using the TOPSIS Method.

A summary of the results providing the basis to establish an artificial country, is shown in Figure 8-25. The artificial country is designed based on the estimated relative distance to the positive ideal option. The highest economic criteria indicator calculated using TOPSIS goes to Sweden (0.7268). The UK is second (0.4731), Germany close behind (0.4517), France placed last (0.3265). This indicator shows Sweden to be the best example to rely on when building an economic foundation for the standard.

The best relative distance between environmental criteria and the positive ideal option as calculated using COPRAS again goes to Sweden (0.9927), with the UK coming second (0.5637), Germany third (0.4096), France placed last in terms of suitability (0.1667). This indicator shows that as far as environmental issues are concerned, Sweden is again the best example for the standard.

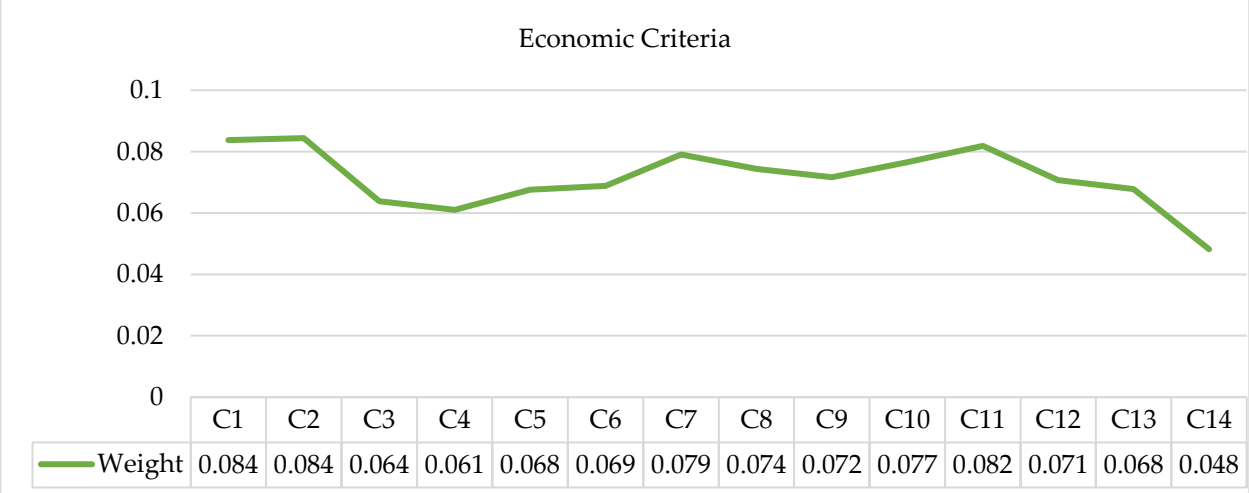
The best relative distance between social criteria and the positive ideal option as calculated using COPRAS, goes to Germany (0.7691), with Sweden placed second (0.6153), the UK third (0.5877) and France fourth (0.2239). This indicator shows Germany to be the most suitable for the standard in terms of social issues.

The highest emotional criteria indicator calculated using TOPSIS again goes to France (1.0000). Sweden is second (0.8274), Germany third (0.3019) and the UK fourth (0.000). This means that the emotional criteria in France are the most suitable for the standard.

The highest indicator of legal and regulatory criteria calculated using TOPSIS, goes to France (0.5171). Germany is second (0.5104), the UK third (0.2677) and Sweden last (0.2972). This indicator shows the legal and regulatory criteria affecting France to be the most appropriate for the standard.

Calculation of Dolls for Commercial Property Rentals Dynamics

Criteria weights are again recalculated for each group. The weights are given in Figures 8-26 to 8-33 below.



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Weight	0.084	0.084	0.064	0.061	0.068	0.069	0.079	0.074	0.072	0.077	0.082	0.071	0.068	0.048

Figure 8-26. The Weights of Economic Criteria within the Group of Commercial Property Rental Dynamics.

These criteria weights fall within the range 5–8%. The heaviest weight goes to Taxes (C2: 0.0844), the lightest to Renewable resources (C14: 0.0482).

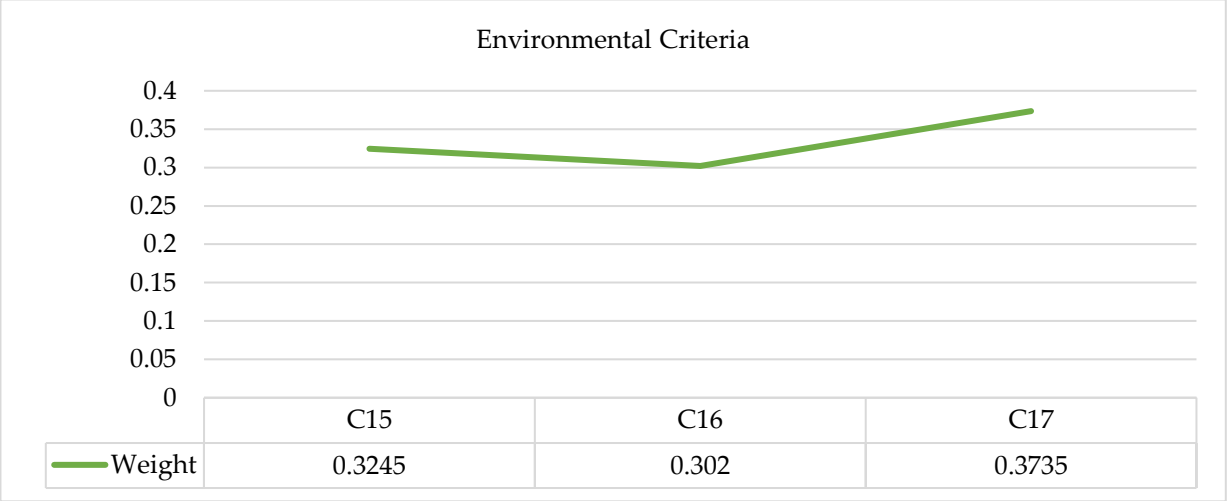


Figure 8-27. The Weights of Environmental Criteria within the Group of Commercial Property Rental Dynamics.

These criteria weights fall within the range 30–37%. The heaviest weight goes to Environmental benefits of sustainable building (C17: 0.3735), the lightest to Environmental protection expenditure (C16: 0.3020).

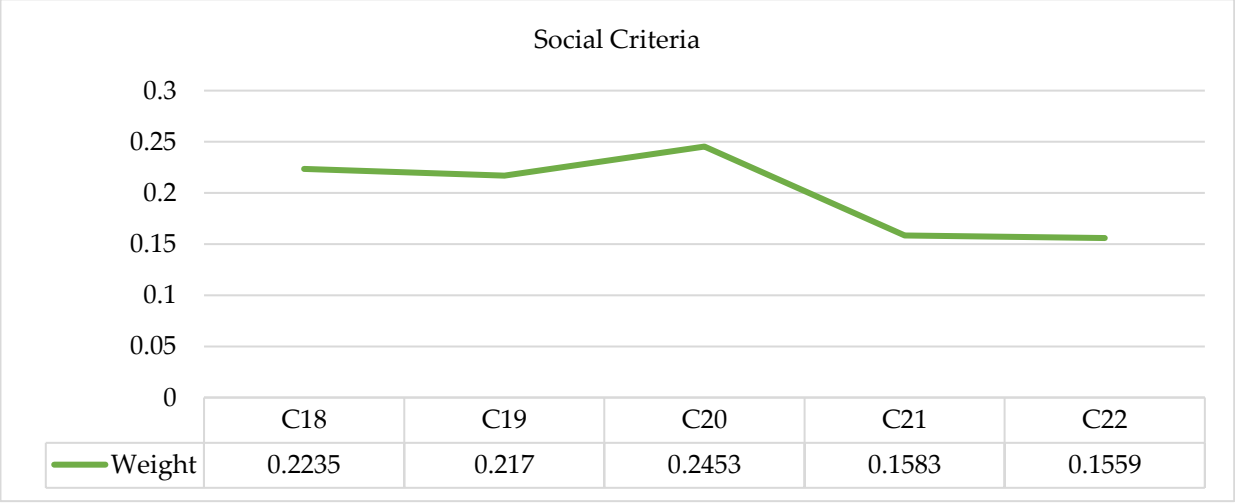


Figure 8-28. The Weights of Social Criteria within the Group of Commercial Property Rental Dynamics.

