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VALUATION OF REIT IMPACT ON REAL ESTATE MARKET STABILITY

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LIST OF ABBREVIATIONS

ARCH – Autoregressive Conditional Heteroskedasticity
CAPM – Capital Asset Pricing Model
CBD – Central Business District
CEO – Chief Executive Officer
CDO – Collateralized Debt Obligation
CEE – Central and Eastern European Countries, which are members of the EU
CGAR – Capital Gathering Acceleration Rate
CRSTE – Constant Return to Scale Technical Efficiency
VRSTE – Variable Return to Scale Technical Efficiency
SE – Scale Efficiency
DEA – Data Envelope Analysis
DRS – Decreasing Returns to Scale
EU – European Union
ECB – European Central Bank
EPRA – European Property Research Association
IPO – Initial Public Offering
IRS – Increasing Returns to Scale
FIRE – Finance, Insurance and Real Estate
FED – Federal Reserve Board
FSLIC – The Federal Savings and Loan Insurance Corporation
HICP – Harmonized Index of Consumer Prices
GARCH – Generalized Autoregressive Conditional Heteroskedasticity
GJR-GARCH – Glosten, Jagannathan and Runkle GARCH
GNP – Gross National Product
GDP – Gross Domestic Product
REIT – Real Estate Investment Trust
REIF – Real Estate Investment Fund
REOC – Real Estate Operating Company (in this dissertation non-REIT and REOC shall be used interchangeably)
Non-REIT– company that works in real estate sector but does not have REIT status
NAREIT – National Association of Real Estate Investment Trusts
NYSE – New York Stock Exchange
LPTs – Listed Property Trusts
SFA – Stochastic Frontier Analysis
S&L – Savings and Loan Association
USA – The United States of America
UA – Unincorporated Associations
TE – Technical Efficiency

INTRODUCTION

The relevance of the topic. The real estate sector is unlike any other sector in the economy. It is a necessity because people cannot survive winter without a housing; it is massively expensive because of the complexity involved in building a property, as it requires a lot of materials, and lastly, it is highly conservative and very bureaucratic, because it usually takes about a year to obtain a building permit and in most cases, involves the judicial process. Certainly, the conservatism in this sector comes from the fact that for the most families, the acquisition of property is a once in a lifetime experience, and the process of testing innovations, when there is a risk of not having a living space, is a very responsible process. Having said all that, the innovations are still the only key to solving most of the economic issues, whether related to inflation, economic growth, or the real estate market.

After the 2007 housing crash, the economists started to rethink how the real estate market should actually work. However, the supply speed at which real estate is built and introduced to the market for consumers by firms is still important, as this directly combats the growing housing prices; nonetheless, the question of how that supply speed is being achieved has become a priority. The financial derivatives CDOs (collateralized debt obligation) of the previous decade induced many vulnerabilities for the real estate market and left millions of people homeless right after the crash. In fact, difficult and complex financial schemes did not add value to the ordinary citizens but essentially made the bubbles more inflated, leading to the other problems in the future. To make the matters worse, CDOs were exclusive to certain investors, excluding ordinary people, thus concluding that making real estate derivatives is not the way to go. The fact of the matter is that most economists should be trying to achieve both, i.e., the real estate market investment tools should be available to everybody and tools that create the real estate supply should be done at a sustainable level of debt. These two points are essential; otherwise, the long-term economy cannot sustain itself and eventually will collapse like in 2007–2008.

Interestingly, before proposing new ideas, all prior innovations that help market should have already been in place rather than skipping technologies and jumping to the new complicated ones. Surprisingly, this is not the case. One investment vehicle that has been left behind in Europe is “Real estate investment trust” (REIT), which was firstly introduced by the USA President Dwight Eisenhower in the 1960s. In short, it is a company that primarily conducts business in real estate and has unique governing laws. According to the EPRA REIT survey in 2018, only 13 countries in the European Union had REITs operational on their stock exchange. The primary regions that did not have an option to be listed as REIT were the CEE countries, while most Western European members had REITs. Surprisingly, a highly innovative country like Germany had its first REIT legislative approved only in 2008, which is 48 years later after the president D. Eisenhower’s bill introduction. Throughout history, most European countries relied on the “Real estate operating company” (REOC), which is a direct competitor to the REITs, for the real estate stock operations. There are subtle legal nuances between these two

investment companies: for instance, REITs are required by the law to distribute 75–90% of their earned profits to their shareholders and are capped to the level of debt they are allowed to accrue. A deeper insight into the differences between these two structures will follow later in this dissertation; for now, it is sufficient to say that these two obligations directly correspond to the previously mentioned goals: availability to the consumers and sustainable development. In addition, these two main legal prerogatives for REITs quickly made them the most popular real estate investment vehicle in the USA, outpacing REOCs in many sectors. Pension funds and stockbrokers started using them as a good diversification tool, because the REITs stock acquisition is basically an indirect investment in the real estate property.

Nonetheless, the question remains why so few EU countries have REITs installed on their stock exchange. Is it incompatible with the EU laws? Obviously not, if countries like Germany have managed to introduce REIT bills. Perhaps, REOC in Europe already provides all the benefits needed, or perhaps, REITs do a poor job at allocating their resources effectively, making them cost-inefficient. These are valid questions, for anybody who is concerned with the real estate market. Not only the introduction of REITs legislation is a costly procedure, as it has to be approved by the central banks and other required institutions, but if the REIT is truly more unreliable than that of REOCs, the conversion to this new investment vehicle could actually make countries more fragile.

The scientific problem and the level of investigation. The historical real estate market stability analysis that was done by such authors as Vanderblue (1927); Pizzo, Fricker, and Muolo (1989); Lowry (1991); Bordo (2003); Kindleberger and Aliber (2005); Anderson (2009) and Rapp (2009) have shown that the real estate crisis is a reoccurring phenomenon. However, there is a lack of consensus on why bubbles emerge and what specific factors influence the cycles. Some authors claim that macro variables are one of the most decisive contributors that influence the real estate market stability, while others noted that micro factors are no less important.

At the same time, the literature analyzing how one investment company type is compared with the other and what impact on the real estate market stability it may convey is scarce. The historical analysis of REIT emergence that were carried out by Cook (1923) or Jones, Moret, and Storey (1988), only in an abstract sense, allows understanding the REIT impact on the real estate market stability and its advantages over the other companies. The lack of literature is especially vivid when trying to compare REIT and REOC. The following researchers: Bers and Springer (1997); Ambrose and Linneman (2001); Anderson, Springer, Webb, and Fok (2002); Anderson, Springer, and Lewis (2003); Lee and Stevenson (2004); Delcoure and Dickens (2004); Ambrose, Highfield, and Linneman (2005); Schacht and Wimschulte (2008); Sham, Sing, and Tsai (2009); Isik and Topuz (2006); Tahir, Harun, and Zahrudin (2012); Kawaguchi, Schilling, and Sa-Aady (2012); Falkenbach and Niskanen (2012); Brounen, Mahieu, and Veld (2013); Newell, Adair, and Nguyen (2013); Hoesli and Oikarinen (2014); Cotter and Richard (2015); Mahmood, Kuhle, Al-Deehani, and Bhuyan (2015); Ahmed and Mohamed (2017); Newell and Marzuki (2018), have analyzed solely REITs in their papers. Some of

the findings were that REITs showed dynamic economies of scales that depended on specific control variables like leverage and management style; others noted that the tax-exempt REITs were fairly less dependent on debt than other real estate investment vehicles, had better stock liquidity, had a potential to attract capital funding opportunities, generally were cost-efficient, paid out bigger dividend yields, were a great addition to diversifying portfolios, and gave a competitive return to the bonds.

Other researchers focused on REITs stock volatility; this includes studies of Case, Yang, and Yildirim (2012); Bhargava, Dania, and Anderson (2010); Kawaguchi et al. (2012); Liow (2013); Liow and Schindler (2014). Some of the findings claim that although correlation existed among stock indexes and REITs in general, the co-movements were only partially relatable; others detected spillover effects for REITs from foreign to domestic markets and discovered that there seems to exist a negative link between the equity value and volatility.

Some authors took the route of analyzing systemic risk concerning the market and interest rates and in some cases incorporated or extended the methodology laid out by such authors as Sharpe (1964), Lintner (1965), and Stone (1974). The authors that should be mentioned are Chen and Tzang (1988); Liang, McIntosh, and Webb (1995); Mueller and Pauley (1995); Allen, Madura, and Springer (2000); Devaney (2001); He, Webb, and Myer (2003); Clayton and MacKinnon (2003); Delcoure and Dickens (2004); Bredin, O'Reilly, and Stevenson (2007); Giliberto and Shulman (2017). A couple of the latter papers stated that REIT returns were robust concerning the market changes or confirmed a negative REIT relationship with the interest betas.

Certain negative conations for REITs were found by authors Liow and Schindler (2014); Kola and Kodongo (2017); Zhou (2011); Li (2012); Zhou (2016). Some authors claimed that at certain periods, REITs displayed higher volatility than non-real estate equity firms, thus making them more unpredictable, while finding high persistency to shocks in REITs. Other nuances have been brought up by McIntosh, Liang, and Thompkins (1995); Ambrose, Ehrlich, Hughes, and Wachter (2000); Gentry, Kemsley, and Mayer (2003); Eichholtz and Kok (2007); Miller and Springer (2007); Brounen, Ling, and Vaessen (2016), claiming that contrary to the other studies, no economies of scales have been detected for REITs and the wealth effect did not arise for REITs. There is as well a suspicion that REITs might distort the market competition. In addition, the researchers add that REITs were sensitive to the interest rate changes and market shocks.

Clearly, some research papers regarding REITs were focused on volatility, stock return, or systemic risk. Unfortunately, the previously mentioned papers solely directed their attention to the REIT's performance, and no comparative analysis between REITs and REOCs was included. This does not give any context, whether that actual performance is better or worse than other investment vehicles' performance, thus leaving economists and investors with a knowledge gap. A few papers that did conduct a contextual analysis between REITs and REOCs or private real estate were Naranjo and Ling (2015); Sin, Chun-Kei, and Yat-Hung (2008); Morri and Cristanziani (2009); Bhargava et al. (2010); Falkenbach and Niskanen

(2012); Brounen et al. (2013); Koulakiotis and Kiohos (2016); Ascherl and Schaefers (2018). The authors claimed that REITs portfolios outperformed private real estate portfolios and private companies were looking up to REITs in terms of information flow. While comparing REITs and REOCs, it has been found that REITs were significantly less over-leveraged than REOCs, both displayed high volatility persistency, and in some cases, a spillover effect from REOCs to REITs was detected.

Regrettably, most of the mentioned studies either only analyzed the USA REITs, did not compare REITs with REOCs, or did not split the set between REITs and REOCs to know the difference in their performance. For instance, a research paper by Ambrose et al. (2016) did an analysis on the European real estate companies but did not differentiate what efficiency or interest rate sensitivity was achieved by REITs or REOCs; thus, it is unclear what benefits REITs hold for the real estate market compared to the REOCs. Consequently, a research gap exists, and before allowing the REIT regime to take over the rest of the Europe, it is crucial to know whether this kind of investment vehicle will make the real estate market more vulnerable. A **scientific problem**, in this case, raises the question how to make an evaluation of the REIT impact on the real estate market stability in comparison to the REOCs.

The research object is the comparative performance differences between REITs and REOCs.

The aim of the research is to evaluate how REITs impact the real estate market stability by comparing performance differences between REITs and REOCs.

The main research objectives are as follows:

1. To examine the structure of the real estate market, its participants, and factors that influence the market.
2. To inspect the circumstances among which historical real estate crises transpired.
3. To analyze REITs and REOCs characteristics and their legislative nuances on a historic and international level.
4. To investigate the methodological approach how to evaluate REIT impact on the real estate market stability by measuring performance differences between REITs and REOCs.
5. To develop models for measuring REIT impact on the real estate market stability by comparing REIT and REOC performance differences.
6. To evaluate systemic risk, volatility, and efficiency models results.

The research methods. The following research tools and techniques have been employed in this dissertation:

1. A systemic analysis of scientific literature and methodology that relates to the real estate market, firm's efficiency, price volatility, interest rate sensitivity has been performed, and a comparative analysis of studies that relate to REOCs and REITs were examined.
2. DEA analysis has been applied to measure the firm's cost efficiency regarding its inputs and outputs.

3. Various regression methods have been used to balance datasets, conduct analysis for Beta coefficients with controls, and assess Beta coefficient differences on a micro level.
4. GJR-GARCH model has been used to measure the shock persistency.
5. All of these statistical models have been employed by using Python programming language. Web-scraping was done by using Python. Some data were collected and wrangled by using Excel.

The research structure. The structure of this dissertation has been composed in such a way that it would consistently provide and reach the necessary objectives and achieve the research goals:

The first chapter of this dissertation lays down the foundational understanding of the terms market, real estate, stability, REITs, REOCs, cycles. It deeply explores the peculiarities of historical real estate market stability and instability cases, discusses the cycle phenomenon, how they emerge, and what effect they have on the overall economy, and offers a conceptual map of what and how factors influence the real estate cycles. Additionally, the timeline of REIT emergence is presented, its structure, attributes, regulations are examined, and its modern place in the real estate market is discussed. Lastly, the theoretical benefits that REITs might hold for the economy are raised by conceptualizing how REIT attributes can forward meaningful real estate market growth. This is done by referencing historic and modern scientific literature.

The second chapter of this dissertation outlines the conceptual pathway of the model construction and how the REIT impact on the real estate stability can be measured. The subsections of this chapter delve into the methodological procedures that can measure firm's performance on micro and macro levels, present widely used efficiency, volatility, interest rate, and market sensitivity models, discuss the data collection methods, and eventually, by following the recommendations of previous authors, construct new models to measure the performance differences between REITs and REOCs. Additionally, the model setups and data used in the last section are justified.

The third chapter of this dissertation deploys the constructed models in the previous sections and presents the results from efficiency, volatility, interest rate, and market sensitivity perspectives. The models are calculated for both REITs and REOCs separately, and the achieved scores are compared among them, whilst also comparing them to any research papers that previously conducted a similar analysis in order to see how far the outcomes differ. Most importantly, this section systemically aggregates the scores and calculates the impact indicator in order to conclude which investment vehicle induced better stability in the analyzed period as well as outlines this dissertation's limitations and certain recommendations regarding the REIT implementation.

Scientific novelty and practical significance of the research:

1. The literature on how real estate market stability works is constantly evolving; however, there is a lack of consensus among scientists when evaluating factors that influence the real estate market stability. For this reason, this dissertation constructs a conceptual map and provides a new

systemic view on how factors that influence the real estate market cycles should be interpreted, thus contributing to the expansion of the ever-evolving knowledge, surrounding the real estate market. The experts and other real estate participants can reference the vast analysis in this dissertation when evaluating the influence of factor change on the real estate market.

2. By reviewing the historical timeline of the real estate market crises, this dissertation provides some general understanding on why certain market disruptions had previously occurred. In order to avoid future market disruptions, the government bodies should diligently monitor credit access, monetary policy, fraudulent activity, and unmeasured confidence in particular investments. Additionally, in the historic analysis, the finding of S&Ls system was emphasized, which at times had similar activity constraints like REITs and liberalization periods. The S&Ls provide valuable evidence that the attempt to constraint companies does not necessarily lead to stable market; on the contrary, it might cause instability. This finding affirms the belief that the evidence-based rather than intuition-based policy should be applied.
3. This dissertation provides a very thorough historical analysis of the REIT conception from its origin to the modern times that encompasses many different scientific sources that are scattered and are not systemically aggregated in other scientific articles. The latter analysis can help policy makers to understand what specific requirements and needs are being offered under the REIT regime.
4. This research delivers a multi-layered framework on how different competing investment companies can be compared on distinct levels, based on the following perspectives: efficiency, interest rate sensitivity, and volatility. The same research framework can be further applied when evaluating “REIT” vs. “ROEC” from other perspectives.
5. The performance differences between REITs and REOCs have been measured extensively from different perspectives and are interpreted systemically by using an impact indicator. By referencing the impact indicator results portfolio, the managers can formulate their investment strategies better and avoid losses. On the same note, the governments, in accordance with the indicator findings, should evaluate whether REIT can be accommodated purposely on their stock exchange without sacrificing the real estate stability.
6. The additional competition from a REIT may help cities, municipalities to develop their shortage of supply; however, the empirical evidence has shown that REIT might make market more sensitive to volatility. Furthermore, in the analyzed period, REOC had a better efficiency; thus, if these findings translate into longer periods as well, the markets with shortage of supply, perhaps, should rely on REOC more.
7. The citizens, pension funds, and other institutions with new investment vehicles in place have an opportunity to derive new value to their budgets

or customers. The income sources of some real estate properties that were not available or previously had accessibility issues would be reduced as more real estate would be listed on the stock exchange.

The structure of the dissertation. The English dissertation contains 21 tables and 24 figures in total, a list of abbreviations, an introduction, 3 main parts, conclusions, references, and the annexes. The dissertation contains 114 pages with 38 numerical formulas and 263 references.

1. THEORETICAL BACKGROUND OF THE REAL ESTATE MARKET AND REIT

This section of the dissertation focuses on the general understanding of the real estate market, what it means to have a stable real estate sector, and how REITs can provide solutions to the existing dilemmas. A historical overview of the most prevalent real estate market crises starting from the 1800s is discussed, the idea of a stable market is delineated, the evidence and definitions of the real estate market cycles are rendered, the real estate market weak points are identified, and the characteristics of REITs are outlined.

1.1. Defining the real estate market and its stability

A well-popularized book *Wealth of the Nations* by Adam Smith has focused extensively on the free market and how invisible hand guides the market forward. However, the meaning of the word "market" can only be partially grasped by reading the whole book, because the definition is not presented; it is taken as an axiom. Nonetheless, the French economists Cournot tried to clear up the ambiguity by describing the market in the following way: "economists understand by the 'market', not any particular marketplace in which things are bought and sold but the whole of any region in which buyer and sellers are in such free intercourse with one another that the prices of the same goods tend to equality easily and quickly" (Thompson, 1991). Interestingly, Cournot's definition assumed that the same price for the same thing must exist; however, today, the modern economists do not emphasize price uniformity. As Marshall (1961) noted, the strong tendency for the same price only becomes possible in near-perfect market competition; perhaps, Cournot was describing a perfect market model. Other economists like Jevon, Chapmen, Benham (1967), Tahir (2010) provided their own interpretation of the market, which are depicted in Table 1, and in doing this throughout the years, the market features became better defined. Nowadays, four essential market features can be listed:

a) At least one commodity (some things must be traded);
b) Area (the market is not defined to a fixed location, but to the whole region or area where supply and demand operate);
c) Buyers and sellers (the participants show interest in the commodity and compete among one another, not necessarily in perfect competition, but in imperfect as well. This competition is described by Geertz (1992) as buy low and sell high);
d) Contact between buyers and sellers (they have to interact either directly or through an intermediary).