These criteria weights fall within the range 16–25%. The heaviest weight goes to Number of employed persons (C20: 0.2453), the lightest to Social responsibility of commercial property business (C22: 0.1559).

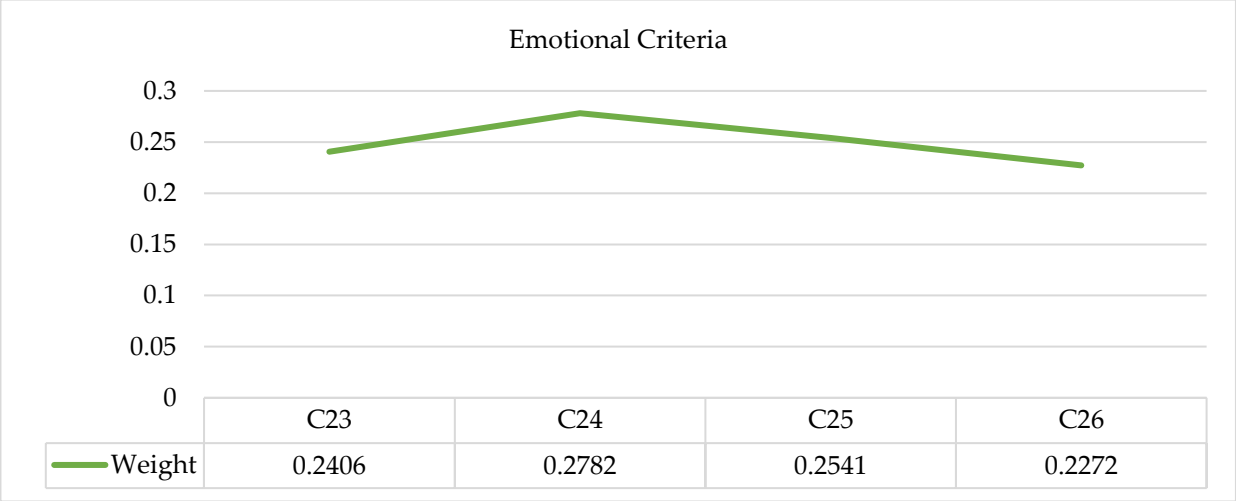


Figure 8-29. The Weights of Emotional Criteria within the Group of Commercial Property Rental Dynamics.

These criteria weights fall within the range 23–28%. The heaviest weight goes to Investors' expectations (C24: 0.2782), the lightest to Human tendency to forget economy busts (C26: 0.2272).

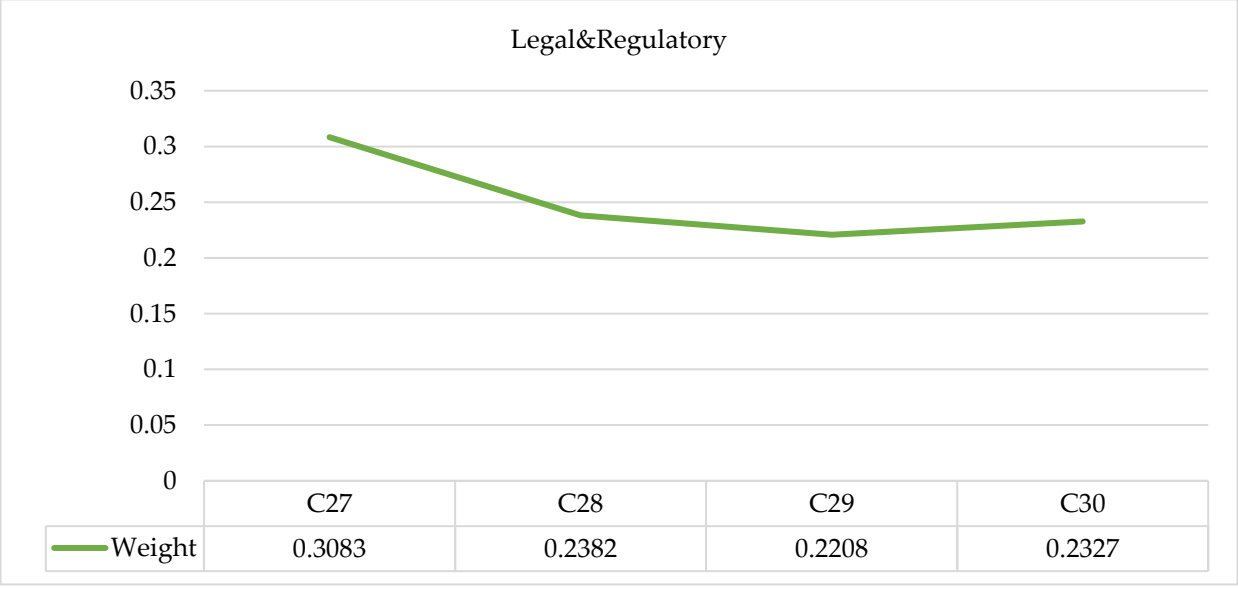
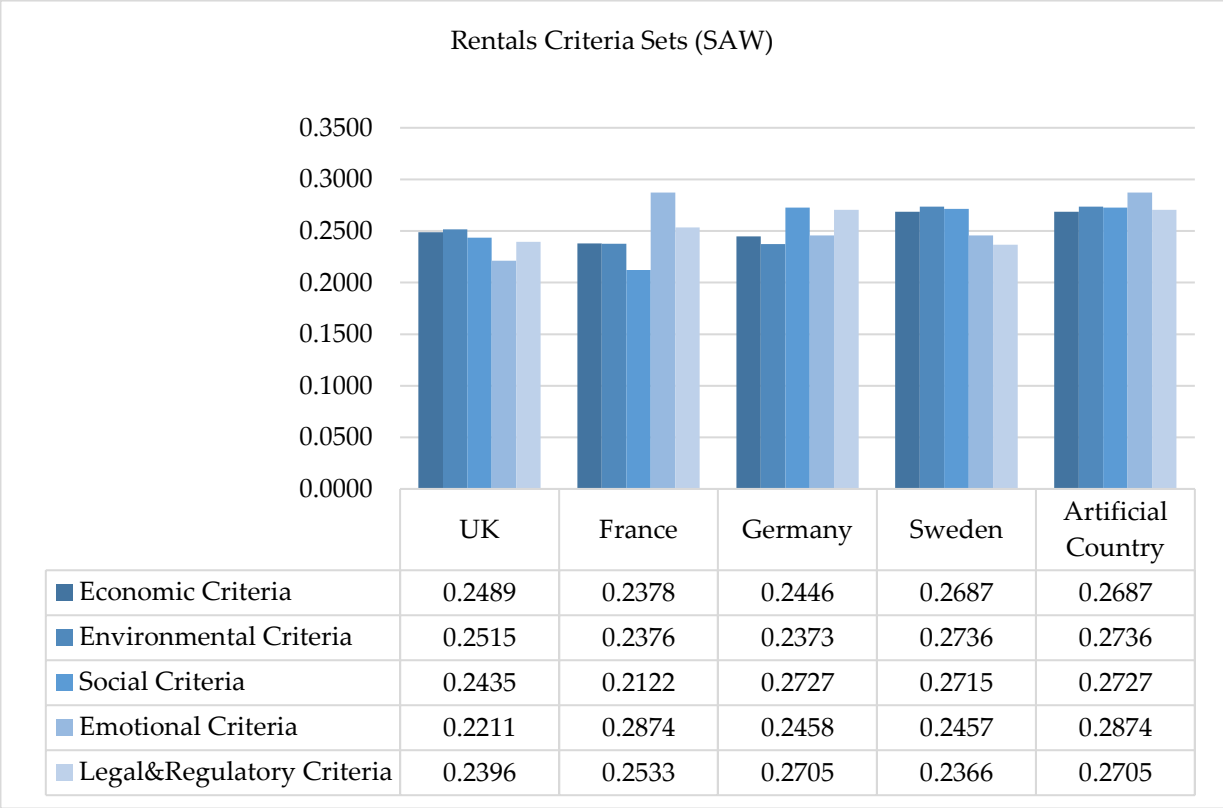


Figure 8-30. The Weights of Legal and Regulatory Criteria within the Group of Commercial Property Rental Dynamics.