Thus, a market can be defined as an area where buyers and sellers negotiate the exchange of a well-defined commodity. A more modern description was compiled by Aspers (2015), claiming that it **could be defined** as a social structure for the exchange of rights where offers are evaluated and priced and compete with one another. Moreover, Aspers (2015) claimed that the market alone does not exist in the modern world, but it is an aggregate of a plurality of markets. In addition,

some other circumstances must exist for the market to work. Firstly, there must be a voluntary and peaceful interaction between the buyer and the seller; otherwise, it is coercion that takes the form of theft. Secondly, the property rights must exist and have to be recognized by the buyers and sellers (Carruthers, Ariovich, 2004). The belonging of a commodity to a person must be guaranteed either by the government or by other special kind of national or international institutions. These two elements must exist at the same time; otherwise, the market does not hold. For example, the mafia acts like an institution that enforces citizens to comply with their decisions, but because it is not voluntary, it is not a market mechanism (Gambetta, 1996). There must be a mechanism for transfer to happen; it might be a special digital platform for trading or a physical meeting place where, for example, the notary office legally recognizes the exchange of rights from one person to another.

Table 1. Historical definitions of the market

Authors	**Definition**
Marshall (1961)	"The more nearly perfect a market is, the stronger is the tendency for the same price to be paid for the same thing at the same time in all parts of the market".
Benham (1967)	"A market is any area over which buyers and sellers are in such close touch with one another either directly or through dealers that the prices obtainable in one part of the market affect the prices in other parts".
Cournot, Thompson 1991)	"The term Market, not any particular marketplace in which things are bought and sold, but the whole of any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods tend to equality easily and quickly".
Chapmen	"The term market refers not necessarily to a place but always to commodity or commodities and the buyers and sellers of the same who are in direct competition with each other".
Kay (2003)	"Originally a market was a public place in a town where provision and other objects were exposed for sale, but the word has been generalized so as to mean anybody or persons, who are in intimate business relation and carry on extensive transaction in any commodity".
Tahir (2010)	"A market is any place where the sellers of a particular good or service can meet with the buyers of that good and service where there is a potential for a transaction to take place".
Cristiano, Teubal (2010)	"Markets are social institutions where at least a critical mass of producers and a critical mass of consumers interact and transact".
Aspers (2015)	"Social structure for the exchange of rights where offers are evaluated and priced and compete with each other".

In this dissertation, the trading commodity is real estate. **The Oxford dictionary defines** real estate as a property in a form of land or buildings. Alternatively, a more precise definition is presented by **English common law**, where the term real estate is a part of a real property: "real property is land which is the property of some person and all structures (as well called improvements or

fixtures) integrated with or affixed to the land, including crops, buildings, machinery, wells, dams, ponds, mines, canals, and roads, among other things". The law exactly defines what real estate is and how it can be exchanged or used under the civil law acts; thus, there is far less ambiguity than compared to the word "market "understanding.

Furthermore, the real estate has important features, which are the following: land or relationship to land, location, value, purpose, ownership, and immovability. All buildings stand on land, which must have a location; the land or building is owned with a clear value and purpose to be used for, and it has an aspect of immovability or difficulty to be moved. The ownership forms do have subsections, which include direct, derivative, or control agreement ownership. In a direct case, a person or other entity precisely owns the building with all the existing rights to that building; in a derivative form, the owner owns only partial right to the property: this partial right might be a claim to profit but not to the management, and lastly, the control agreement ownership is when the owner gives control to the other entity to manage and has limited control over the building. Moreover, the real estate as an object can be viewed from legal, social, economic, and physical perspectives. The legal perception comes in a form of servitude, contract, inheritance or deposit, social as a place where individuals gather, the status or prestige, economic as a means of profit or value, and physical in terms size, minerals, etc. The additional attributes of the real estate are, but not limited to:

1) uniqueness, no building is the same; longevity, most buildings last for ages;
2) government control, institutions foresee how real estate can be used;
3) information scarcity, although this is being combated by big data and property selling portals, still, the information regarding the property is confidential and difficult to achieve;
4) illiquidity, due to a large value, it is difficult to sell and buy a property;
5) uneven taxing, depending on the size, value, and location, property owners are taxed individually;
6) demand and supply inflexibility, it takes time to build and gather funds to buy or sell a property;
7) amortization, over the time, the real estate has a functional deterioration.

By connecting the theoretical definition of the word market and the term real property, a general understanding emerges that the **real estate market** is an area where buyers and sellers negotiate the exchange of rights of real estate on an institutional level. Additionally, the real estate market can be subdivided into these three segments:

- residential real estate, which includes apartments, semi-attached houses, condominiums, and other;
- commercial real estate market, which combines office space, warehouses, and office buildings;
- lastly, the industrial market, which covers factories, farms, mines, railroads, and business parks.

The most prominent operations in the real estate market, as described by Kvederavičienė (2009), consists of buying and selling real estate, financing and

leasing real estate, real estate insurance, development, and renting. The participants can be private persons, firms, governments, banks, or even religious institutions. Obviously, the market can be on a legal or an illegal footing. The illegal contains shadow economy, but as the real estate ownership rights must be transferred and registered by an authority, it can only be partially in the shadow realm.

The reason why real estate is a widely popular commodity for transactions is because it has 3 economic functions: it is a capital base where products and services are created, it is a livable space, and it is a short- and long-term investment storage unit. Consequently, for the economy to work, the real estate is a necessity, because the products are built on land or inside a property. Furthermore, the real estate markets can as well be efficient, partially efficient, or not efficient at all. Efficiency in this case refers if prices reflect all available information about the product. Although it is hypothetical, but in a perfectly efficient market, there is no chance of beating the market price, as information is available to everybody. Partially efficient reflects that only some portion of information about the product and price can be found. This leaves space for markup, although it can still be influenced. In a completely inefficient market, speculation is rapid and fraudulent activity that is everywhere. Usually, buyers are hurt the most by the scarcity of information, but sellers can be affected too. The theoretical framework of the real estate market and its characteristics are displayed in Figure 1.

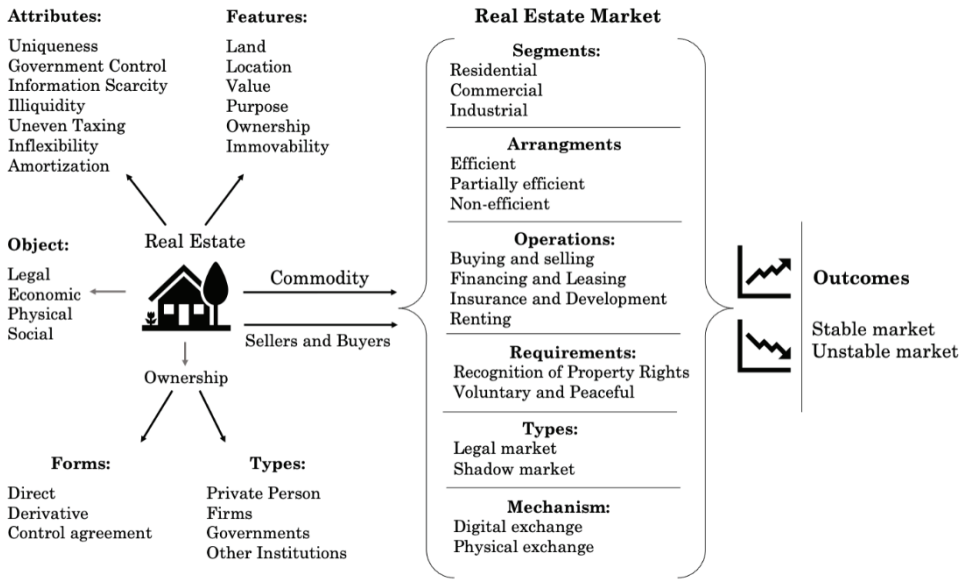


Figure 1. Theoretical framework of the real estate market, created by the author

A more difficult term to define is stability. Similarly to the term "markets", the term "stability" by most researchers is taken as an axiom and is not defined clearly. For instance, Smith (2000) put forward a concept of "natural price", where markets by the help of "the invisible hand" guide themselves to the market equilibrium. Unfortunately, Kaynes in his book *The Instability of Capitalism* opposed this idea,

claiming that markets do not guarantee full employment or price stability and deliberately advised for government intervention to foster demand. Both legendary economists equated large price fluctuations to be in opposition to stability, although they did not explicitly state the definition. Other researchers like Pasini (2013) adapted a broad understanding of the word stability and described it as ensuring that economy functions smoothly and preventing the occurrence of economic recessions. In the similar direction, Stein (1956) and Özpençe (2017) defined stability as a situation where there are no extreme fluctuations or volatility in macroeconomic variables. In the real estate case, the most natural variable to monitor for fluctuations are probably prices, whether it is the housing prices, commercial or industrial rent price indexes, or any other prices related to the real estate property. However, in order to avoid being trapped, this dissertation adopts the word metric or measure instead of the price. Thus, the **definition of real estate market stability is as follows**: it is the situation where there are no extreme fluctuations or volatility in a particular real estate market performance measure.

The performance measure can be rent, sale prices, vacancies, etc. In the case of price, the stability would mean that the market can handle large amounts of trade volumes without causing large shifts in the sale price. The price itself is the value of property, which is set through the services of independent valuators. Depending on the situation, the prices are determined either by using capitalization rates, comparative methods of what similar properties in nearby areas have been sold in a recent time period, or doing a comprehensive rebuilding estimation of the property. Finally, in order to understand what are these extreme fluctuations, this dissertation will reference the announcement of stability-oriented monetary policy that was enacted on 13th of October in 1998 by the governing council of the ECB. The latter institution defined price stability as a year-on-year increase in the HICP below 2% for the euro area. This is what the ECB is aiming every year to reach; however, as in law and other disciplines, there will always be some gray area in understanding what is left for the interpretation. If the real estate market was to grow at a pace of 2%, the economists would probably consider this a sustainable growth; nonetheless, it does not mean that a 2.5% or 2.9% growth is an extreme growth, it will always depend on the economic context. Thus, in a broader understanding, the real estate market price stability exists when the average real estate prices are constant over time or when they are rising at a very low and predictable rate.

1.2. Defining real estate cycles and factors that influence volatility

For more than 200 years, the economists have studied the stability processes that occur in the market, and what researchers have discovered is that there are some regularities or periodic alternations between the times of stability and instability. The economists call these fluctuations business cycles (historic definitions are provided in Table 2). This dissertation adopts a similar definition that was provided by the RICS (1993), which understood the property cycles as a recurrent but irregular fluctuation in performance. In their case, they measured the returns of the real estate property, but price, vacancy, or rent can have the same recurrent fluctuations as well. **Therefore, the definition of the real estate cycle** in this

dissertation is understood as recurrent but irregular fluctuations in the performance of the real estate assets.

In order to prove that the real estate market cycles exist, the following few paragraphs outline some of the major studies that confirmed the cyclic phenomenon. First scientist to document periodic market behavior was Sismondi (2012), who in 1819 was very critical of Smith's concept that invisible hand stabilizes everything and identified that the leading causes of market disruptions were overproduction or underconsumption and the unnecessary high unemployment that occurs and could be solved with the government intervention. Mitchel (1927) went further to describe the features of the economic fluctuations separating them into expansion, when prices for products are growing, and contraction, when the economy is on the downturn. Researcher Nikolai Kondratieff expanded the topic by calculating long-waves, which were found to be from 25 to 35 years of increasing living standards and prosperity and then a decade of decline, which is closely related to the technology life cycle (Pyhrr et al., 1999).

Table 2. Definitions of business and property cycles

Authors	Definition
Mitchel (1927)	"Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises."
Parkin, Bade (2012)	"The business cycle is the periodic but irregular up-and-down movements in economic activity measured by fluctuations in real GDP and other macroeconomic variables."
Keynes	"Trade Cycle is composed of periods of good trade characterized by rising price and low unemployment percentage altering with periods of bad trade characterized by falling price and high unemployment percentage".
RICS (1993)	"Property cycles are recurrent but irregular fluctuations in performance as measured by fluctuations of real total return about its trend".
Wheaton (1999)	"Real estate cycles are defined as some degree of instability in the market whereby a single economic shock leads the market to oscillate around its steady state for some number of iterations"

According to Jadevicius, Sloan, and Brown (2017) review paper, Germans were the first to popularize the concept of property cycles with rigid analyses. Researchers like Mangoldt (1907); Reich (1912); Eychmüller (1915); Carthaus (1917); Eisenlohr (1921) analyzed how the growth of German cities influenced land values, residential construction, real estate market activity. Only in 1933, the property market research began to take off in the USA, after Hoyt (1933) released a publication of cyclical fluctuations in the Chicago property market. Soon followed Wenzlick's (1933) and Maverick's (1933) analysis of St. Louis, San Francisco, and Los Angeles cities, where similar cyclical patterns were diagnosed. A study by Cairncross (1934) identified Glasgow building cycles in the time period of 1870–

1914 and claimed that the housing market will naturally fluctuate because of supply and income of the tenants (Jadevicius et al., 2017).

Table 3. Features of the property cycle

Authors	Length of the Cycle	Objects of the Performance
Hoyt (1933)	Long run cycles, on average 18 years.	New construction rates, land values, foreclosures.
Cairncross (1934)	Building cycles of 20 years.	Home building and demolition rates.
Newman (1935)	Major cycles lasted around 15–21 years, minor cycles around 4–5 years.	Building costs, building permits.
Long (1940)	Short cycles of 4 years, long cycles of 20 years.	Total construction, building levels, housing costs.
Bowen (1940)	-	Returns on houses, passed building plans.
Lewis (1965)	Long cycles of 18–20.	House prices, rent, building rates
Gottlieb (1976)	Cycles lasted 20 years.	Building rate, building costs, land values.
Grebler, Burns (1982)	18 to 29 quarters.	Residential and non-residential construction
Barras, Ferguson (1985)	Short cycles of 4–5 years, long cycles of 28 years.	Orders of construction and output, fixed capital formation.
Barras (1987)	Cycles of 20–30 years	Overview of 5 Sectors
Wheaton (1987)	Office cycles of 10 years.	Production, construction finances, vacancy.
Irwin, Landa (1987)	Cycles of 8 years.	Real estate returns
RICS (1993)	Cycles of 4–5 years.	Property returns, rents, building investment.
RICS (1999)	Cycles of 4–9 years.	Property returns, rents, building investment.
Barras (1994)	-	Rents, capital values.
Wheaton (1999)	-	New construction, absorption rates, vacancy.
Barras (2009)	-	Rents, vacancy, building starts and completions.
Barkham (2011)	-	Rents, real estate spreads over bonds.

After the great depression, a publication by Newman (1935) was released, where the construction index was monitored, and many discoveries of the so-called major cycles that lasted from 15 to 21 years were found. Similarly, by constructing a monthly building index, an extensive analysis of the period from 1868 to 1940 was done by Long (1940), once again confirming short and long cyclic behavior. Soon after came the first major historical survey done by Lewis in 1965, analysing a

lengthy time period from 1700 to 1950. The author used 20 time-series and emphasized building cycles of 18 years by using a turning point analysis. Even on a larger scale, the first international study of cycles was conducted by Gottlieb (1976) where countries like the US, the UK, France, Germany, the Netherlands, Canada, and Australia were analyzed. The author employed over 200 timelines and used smoothing procedures to exclude short-cycle fluctuations from the data. The author confirmed long cycle duration to be around 20 years (Jadevicius et al., 2017).

Following the timeline, Barras (1987) have piloted urban cycle investigation and identified cycles of 20–30 years, whilst discovering linkages between the short and long cycles. Two years earlier, Barras and Ferguson (1985) studied residential, office and industrial sectors. Short cycles of 4–5 years, major cycles of 7–9 years, and long cycles of 28 years were captured. Moreover, the following authors: Ibbotson and Fall (1979); Ibbotson and Sinquefield (1982); Ibbotson and Seigel (1983); Ibbotson and Seigel (1984); Ibbotson, Seigel, and Love (1985), have documented the performance of the real assets in cyclical conditions. The results indicated that one and one-half cycles of activity change happened in 1960–1980 with an average cycle length of thirteen years, while paper by Ibbotson and Seigel (1984) compared composite return index with inflation over a period of 1947–1948 and concluded that for both indexes, the length of the cycle was approximately 16 years. Additionally, both papers written by the authors Webb and Sirmans (1988) and Zerbst and Cambon (1984) confirmed that the real estate returns are cyclical (Born, Phyrr, 1994; Jadevicius et al., 2017).

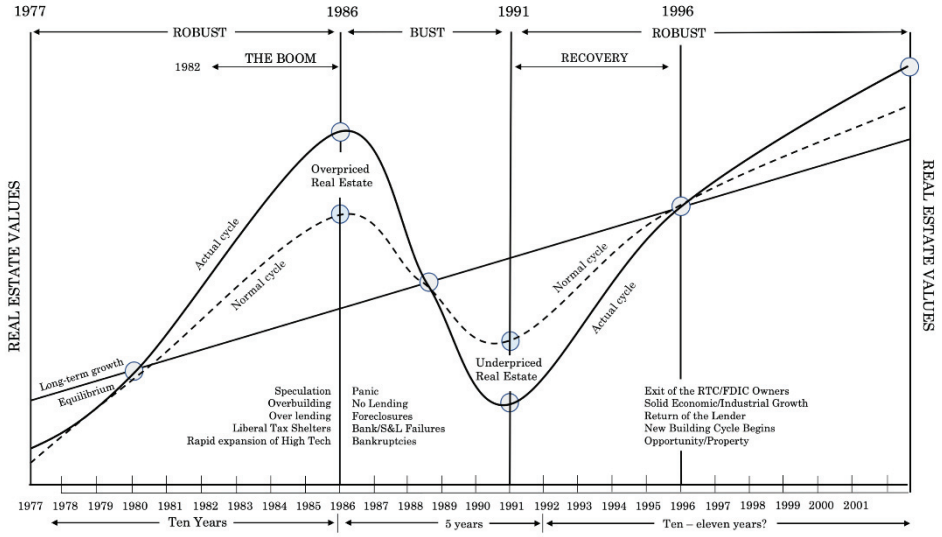


Figure 2. Austin real estate market cycle provided by Synermark Investments, Inc. by Pyhrr, Roulac and Born (1999)

More evidence of cyclic behavior came from a prolonged analysis of construction cycles by Grebler and Burns (1982) between 1950–1978 that detected six cycles in residential and four cycles in nonresidential construction. The mean

duration of residential cycles were 4.5 years, but for non-residential cycles, around 7 years. Rabinowitz (1980) charted long cycles of housing transactions from 1795 to 1973 and discovered that the mean length of the long cycle in real estate market was eighteen years; whereas, Irwin and Landa (1987) study, by comparing unleveraged residential, farm, and business real estate returns in the period of 1975–1985, showed cycle duration of 8 years with magnitude in difference of real estate returns between 3.1% and 6%. After evaluating post World-War II national office building construction and vacancy data, Wheaton (1987) concluded that cycles were recurring ten to twelve years. Likewise, an in-depth study by The Royal Institution of Charted Surveyors (RICS, 1999) with spectral analysis showed that the length of the cycles is from 4 to 12 years. Thus, in accordance with historical literature on cycle discoveries, it is evident that cyclic behavior in the real estate market exists, and even the more modern researchers like Barras (2005), Barras (2009), and Barkham (2011) are still analyzing the many subtleties of cycles, which are still relevant today. A concise guide of the mentioned authors with cycle lengths and data that was used to determine the cycle length is displayed in Table 3 (Born, Pyhrr, 1994; Pyhrr et al., 1999; Jadevicius et al., 2017).