These criteria weights fall within the range 22–31%. The heaviest weight goes to Built environment planning policy (C27: 0.3083), the lightest to Regulation of property accounting standards (C29: 0.2208). The artificial country standard estimated using SAW, COPRAS and TOPSIS, is presented below. Figure 8-31 contains the data derived using SAW.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	0.2489	0.2378	0.2446	0.2687	0.2687
Environmental Criteria	0.2515	0.2376	0.2373	0.2736	0.2736
Social Criteria	0.2435	0.2122	0.2727	0.2715	0.2727
Emotional Criteria	0.2211	0.2874	0.2458	0.2457	0.2874
Legal&Regulatory Criteria	0.2396	0.2533	0.2705	0.2366	0.2705

Figure 8-31. The Artificial Country Standard for the Dynamics of Commercial Property Rentals Calculated using SAW.

The largest sum of economic indicators estimated using SAW goes to Sweden (0.2687). The UK is second (0.2489), Germany third (0.2446), and France fourth (0.2378) in terms of suitability. This indicator shows Sweden to be the best example to use when building an economic foundation for the standard.

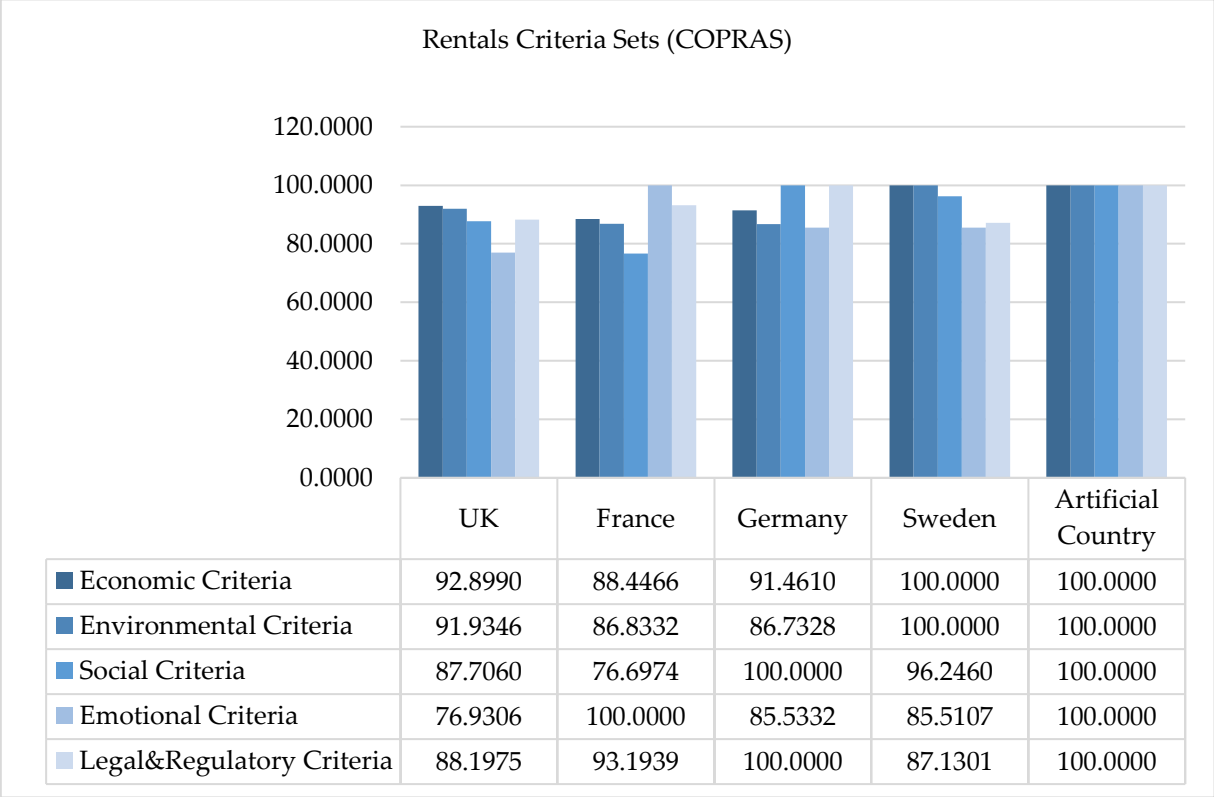
The largest sum of environmental indicators calculated using SAW again goes to Sweden (0.2736). The UK is second (0.2515), France third (0.2376) and Germany last (0.2373) in terms of suitability. This indicator shows that regarding environmental issues, Sweden is the best example for the standard.

The largest sum of social indicators calculated using SAW goes to Germany (0.2727), with Sweden coming in second (0.2715), the UK third (0.2435) and France fourth (0.2122). This indicator shows that Germany is the most suitable for the standard in terms of social aspects.

The largest sum of emotional indicators calculated using SAW goes to France (0.2874). Germany is second (0.2458), Sweden third (0.2457) with the UK coming in last (0.2211). This indicator shows the emotional criteria in France to be the most suitable for the standard.

The largest sum of legal and regulatory indicators calculated using SAW goes to Germany (0.2705) followed by France (0.2533), the UK in third place (0.2396) and Sweden coming last (0.2366). This indicator shows that the legal and regulatory criteria affecting Germany are most appropriate for the standard.

Figure 8-32 shows data estimated using COPRAS.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	92.8990	88.4466	91.4610	100.0000	100.0000
Environmental Criteria	91.9346	86.8332	86.7328	100.0000	100.0000
Social Criteria	87.7060	76.6974	100.0000	96.2460	100.0000
Emotional Criteria	76.9306	100.0000	85.5332	85.5107	100.0000
Legal&Regulatory Criteria	88.1975	93.1939	100.0000	87.1301	100.0000

Figure 8-32. The Artificial Country Standard for the Dynamics of Commercial Property Rentals Calculated using COPRAS.

A summary of the results providing the basis to establish an artificial country, is shown in Figure 8-32. On the economic indicator priority line, the highest score goes to Sweden (100.0000). The UK is placed second (92.8990), Germany third (91.4610), and France fourth (88.4466). Sweden is the best example to rely on when building an economic foundation for the standard.