The importance of the real estate cycle analysis was described by the researchers Born and Pyhrr (1994); Pyhrr, Webb, and Born (1990); Pyhrr, Cooper, Wofford, Kapplin, and Lapides (1989); Pyhrr et al. (1999). The authors analyzed the real estate valuation processes and found significant inconsistencies when appraisals of property prices were given, without taking into consideration the impact of the cycle. This was especially visible when the traditional discounted cash flow models were used. The scientists have discovered that during the market peaks, when demand exceeded supply, the forecast of the DCF model implicitly assumed that new construction supply would be absorbed; thus, the value was usually overstated or understated at times of recession. Others, like Cole, Guilky, and Miles (1986) that analyzed 147 sales with 108 appraisals between 1978 and 1984, found an absolute difference of 6% between the appraised and actual prices; whereas, Pritchett (1984) argued that the cycle magnitude from the bottom to the peak was between 50% for industrial and 160% for office market of the average value and the office activity was the most volatile. Gau, Wang (1990) and Geltner (1989) have also found considerable bias in appraisals that shifted depending on the economic conditions (Born, Pyhrr, 1994; Pyhrr et al., 1990; Pyhrr et al., 1999).

Roulac (1988) admittedly found that the real estate securities appeared to be overvalued because of the misunderstanding of recovery of the real estate market and overly simplistic cash flow valuation methods. Most real estate experts settled on the fact that from seven to ten years, one-third to one and one-quarter cycles of economic activity were expected to occur. The magnitude was significant to cause price changes and make incorrect appraisals. In his prior research, Roulac (1982) stated that capitalism is a form of economic change and can never be stationary; thus, the investments should be analyzed in a dynamic market environment, not in a static one. A good example on how cycle investment strategies were exploited by investment groups are depicted in Figure 2 with the data provided by Synemark Investments Inc. According to Pyhrr et al. (1999), the boom in 1982 was initiated by

the Garn-St. Germain Act (financial deregulation), which vastly improved institutional investment decision powers, and the Tax Reform Act of 1981, which let investors shelter their profits. Because of the latter, in Texas (around the mid-1980s), the property prices rose from 25% to 50%; nevertheless, many participants neglected the fact that this cycle cannot continue forever. During the down cycle, the prices in 1987–1991 went down faster than they grew in the growth cycle. It was estimated that the measured value fell by around 60% to 80%. Office properties that were sold for $100–120 per square meter went down to $25 per square meter. Interestingly, different real estate market sectors had their own cycles. In Austin, after the crash in 1986, the recovery first began in the apartment sector than in the office and industrial sectors, and later on in CBD. For this reason, the investors should be constantly ready to adapt their portfolios (Born, Phyrr, 1994; Pyhrr et al., 1999).

In general, modern economists see cycles in four stages (as shown in Figure 2 or Figure 5):

- boom or a peak, where prices are growing fast;
- bust, where price growth changes the direction and begins to fall;
- slump, in this period, the entities have a hard time conducting any real estate activity;
- recovery, where prices begin to raise again.

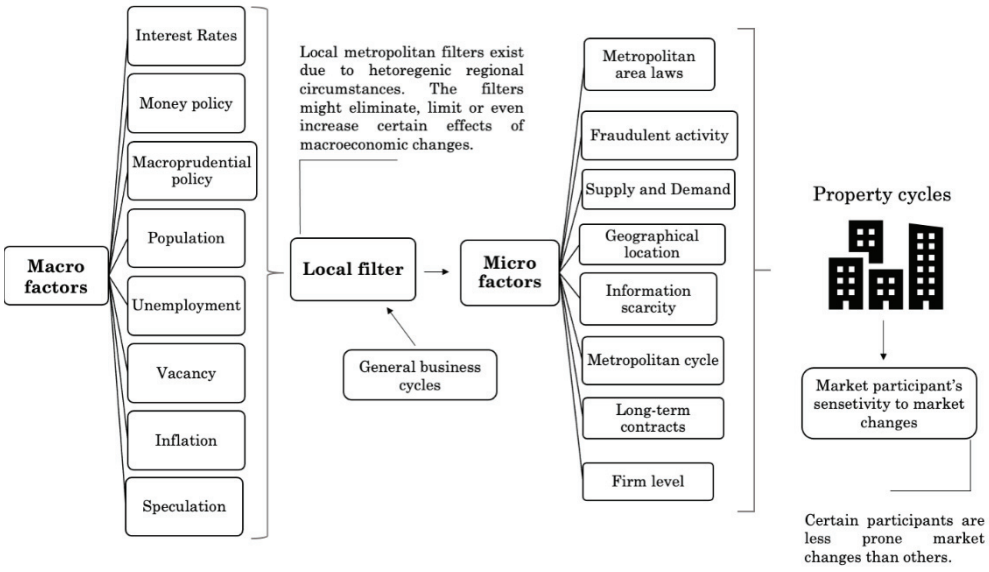


Figure 3. Variables that affect the real estate market cycles, created by the author

As cycles cause devastating calamities, it is important to understand how and why they appear, and numerous articles have attempted to explain what causes the real estate market cycles to occur, burst, or be stable. In some cases, the perspectives from scientific literature delve into the psychology of people or goes to macro variables. In this dissertation, for the purpose of systematic analyses, two distinct sub-groups shall be observed: Macroeconomic variables and Microeconomic

variables. The microeconomic factors will be related more to the metropolitan area supply and demand, urban cycles, and other related matters, while macroeconomic factors will generally concern inflation cycles, interest rates, population, employment cycles, aggregate supply-demand. A general understanding how these forces affect the market is depicted in Figure 3.

The macroeconomic factors are as follows:

Grebler and Burns (1982), DiPasquale and Wheaton (1994) affirmed that single and multi-family housing are closely connected to the national macroeconomic cycles and developers and the consumers of the real estate react to the short-run changes in the macroeconomy. Similarly, a research by Clapp (1993) found that 4 metropolitan areas in the 1990s were highly correlated with national business cycles, adding that in the long run, investment-grade office portfolio performed like a national market. Another paper published by Clayton (1996) used a vector autoregressive time series model to study linkages between business cycles (in this case, GDP growth was used) and the real estate cycles (in this case, aggregate total real estate returns was used), the effects of cycles on property return and pricing, and how that effects buy-sell behavior. In conclusion, the author argued that commercial estate prices could have been forecasted and the major market shifts can be detected in advance, hence providing evidence that macroeconomic factors do play a role in cycle formation. An alternative in-depth analysis that has been carried out by RICS (1999) suggested that property cycles ranged from 4 to 12 years with a mean of 8 years. The growth or upswings usually lasted from 2 to 7 years, while downswings took around 9 years. The report also discovered a strong correlation with economic or so-called business cycles, but not with all of them, suggesting that some movement in the real estate market might be independent. Subsequently, as the property market is related to macroeconomics movements, it is possible to describe each factor effect found in the research in the following ways (Pyhrr et al., 1999).

Interest rates. Low interest rates make money more easily available in a form of loans, which in some cases might alleviate the level of speculation. Thus, Kling and McCue (1987) proposed that the office market cycles resulted from a decline in nominal interest rates, and a substantiated effect on the real estate market was found by the tax cuts in 1981 that managed to stimulate the office construction market. Hekman (1985) found that no matter what real estate market was analyzed (larger cities, smaller cities, central or suburban area), all regression lines suggested that higher interest rates had a negative impact on the building permits, concluding that suppliers were less able to produce new real estate space with higher costs. Further on, Corcoran (1987), while working on the 1984–1987 vacancy data, discovered a strong influence of interest rates on the real estate demand. In classical real estate market theory, when real estate cycles are in the growth stage, usually, a decline in vacancies can be observed. Captivatingly, in this time period, the vacancy rates were constantly growing, meaning that supply and demand at the local level were not influencing traditional change. Later on, using the user cost formula depicted in Figure 4, the author explained that the real estate exists in two separate perspectives: as a factor of production and as an asset. Because of this, the local supply-demand

interaction had not made an impact on the vacancies, but as interest rates were heavily falling at that time, this made real estate an attractive investment. For this reason, the valuation of the real estate market only from a micro perspective is very misleading. Similarly, Hamilton (2008) confirmed that the housing market was sensitive to FED funds rate, although there was a lag in the new home sales of about 15 weeks. Likewise, Égert and Mihaljek (2007), while analyzing 19 European countries, have established a strong connection between housing prices and interest rates, and a study by Kuang and Liu (2015) have as well determined that higher interest rates had a negative effect on the housing prices. Lastly, a more nuanced extrapolation by Di Maggio, Kermani, Keys, Piskorski, Ramcharan, Seru, and Yao (2017) claimed that the reduction in mortgage payments will not necessarily increase the housing loan demand. For some consumers, the lower interest rates shifted consumers to leasing new cars and other consumption goods. Thus, although interest rate change is correlated to the real estate market deviations, not always a cascading effect will commence (Pyhrr et al., 1999).

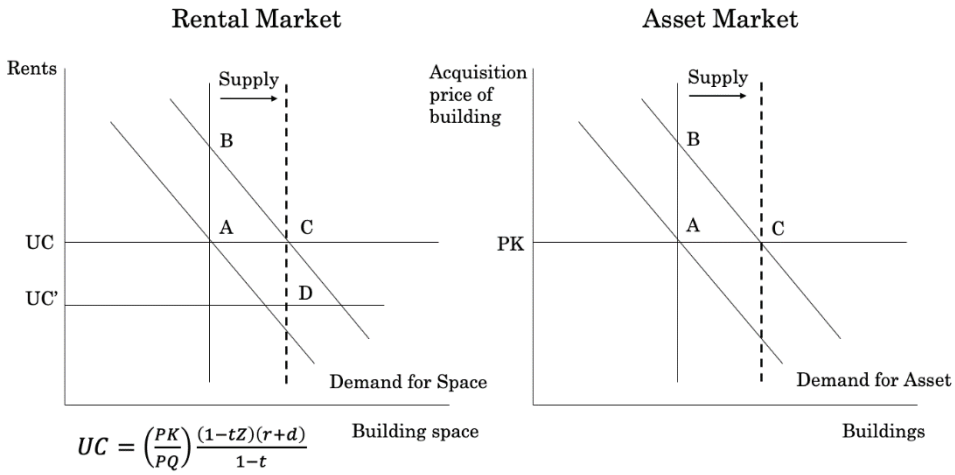


Figure 4. Rental and Asset market of the real estate by Corcoran (1987)

Inflation. Hartzell, Hekman, and Miles (1987) presented a summary of research on the connection between inflation and the real estate returns and as well performed a stringent test of real estate return response to inflation. It was concluded that the real estate market compensated investors in an unexpected and expected inflation in the period of 1973–1983. Furthermore, Hekman (1985), using regression analysis, found that the office market rents highly correlated with the inflation-adjusted office rents. Wurtzebach, Mueller, and Machi (1991) similarly concluded that the real estate (office and industrial) was generally a great hedge against inflation when supply-demand was in balance. Nonetheless, when supply and demand forces were not in their equilibrium, the inflation hedging effects were diminished considerably. The empirical research by Kaiser (1997) confirmed that before the boom in 1985, there was an unusual spike in inflation, which might have

been caused by the central bank's monetary policy. After that, the inflation triggered operating income growth, this in turn attracted large amount of investment and overdeveloping. Eventually, everything resulted in a real estate market bust. Furthermore, researcher Born (1984) established that inflation can create different performance results that significantly diverge from the results when inflation is constant. Kuang and Liu (2015) have found an asymmetric relationship between inflation and house prices in the time period of 1996–2010 in 35 major cities in China. The findings suggested that inflation did affect house prices more than vice versa. Simpson, Ramchander, and Webb (2007) have even found that for REITs, an expectation that the inflation will rise increased the REITs return and vice versa. Additionally, De Wit and Dijk (2003) have as well found that inflation did affect office space returns (Pyhrr et al., 1999).

Unemployment. Corcoran (1987), by analyzing the real estate market from 1984 to 1987, has found that demand for office space was extremely driven by the unemployment numbers in the trade sector, whilst the office market was slightly lagging behind the unemployment trends. Authors Rapach and Strauss (2007) have found that the unemployment variable had increased, forecasting accuracy for some districts with regards to housing prices, but not in all states. Liu, Miao, and Zha (2016), using a DSGE model, documented that unemployment and the land prices moved in opposite directions, while Geerolf and Grjebine (2014), using a dataset of 40 years from 34 countries, demonstrated that a 10% increase in the housing prices lead to 3.4% increase in the unemployment. Likewise, while investigating Australia house prices in the period from 1970 to 2003, Abelson et al. (2005) concluded that prices were negatively related to unemployment. Analogously, Quercia, Pennington-Cross, and Tian (2016) determined that mortgage defaults were more sensitive to the unemployment size rather than the cyclical component of leverage.

Speculation. Malpezzi and Watcher (2005) have found evidence that speculation might have a detrimental effect on the real estate cycle. A lagged response of supply (no new construction) to price changes and speculation seems to be enough for a cycle to start, although the authors noted that supply response was key whether speculation will occur, and the regulations played a role in cycle occurrence as well. Brown and Liow (2001) discovered a co-movement between the stock market and the real estate market. In the long run, these two markets were closely related; however, in the short run, the stocks had a lead up 1–3 quarters. It might be that profits earned from speculation in the stock market eventually end up in the real assets for value storage purposes. Itzhak (2011), using transaction data from Illinois, exposed that in 2005–2008, around 16% of greatly leveraged transactions had inflated prices up to 9%. Another example on how speculation inflates real estate cycles was described by Levitt and Syverson (2008). By their calculations, the real estate agents distorted the market by on the average selling house for 3.7% more than other similar houses on the market. Additionally, Austin (2008), after analyzing loan performance, spotted that customers who were not required to make a down payment had higher credit risk than comparable buyers who brought cash to the transaction. Lastly, Glaeser (2013) had claimed that rising

real estate prices were associated with optimistic expectations, while credit availability conditions more typically played a supporting role.

Table 4. Macroeconomic factors that influence the property cycles

Authors	Macroeconomic findings
Hoyt (1933)	Business conditions, commodity price level, the value of money, and rapid increase in population inflate property cycles substantially.
Long (1940)	Building cycles preceded business cycles; correlation existed between long building cycles and the general business conditions.
Bowen (1940)	Population was significantly correlated with building cycles.
Lewis (1965)	Building cycles are influenced by population structure, migration, income, production, credit supply, rent level, and wars. Credit conditions were extremely emphasized.
Fleming (1966)	Abundance of funds influences property cycles.
Gotlieb (1976)	Demographics create demand as new household forms; local and national cycles are similar.
Hekman (1985)	High interest rates reduce construction rates.
Hartzell et al. (1987)	Real estate returns compensate expected and unexpected inflation.
Kling, McCue (1987)	Reduced interest rates increase construction rates.
Barras (1994)	Cycles operate on the basis of demand and supply in the money economy and property market.
Borio, Shim (2007)	Macroprudential policy deescalates real estate market growth.
Hilbers et al. (2005)	Macroprudential policy helps to accelerate or deaccelerate housing market growth.
Itzhak (2011)	Highly leveraged transaction inflates prices.
Levitt, Syverson (2008).	Real estate agents distort market prices.
Glaeser (2013)	Price expectations lead to price increase.
Cerutti et al. (2015)	Macroprudential policy can limit credit growth
Corcoran (1987)	Real estate is driven by unemployment.
Malpezzi, Watcher (2005)	Speculation is the causal factor of cycles.
Wurtzebach et al. (1991)	Real estate is a good hedge against inflation.
De Wit, Dijk (2003)	Inflation increases office returns.
Quercia et al. (2016)	Mortgage defaults are sensitive to unemployment.
Liu et al., (2016)	Unemployment and prices move in opposite direction.
Wheaton (1999)	Unemployment induces instability in the office market.
Geerolf, Grjebine (2014)	Increase in housing prices increases unemployment.
Égert, Mihaljek (2007)	Housing market is strongly correlated with the interest rates.
Hamilton (2008)	Housing market is sensitive to FED rate.
Barras (2009)	Construction lag and other endogenous variables influence market volatility. Speculation is the major contributor.
Kuang, Liu (2015)	High interest rates reduce housing prices.
Di Maggio et al. (2017)	Reduction in interest rates does not increase housing demand.

Macroprudential policy. Hilbers, Otker-Robe, Pazarbasioglu, and Johnsen (2005) analyzed 18 CEE countries in the period of 2000–2005 and concluded that macroprudential policy effectiveness varied among the countries, although different legal provisions were applied. In general, in some countries, sound macroprudential policy helped to slow credit growth, e.g., in Poland, Bosnia, or Croatia; in other countries, it did not have any effect, or laws were circumvented by taking credit from the foreign banks. Crowe, Dell'Ariccia, Igan, and Rabanal (2011) in a published working paper on IMF did an overview of macroprudential policy. It was concluded that indeed, macroprudential actions can make a big difference, but it should be made alongside with monetary policy, as it can have opposite effects and cancel one another. Likewise, Tovar, Garcia-Escribano, Martin (2012) in their research claimed that macroprudential policy had moderate impact on credit expansion. Borio and Shim (2007) in an extensive analysis of countries in Europe and Asia with a time period starting from 1988 stated that macroprudential policy was successful in reducing credit growth from 4% to 6% in the years after introduction, and the housing prices fell by around 3–5%. Lim, Columba, Costa, Kongsamut, Otani, Saiyid, Wezel, and Wu (2011) by surveying 49 countries found that 40 regions had taken macroprudential actions, and those actions did impact the credit growth cycle. A large analysis on 119 countries by Cerutti, Claessens, and Laeven (2015) looked at 12 particular macroprudential instruments and how they impacted the market. It was concluded that it can limit credit and housing price growth.

Supply and Demand. This subject was researched by Hekman (1985); Rosen, Toward, Smith (1983); and Wheaton (1987). Hekman noticed that rents responded urgently and strongly to the vacancy rates. Additionally, Rosen et al. (1983) found a linkage between a change in rental rates and vacancy. As noted by Pritchett (1984), Witten (1987), and Wheaton (1987), on average, there were more good times than bad times for investors, meaning that the real estate market was growing most of the time. Usually, the change in supply has been more volatile than the changes in demand. The lenders or suppliers of the real estate caused supply to rise above the existing consumption demand many times, because of their enthusiasm. Sometimes, the construction rose higher because of economies of scales, because it is more profitable to build bigger buildings. The opposite relationship existed in downward cycle: the pessimism overturned investors risk parameters to wait for better times (Pyhrr et al., 1999).

A unique characteristic in the real estate market regarding the equilibrium is that it never reaches this stage naturally, only artificially. This is partly because the real estate market is inefficient and very few consumers can afford to pay the full price for the house or apartment at once. Usually, the acquisition happens in a form of a mortgage, which is a future payment, and as the majority of purchases are in the following forms, the equilibrium for the real estate market is achieved artificially. Because of this unique characteristic, the researchers Pyhrr et al. (1990) defined arbitrarily market equilibrium as a point in time when aggregate demand and supply are in balance in the peak of the real estate cycle, when the occupancy rates are from 90% to 96%. With this definition, the author identified the gap in construction

market rents and actual rents. An example was given: if new construction rent levels are at $.56/sf/mo., and the actual rents are at $.43, the actual rent rate as a percent of equilibrium property rent is 77%. The construction companies are not willing to build anything below the 100% threshold, because it is not profitable for them. When this ratio reaches 100%, the overbuilding begins, and eventually, a down cycle begins. This is called the rent catch-up cycle. In this scenario, because real wages grow slower than inflation, in order for occupancy to reach the market equilibrium, the future financing has to be employed, thus creating artificial demand.

Researcher Pritchett (1984) argued that the vacancy rate was the best predictor of the office cycles. After the publication of this paper, other important articles followed that paid special attention to vacancies. Wheaton and Torto (1988) had discovered that peaks and bottoms of the real rent cycle lagged by approximately one year from the vacancy rate cycle, meaning that developers had a reactionary position rather than leading the market. One year earlier, Wheaton (1987) calculated the office space vacancies in the US market post WWII. The magnitude of the office vacancy rates were as follows: from 4.9% to 11.5% in 1961–1966, from 4.1% to 18.8% in 1969–1975, and from 3.4% to 17% in 1980–1986. It has been found that the magnitude of office construction responded to the office employment, and although Wheaton and Torto (1988) managed to document the existence of the real estate cycles, they did not provide enough explanation to answer the boom-and-bust cycle behavior. The authors mostly put blame on the developer's inability to build and supply real estate at optimum timing: usually, most of them built too late in the cycle (Pyhrr et al., 1999).

Clayton's (1996) valuable finding was that market forces become more important than supply and demand fundamentals when the economy is volatile. The author suggested that in times of high volatility, the property price changes were driven by the expected returns, rather than current returns. Similarly, Wheaton and Rossoff (1998) found that occupancy and room rental rates moved alongside the cycle of supply. Interestingly, the demand for hotel were close to the macroeconomic cycle, and their models admitted finding long lags between occupancy and room rental changes as well as prolonged lags between room rental levels and new supply. Additionally, the population in some instances had been a significant variable in forecasting for some cities, but not all, as found by Rapach and Strauss (2007). Abelson et al. (2005) as well noted that housing stock had an influence on determining the real estate prices. A short summary of macroeconomic factors that influence the real estate cycles is provided in Table 4 (Pyhrr et al., 1999).

The microeconomic factors are as follows:

Janssen, Kruijt, and Needham (1994); Ghent and Owyang (2010) demonstrated that the metropolitan level cycles were different from the national level cycles, and on a similar note, the findings were discovered by Grenadier (1995) who admitted that long-run cyclic movements in office rents, construction, and vacancy differ from the more frequent macro-economy fluctuations. Even a research by RICS admitted that a significant correlation was not found among all business cycles and the real estate cycles. The metropolitan differences were as well observed

by Hekman (1985). Corgel and Gay (1987) suggested that there existed significant distinct peculiarities among particular metropolitan zones in economic volatility in 30 largest U.S areas. Subsequently, because the property market is related to the microeconomic movements, it is possible to describe each factor effect found in the research in the following ways (Pyhrr et al., 1999):

Metropolitan and Sectoral Supply and Demand. Pritchett (1984), while studying New York, did find different sectors to be in different cycle stages. The residential and retail activity was most of the time falling between the most volatile office and the least volatile industrial sectors. Hekman (1985) differentiated cities into large and small, inner, and outer. While running separate regressions, the author discovered that GNP growth had different effects on particular cities depending on their size, meaning that metropolitan area had a dominant effect on the real estate cycle. If data was aggregated and regression line was calculated, a correlation might have existed with national economic data, but to make investment decisions solely based on this was inaccurate, because the correlation coefficient was dominated by the larger cities, and the weights of smaller cities were neglected. It was noted that in larger cities, the rent increased faster than in the smaller cities (Pyhrr et al., 1999).

A strong argument for microeconomic factor was presented by Corgel and Gay (1987), in which a principal component analysis was divided by 30 different regions, and their cumulative correlation coefficient was calculated. It was shown that only 17% of the regions had positive correlations, meaning that many local real estate markets had their own cycles that emerged because of the local market conditions. Therefore, the authors strongly advised to diversify. Corcoran (1987), similarly to Corgel and Gay (1987), implied the dangers of looking at the economy only from one perspective and claimed that both concepts at micro and macro levels do influence the real estate cycles. Witten (1987) argued that every metropolitan area had its own real estate cycle, which was unique in characteristics, like length (time) and degree of change (magnitude), and were dependent on the internal dynamics of each market rather business cycles. Furthermore, Voith and Crone (1988) reasoned that geographical location had robust implications for the real estate cycles. The variance in the suburban areas was 21% higher than in the CBD. During the whole sample period, the mean vacancy deviation among the states were from 0.5% to 5.9%, again showing that a huge dichotomy existed between aggregate cycles and micro-metropolitan areas, while in some extreme cases, the vacancy graphs had different trend directions. The natural vacancy rate was upward sloping for thirteen cities, almost constant for two, and negative for two, even though this period included two recessions, i.e., one in the 1980s and the other in 1982 (Pyhrr et al., 1999). A summary of microeconomic factors is displayed in Table 5.

Likewise, Grenadier (1995) as well found the mismatch between the supply and demand that resulted in long periods of typical high vacancy rates, which later were followed by irregular low vacancy rates. The author identified two phenomena that occurred under the combination of demand uncertainty, construction lag, and adjustment costs. Firstly, a very hesitant behavior of owners emerged to adjust occupancy and rent levels, even in the face of large shifts, and secondly, the developers seemed to overbuild even in the face of high vacancy rates.

Table 5. Microeconomic factors that influence the property cycles

Authors	Microeconomic Research Findings
Cairncross (1934)	Number of housing and tenant income, population changes.
Newman (1935)	Vacancy and population. Business cycles are independent from the property cycles.
Fleming (1966)	Abundance of available funds influences property cycles.
Barras, Ferguson (1985)	Construction lags, public expenditure caused property cycles.
Barras, Ferguson (1987b)	Construction lags were major causes of economic cycles.
Barras (1994)	Cycles operate on the basis of demand and supply in the money economy and property market.
Barras (2005)	Fluctuations are created by endogenous variables around equilibrium. Depreciation rate, construction lag, and demand elasticity, all contributes to the market volatility.
Barras (2009)	Construction lag and other endogenous variables influence market volatility. Speculation is the major contributor.
Jansen et al. (1994)	Local cycles and national cycles differ.
Grenadier (1995)	Macroeconomic movements do not match local market movements.
Corgel, Gay (1987)	30 largest US areas have different cycles.
Pritchett (1984)	Different real estate market sectors have different cycle positions.
Hekman (1985)	Metropolitan areas had a dominant effect on the real estate cycles.
Witten (1987)	Metropolitan areas have their own cycles.
Voith, Crone (1988)	Geographical location has strong impact on the real estate cycles.
Grenadier (1995)	Planning strategy has a large impact on the property cycles.
Grenadier (1995)	Mismatch between supply and demand produces cycles.
Downs (1993)	Micro causes lead to the expansion of the real estate cycles.
Chinloy (1992)	Under-forecasting of builders creates a shortage and effects cycles.
Pollakowski et al. (1992)	Local area is a huge contributing factor to the real estate market growth.
Mueller, Laposa (1994)	Cyclical differences between markets were confirmed.
Gordon, Mosbaugh, Canter (1996)	Vacancies vary between metro areas considerably.
Lee, Devaney (2007)	Geographical locations give different returns.
Laposa, Mueller (2017)	Found macroeconomic data is unreliable to forecast.
Glaeser, Gyourko (2007)	City specific factors influence the housing prices.
Rapach, Strauss (2007)	Heterogeneity among districts significantly influences the housing market prices.
Pfeffer (2009)	Before the crash, the vacancy peak positions significantly differed among the cities and sectors.

The findings as well suggested that this abnormal behavior was not a result of leasing agreements or a lack of information, but it was an optimal long-term planning strategy in an environment of demand uncertainty. Equally, Downs (1993) argued that ultimate variations in equilibrium vacancy rates happened because of supply and demand conditions. He pointed to the micro-level causes, stating that

some real estate markets contained higher numbers of rapidly growing firms or experienced a rapid population growth, which in turn changed the vacancy rates (Pyhrr et al., 1999).

Furthermore, in a theoretical model, Chinloy (1992) claimed that if builders inaccurately under-forecast development rate, the unexpected excess returns often will trigger construction; thus, the biggest trigger for apartment market rent rates was the vacancy rate cycle. Even more, Pollakowski, Wachter, and Lynford (1992) analyzed 21 metropolitan areas and confirmed the importance of microanalysis. The authors reasoned that the market outcomes varied by the city size, and some areas, e.g., Manhattan, were outliers in the sector performance. The differences come down to the employment by FIRE, where larger cities usually dominated. Analogously, Mueller and Laposa (1994), after analyzing 52 office space markets, acknowledged inherent cyclical risks in these markets and additionally confirmed that there were cyclic differences between these markets. Moreover, after investigating semi-annual data from 1978 to 1995 for 31 metropolitan areas, Gordon et al. (1996) indicated that the average vacancy rates varied considerably between the cities. In 17 years, the average vacancy in the city of Washington, D.C. was 9.9%, while Atlanta had 16.8%. Lee and Devaney (2007) provided even stronger evidence that different sectoral and geographical locations can have different timings. It was concluded after using the return data from different real estate sectors and different geographical locations in the UK region that in the chosen time periods, different places in the UK with different sectors were outperforming the previous best-performing sectors and locations. The study suggested that in the periods of boom-and-bust, the real estate sectors had a leading effect; whereas, in stability periods, the regional effects dominated. Comparably, Glaeser and Gyourko (2007), using a housing model, explained that variation in city prices came primarily from city-specific factors (Pyhrr et al., 1999).

Contrary to some macroeconomic research findings previously, Laposa and Mueller (2017) had found tremendous difficulty in trying to forecast office space price from macro-economic variables; however, the authors concluded that the employment numbers in professional and business services and financial activities that happened in the previous two quarters decreased the probability of negative office returns. The latter findings could be attributed to the macro variables, but one should not forget that the employment numbers differ among geographical locations strongly. On a similar matter, Del Negro and Otrok (2005), whilst using a VAR model to predict housing prices, concluded that monetary policy shocks on housing had a small impact. Likewise, Fratantoni and Schuh (2003) by using a heterogeneous VAR model analyzed 52 states in the US and concluded that separate regions had significantly different reactions to monetary policy. Rapach and Strauss (2007) found some macro variables that gave better forecasting results and discovered a significant aspect of heterogeneity among the districts as well, which heavily influenced the forecasting model results.

Another great example of how the real estate regions differ from the national cycles was displayed by Pfeffer (2009). Figure 5 depicts the peak of the real estate crisis in the second quarter of 2007 by using vacancy rates as proxies. At that exact

moment, the housing index hit its highest numbers, while property prices and mortgage numbers were growing by an hour. From a real estate market cycle perspective, most sectors should be hitting the peak in their vacancy rates; however, the reality was very different. On average, the office sector in the U.S was still in the recovery phase, and the apartment sector still did not reach the hyper-supply phase. Even worse, when investigating state cycle positions, which are depicted by numbers at the end of the state's name, it is obvious that some states were only at the recovery stages, thus giving more arguments to question the notion that macroeconomic variables are the best predictors of the real estate market cycle.

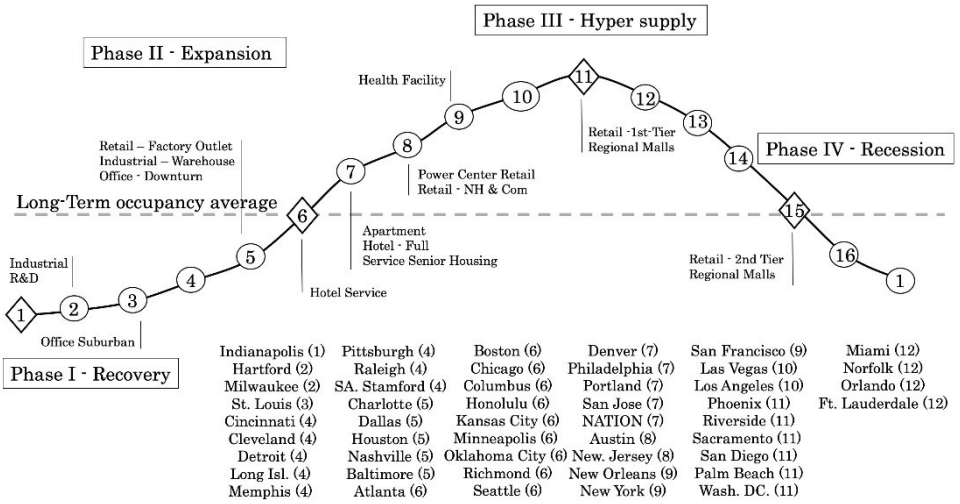


Figure 5. National property type cycle for the second quarter of 2007 by Pfeffer (2009)

Metropolitan area laws. Another factor to consider is the diverging law specifics among cities, districts, or regions. Some towns are very concerned with the environment and are not willing to eliminate trees or parks for buildings to emerge. The height of the building is as well governed by the different laws in different cities, making it harder to create taller buildings and provide more office space. The bureaucratic procedures have different time spans in particular regions, thus creating a shortage of supply and influencing the property cycles.

Information scarcity. Some cities do not have a comprehensive database of vacancy rates, thus making harder for suppliers to understand the market needs. With information shortage, suppliers can underpredict or overpredict the supply, creating shifts in the market situations.

Fraudulent activity. Two authors, Rapp (2009) and Anderson (2009), have conducted a major review of historic archives that relates to the real estate crises, and a clear pattern of disobedience in terms of the law was found. By circumventing macroprudential policies, citizens and firms alike create property cycles that later became a bubble that eventually led to the recession. The fraudulent activities can differ by states and regions strongly.

1.3. Historical overview of the real estate stability

One must know the history in order to avoid making the same mistakes again, and the authors like Anderson (2009) and Rapp (2009) have extensively overviewed prior market crashes starting from year 1800, which are depicted in Figure 6. The first prominent real estate market collapse that had registered and available data set was the Alabama crisis in Huntsville in the year of 1818. It was due to the rising cotton value that was driven by the English textile manufactures. According to Chappell (1949), the registered data showed that in Madison County in 1817, the properties were traded at $2 per acre, whilst just after one-year, the price went up to $7.40. Some even claimed to have witnessed transactions of $28 or $78 per acre. Right after the crash in 1819, the prices collapsed to $0.2 per acre. This speculative boom was highly indulged by the USA government "Land Act of 1804", which gave the federal government the ability to auction land with 25% down payment and 6% interest rates (Chappell, 1949).

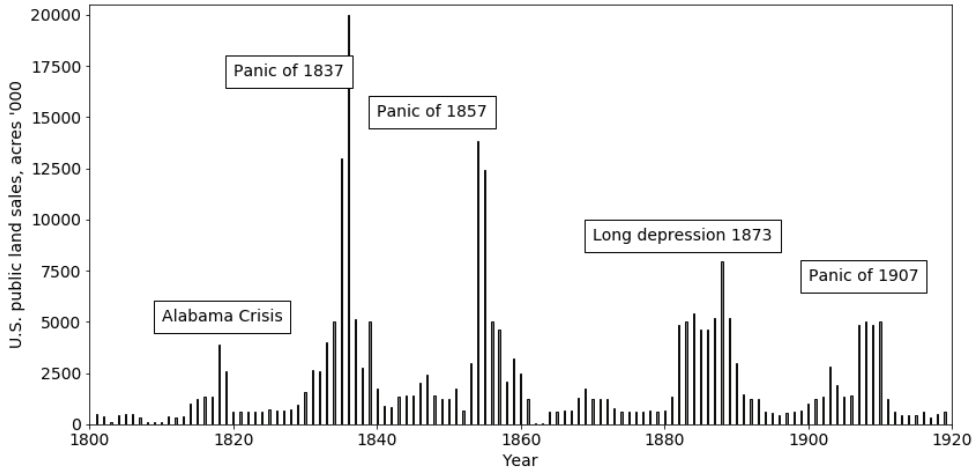


Figure 6. Historic U.S public land sales throughout 1810–1920 by Anderson (2009)

Furthermore, the panic of 1837 was the biggest crisis of the 19th century in the USA. At that time, the land speculation was on the rise, the banks were holding unsafe reserve ratios, and the easing lending conditions were widespread. President Andrew Jackson enacted a "Specie Circular" bill in 1836 that commanded to buy western land only with hard metals like silver and gold. The sole purpose of the bill was to control speculation, but unfortunately, many individuals were incapable to come up with hard coin payments, thus creating a real estate market crash. Similarly, the crisis in 1857 was caused in part due to the speculation, bank lending, and fraudulent activity. A huge mortgage owner of "Ohio Life Insurance and Trust" had suspended its payments to its customers and threatened to enact runs on the banks. By 1858, the credit to businesses had become barely accessible, leading to slowing the economy. Many citizens in Iowa and Keokuk had experienced a sharp downturn in the railroad and property bond values, which initially was bought for $1000 and

later on sold for $10, hence putting investors in the tax delinquency position (Calomiris, Schweikart, 1991; Sobel, 1999; Ross, 2003; Knodell, 2006).