The highest environmental indicator calculated using COPRAS again goes to Sweden (100.000). The UK is second (91.9346), France third (86.8332) and Germany fourth (86.7328) in terms of suitability. This

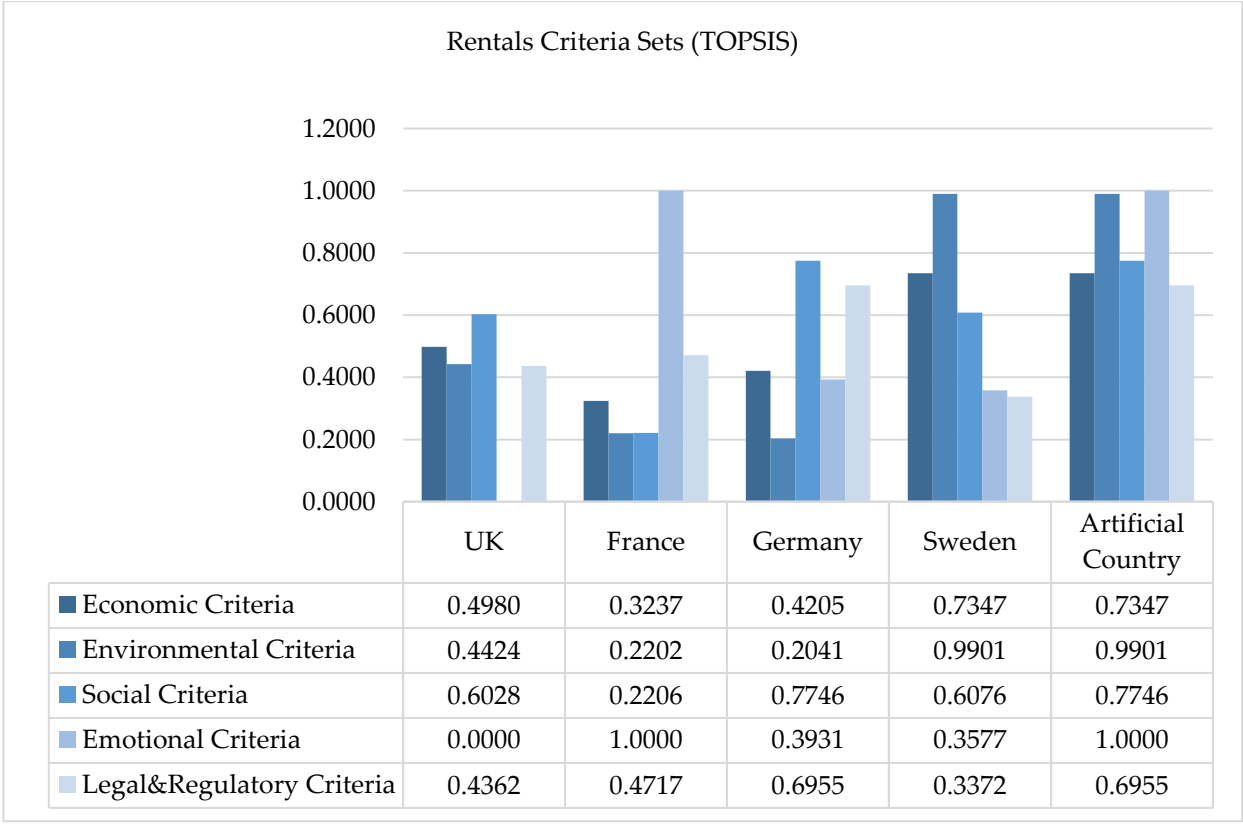
indicator shows that as far as environmental issues are concerned, Sweden is the best example for the standard.

The highest social criteria indicator calculated using COPRAS goes to Germany (100.0000). Sweden is second (96.2460), the UK third (87.7060) and France fourth (76.6974). Germany is therefore the most suitable for the standard.

The highest score for emotional indicators calculated using COPRAS was for France (100.0000). Germany is second (85.5332), Sweden third (85.5107), the UK coming fourth (76.9306). This indicator shows that France's emotional criterion rating is the most appropriate for the standard.

The highest score for legal and regulatory indicators calculated using COPRAS goes to Germany (100.0000). France is second (93.1939), the UK third (88.1975) and Sweden fourth (87.1301). This indicator shows that the legal and regulatory criteria influencing France, are the most appropriate for the standard.

Figure 8-33 shows data estimated using TOPSIS.



	UK	France	Germany	Sweden	Artificial Country
Economic Criteria	0.4980	0.3237	0.4205	0.7347	0.7347
Environmental Criteria	0.4424	0.2202	0.2041	0.9901	0.9901
Social Criteria	0.6028	0.2206	0.7746	0.6076	0.7746
Emotional Criteria	0.0000	1.0000	0.3931	0.3577	1.0000
Legal&Regulatory Criteria	0.4362	0.4717	0.6955	0.3372	0.6955

Figure 8-33. The Artificial Country Standard for the Dynamics of Commercial Property Rentals Calculated using TOPSIS.

A summary of the results providing the basis to establish an artificial country, is shown in Figure 8-33. The largest sum of economic indicators calculated using TOPSIS goes to Sweden (0.7347). The UK is second (0.4980), Germany third (0.4205), with France last (0.3237) in terms of suitability. This indicator shows Sweden to be the best example to rely on when building an economic foundation for the standard.
The largest sum of environmental indicators calculated using TOPSIS goes to Sweden (0.9901). The UK is second (0.4424), Germany third (0.2041) with France placed last (0.2202) in terms of suitability. This indicator shows that as far as environmental issues are concerned, Sweden is the best example suitable for the standard.
The largest sum of social indicators calculated using TOPSIS goes to Germany (0.7746). Sweden is second (0.6076), the UK third (0.6028) with France last (0.2206). This indicator shows that in terms of social matters, Germany is the most suitable for the standard.
The largest sum of emotional indicators calculated using TOPSIS again goes to France (1.0000). Germany is second (0.3931), Sweden third (0.3577) and the UK fourth (0.0000). This indicator shows that emotional criteria in France are the most suitable for the standard.
The largest sum of legal and regulatory indicators derived using TOPSIS goes to Germany (0.6955). France is second (0.4717), the UK third (0.4362) and Sweden fourth (0.3372). This indicator shows that the legal and regulatory criteria affecting Germany are the most suitable for the standard.

8.4. Chapter Summary

This framework for the sustainable management of the commercial property market, was developed and applied to four countries. To validate the application of the framework, the dynamics of all countries under analysis for the years 2015, 2016 and 2017 were compared. The data in relation to the dynamics of commercial property transactions, indicated that:

1. The UK was second in 2015, fourth in 2016 and third in 2017.
2. France was fourth in 2015 and 2017, third in 2016.
3. Germany was third in 2015, and second in 2016 and 2017.
4. Sweden was first throughout the entire period.

The data used to reach decisions in relation to the dynamics of commercial property rentals, indicated that:

5. The UK was second in 2015, fourth in 2016, and third in 2017 using SAW and COPRAS. The UK was second in 2015 and 2017, and third in 2016 using TOPSIS.

6. France was fourth in 2015, 2016 and 2017 using TOPSIS, and third in 2016 using SAW and COPRAS.
7. Germany was third in 2015, coming second in 2016 and 2017 using SAW and COPRAS. It was third in 2015 and 2017, and second in 2016 using TOPSIS.
8. Sweden was first throughout the entire period.

The structure of the artificial country, created on the basis of the priority sequence for each group of criteria, shows that a standard can be derived using different countries. The standard for making a decision with reference to the dynamics of commercial property transactions, consists of the countries placed first in every group of criteria. Calculated using SAW, COPRAS and TOPSIS, first place goes to Sweden regarding economic and environmental criteria, Germany re social criteria and France for emotional and legal and regulatory criteria.

The standard for making a decision pertaining to the dynamics of commercial property rentals, also consists of the countries placed first in every group of criteria. Calculated using SAW, COPRAS and TOPSIS, first place goes to Sweden regarding economic and environmental criteria, Germany re social and legal and regulatory criteria, and France for emotional criteria.

8.5. Outcomes

Referring to the comparison of countries, there is the question of who might see relevance in them and how it could benefit the management of the commercial property market. The overarching idea of behavioural economics is that human decisions determine economic results. In essence therefore, this framework can be used to make decisions on a governmental, bank or client level. Such decisions need not necessarily be connected to the disposal of commercial property: they could also aim to address regional development or investment landscape issues.

Managing commercial property may relate to a decision to purchase, sell or rent commercial property on the local market, or a foreign market. For example, if the results of country comparisons are used for the purposes of purchasing commercial property, the best time to purchase is when its yield is higher than usual. The comparison results for the UK show that the best year for making investments in commercial property was 2016. Yields were on the rise that year (Chapter 4), which means that the cost of commercial properties were decreasing. However, the comparison results also indicate that overall, conditions were better in 2015 and in 2017, placing the UK second after Sweden during that period. Let us assume that the 2016 results were the product of decisions, or behaviour, on the part of the government, banks and other market players. The results of behaviour in the UK were as follows: in 2016, compared to 2015 (Chapter

4), commercial property yields increased, GDP decreased, government bond yields grew, the amount of taxes - including environmental taxes per capita - shrank, income from foreign investment decreased, and GDP and social protection expenditure per capita went down. Positive changes included an increase in the number of employed persons and a subsequent drop in unemployment.

In terms of the rental possibilities for commercial property, these are not related with the need to buy at reduced prices, but with the possibility to conduct business at a specific location, or in a specific country. As such, the best time to rent commercial property in the UK was 2015 and 2017. In 2016, the UK's commercial property rental market environment was placed third out of four on a country-by-country basis.

Regarding the attractiveness of investment, France came in last in 2015 and 2017. However, in 2016, the country rose from fourth to third place. The results of economic activity in France were as follows: in 2016, compared to 2015 (Chapter 4), government bond yields and unemployment went down. The changes undermining favourable conditions to invest were reduced commercial property yields, the number of employed persons and the relative indicator of international trade exports and imports. There was no change in GDP in addition to an increase in taxes (including environmental taxes), GDP per capita and social protection expenditure per capita. Based on this analysis, it can be said that the best time to purchase property in the UK was 2016, whereas in France, the best time to do that would be 2015 or 2017. However, this investment decision does not take the long-term perspective into consideration. Regarding investment opportunities in general, the comparative analysis has showed that in the long run, the Swedish commercial property market is the best target for investment, its conditions improving year-on-year between 2015 and 2017. The results of economic activity in this country were as follows: taxes, including environmental taxes, GDP and social protection expenditure per capita grew, the number of employed persons increased, while commercial property yield, government bond yields and unemployment, shrank. There were only a handful of indicators that deteriorated in 2016 compared to 2015: the international trade ratio, a reduction in FDI income per capita and returns on commercial property.

The initial expectation was that the commercial property market landscape in the UK would be among the most appealing, compared to the rest of the countries. However, a comparison with four European countries has produced a different set of results. In terms of stability, Sweden is clearly at the top having experienced no long-term threat of sudden change in the investment landscape. Germany also appeared as a more attractive option, based on initial expectations. Other results for Germany are variegated though, the dynamics of the country's commercial property market among the flattest compared to the

other countries (Chapter 4). Nonetheless, the year 2016 was particularly good when compared to 2015. In 2016, the results of economic activity in Germany were as follows: returns on commercial property shrank, GDP increased, the amount of taxes per capita increased just as environmental taxes went down, income from foreign investments rose, GDP and social protection expenditure per capita and the number of employed persons increased. The relative indicator of international trade exports/imports went down, as did government bonds, commercial property yields and unemployment.

The framework could be applied to resolve matters relating to the dynamics of the commercial property transactions market and the dynamics of the commercial property rentals market in the UK, or in any analysed country. The framework can be used to choose the best country through a comparison of countries, or the best group of criteria or the best criterion through a comparison of groups of criteria and a comparison between individual criteria. 'Dolls', a standard which was created using analysed countries, can be used to compare other countries outside of those analysed in this case.

Chapter 9. Discussion and Conclusions

9.1. Introduction

This final chapter comprises a summary of the outcomes of each chapter. The aim is to map the general conclusions of this paper onto the aims and objectives outlined in the introduction. It provides an overview of the literature analysis used to identify the problem and substantiate the study. The results of the data collection and analysis are discussed and their significance for the study is explained. A substantial section of this chapter is dedicated to a discussion of the survey results, specifically concerning differences between the UK and other countries. Finally, the chapter discusses the details and outcomes of building a framework for the sustainable management of the commercial property market created using MCDM methods, as well as the beneficiaries of this framework. It also discusses the contribution to knowledge and the limitations of the study.

9.2. Key Findings from the Literature Analysis

The literature analysis was conducted in four stages. Firstly, the literature on behavioural economics was reviewed to investigate articles where behavioural economics has been related to the behaviour of property market players (the first objective of the thesis). Secondly, the literature was reviewed to identify patterns of property dynamics, including as they relate to commercial property, in the context of economic booms and busts (the second objective of the thesis). Thirdly, the literature on the investment environment was reviewed to identify countries with commercial property dynamics patterns different to those of the UK (the third objective of the thesis). Stage four involved a review of literature that contained references to criteria affecting commercial property dynamics (the sixth objective of the thesis). Finally, based on the insights obtained during the four initial stages, stakeholders of the commercial property market were identified (the fourth objective of the thesis). The key findings of the stages are summarised below.

9.2.1. Behavioural Economics in Relation to the Behaviour of Property Market Players

Analysis of literature on behavioural economics has revealed that decision making in humans is driven by psychological factors (Heukelom, 2011; Samson, 2014; Thaler, 2018; Truc, 2018) and market players change their behaviour in view of the form in which new information is presented. That way, their behaviour can have a potential effect on a macro level, which could be invisible on a micro level (Wyman et al., 2011). Furthermore, Truc (2018) believes that traditional economists have become more open to the

ideas of behavioural economics only when mathematical simulation of these ideas has become a possibility.

There have been several authors who have addressed the ties between behavioural economics and property market players. Black et al. (2003) conducted a study of decision-making behaviour in property experts. The study argues that property appraisers usually make (anchor) opinions on property value based on asking prices rather than closed transactions. In turn this affects decisions made by bank personnel regarding the issuing of loans when the appraised property is used as collateral. Furthermore, it has been observed that granting bank credit to the client depends on the experience of the employee, and not on objective reasons. Bank personnel with longer experience agree to more loan applications. The anchor phenomenon was also scrutinised by Crosby and Hughes (2011). Crosby and Hughes (2011) carried out a literature analysis which demonstrated banking operations to be procyclic. Durring a period of expansion, banking operations experience a boom, and during a period of recession, they deflate in line with whole economy dynamics. The authors argue that property valuation results affect the decisions which banks make in the procyclic context. Salzman and Zwinkels, (2013) addressed the impact of behaviour on decision-making on property investments. The authors emphasised that the behaviour of property investors can be biased and involves aspects of psychology and sociology. The analysis of the literature has shown that so far, behavioural economics lacks any theory of market behaviour and action of macroeconomic phenomena (Heukelom, 2011), and that governments make a lot of decisions giving more regard to property than to the rights of an individual (Hsieh, 2015). It has also been noted that the behavioural tendencies of individual property market players could affect the thinking, decisions, and investment strategies of the decision-maker (Black et al., 2003; Crosby and Hughes, 2011; Wyman et al., 2011; Salzman and Zwinkels, 2013; Brzezicka and Wisniewski, 2014; Ahmad et al., 2018).

In the opinion of Berg (2020), who falls into the group of opponents of behavioural economics, one clear quality of behavioural economics is that it includes sets of axiomatic norms that are not grounded on any empirical research. The authors argue that in order to become more useful in improving the expected accuracy and descriptive realism of economic models, more attention needs to be paid to the decision-making process and bolder normative research based on a broader set of critera needs to be conducted.

With reference to the above observations, this study could make the following contributions to the theory of behavioural economics: (1) carry out a study of the connections between the decision-making of the commercial property market players and the action of macroeconomic phenomena; and (2) perform a mathematical simulation of this connection and develop a decision-making model based on a broad range of macro criteria.

9.2.2. Property Dynamics in the Context of Booms and Busts

The difficulties in identifying patterns of property market dynamics are associated with the fact that many researchers focus on economic busts rather than booms. Added to that is also the fact that researchers differ in their opinion on what such busts should be called. Some, i.e. Laeven and Valencia (2013); Schularick (2011) and Kiyak et al., (2012) refer to them as financial crises because of their close association with bank crises. Others, i.e. Gibilaro and Mattarocci (2016) argue that it is the dynamics of the property market that have inspired financial (bank) crises.