The panic in 1873, which was smaller than the previous two, has been caused when the US decided to go on a pure gold standard. This, in turn, contracted the money supply and compromised the bond market along with the banking sector. Similarly, in 1907, while trying to corner the market on the stock, "United Copper Company" led to a panic and a massive withdrawal of money from the banks. In addition, according to Moen, Tallman (1990) and Piatt (1908), most of the time, the trust companies constrained their activities to holding deposits and securities or managing real estate; however, in mid of 1907, they began acting like the national banks. They issued mortgages and invested in real estate, which most national banks were barred from doing. Because of these and many other reasons, trusts began holding riskier portfolios and began to exhibit highly speculative behavior that eventually ended in a disaster (Bruner, Carr, 2007).

Table 6. Solvency of S&Ls in the 1980s, data source: FDIC (1996)

Year	No. of S&Ls	Total Assets (TA)	Net Income	Tangible capital (TC)	TC/ TA (%)	No. of insolvent S&Ls	Assets in insolvent S&Ls	FSLIC reserves
1980	3,993	604	0.8	32	5.3	43	0.4	6.5
1981	3,751	640	-4.6	25	4.0	112	28.5	6.2
1982	3,287	686	-4.1	4	0.5	415	220	6.3
1983	3,146	814	1.9	4	0.4	515	284.6	6.4
1984	3,136	976	1.0	3	0.3	695	360.2	5.6
1985	3,246	1,068	3.7	8	0.8	705	358.3	4.6
1986	3,220	1,162	0.1	14	1.2	672	343.1	-6.3
1987	3,147	1,249	-7.8	9	0.7	672	353.8	-13.7
1988	2,949	1,349	-13.4	22	1.6	508	297.3	-75.0
1989	2,878	1,252	-17.6	10	0.8	516	290.8	NA

Furthermore, one of the most vivid crashes of the real estate market of the 20th century has been attributed to the Florida bubble, which started in the 1920s. As noted by the authors Vanderblue (1927); Bordo (2003); Kindleberger, Aliber (2005); Anderson (2009) and Rapp (2009), in 1925, Florida became known as the hottest real estate exchange location that had around 25,000 marketing agents and 2,000 offices. The demand for properties multiplied overnight, with people sleeping on the floors waiting for a chance to gain high profits. Soon, the bank clearings, which were at $1,066,528,000 in 1925, fell to $142,316,000, most of them disappearing, as the majority was lost in unfulfilled project development. The biggest activities were mostly located in West Palm Beach. Donald (1986) stated that property prices were growing by $750 an hour; buyers would buy a 100-foot lot for $11,000 at three in the afternoon and after two hours, sell it for $12,500. A Palm Beach 32-acre tract, which was bought in 1916 for $75,000, was sold for one million in 1925. What is worse, after nine months, that same tract was subdivided and resold in parts for

$1,725,000. All of this was intelligently marketed, and people did not want to miss the opportunities, thus increasing speculation to its limits (Donald, 1986).

Another hit to the real estate market was the "Great Depression", which began in 1929. Researcher Hoyt (1933) discovered that land values in the city of Chicago fell by 50% between 1928 and 1933. The biggest price reduction was felt in the luxury apartments and commercial real estate. A paper by Nicholas and Scherbina (2012) constructed a high-frequency real estate quarterly index, using transaction prices in Manhattan, and concluded that because of the sudden downturn, the real estate prices did not recover till 1939; whereas, the stock market recovered in 1933. Even more dramatically, the Annual Report on the NYC Property Tax for the fiscal year 2000 claimed that the recovery only happened in the 1960s, because only then property assessments exceeded their pre-depression level. According to the data collected from the Real Estate Record and Builders' Guide, the mean prices for tenements, dwellings, lofts, and other were $75,733.53 in 1929 and reached the rock bottom and were equal to $30,307.51 in 1939. The foreclosures were regular, especially because people did not have their own home but were renting a living place.

Moving further along the timeline, in 1980s, there appeared another housing disaster as displayed in Figure 7. At that time, Savings and Loan (S&L) institutions in America were primarily delivering funding for the residential homes. According to researcher Lowry (1991), these institutions were not limited to but heavily regulated in the following ways:

- only residential housing loans were allowed, non-residential loans were forbidden, although some states like Texas had different regulations that allowed to certain threshold to participate in other real estate sectors,
- borrowing long-term for S&L were not allowed,
- one investor was not allowed to own more than 25% of the stock,
- it was required to maintain the percentage, as assets, mortgages were only issued if the client payed at least 20% of the down payment.

The sole idea was to provide stable housing loans; however, due to the fact that interest rates began upsurge, the S&L were becoming insolvent in 1980s, because the majority of mortgages were not generating enough of profit spread. As a result, in 1980, out of 5,000 operating S&L, around 1,800 lost money, and by 1982, around 4,000 were near bankruptcy (Lowry, 1991; Rapp, 2009).

It seemed that the original S&L design was flawed from the start. The reason for this is the fact the US Congress capped rates on deposits and savings in all federally insured institutions as a measure to protect thrift institutions from paying market interest rates, which they might not be able to afford. With these actions, the US Congress artificially set-in place long-term interest rates. However, when the inflation unraveled in 1978, the Treasury bills began to pay 9% rates, certainly making S&L deposit rates subpar to compete. The situation became increasingly unstable in 1979 when the FED, in effort to combat inflationary processes, constricted money supply. Therefore, the market interest rates hit record high, and the S&Ls had either to sell mortgages at a discount or handout higher interest rates than they were charging. Both options were only temporary solutions before the

upcoming demise. Shockingly, in year 1984, in total, around $360.2 billion assets were insolvent. The development of S&Ls insolvency events is displayed in Table 6 (Rapp, 2009).

A positive change occurred with the act of Garn-St. Germain in 1982. It provided extensive deregulation for the S&L in the following form:

- the majority of regulations that governed S&Ls were demolished,
- S&Ls were allowed to change their status from mutual banks to stockholders,
- loan-to-value tests were removed for making apartment and home loans,
- the asset limits were increased that the institution could invest,
- 10% of unsecured business loans were authorized,
- single stockowner was allowed to own 100% of the company, and many other deregulations were set in place.

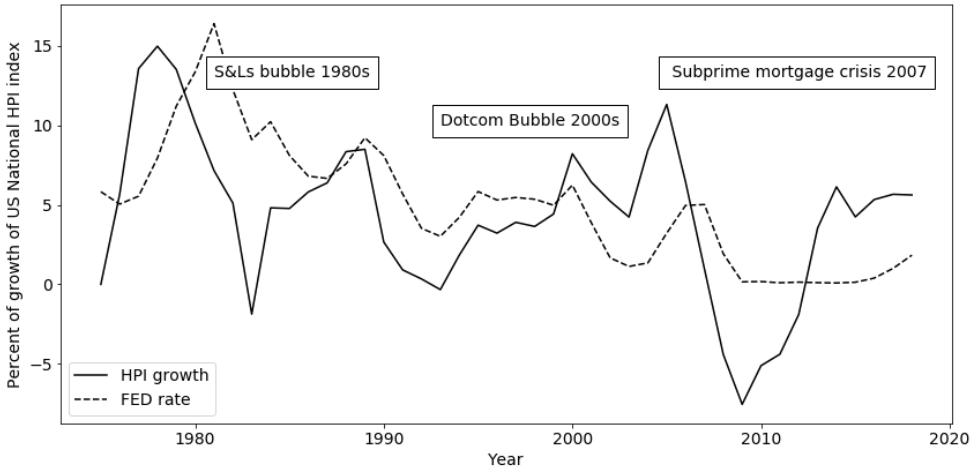


Figure 7. The US national housing index growth and FED rate in percentage during 1975–2018, created by the author, using data from FRED

According to Rapp (2009), because of president Reagan's tax cuts and deregulation, the optimism in the markets grew, stabilizing S&L for the time being. Under these new laws, S&Ls were essentially unregulated and were able to invest in a much broader spectrum than before. Although S&Ls made gains of $2.5 billion in 1983, all of it was from adding new loans, which were even riskier than the previous ones. As S&Ls were able to set any kind of rates for deposits, they offered to pay higher than the market rates to attract more money, and in 1984, more than $120 billion in net new money flowed into savings and loan institutions. By using this kind of free money-making schemes from 1980 to 1986, nearly 500 new S&Ls were launched, and by the end of 1986, around 56% of the assets of S&Ls were invested in mortgage loans, compared to 83% in 1978. The expansion led to investing in ski-resorts, farming, casinos, windmills, fast-food franchises. Consequently, this new easy money created a big financial boom, because entrepreneurs took advantage of large potential profit from owning S&L, whose charters allowed a wide variety of

activities without being regulated as commercial banks at that time (Lowry 1991; FDIC, 1996; Rapp, 2009).

As claimed by Rapp (2009), the fraudulent activity was as well rampant. The examples range from deceitful accounting to money laundering, like in companies "Lincoln Management" or "Centinnial". According to Pizzo, Fricker, and Muolo (1989), in 1984, when Keating's activities, who was the CEO of "Lincoln Management", were analyzed, the first-year investment pursuit was described as follows: $2.7 million in an oil company, $18 million were found in Saudi Bank, $5 million in junk bonds, $132 million in a takeover bid, $19.5 million in a hotel. At a first glance, this does not look like a housing loan company, and it actually was not. The chairman Ed Gray of Federal Loan Bank Board wanted to limit Keating's investment activities but encountered obstacles. Mr. Gray did not have sufficient powers to enforce regulations, and because many congressman themselves had sizable investments in S&Ls, the chairman Gray constantly met with opposition. On one occasion, the CEO of "Lincoln Management" provided $97 million to John Connally and his partner, former Texas Lieutenant Governor Ben Barnes, or in other cases, set special fundraisers for prominent figures as McCain in 1982. The aftermath cost for "Lincoln" corporation ended in $3.2 billion loss, which was bailed out by FSLIC. In 1987, it was concluded that $132 billion was needed to resolve the S&L failure (Pizzo et al., 1989; Rapp, 2009).

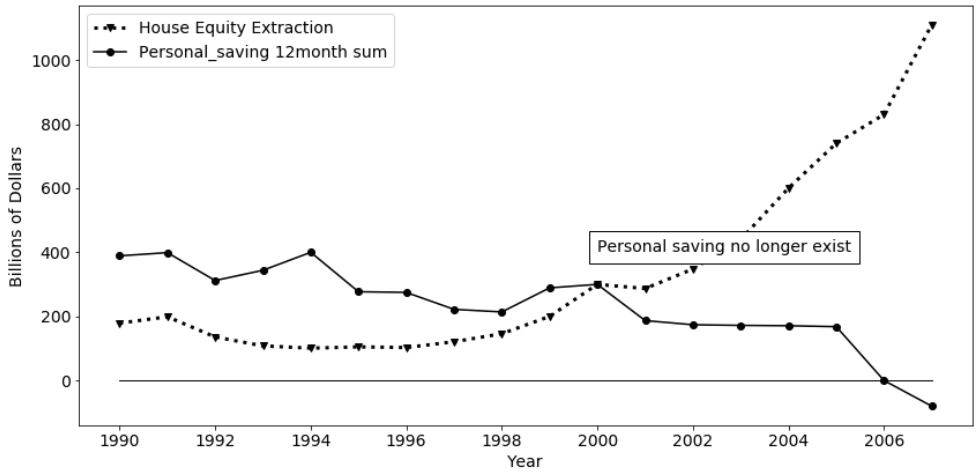


Figure 8. House equity extraction vs. personal savings by marketoracle.com (2007*)*

Finally, 2001–2007 was the biggest real estate bubble. Interestingly, although the Dotcom phenomena did increase the housing prices, its burst only made a correction in the housing market. Perhaps, one of the reasons mentioned in the Rapp (2009) book is that not many people participated in the stock market; thus, individuals that benefited the most were super wealthy individuals, which invested in housing that is more elaborate. Moreover, after the dot-com bubble burst, the FED quickly reacted by lowering the funds rates as shown in Figure 7. As a result, most people refinanced their mortgages by taking out cash from their older mortgage

terms; therefore, the leftover money was a big boost for the economy to grow further. Individuals extracted cash from their houses via these methods: selling their houses at inflated prices, refinancing their mortgages at higher levels, and obtaining line of credit. Appendix 1 depicts how these changes differed through the years. Sadly, Figure 8 shows that after the dotcom bubble, the majority households gave in to the real estate market frenzy by completely abandoning personal savings and going straight into the speculation. Because of this, many citizens bought other houses that stretched their finances to their limits. Knowing that they will not be able to meet monthly mortgage payments for too long, they positioned themselves to sell after the price appreciation of 10%. Nearly 20% of candidates were fraud applicants that lied about intending to live in a property, reason being that if a client was going to live in a place, no down payment was required. For this and many other reasons, more than one million homes were in foreclosure (Rapp, 2009).

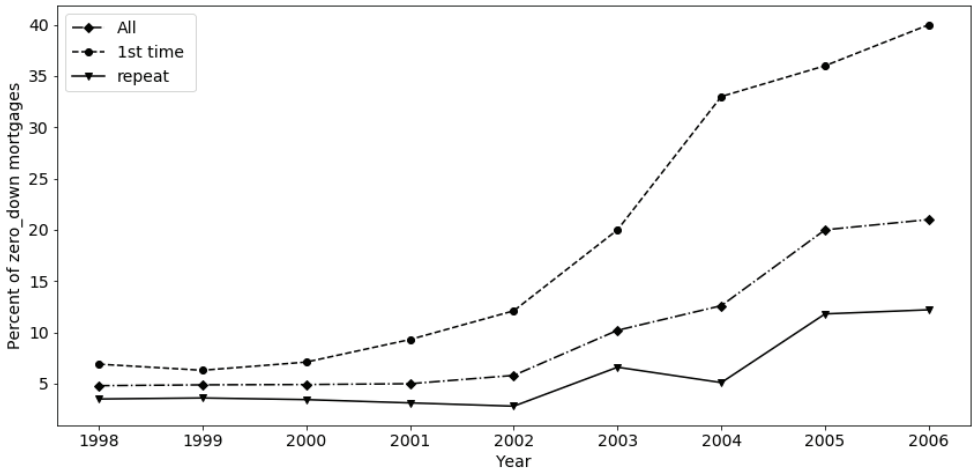


Figure 9. Percentage of zero down payment mortgages by Doctorbubble.com

Figure 9 reveals even more obscure story. Real estate mortgages became like a casino slot machines and attracted the most impulsive players to the market, because in 2006, by circumventing application laws, the clients were able to take out mortgages with zero down payment, thus making speculation to increase. On top of that, sub-prime mortgages were issued, which relied on annual 10–20% increase in the asset value. This activity started in the 1990s, when local banks, which issued the mortgages to the customers, began packing these loans and sold them to various mortgage investors. Later on, the mortgages began to be traded as securities and were generally considered safe, because they were backed by property. All of this was done complicity by rating agencies, appraisers' banks, and other parties involved. The rating agencies gave fraudulent ratings to structured investment vehicles where almost 58% of loans in these structured investment vehicles had no documentation. After the bubble burst, the economies came crashing hard. According to IMF estimates, for countries like Denmark, the Netherlands, the UK,

Australia, and the US, the ratios of mortgage debt of GDP in 2006 were 100%, 98%, 80%, 80%, 76%, respectively, leaving no easy way out of recession (Rapp, 2009).

After overviewing the USA economic history, Bordo (2003) identified 20 different real estate market crashes, and it seems that the trends keep repeating. However, the U.S. is not alone in these struggles. Another substantial bubble developed in Japan from 1970 to 1990. The country simulated the West in their railroad development, banking, and central banking systems. The prosperity escalated quickly in 1985, while Japan continued to hold banking lending rates for deposits and banks low. According to Kindleberger and Aliber (2005), when deregulation was employed in 1986, Japanese banks were racing to acquire the most assets and ultimate number of mortgages. By the year of 1989, the banks were facing 100-year three-generation mortgages. When the stock market began to show signs of instability, the mortgage owners became distressed, eventually defaulting on them; after that, the whole economy collapsed like a spiral. Other real estate market bubbles that happened for similar reasons and are worthy to mention are Scandinavian bubble in 1980–1990, Russian crisis in 1999, Chinese bubble in 2005–2009, and East Asian in 1990s (Rapp, 2009).

After an in-depth analysis of historical cases, a couple of interesting points can be made. Firstly, although not all crises start in a real estate sector, in the end, it always or partially attaches to it. The point of origin might be the stock market, like in the example of 1887 or the dotcom bubble; nonetheless, at the crashing stages of a cycle, it seems to have a spillover effect in the housing area. This might be because people tend to think of the real estate as a value storage mechanism or safe deposit box, because the real estate is a necessary commodity without which humans cannot exist or thrive. Secondly, it can be identified that the most real estate crises involved the following things: an availability of some sort of easy credit, loose monetary policy (like low interest rates), fraudulent activity (falsifying loan documents), and unmeasured confidence in something. The availability of easy money example was the 2007 housing crash when down-payment was zero; the fraudulent activity in the case when 40% of mortgage loans had counterfeit mortgage intentions or the S&L example of giving loans to insiders who misrepresented their profile; the unmeasured confidence came from people's belief in getting rich quickly, like enrolling into speculative activity in Miami in 1927 or 2007, and lastly, the loose monetary policy came from holding interest rates too low for a prolonged time. This combination has been a recipe for disaster. Therefore, any future innovation that would be proposed should tackle these four pillars: leverage safety, limited speculation, activity transparency, and availability to the public.

1.4. Understanding the REITs and their characteristics

This section of the dissertation introduces the concept of REITs, how and under what circumstances it originated, the challenges it faced historically, its legislative attributes, its current legal footing worldwide, and the potential benefits that it could bring to the market.