Allen and Gale (2000), Gyourko (2009) and Chakraborty (2009) have analysed the dynamics of banks and property markets and highlighted that booms and busts repeat and have their own cycle. This is why an additional analysis of the literature on economic cycles was performed in the thesis and why ways to manage these cycles were discussed. In doing so, booms and busts were determined to be two opposite sides of the economic cycle. This economic cycle involves such elements as financial institutions, property businesses and other trades (Burns and Mitchell, 1946); Krystalogianni et al., 2004; Kiyak et al., 2012; Jadevicius et al., 2017). These elements also have their own cycles that interact with each other. A further dimension is that these cycles can be managed at the governmental level and that their cyclic nature has a negative impact on the long-term outlook, or sustainability, of business (Gwartney et al., 1998; Phelps, 2003; Colander, 2006; Morris et al., 2010). Basically, deep recessions that paralyze business, property business included, should be referred to as economic crises, for such busts have a clear effect on the economy. In addition, the property market was found to have a positive correlation with the overall condition of the domestic economy and is connected to economic fluctuations, making it procyclic (Kaminsky et al., 2004). Countries are able to manage property business cycles by enforcing monetary and fiscal policy and triggering procyclic and countercyclic fluctuations in the property business (Phelps, 2003; Colander, 2006; Morris et al., 2010).

The literature review revealed that property market trends in some countries were not so unstable as they were in the UK. This may be because government and relevant bodies have the tools to manage these dynamics (Dreger and Kholodilin, 2013). Based on the above observations, this hypothesis provided the foundation for this research which aimed to investigate whether the UK could have a harmonised commercial property dynamics framework, based on the experience of other countries. Therefore, considering the complexity of the topic and the procyclic nature of commercial property dynamics, there is good reason to look for ways to ensure the sustainability of commercial property market dynamics and to minimise its cyclicality.

9.2.3. Different Countries Current Investment Environment, Factors for Investment and Stakeholders

In summary, the question for the study was formulated from the available literature, specifically literature on the dynamics of commercial property markets in different countries. The literature analysis uncovered cases when the commercial property market of some countries had remained stable at times of global economic crisis (Ferrari et al., 2010; European Central Bank, 2010; Dreger and Kholodilin, 2013; Investment Property Forum, 2014; MSCI, 2018). For all practical purposes, it can be argued that stakeholders investing in commercial property in these countries, did not suffer tremendous losses.

Four groups of the beneficiaries have been identified for the purposes of this study (ESRB, 2015). These are national governments, lenders, borrowers and investors.

Analysis of the property investment environment shows that the dynamics of the UK property market are different from that of other European countries. According to the literature, the global crisis did not see any decline in commercial property prices in Germany, Norway, Sweden, France, Austria or Switzerland (Section 2.4.1.). Germany, Sweden and France were selected for this study because the commercial property markets aligned to these countries are among the largest and, as such, can be used for comparison with the UK.

Analysis of the investment environment has shown that the UK commercial property market suffered a recession in the periods 1973–1975, 1990–1994 and 2007 (Investment Property Forum, 2014; MSCI, 2018). As with most cases of recession, UK economic busts were related to the activities of financial institutions. The French property market also went through a period of decline in 1990 and in 2008 but between 2008 and 2012, French banks gradually tightened their financing requirements in view of the worsening economic conditions for commercial property developers and investors (Point et al., 2013). France started implementing normative restrictions on loans: Basel 2 in 2008, Basel 2.5 in 2012, and Basel 3 in 2014 (de Bandt et al., 2018). However, Francis and Osborne (2011) carried out an investigation noting that during the period from 1990 to 2007, the UK`s banks could readily satisfy the countercyclical capital requirements of Basel by using lower costing capital units instead of higher-quality capital. This meant that the principle of responsible lending was disregarded during a time of recession. Therefore, the banks satisfied Basel without using high quality capital.

While the UK and French investment environments were not so stable, Germany`s commercial property market remained stable. The German commercial property market has remained stable for an extended period of time for several reasons. German banks have exercised a higher degree of responsibility in their lending operations and followed more conservative commercial property valuation requirements (Fecht and Wedow, 2014). In addition, after the collapse of the Berlin wall in 1989, Germany was able to use

borrowed money for investment expansion purposes (Boston, 2012). At a time when many countries were going through a commercial property crisis, new investment opportunities emerged (Boston, 2012).

A financial crisis did strike Sweden in 1990. In 2008, a collapse of banks was avoided when the government provided financial assistance to prevent a financial bust. Moreover, Sweden's banks undertook responsible lending with the result that the country avoided a crisis in the commercial property market in 2008.

Analysis of the experience of these countries has revealed the following four insights: (1) the property market and the financial market are tightly connected to each other; (2) national governments can manage the consequences of economic crises if they prepare for them in advance by accumulating financial resources; (3) capital lenders must develop tools to control the solvency of their clients, and (4) the literature has provided arguments to the effect that investments are often hindered by language and cultural barriers (Guiso et al., 2009a, 2009b). In that an individual's characteristics may be important for the purposes of achieving individual success, national culture may also have a certain degree of significance for the economic success of the country.

In summary, the literature review identified the need to investigate the availability of a framework for the sustainable management of the commercial property market and to apply this to the UK.

9.2.4. The Frameworks already in Place and Criteria that Impact Sustainable Commercial Property Market Dynamics

Considering the multifaceted nature of commercial property market dynamics, this study included a thorough analysis of frameworks already in place. An overview of the literature determined that frameworks for managing and appraising commercial property markets have covered aspects such as commercial building maintenance (Das et al., 2010), facade works (Šaparauskas et al., 2011), sustainability (Ellison and Sayce, 2007), a system that enables the comparison of commercial and residential properties (Lin, 2014), and commercial property development (Komarovska et al., 2015). There is currently no model that would help players in the commercial property market make decisions in the dynamic setting of the commercial property market. However, to minimise financial losses during an economic recession as well as the resultant changes in property prices, macro-prudential regulation of banks and/or the financial system, has been developed (Borio, 2003). Macro-prudential regulation is used as part of the process of managing relationships between individual financial institutions and individual property markets, focusing on the procyclic behaviour of the financial system, the aim being to maintain its stability.

According to the literature, a coordination system can be created by analyzing the characteristics that impact the fluctuation of property markets. The goal of the literature review was to select and group those

characteristics together that affect the dynamics of the commercial property market. This was done following the literature review, whereby 31 criteria (finaly reduced to 30 (see Chapter 5)) which affect the dynamics of the commercial property market were selected. The characteristics were called criteria in the study, and these characteristics were split into five groups: (1) economic factors; (2) environmental factors; (3) social factors; (4) emotional factors, and (5) legal and regulatory factors.

The present study reflects the fact that the modern literature on sustainability places a heavy emphasis on environmental (e.g., Elkington, 1998), economic (e.g., O'Riordan, 1993), and social concepts (e.g., Lützkendorf and Lorenz, 2005). However, Kaklauskas and Zavadskas (2016) also attached relevance to legal and normative factors, while Rachel Weber (2016) notes that property dynamics are also affected by human behaviour. This means that the foundations of the dynamics of commercial property market may rest on a broad range of criteria, covering every aspect of sustainable market development including economic, environmental, social, emotional, and legal and regulatory components which in turn, may be subsumed to the macro level. In the light of this, a review of the literature on possible criteria was conducted, and the the most higlighted criteria that can be attributed to these components and which affect the dynamics of the commercial property market, were identified.

9.3. Key findings from Data Collection and Results Discussion

The gathering of information and analysis of the results was carried out in three stages. To begin with, the dynamics of commercial property capital growth and market rental value growth and the analyses of the economic downturns and the historic variations in the dynamics of national economic conditions in the UK, France, Germany and Sweden were analysed individually (the fifth objective of the thesis). This comparative analysis aimed to confirm that commercial property market dynamics and economic conditions differ in the countries under comparison. The second stage involved investigating criteria that can be significant for the dynamics of commercial property market. In stage 2 these criteria were validated and evaluated (considering different levels of significance) by commercial property experts (the sixth objective of the thesis). This analysis was intended to identify any differences in expert opinion on the significance of the criteria, the experts subsequently confirming the relevance of all the criteria for the dynamics of the commercial property market. Differences in the criteria in each of three countries, were analysed in comparison to the UK. This was achieved using non-parametric statistics (Mann-Whitney U) and aimed to identify any potential statistically relevant differences in the significance of the criteria, as determined by experts from the UK and the other countries. Stage three contains data collected for the purposes of building a decision-making model (the seventh objective of the thesis). This stage describes

the procyclic and countercyclic influence each of the collected criteria have on the dynamics of commercial property market transactions and rentals and offers a calculation of their numeric values.

9.3.1. Data Collection and Results Discussion Stage 1

Analysis of the dynamics of commercial property capital growth and rentals market value growth in the UK, France, Germany and Sweden, has revealed that the UK market varied over a wider range compared to the other countries. It was also observed that the dynamics of commercial property capital growth in France and Sweden is similar, while the dynamics of commercial property capital growth in Germany is slightly different (flat) from all the other countries, owing to a decrease in the growth rate over the period of analysis. Based on this analysis, it can be said that the French, German and Swedish commercial property markets are suitable for the purposes of comparison with the UK commercial property market, since market fluctuations in these countries occur within a limited range. Analyses of the economic downturn and the historic variations of the dynamics of national economic conditions and commercial property suggest that an economic downturn, a crisis, has a significant effect on the sale prices and rent rates of commercial property. Analysis of developments in the commercial property market reveal that periods of economic downturn (global crisis), happened at roughly the same time across all countries: in 2008–2009. However, not all of the economic conditions' indicators followed a procyclic shift in line with the commercial property market, as unemployment and government bond yields changed in the opposite direction, indicating that the dynamics of these two indicators were countercyclic.

9.3.2. Data Collection and Results Discussion Stage 2 and Stage 3

A total of 9,510 (nine-thousand five-hundred and ten) commercial property professionals from the United Kingdom, France, Germany and Sweden were invited to take part in the survey. The replies received amounted to 3.63% of the total offered, meaning that 345 (three-hundred and forty-five) commercial property professionals answered the questionnaire. Regarding completed questionnaires, 34% were from the UK, 14% from France, with 26% equally from Germany and Sweden. A total of 166 (one-hundred and sixty-six) replies to questions about the dynamics of commercial property transactions and 179 (one-hundred and seventy-nine) replies to questions about the dynamics of commercial property rentals were returned. All of the criteria relevant for the dynamics of commercial property have been validated by the data collected in the expert survey. The reliability of the respondents' replies was measured using Cronbach's Alpha (McGraw and Wong, 1996; Hallgren, 2012; Prochorskaite et al. 2016; Pinto et al., 2014); the reliability was greater than 0.8. A Mann-Whitney U test was used to compare the UK to the other countries. The relevance by groups of criteria shows that the emotional criteria were ranked the highest and the environmental criteria were ranked lowest by experts for both the transactions` and rentals`

markets. Also, the economic criteria were ranked second for both markets. However, the social criteria were ranked fourth for the transactions market, while for the rentals market experts gave third place for the social criteria. The fact that the opinions of experts from different countries vary significantly in terms of the relevance of certain criteria, has been seen as a prospective point to investigate.

The next step (Stage 3) was to determine the measurement tools (Chapter 6) of the collected criteria for each country for comparison. The decision depended on which criterion has the greater and the lesser impact on the above dynamics. However, some of the criteria have a positive and some of them have a negative impact on market fluctuation. Mostly all groups contain positive and negative criteria, excluding the group of environmental criteria. The average of the experts' assessments of each country was calculated. This was done for the purpose of measuring all qualitative and some of the quantitative criteria. For one of these quantitative criteria (C9) it was not possible to obtain measurement tools for all compared countries from one source. The rest of the data were obtained from the European statistical database. The averages of return on commercial property were obtained from the database of Morgan Stanley Capital International, an international property information provider.

9.4. Developed Framework for the Assessment of Commercial Property Market Dynamics, its Sensitivity Analysis and Implementation

Decision-making is required to avoid losses caused by the dynamics of commercial property transactions and rentals. This is why the underlying goal of this paper was to build a framework to allow for appropriate decision making in the volatile environment of commercial property transactions and rentals (the seventh and eighth objectives of the thesis).

In the sequence of priorities for making decisions in relation to the dynamics of commercial property transactions (Chapter 7), Sweden is first, Germany second, the UK third and France is fourth in 2017. The sequence of priorities for making decisions in relation to the dynamics of commercial property rentals is slightly different. Sweden is first and Germany is second using the SAW and COPRAS methods, while the UK is second and Germany third using the TOPSIS method. France is fourth, in terms of suitability, across all three methods.

To measure the validity of the framework, the next step was to use historical data from 2015, 2016 and 2017 for the purposes of country comparison, namely to investigate the dynamics of each country during the above period and to compare this with the other countries. The sequence of priorities for making decisions in relation to the dynamics of commercial property transactions was as follows: the UK was

second in 2015, fourth in 2016 and third in 2017. France was fourth in 2015 and 2017, and third in 2016. Germany was third in 2015, and second in 2016 and 2017. Sweden was first throughout the whole period. The data used for making decisions in relation to the dynamics of commercial property rentals, was as follows: the UK was second in 2015, fourth in 2016 and third in 2017 using SAW and COPRAS methods. The UK was second in 2015 and 2017, and third in 2016 using the TOPSIS method. France was fourth in 2015 and 2017, and third in 2016 using all methods. Germany was third in 2015, second in 2016 and 2017 using SAW and COPRAS methods, third in 2015 and 2017, and second in 2016 using TOPSIS. Sweden was first throughout the entire period using all methods.

No differences in the final results were observed between SAW, COPRAS and TOPSIS methods as applied to manage the dynamics of commercial property transactions. However, when all three are applied to manage the dynamics of commercial property rentals, TOPSIS produced a different sequence of priorities. Criteria sensitivity and alternatives sensitivity analyses have also been carried out. The criteria sensitivity analysis has identified Taxes (C2) and Foreign direct investment (C6) to be the most sensitive criteria in terms of both commercial property transactions and rentals. The alternatives (countries) sensitivity analysis conducted based on the change in the most sensitive criterion on a scale of -5%, - 50%, 50%, and 5%, has shown that as C6 changes, the weights of all criteria also change. Therefore, changes in criteria weights could rearrange the sequence of priorities of countries for decision-making. This sensitivity analysis has shown that the UK, French and German markets were the most sensitive in their response to C6 change on a scale of -5%, - 50%, 50%, and 5%. The analysis of the chosen countries in relation to the dynamics of commercial property transactions and rentals has shown that the UK, French and German markets were the most sensitive in their response to C6 change.

All methods point to Sweden being the optimal alternative that can be used as a standard for building a framework for the sustainable management of the commercial property market. However, in some countries, separate groups of criteria had advantages over the same Swedish groups. Therefore, the next step was to compare the different groups of criteria per country, to create an artificial country as a standard for analysis. This was carried out to render the framework adjustable for the comparison of both the countries under analysis and any other country. The artificial country was created on the basis of the sequence of priority for every group of criteria. The standard for decision-making in relation to the dynamics of commercial property transactions, consisted of the countries ranking No 1 in the sequence of priorities for each criteria group. Using SAW, COPRAS and TOPSIS, 1st place was held by Sweden in the group of economic and environmental criteria; Germany in the group of social criteria, and France in emotional and legal and regulatory criteria.