1.4.1. Historical timeline of REITs

The story begins with the so-called unincorporated associations (UA), which existed in England for many years and were analyzed by Cook (1923). According to Cook (1923), this entity is a derivative of corporations and partnerships. The differences between partnerships and UA in the early 19th century was that the death of a member or a transfer of shares was not a discontinuation from responsibilities, and unlike with corporations, it had no charters and was not able to be sued. At first, two types of UAs emerged, i.e., non-profits and for profits. The non-profits were voluntary organizations, clubs, building associations, and other societies. Interestingly, the members were not liable for their debts; the relationship was founded on agency rather than partnership. In a different manner, the associations for profits (that includes Massachusetts Trusts, which will be discussed later), had particular prescriptions of the procedures and the rights of the members that differed among regions like New York, Massachusetts, England (Cook, 1923). The early pre-history of REITs is summarized in Figure 10 (Jones, Moret and Storey, 1988).

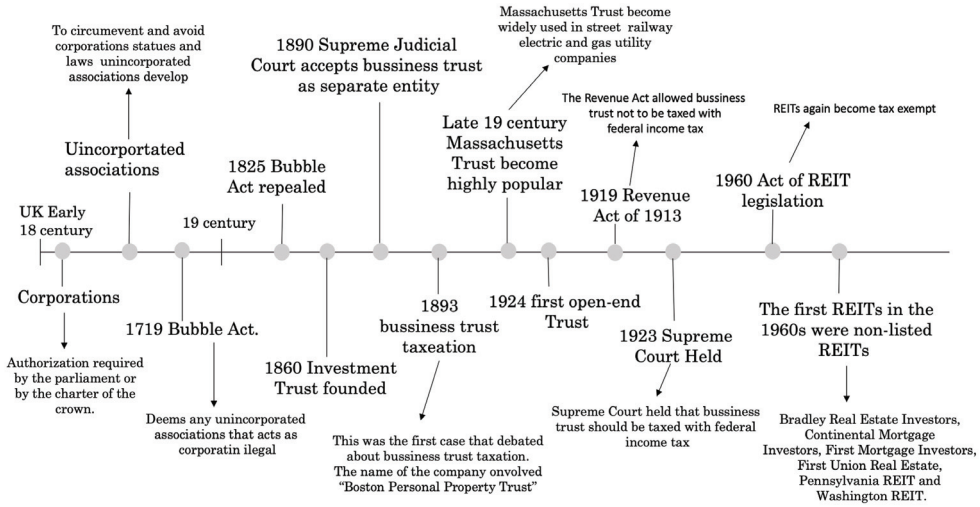


Figure 10. Timeline of REIT origin, created by the author, according to Cook (1923) and Jones et al. (1988)

As stated by Cook (1923), at first, these UAs were deemed illegal and were denounced for share transfers, which the court of England considered as circumventing of the common law. The UAs as well were involved in speculative behavior and could not be sued if not all members were available as defendants. For these reasons, in 1719, the Bubble Act declared them to be a nuisance and void. However, this act became a dead letter, as companies continued to trade and grow. Due to the growing popularity of the UA, in 1825, the Bubble Act was repealed, but the existence and legality of the UA were still in the gray area. However, a massive change occurred in 1880s, when Smith vs. Anderson won a case against prohibition, and finally, 20 or more individuals were allowed to enroll to a fund and be invested in the shares of companies by trustees. This is one of the most important turning

points as two new types of UAs emerged: partnerships and other trusteeships. The court as well held that shareholders do not enact the business investing, as this was the job of the trustee; thus, two separate grounds for deciding if an organization was eligible for trusteeship status were noted: first, investment; second, the shareholders did not control the investment (Cook, 1923).

The story in New York regarding UA did not turn into a success, and UAs in the mid-19th century did not receive any special privileges. In 1849, they were authorized to sue and be sued; by 1854, the courts had the power to dissolve them for deception; they were as well not given any corporate rights. Because of so much legislative trouble, in 1922, only 28 associations were filling their annual statements, while 18,227 corporations filled certificates of incorporation (Cook, 1923).

According to Cook (1923), the best example where the jurisprudence of UAs solved was the Massachusetts UAs, but the success materialized in 1890, ten years after the famous Smith vs. Anderson case. At first, the UAs were similarly divided into partnerships and trusteeships and were firmly established under Supreme Court of the United States of America, but if the Massachusetts Trusts were under thorough analysis, namely, in terms of control, very few of them would have passed as trusteeships. The courts were still not harmonious and illuminating on this subject matter. The Supreme Court confinement that Trusteeship was the double test where the shareholder has no control and that the business is an investment were in the gray area, because it was unknown what defined the level of control. After long and tiring legislative debacle, the net results were that the Massachusetts Trust was considered not as a trusteeship but as a partnership, and the shareholder was eligible to be taxed as a partner under the state's law. Nonetheless, the Massachusetts Trusts grew in numbers because of the following reasons: they were able to avoid the penal statues, were not required to do purposeless reports; there were no statutory liability of directors; the license fees that were imposed on foreign corporations for the privilege of doing business in the region of the states did not apply; the tax evasion schemes were eligible; the franchise taxes and capital stock prices did not apply (Cook, 1923).

As noted by Jones et al. (1988), in 1987, in total of 2,324 investment companies existed in the U.S. that taken together owned around $769.9 billion assets. During the period from 1985 to 1987, exactly 448 out of 904 new investment companies were Massachusetts Trusts, which accounted for almost 50% of all new companies, while the second most popular investment choice was a Maryland corporation at 28%. Another reason for this high popularity in trust structure was that corporations by statute were prohibited from dealing in real estate, which significantly narrowed the ability to expand their investment portfolios; thus, trust companies became widely used in street railway, electric and gas utility companies (Jones et al., 1988).

Regarding the taxation, according to Jones et al. (1988), "In one of the early Massachusetts cases regarding business trusts […] the Supreme Judicial Court held that a business trust organized to deal in real estate should be taxed as a trust rather than a partnership or corporation" (Jones et al., 1988, p. 426). A famous case in 1913 of Williams vs. Inhabitants of Milton involved a Boston Personal Property

Trust that asked to be taxed as a trust and not as a partnership. The court ruled that Boston Personal Property Trust was not a partnership, but it was a trust company, hence giving additional legal benefits. As reported by Jones et al. (1988), because of tax privileges, a considerable amount of investment companies were structured as Massachusetts business trusts; this included such companies as American Founders Trust (1925) or Trust of America (1920). In addition to trust structure, in 1924, an open-ended trust option was formed, meaning that shares could have been redeemed at the option of the holder, although most of the companies in the 1920s were close-ended. At the end of 1929, out of all 677 investment companies, only 19 were open-ended, in total holding around $140 million in assets (Jones et al., 1988).

Unfortunately, the great depression negatively influenced the firms at that time. According to Jones et al. (1988), the investment companies decreased from 728 to 560 in 1930, and the market value of investment companies dramatically dropped from $6.3 billion to $2.5 billion. However, open-ended companies managed to recover faster and grew from $75 million in 1932 to $506 million in 1936. Jones et al. (1988) attributes rise to three open-end investment companies: “Incorporated Investors”, “Trust State Street Investment Co”, and “Massachusetts Investor”. The latter company was the largest open-ended company whose assets grew from $14.5 million in 1929 to $130.3 million in 1936. Unexpectedly, 4 largest investment funds held over 60.6% of all open-end assets after 1936 (Jones et al., 1988).

As reported by Jones et al. (1988), one of the reasons why interest in trust companies existed was that many investors thought that trusts firms would not be charged with federal corporate income tax. This speculation was confirmed in 1919 by the U.S supreme court under the Revenue Act of 1913, which made business trust not liable for federal income taxes. This victory was short-lived, as by 1923, it was declared that business trust would be taxed under the same scheme as corporations. From this point forward, many legal battles ensued trying to prove that the business trust were not corporations, but the final stop was declared in 1935 when the Supreme Court announced that business trust should be taxed accordingly to corporations. Following the historical timeline, the Revenue act of 1936 laid the ground on dividend taxation, claiming that companies were allowed to deduct the number of dividends from taxable income if the company distributed 90% of its profits to the shareholders. The following Revenue codes of 1939 and 1954 enforced similar treatment.

In later years, the business trusts were recognized as an investment company in the 1940 Act, which, as claimed by Jones et al. (1988), expanded the term “company” to partnership, corporation, a trust, association, a joint-stock company, or any organized group that were incorporated or not. Soon, there followed the first study of investment companies in the Wharton Report, which stated that the demand for business trust decayed after the 1940 Act. The analysis of the Wharton Report by Jones et al. (1988) found that between 1952 and 1958, only 39 out of 156 open-end companies were trusts, and around 69% of these 39 companies were organized as Massachusetts business trusts. Wharton attributed this decline to the fact that many abroad opportunities arose outside of Massachusetts (Jones et al., 1988).

Most interesting is the year of 1960. As reported by REIT institute (2020), the President of the United States of America Eisenhower signed into the law the Real Estate Investment Trust Act (REIT Act) as an adjustment of the Cigar Excises Tax Extension in 1960. REITs were analogous to investment companies, but their scope of operations was limited to the real estate. The laws favored the passive investments for REITs, and they were freed from corporate taxes. According to Jones et al. (1988), in the next decade, a boom in the REIT growth was detected. IPOs for REITs grew from $6 of $50 million worth in assets to 804 REITs with total assets of $900 million in 1971. In the 1960s, the National Association of Real Estate Investment Funds was founded to promote REITs and make them to deal with the real estate in the preferred way. Later on, this organization was renamed to NAREIT (Jones et al., 1988; REIT institute, 2020).

One of the first REITs that were successfully launched in the 1960s were non-listed REITs with the following names: “Continental Mortgage Investors”, “Pennsylvania REIT”, “First Mortgage Investors”, “First Union Real Estate”, “Washington REIT”, “Bradley Real Estate Investors”. Just only after 5 years, a mortgage REIT in a name of “Continental Mortgages Investors” became the first REIT to be listed on the NYSE. According to Mazurczak (2011), in 1970s, the mortgage REITs were the primary sector where REITs were applied and held 3 to 1 edge over the other investors, including the equity REITs. The statistics showed that 80% of all REITs were mortgage REITs, and only 20% were equity REITs in the 1970s. In 1975, a new amendment was passed for REITs that removed the disadvantage of mortgage REITs. The original law provided by President Eisenhower stated that mortgage REITs that foreclosed property and sold it within the 2-year period could lose the REIT status, but after this elimination, the equity REITs and mortgage REITs were on an equal playing field. By the next 30 years, the ratios between equity and mortgage REITs altered as the US went through many residential and office booms. Somewhere in the mid-1980s, the ratio dramatically changed to 50–50%, and in the 1990s, this ratio was reversed to having 3 to 1 equity to mortgage REITs (Jones et al., 1988; Mazurczak, 2011; REIT institute, 2020).

Another problem that according to REIT institute REITs constantly grappled with in the 1970s was that they were forbidden to deduct their net operating losses; some companies even dissolved their REIT status in order to obtain this privilege. However, soon, in 1976, the tax reform act stated that corporations were allowed to be REITs and receive all the law attributes of REITs, and REITs were finally allowed to deduct net operating losses. Additional legislations in 1993 as well made easier accessibility of REITs to pension funds for investing. Another important legislation was the REIT simplification act in 1997 that helped REITs in the following ways: a) expanded the previously unavailable services that REITs were not allowed to perform; b) the capital gains that were retained were no longer taxes at a shareholder level, but only at the corporate level; c) the previous rule that REITs might lose status if REITs made 30% of its income from proscribed sales, otherwise called the dealers sales, was eliminated; d) 5 or fewer people were not allowed to own 50% of REIT, and many other rules were changed regarding subsidiaries, safe harbor rules, etc. (REIT institute, 2020).

Furthermore, as described by REIT institute, in 1999, there came the REIT Modernization Act. The obligatory size of taxable income to distribute fell from 95% to 90%; REITs were allowed to own REIT subsidiaries at a 100% rate; independent contractors were allowed to be hired by REITs to run health care facilities for up to six years without a lease. REIT improvement Act of 2003 allowed REITs to make certain loans and shielded timber REIT from tax transactions that were prohibited. A bigger change happened with the REIT Investment Diversification and Empowerment Act in 2007. The rules for dealer sales were relaxed; some more restructuring was done, regarding the healthcare contractors that made management more efficient. The penalties were relaxed, regarding the composition of assets, gross income, hedging income, and foreign currency gains. Lastly, the Tax Cuts and Jobs Act in 2017 provided REITs to gather more additional capital through tax cuts in income brackets, because withholding tax on foreign REIT investors declined from 35% to 21% (REIT institute, 2020).

Australia introduced LPTs, which was subsequently renamed as REITs in 2008, in order to be on par with the international terminology. The first country in Asia to accept REITs was Japan in 2001, soon becoming the largest REIT market in Asia. In a matter of months, after Japan delivered REITs in 2001, Singapore tried to launch a new REIT called "Sing Mall Property" Trust, but due to the lack of awareness, the listing was scraped. In mid of 2005, Japan already had 17 J-REITs listed on the Tokyo Stock market, and five S-REITs were on the Singapore stock exchange. Other countries like Malaysia had LPTs since 1989 and in 2005, decided to liberalize the framework for IPOs. The Philippines enacted the REIT law in 2009 and Thailand in 2005, while in Hong Kong, a large REIT called "Link" made the largest IPO in the world at $2.86 bill in 2005 (Gordon, 2008; REIT institute, 2020).

A more difficult REIT development was recorded in Europe. The first country to enable REITs was the Netherlands in 1969, and no other European country had REITs established until 1995 (except for Belgium). The reasons for why such a delay occurred are obscure; however, the researchers like Eichholtz and Kok (2007) were concerned and outlined several problems that might occur in Europe if the EU's REIT regulations will not be in place, e.g., market distortion or lack of transparency. The authors as well have mentioned that due to the lower leverage, REITs were a safer real estate market development option, and countries that did not have REITs have begun to see companies, finding their own ways to circumvent the double taxation problems. In 2003, France decided to put their own REIT equivalent called SIIC; Bulgaria joined the REIT regime in 2004; Germany, the UK, and Italy added REITs in 2007; in 2009, Finland and Spain as well became the members of REITs regime. Hungary joined in 2011, Luxemburg in 2016, Ireland in 2013, and Portugal only in 2019 (EPRA, 2019).

1.4.2. Defining modern REITs, their legal attributes, and other real estate market participants

Figure 11 shows the available legal entities in 2019 for investment vehicles that can derive income from the real estate sector. As shown in the picture, there are

4 major legal entities that derive and provide value to and from the real estate market, which are the following:

a. Private person or entity,
b. Company,
c. State-owned enterprise,
d. Government.

Obviously, it is possible to develop a real estate supply as a private person and some people do; however, as written below, the CGAR is very slow, because the person has to raise capital individually using collateral. For the latter reason, most real estate development from a private capital is done on a smaller scale, and that is why for CGAR, it was given a letter C (letter A being the most efficient way to gather capital). Government and state-owned enterprises have certainly played a role when deriving new real estate supply; most of the time, it is done at a large scale like building stadiums or bridges. In terms of how fast it can gather capital depends on taxation; thus, in a sense, the capability to gather enormous capital is strong; nonetheless, the problem is the bureaucracy that delays projects for years. For this reason, it is not an efficient way to develop real estate supply on a regular basis, although in certain large-scale projects, it might have a competitive edge.

Finally, there are company-level investment solutions. Companies can be private or listed on the stock exchange. As empirical evidence shows, the firms go for listed status to attract more capital and resolve debt issues after fast growth (Kim, Weisbach, 2005; Pagano, Panetta and Zingales, 1998). For this reason, private firms were given a letter B at raising capital and listed companies were given A.

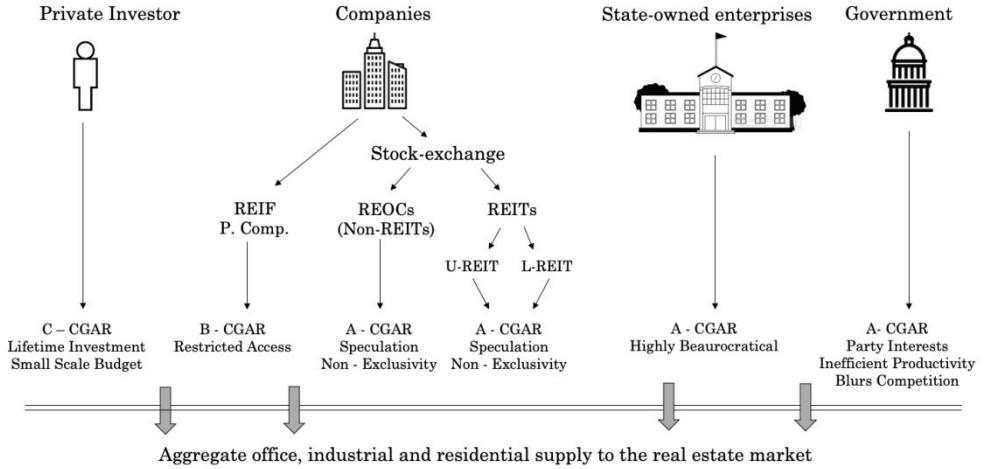


Figure 11. Legal entities of investment vehicles that derive income primarily from the real estate, created by the author (2019)

As shown in Figure 11, one listed company entity is REITs. With a short overview of the chaotic REITs history, it is **possible to define the modern REITs precisely in the following way**: it is an investment company that has its own legal entity that primarily conducts business in the real estate market and has unique

governing laws. Although the REIT laws fluctuate among countries and companies, the average formation of a REIT is displayed in Figure 12. The Trustee is usually the legal owner of the assets; whereas, a REIT is managed by a manager; however, both are obliged to put the interest of beneficiaries above theirs. All REITs are based on the separation of power between the owner (the trustee) and the management. This is done in order to protect the property from being fraudulently used or sold to the other trusts. Sometimes, REITs hire a separate company to manage their property; in that case, REITs do not have their own management team. Additionally, the REIT manager provides recommendations to the trustee in terms of what property should be acquired.

As shown in the scheme, both REITs and non-REITs are listed companies on the stock market, and they primarily derive their income from the real estate sector. The main difference between these two investment companies are as follows:

a) REITs are all about the property, while REOCs are all about the company;
b) REITs leverage is restricted in most cases, while REOCs is not;
c) REITs in many cases are not allowed to speculate, while REOCs can;
d) REITs must distribute most of its income, while REOCs can reinvest into the company without paying dividends;
e) Non-REITs are not limited in ownership concentration, and income can come from any investment combination.