The standard for decision-making in relation to the dynamics of commercial property rentals also consists of the countries placed first in each of the criteria groups. The first place estimated using SAW, COPRAS and TOPSIS, was held by Sweden in the group of economic and environmental criteria; Germany in the group of social and legal and regulatory criteria, and France in the group of emotional criteria.
The artificial country framework may also be used as a decision-making standard for stakeholders on an international and national level.

9.5. Beneficiaries and Recommendations

The commercial property market is affected by its many players (Weber, 2016). These are national governments, lenders, borrowers and investors. National governments pursue the goal of managing the aftermaths of crises (economic, environmental, climate and political) while lenders aim to develop tools to control the solvency of their clients. Borrowers seek to have a stable cash flow to cover their debts, while investors are concerned with making successful investments and minimizing the risks to their returns which arise from the dynamics of the commerical property market. The behaviour and choices of all these players affects the sustainability of commercial property market dynamics. Many indicators of quantitative criteria have been translated into numeric values per capita, thus accentuating the visibility of economic activity for each person.
As discussed above, the dynamics of commercial property markets are influenced by economic, environmental, social, emotional, and legal and regulatory criteria. This makes such criteria potential points of reference for making a wide range of decisions. In the course of this study, a framework has been developed which aims to allow the best alternative to be chosen through a comparison of countries and groups of criteria. The framework may be applied to resolve matters pertaining to the dynamics of the commercial property transactions market and the dynamics of the commercial property rentals market. This framework could be applied in the UK, in any analysed country, or to any country outside of those analysed in this study.
In making decisions on the transactions of commercial property in the countries under analysis, all groups of beneficiaries should consider that:

1. French and Swedish commercial property experts assigned a higher degree of relevance to criteria Taxes (C2), Government Bond Yields (C3), Debt Interest Rate (C9), GDP per Capita (C18), Number of Employed Persons (C20), Predictive Agents (C23), Sellers` Speculative Activity (C25), and Human Tendency to Forget Economy Busts (C26) compared to their counterparts in the UK (Table 5-8).

2. French commercial property experts give more weight of relevance to criterion Gross Domestic Product (C1), compared to their UK counterparts, whereas the UK experts rated the criteria of Environmental Taxes (C15), Environmental Protection Expenditure (C16), and Regulation of Property Accounting Standards (C29) as having more relevance for the dynamics of commercial property transactions prices than experts from France (Table 5-9).

3. German commercial property experts assigned a lower degree of relevance to criterion Return on Commercial Property (C8) compared to their counterparts in the UK (Table 5-9).

In making decisions on the rentals of commercial property in the countries under analysis, all groups of beneficiaries should consider that:

1. French and German commercial property experts assigned a higher degree of relevance to the criterion of Sellers` Speculative Activity (C25) compared to their counterparts in the UK (Table 5-10).

2. French commercial property experts assigned a higher degree of relevance to Built Environment Planning Policy (C27) compared to their counterparts in the UK. However, the UK gave more weight compared with Germany to the criterion of Built Environment Planning Policy (C27) (Table 5-10).

3. French and Swedish commercial property experts assigned a higher degree of relevance to the criterion of Number of Employed Persons (C20) compared to their counterparts in the UK (Table 5-11).

4. UK experts rated Predictive Agents (C23), Investors' Expectations (C24) and Regulation of Properties Accounting Standards (C29) to be not as relevant in comparison to experts from France (Table 5-12). However, UK experts rated Regulation of Properties Valuation Standards (C28) as having more relevance for the dynamics of commercial property rental prices than experts from France (Table 5-12).

5. German experts rated Return on Commercial Property (C8) to be not as relevant in comparison to experts from the UK (Table 5-12).

6. UK experts rated Commercial Building Time Frame (C12) as having more relevance for the dynamics of commercial property rental prices than experts from Germany (Table 5-12).

7. UK experts rated Green Leases Regulation (C30) to be not as relevant in comparison to experts from Sweden (Table 5-12).

In making decisions on the dynamics of the commercial property market the proposed framework may help avoid mistakes when making decisions on investment, development, sales and management and other issues at both the national and international levels.

The framework enables investors, property owners, credit institutions and governments, to address matters relating to the cyclic environment in which the commercial property market exists.

On an international level, this framework offers appropriate tools to compare countries and observe their dynamics through the monitoring or analysis of various indicators.

Government bodies could benefit from this framework when addressing the effect of fiscal and monetary policy on commercial property business.

Beneficiaries can make theoretical simulations of potential changes and examine how the results of the framework follow from changes in the criteria weights or the criteria measures.

'Dolls' can be used to compare other countries outside of those analysed in this case.

Both internationally and in the UK or other countries of comparison, governments and the other players mentioned above, could use the groups of criteria to make individual decisions. For instance, the significance of the legal and regulatory criteria group can be reinforced with legislation on selling activities, green leases and property valuation. The problem of the dynamics of the transactions and rentals market can be resolved using 'Dolls' as a standard for modifying markets, adjusting markets, or comparing them.

When it comes to making decisions, it should be noted that the criteria sensitivity analysis established that any slight change in the criterion of Foreign Direct Investment (C6) has the biggest effect on the sequence of priorities of the countries.

Country sensitivity analyses have shown that the UK, French and German markets are more sensitive in their response to changes in criteria weights in comparison to Sweden. This means that the commercial property markets of these countries are more sensitive to change.

With the comparative framework, the choice of country for commercial property investment may appear rather superficial, because it takes account of the right time or the right country rather than the specific type (office, retail or industrial) of commercial property. It is important to note that, in addition to the macro level, the need to analyse investment opportunities also covers the meso and the micro levels. Which, in future, will call for studies of meso and micro criteria to select the appropriate criteria affecting the dynamics of commercial property on these levels.

It would be interesting to analyse the sensitivity of macro criteria to changes in the return on commercial property (C8) in the future as well. The sensitivity analysis performed within the scope of this work measured the criterion that needs to exhibit the smallest change to have the biggest effect on the rest of the criteria. That criterion is FDI (C6).

As far as the crisis analysis is concerned, it would be interesting to review, some time in the future, the historical crisis periods and to make a comparison of the countries with reference to 2008–2009, using this comparative model or 'Dolls'.

9.6. Significant Contribution to Knowledge

In the study 'A Framework Development to Facilitate the Effective Management of a Sustainable Commercial Property Market', the links between commercial property market behaviour and the action of macro level criteria including economic, environmental, social, emotional, legal and regulatory factors have been investigated. Additionally, the theory has been supplemented by a framework for the sustainable management of the commercial property market. In addition, criteria for commercial property market performance which support the healthy development of the commercial property market and which promote successful property investment have been developed. Moreover, the criteria affecting the commercial property market have been weighted by their relevance to the market and their sequence of relevance has been established. And finally, the developed criteria have been placed into five groups that could serve as a foundation for a macro-level assessment of commercial property market dynamics.

In addition to this, the study has made a contribution to existing practice by offering a framework which facilitates or improves decision making. The framework does this through its use of MCDM methods. Two models have been developed to provide a basis for making effective decisions in the volatile environment of both commercial property transactions and rentals markets.

9.7. Research Limitations

Several limitations have been observed in the course of this research which will need to be addressed in future studies. Firstly, the comparison only covered four countries in Europe (three of them are in European Union) but the research work has revealed that there is no single source of information which comprises historical data on transactions and rentals for all of these countries. As a result, MSCI data on the capital growth of commercial property was used for the purposes of comparison of the commercial property transactions dynamics in the subject countries. MSCI data on the growth of the rental market value of commercial of property was used for the purposes of comparison of the dynamics of commercial property rentals.

Secondly, the choice of criteria measurement tools for the comparison of the dynamics of the commercial property market of different countries, has led to the following limitation, namely the measurement tools of qualitative criteria are average relevancies established by experts, as no values for these criteria were available for all four countries. The development of more accurate measurement tools for the qualitative criteria are expected to be an objective for future research.

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Appendices