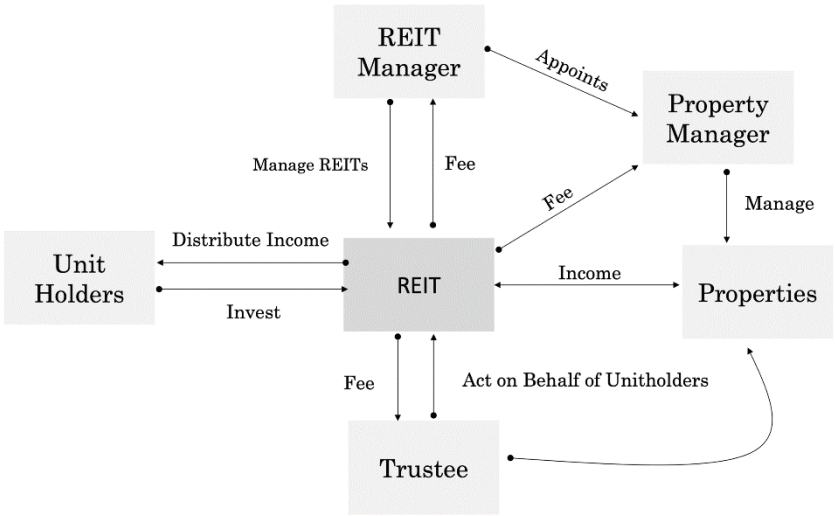


Figure 12. A typical structure of REIT, source: Market Realist

In general, REOCs are mostly limited by their own created by-laws, and they are just like any other listed stock company, except it primarily does business in the real estate sector. In retrospect, one could understand REOC as a company that does not have any REIT limitations. Moreover, non-REITs in 2019 were almost universally adopted in all EU and North American countries, since they have similar

regulations to common equity stock companies. Nevertheless, the law peculiarities exist for both REITs and non-REITs, and the laws do vary between countries.

In this dissertation, only REITs peculiarities among the countries will be reviewed, which include the following:

Belgium. REIT laws were established in 1995 but additionally changed in 2014. The 1995 legislation created the so-called SICAFI (pro memorie); whereas, the 2014 legislation created another corporate type called BE-REIT. The latter was created to expand REIT capabilities and retain attractiveness to investors to devote funds to the real estate sector. Differences exists between the BE-REIT and SICAFI. The latter is an entity that raises funds from a certain number of investors with an aim to invest in accordance with the laid-out strategy in order to serve the investors. Contrary to 2014 legislation, the BE-REIT does not have to have a plan made by investors; they are oriented more to follow a long-term value creation strategy, and it is not exclusively managed by investors, but it must as well take into account the general interest of the company and its continuation. The legislation as well provides an ability for the unlisted REIT to exist, but only for social purpose like education or care. In 2019, in Belgium, 17 REITs existed, and the overall sector market capitalization was EUR 16,324. The top five REITs in 2019 were "Warehouses De Pauw", "Cofinimmo", "Aedifica", "Befimmo (Sicafi)", "Montea". Regarding regulations, before obtaining a BE-REIT status, a company must obtain a license from the Financial Service and Markets Authority. Additionally, the company has to be registered as a Belgian public limited liability company or a Belgian limited partnership with shares. The minimum capital requirements in 2019 were EUR 1.2 million. All BE-REIT must be listed. Furthermore, only 20% of all total assets can be invested in one real estate project; development is allowed, but it cannot be sold in shorter than five-year period; BE-REIT is allowed to hold shares in subsidiaries, investing in real estate; BE-REIT is allowed to hold hedging instruments. Lastly, the loan-to-value ratio is limited to 65% of the total assets, and the interest expenses are limited to 80% of the total income.

Bulgaria. REIT laws were created in 2004. REITs in Bulgaria are as Special Purpose Investment Companies (SPICA). In 2019, 29 REIT existed on the stock-exchange with a market capital of €430M. In order to become a REIT, a license from the Financial Supervision Commission has to be granted. A company must have at least €255,646 of capital, and no more than 50 founders must exist. In terms of activity restrictions, no more than 10% of the REITs assets may be put in mortgage bonds; only 10% of the REITs assets may be put in service companies; REIT cannot invest in the real estate that has a legal dispute, and the short-term leverage cannot exceed 20% of income generating assets.

Finland. The REITs in Finland are called the Finnish REIT. They were enacted in 2010; unfortunately, no REITs existed in 2019 on the Finland stock exchange. The activity limitations are as follows: the REIT only carries the activity of renting property and certain ancillary activates, although development on own account is allowed; 80% of the total assets must be invested in the real estate; the REITs total liabilities cannot exceed 80% of the total assets; a shareholder can only

hold 10% of the company; the minimum share capital for applying to REIT status is €5M.

Table 7. Requirements to become a REIT in North America and Europe

Country	Type of REITs	LM[1]	Min. capital	Profit distribution	Capital gains	Current income
Belgium	SICAFI BE-REIT	Yes	€1.20M	80% of the net profit	Tax-ex[2]	Tax-ex
Bulgaria	SPIC	Yes	€255,000	90% of the net income	Tax-ex	Tax-ex
Finland	Finish-REIT	Yes	€5M	90% of the net income	Disposals of property permitted	Tax-ex
France	SIIC	Yes	€15M	95% of profits	Eligible capital gains are tax-ex	Eligible income is tax-ex
Germany	G-REIT	Yes	€15M	90% of the net income	All income is tax-ex	Capital gains are tax-ex
Greece	REIC	Yes	€25M	50% of its annual net profits	Tax-ex	
Hungary	REIT	Yes	HUF 5M	100%	Income from a property rental is tax-ex	Tax-ex
Ireland	REIT	Yes	€25,000	85% of the property income		
Italy	SIIQ/SIINQ	Yes	Same as for joint stock company	70% of the net profit	Tax-ex	Tax-ex
Lithuania	3 types of REITs	No	Various	Not required	Tax-ex	Tax-ex
Netherlands	FBI	No		100% of profits	Tax-ex	Tax-ex
Portugal	SIGI	Yes	€5M	90%	Tax-ex	Tax-ex
Spain	SOCIMI	Yes	€5M	80%	Tax-ex	Tax-ex
UK	UK-REIT	Yes	GBP 750,000	90%	Tax-ex	Tax-ex
The USA	US-REIT	No	None	90%	Tax-ex	Tax-ex
Canada	MFT	Yes	None	100%	Tax-ex	Tax-ex

France. REITs were enacted in 2003 and are called SIIC. In 2019, in total, 30 REITs existed on the stock exchange with a market capitalization of €51.010M. The biggest REITs were "Gecina", "Klepierre", and "Covivio". In order to become a REIT, a company must send a letter to French tax authorities in which the company states that it wants to change its regime. Joint-stock companies and partnerships limited by shares can convert themselves to become a REIT. The shareholders may

[1] Listing mandatory
[2] Tax-ex is a short hand for tax exempt

not hold more than 60% of the company's voting rights. The operating limitations include the following: ancillary activities cannot exceed 20%; the main activity must be renting property or construction with an aim to rent the property; however, REITs do not have specific leverage restrictions.

Germany. REITs were enacted in 2007 and are called G-REIT. In total, 5 companies existed on the market in 2019, aggregating to a market capitalization of €4.241M. The biggest REITs in 2019 were "Alstria Office REIT AG" and "Hamborner REIT AG". In order to become a REIT, one must register in the Commercial Register and later in the Federal Central Tax Office. A shareholder is not allowed to own more than 10% of voting rights; 75% of income must come from immovable property, and assets must consist of at least 45% of the equity value.

Greece. REITs are called REIC and were created in 1999. There were four listed REICs in Greece, with a combined market capital value of €1.528M. In order to become a REIC, one must acquire a license from the Hellenic Capital Market Commission. No shareholder requirements exist; 80% of all assets must be invested in the real estate in Greece; the developments are allowed on condition that it will not exceed 40% of REIC assets; it may not invest in a single property exceeding 25% of REIC assets, and the overall leverage cannot be bigger than 75% of the total assets.

Hungary. REITs were first enacted in 2011 and are called REITs. In order to become a REIT, a company has to be registered with the tax authority. The stock exchange listing is mandatory; as a rule, 25% of the shares have to be publicly traded; 70% of all assets have to be in a form of the real estate; the maximum amount of debt is limited to 65%, and all dividends should be distributed.

Ireland. REITs were enabled in 2013 and are called REITs. In 2019, 4 REITs existed with a combined market cap of €3.135M. The biggest REITs were "Green REIT PLC" and "Hibernia REIT PLC". In order to become a REIT, a notice must be filled for the Irish Revenue commissioners; 75% of income must come from the property rental business; any property may not exceed 40% value of the portfolio; 1 to 1.25 property income and property cost ratio must be maintained; the debt cannot exceed 50% value of the assets.

Italy. REITs were enacted in 2007, and in 2019, only 3 existed in Italy, aggregating to 966 million in market capital with the biggest company being "Igd-Immobiliare Grande Distribuzione". A single shareholder is not allowed to hold 60% of voting shares; 80% of assets must be invested in the real estate, and 80% of income should come from the real estate; whereas, the leverage is only constrained if it is mentioned in the by-laws.

Lithuania. The laws of collective investment were enacted in 2008 and 2013, and the following forms of REITs exist: REITs for nonprofessional investors, REITs for informed investors, and REITs for professional investors. Although Lithuania is included in the REIT-enabled regime, it does not have the usual REIT characteristics, and the requirements for all of three REIT types are different: REIT for nonprofessional investors is required to hold a minimum net asset value of €300,000 or €600,000, depending on how the company is set up; REIT for informed investors is required to hold a net asset of €1,000,000; whereas, the size of net assets

in REIT for professional investors are not stated by the law. The activity restriction list is very long, but some of the most important are as follows: the real estate under development cannot exceed 20% of the net asset value; no more than 40% of its net assets can be invested in a single real estate property; no more than 20% of net assets can be invested in other company securities. In 2019, 23 funds existed that followed these law provisions, but they were not listed companies.

The Netherlands. REITs have been enacted in 1969 and are called FBIs. In 2019, the two biggest REITs were "WFD UnibailRodamco" and "EuroCommercial Ppty", although only 5 REITs existed with the sum market capital of €21.514M. The following restrictions for REITs must be upheld: one single entity cannot hold more than 45% shares, and 75% of shares must be held by a combination of individuals or corporate entities; FBIs are allowed to invest abroad and hold only passive investment portfolios; 60% of the tax book value must be in the real estate.

Portugal. The REIT model was introduced in 2019 and is called SIGI. In 2019, no REITs on the stock exchange were recorded. Some of the requirements are the following: at least 25% of the shares must be split among the investors with holdings, corresponding to less than 2% of voting rights; 80% of assets must be invested in the real estate; the acquired real estate must be held for at least 3 years. The overall indebtedness cannot exceed 60% of its net asset value.

Figure 13. Countries that have REITs, according to EPRA, global REIT survey (2019), created by the author

Spain. REIT companies have been enacted in 2009 and are called SOCIMI. Spain had the largest number of REITs, aggregating to 71 with market capital sum of €22.954M. Some of the largest REITs were "MERLIN Properties SOCIMI SA", "Inmobiliaria Colonial SA", and "Lar Espana Real Estate SOCIMI SA". The following requirements existed for REIT firms: the real estate assets must make around 80% of the total company assets; 80% of revenue must be derived from the lease of qualifying assets; qualifying assets are subject to 3 year holding period, and the leverage restrictions are in place.

The UK. REITs were enacted in 2007 and are called UK-REITs; 55 of them existed in 2019 in the UK and had a sum market capital of €63.988M. The biggest

REITs were “Segro”, “Land Securities Group”, and “British Land Co”. The restrictions on activities were as follows: 75% of profits must come from rental activities; 75% of assets must be in the real estate; REIT must hold property for at least 3 years from the acquisition date; one property asset cannot exceed 40% of the total assets. In terms of leveraging restrictions, the property profits must be at least 1.25 times higher than the property financing costs.

Canada. REITs were established in 1994 and are called MFTs, which under the Canadian law, qualify as mutual fund trusts. In 2019, 46 REITs operated in Canada with a market capital sum of €53.170M. The biggest REITs were “Riocan REIT”, “Canadian Apartment Props REIT”, and “H&R REIT”. Only investing in property is allowed, and there is no limitation on leverage.

The USA. REITs act was enabled in the 1960s, and REITs are called US-REITs. In total, 192 REITs operated in the US in 2019 with a market capital sum of €1.04006 trillion. The biggest companies were as follows: “Prologis”, “Simon Property Group”, and “Public Storage”. The following restrictions exist: 75% of the company’s assets must be in real estate property; it is not allowed to own more than 10% of the other corporation's stock; 95% of income must come from the real estate, and no leverage restrictions have been made.

In 2019, REIT regimes still have not been adopted all around the world; however, 40 countries are currently subscribed to this investment vehicle as shown in Figure 13. However, the scope of this dissertation shall be limited to North America [3] (primarily the USA and Canada, although due to the abundance of REITs, only the USA will be used in the empirical analysis in the later chapters) and Europe. This is due to time constraint and personal familiarity with the market. Moreover, these two continents are highly relatable in terms of their market structure and culture; furthermore, the data is easily accessible and comparable.

The biggest and the most developed REIT market was in the USA, according to EPRA (2019). According to the data gathered from EPRA database, there were 192 active listed REITs on the USA stock market, 223 in Europe and 46 in Canada. In general, the size of the real estate market in terms of GDP was tremendous in both continents. The GDP size of North America and Europe in 2019 was valued at €19.860 billion and €16.541 billion, respectively, while the size of the commercial real estate in North America and Europe was valued at €8.537 billion and €7.265 billion, correspondingly.

In terms of the raw size of existing real estate, these two continents were very similar. Comparing the aggregate real estate value to national GDP numbers in North America, the real estate value made 43.48% and in Europe, 43.92%. The share size shows how important it is for the real estate market to be as efficient as possible, because enormous value is obtained every day from the real estate market. Moreover, the numbers in 2019 between the two continents were practically identical, drawing attention that these markets indeed have similarities; perhaps, the historical entanglements had an effect. However, the differences occur when trying to measure aggregate listed real estate size; in this respect, the USA and Canada are

[3] North America, excluding Mexico

more efficient. In 2019, in North America, the amount of listed real estate on the stock market was calculated to be at €1.229 billion, out of which €1.186 billion was listed in a form of REIT and €43 billion in non-REIT form. In Europe, the listed real estate on the stock market only aggregated to €502 billion, €288 billion in non-REIT form, and €215 billion in REIT form. Thus, concluding that REIT in North America controlled 96% of the market, while in Europe, only 42%. Although the share size of REIT is small in Europe, the majority of countries implemented REITs only in 2005, and the share size have been steadily growing. In the period of 2017–2019, in certain European countries, 32 new REITs were established, and non-REITs in the period of 2018–2019 were reduced by 5. Another progression benchmark is the FTSE EPRA NAREIT Europe developed index, which was launched in 2000. At that time, it had a market size of €80 billion; whereas, in 2018, this index size grew to €286 billion. The leading country in the number of REITs in Europe remains Spain with a total of 72 REITs.

1.4.3. Theoretical benefits of REITs to the real estate market stability

As noted in the real estate cycle and historical stability analysis sections, the identified factors of market disruptions can be merged into the following:

- availability of easy credit,
- loose monetary policy,
- fraudulent activity,
- unmeasured confidence in something.

On a theoretical setting, REITs can counter some of these market-disrupting factors as displayed in Figure 14. First, as REITs are limited by the law to a certain level of the debt ratio, regardless the credit availability, they are not allowed to accrue more leverage than it is allowed. Thus, from a theory perspective, REITs to so extent will avoid easy credit. Moreover, as credit is limited, the buildings that REITs acquire will need to be carefully chosen, thus, again, not allowing taking excessive risk that could otherwise be exploited by REOCs.

The fraudulent activity factor, which can cause major financial crises, can be limited by the fact that REITs need to comply with publicly traded transparency requirements. As companies are traded on the stock exchange, they are required to produce and make certain documents available about the company's activity that private companies are not required to provide. This higher level of transparency and being regulated by many authorities will make harder for the companies to circumvent laws and participate in a shadow real estate market.

Certainly, the loose monetary side is a challenge for a company as well as the whole market. However, the limitations of REITs by-laws give a partial advantage, as they are not allowed to speculate with property. Most investments in REITs must come in a form of long-term value investing, like being obligated to buy a property and hold it for 5 years before selling. As REITs do condition themselves for long-term horizon investing, they should be more robust to economic shocks or black swans. This as well addresses the unmeasured confidence aspect, as REITs do have limited expectations, because over-leveraging is not an option. In most cases, REITs own a passive income-based portfolio. Thus, on a theoretical level, any Eastern

European country that accepts REIT regime should experience a more balanced growth in the real estate market than compared with the REOCs, which are allowed to speculate and have no leverage restrictions.

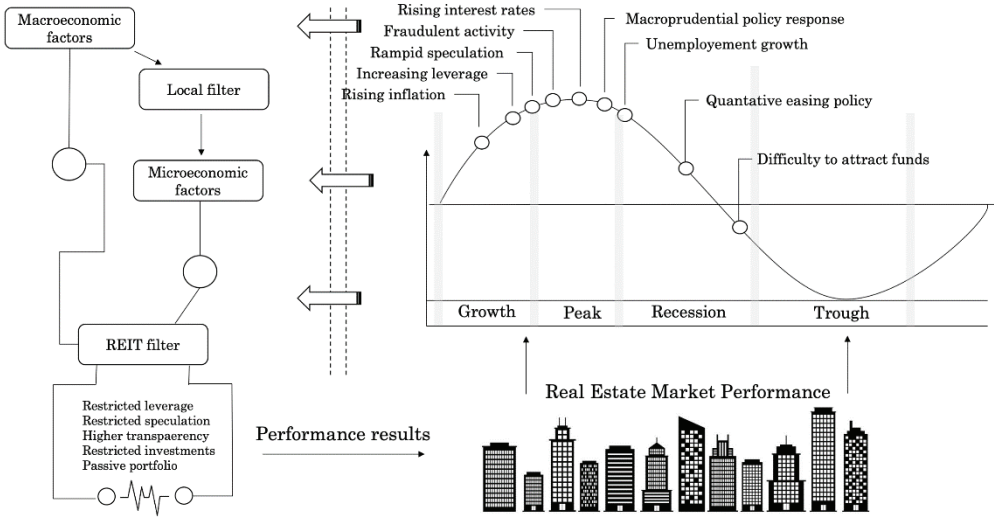


Figure 14. Theoretical interaction of REIT investment vehicle to the real estate market performance, created by the author

Additional benefits of REITs are the following: real estate is a very valuable asset in any country, because it delivers a reliable inflation hedge as well as a stable cash flow from the rental operations. However, the majority of individuals rarely can access the real estate market privately due to the large sale prices. By enabling the REIT legislation, in theory, more real estate properties might be publicly listed. This would allow pension funds, citizens, and other investors derive additional value from high earning assets that are exclusive to some investors. Although one could make an argument that investing in non-REITs is already an option; however, due to reinvesting schemes that non-REITs could use, a shareholder might not obtain rent benefits in terms of dividends if the non-REIT company decided to do that.

Furthermore, additional collective funds in REIT would allow new large-scale projects to commence, which otherwise would be impossible or would not be absorbed by REOCs. At the same time, the overall competition would increase, as REOCs would face a new rival in the real estate market. Lastly, higher transparency in the real estate market might attract new investors that can help to add additional real estate supply.

2. METHODOLOGY FOR EVALUATING REIT IMPACT ON THE REAL ESTATE MARKET STABILITY

In this section of the dissertation, the conceptual pathway for analysis is clarified, the most suitable model construction methodology is delivered, and the preferences for the models are explained. The mathematical equations are presented, and an overview of some already published research is conveyed. Lastly, at the end of this chapter, the model setup with data is provided.

2.1. Conceptual pathway of model construction

As the real estate market stability depends on the property market participant's performance and rigidity that is affected by external or internal variables, the models in this section shall be evaluating REITs and REOCs from different perspectives. The concept of this comparison comes from the fact that REITs can be viewed as either a replacement or alternative investing option to the REOCs, as both are the only available choices for investing solely into the real estate sector. By comparing the differences between these two companies, a theoretical understanding of how the real estate market stability will be altered, when REITs are introduced, will be grasped. A general concept of modelling approach for REITs and REOCs is provided in Figure 15.

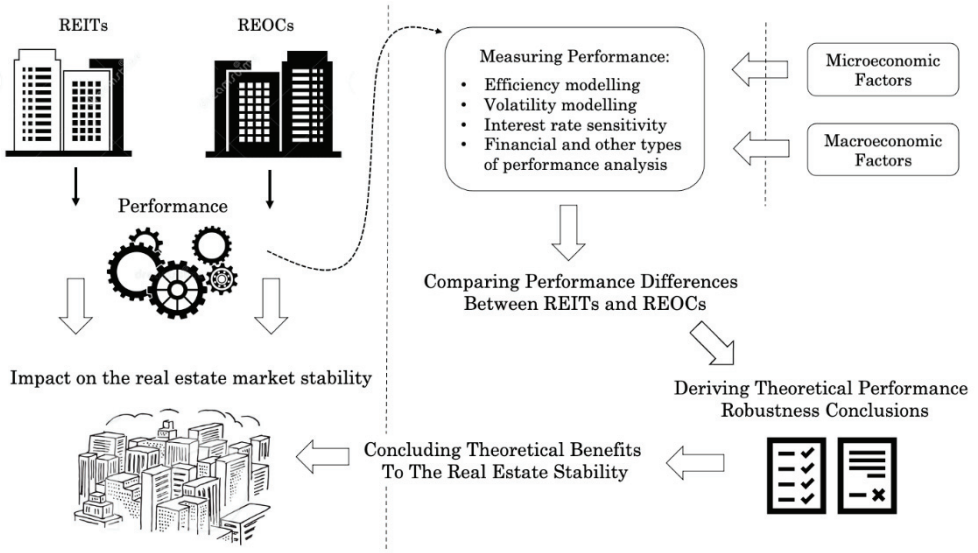


Figure 15. Theoretical framework for measuring performance differences between REITs and REOCs to derive stability alterations, created by the author

Although, there are many ways to measure the firm's performance, this dissertation will look at companies from five different perspectives: efficiency, interest rate sensitivity, inflation sensitivity, volatility modelling, financial, and other types of analysis. The decision for choosing this analysis framework perspective

comes from doing an in-depth research on the previous performance literature that has investigated solely REITs or listed the real estate companies.

The efficiency models have been numerously employed by the following authors: Bers and Springer (1997); Anderson et al. (1998); Anderson and Springer (2002); Anderson et al. (2002); Anderson et al. (2004); Miller, Clauretie, and Springer (2005); Ambrose et al. (2005); Miller and Springer (2007); Isik and Topuz (2006); Tahir et al. (2012); Ambrose et al. (2016); Beracha, Feng, and Hardin (2018); Springer, Highfield, and Shen (2019). This type of econometric modelling is important, as it delves into the microeconomic level by trying to answer if structural differences are important and how a company is managing its resources. The companies with better efficiency achieve higher scores.

The interest rate sensitivity was analyzed by Christie (1982); Chen and Tzang (1988); Mueller and Pauley (1995); Buetow and Johnson (2001); Devaney (2001); He et al. (2003); Clayton and MacKinnon (2003); Chaudhry, Maheshwari, and Webb (2004); Delcoure and Dickens (2004); Bredin et al. (2007); Brounen et al. (2016); Giliberto and Shulman (2017). The interest rate sensitivity is paramount to all entities of the real estate market; thus, the analysis of this variable gives some perspective on how REITs perform under the influence of macroeconomic shocks.

A significant number of researchers attempted volatility modelling. This includes authors like Black (1976); Devaney (2001); Cotter and Stevenson (2006); Case et al. (2012); Morri and Cristanziani (2009); Bhargava et al. (2010); Zhou (2011); Falkenbach and Niskanen (2012); Kawaguchi et al. (2012); Lee, Stevenson, and Lee (2012); Asteriou and Begiazi (2013); Liow and Schindler (2014); Agarwal and Hu (2014); Lee and Stevenson (2004); Zhou (2016); Kola and Kodongo (2017). The volatility aspect lets the economists to comprehend how risky the assets are and whether it is good for diversification purposes. Furthermore, the understanding how high shock persistency contributes to the firm's stock value helps to derive what effects it might transfer to the general stability of the real estate market.

The financial and other types of performance analysis have been touched by Redman and Manakyan (1995); Shelor and Anderson (1998); Brady and Conlin (2004); Bianco, Ghosh, and Sirmans (2007); Morri and Cristanziani (2009); Falkenbach and Niskanen (2012); Brounen and Koning (2014); Zainudin, Ibrahim, Hussain, and Had (2017); Schrand, Ascherl, and Schaefers (2018). The financial analysis of assets, leverage, management structure (like the experience of a CEO) might work in addition to the cost efficiency analysis, providing depth from a different perspective.

Unfortunately, most of these studies touched only on REITs or grouped all investment vehicles under the term 'listed real estate' without delineating REITs and REOCs. This makes impossible to know the comparative differences and make valid future decisions. Additionally, few existing studies that compared REITs to REOCs did not provide sufficient performance information, as they analyzed only US companies or focused on only one type of analysis. However, as the methods used by the previously mentioned authors were adequate to analyze the real estate investment peculiarities, this dissertation will adapt and modify the econometric

modelling experience of the previous researchers to analyze REITs and REOCs at the same time adding supplementary improvements.

Lastly, the analyses from five different perspectives on REITs and REOCs performance have been done, and a difference indicator has been generated that compares where REITs or REOCs have an edge in their abilities. Furthermore, by knowing the inner workings of both companies, this dissertation will conclude a theoretical benefit or disadvantage that can be expected after implementing REIT regime into the market.

2.2. The methodological approach to performance modelling

2.2.1. The efficiency model framework

The efficiency models have been extensively used in many sectors of the economy, starting with banks, farms, factories, and ending with the real estate. As described by Khalil et al. (2015), the efficiency can be measured with the following functions:

a) production function,
b) cost-efficiency function,
c) profit/revenue efficiency function.

These functions have their corresponding inputs and outputs, and the aim of the functions is twofold:

1) to maximize the production output with current input size,
2) or to minimize the resources that were used to achieve a certain level of output.

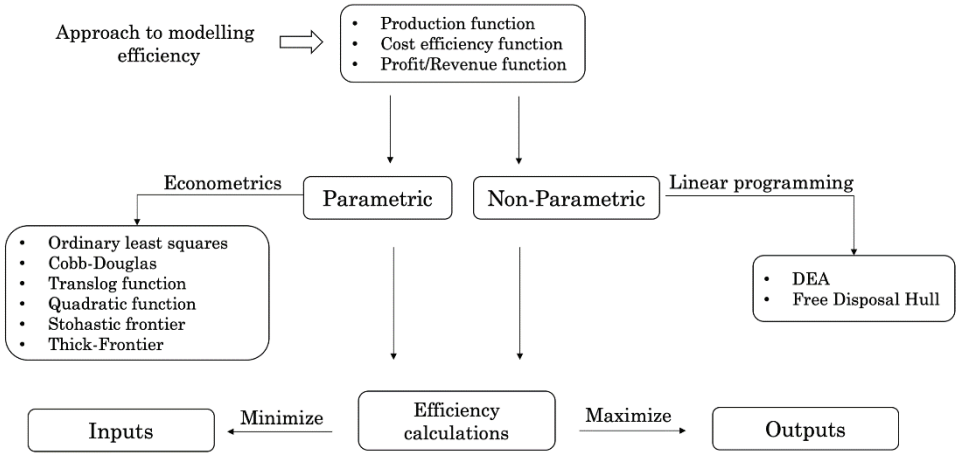


Figure 16. Mapping of efficiency modelling

The two pathways to calculate the efficiencies are parametric and non-parametric. The parametric methods involve using econometric models like Cobb-Douglas or Translog functions, while non-parametric methods use linear programming to measure the relative efficiency of decision-making units

(Henningsen, 2014). The general understanding on how efficiency models work and what types of options are available is depicted in Figure 16.

Table 8. Methods and variables used by the other authors for the efficiency analysis

Author	Method	Inputs/Outputs
Bers and Springer (1997)	Parametric	Inputs – Dividends, Total Assets. Output – Total Expenses, Interest Expense, Operating Expenses, General Administrative Expenses, and Management Fees.
Anderson and Springer (2002)	DEA	Inputs – Interest Expense, Management Expense, Operating Expenses, and General Administrative Expenses. Output – Total Assets.
Anderson et al., (2002)	DEA	Inputs – Interest Expense, Operating Expense, General and Administrative Expense, Management Fees. Output – Total Assets.
Anderson et al. (2003)	SFA-cost	Input – Interest Expense, Operating Expense, General and Administrative Expense, Management Fees. Output – Total Assets.
Anderson et al. (2004)	DEA-cost	Inputs – Resources Invested. Output – Annual Returns.
Miller et al. (2005)	SFA-cost	Inputs – Total Assets, Total Revenue, Average Interest Cost per Dollar of Debt, Average of Other Expenses per Dollar of Assets. Output – Interest Expense and the Sum of Operating Expense, General and Administrative Expense, and Management Fees.
Miller and Springer (2007)	SFA-cost	Output – Interest Expense, Operating Expense, General and Administrative Expense, Management Fees. Inputs – Total Assets, Total Revenue.
Isik and Topuz (2006)	DEA-cost	Output – Total Assets. Inputs – Property Operating Expenses, Interest Expenses.
Tahir et al. (2012)	DEA-cost	Inputs – Operating Expenses, Administrative Expenses, Management Fees, and Interest Expenses. Output – Total Assets, Total Revenue.
Ambrose et al. (2016)	DEA/SFA	Inputs – Operating and G&A Expense, Operating Rental Expense and Interest Expense. Output – Assets, Enterprise Value.
Isik and Topuz (2017).	DEA	Output – Total Assets. Inputs – Cost of Borrowed Funds, Property Operating Expenses, Total Interest Expenses Divided by Total Borrowed Funds, Property Operating Expenses to Total Income.
Springer et al. (2019)	SFA-cost	Output – Total Operating Expenses Input – Total Assets Market Capitalization.

It is a continuous debate which methods yield better results, but as pointed out by Asmare and Begashaw (2018), these methods should be considered more as a

complement to each other rather than one technique being superior. Nonetheless, the parametric methods do have an attribute to separate random noise from efficiency, but in this case, a valuable set of information might be lost. Non-parametric methods immediately impose axiomatic properties. Some authors suggested that in the case of serious measurement errors and random events, the parametric methods might be a better option. In contrast, Parman and Featherstone (2019) have noticed that non-parametric methods were more robust when dealing with data that are characterized by distributions as being half-normal. As this dissertation will use data from the Bloomberg terminal and yahoo finance and because the data is self-reported by the public companies, as required by the law, and audited by independent contractors, the measurement error issue or noise in the data are less likely to occur.

The chosen methods of previous authors are reported in Table 8. It does seem that both parametric and non-parametric methods were popular and eligible in analyzing the real estate investment trusts; however, the DEA model was a more favored choice in the analyzed studies. According to the authors Emrouznejad, Parker, and Tavares (2008), there have been identified more than 4,000 studies that used the DEA method for the analysis. As a result, for the efficiency measurement, as the data itself is reliable and self-reported by the companies and many scientists have used the DEA model confidently in their studies, this dissertation shall use the DEA model for the efficiency analysis.

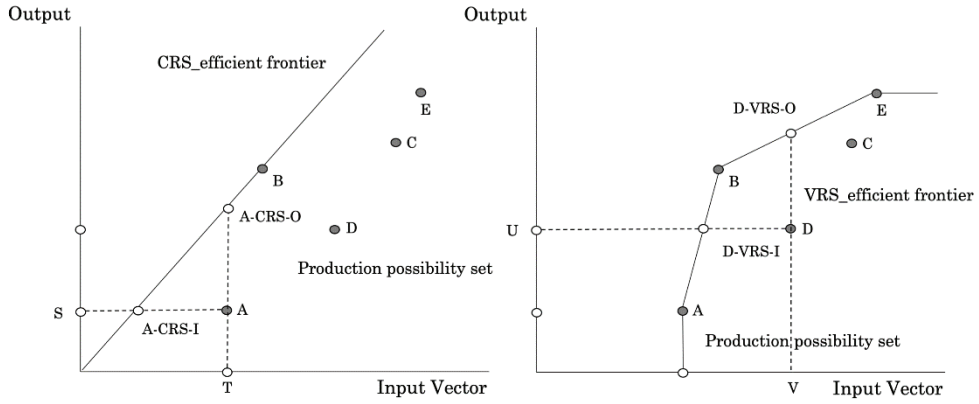


Figure 17. Left graph: CRS efficient frontier, right graph: VRS efficient frontier

The DEA method was formerly created by Charnes, Cooper, and Rhodes (1978), which by using linear programming, constructed an efficiency frontier that measured firm's relative efficiency. Each company, in this case REIT or REOC, is placed on the frontier, and the deviations from the perfect efficiency have been derived. Two different frontier models exist for the DEA:

a) Constant return to scale (CRS),
b) Variable return to scale (VRS).

The CRS model assumes constant return to the scale technology. This kind of frontier suits when all firms are operating at an optimal scale. For this to be the case, all companies must evolve in a perfectly competitive environment; however, this is a

rare situation. As shown in the left graph of Figure 17, CRS has an upward increasing frontier, and all production possibility sets are below that line. The capital letters in all the graphs stand for firms. In the VRS frontier, it is assumed that companies are not performing at an optimal scale. Usually, the firms find themselves working in the latter environment, because the government regulations and imperfect competition are more common. VRS frontier in Figure 17 has a concave function, because not all firms have the same technological tools to compete (Huguenin, 2012).

Both the CRS and VRS frontiers can have an input and output orientation that can be chosen by the researcher. In the input option, the DEA model minimizes the input level to a given level of the output to achieve efficiency. This indicates how much a company can decrease the input to achieve the same level of output. However, the output orientation maximizes the given output to the existing level of input, revealing how much a company can increase its output with the same level of input. As Coelli (1996), Coelli and Perelman (1999) noted in most cases, the orientation would have a minor impact on the efficiencies. Huguenin (2012) suggested that when choosing between input and output orientation, the authors should decide which one is more controllable for the firm. In the context of REITs and REOCs, the total asset size is probably less controllable than the administrative expenses; thus, the input approach might be a better choice. The inputs in Figure 17 are depicted as CRS-I and VRS-I, while the output as CRS-O and VRS-O.

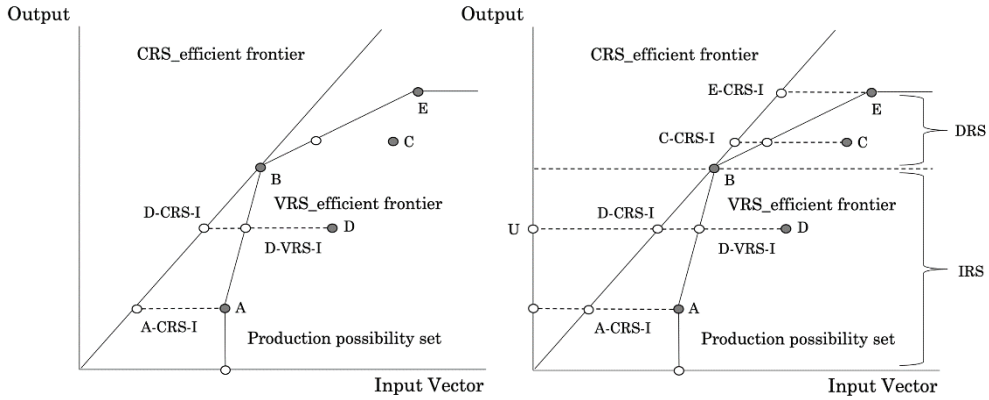


Figure 18. CRS and VRS frontiers depicted together

As CRS frontier assumes the optimal scaling and VRS gives variable scaling in technology, the combination of these two graphs can help to derive the SE. The scaling effects in Figure 18 are depicted as the difference between A, which is on the VRS frontier, and A-CRS-I. Only the company B in this context is on the VRS and CRS frontiers, meaning that the company B is at the optimal efficiency and size. Other companies like C and D are not located even on the VRS scale, suggesting that they are poorly managed and have scaling problems (Huguenin, 2012).

The efficiencies are calculated in terms of percentages, and the firm can be up to 100% efficient. The efficiency for CRS is called the CRSTE, while for VRS,

VRSTE. The formulas for company D, regarding the right-hand graph of Figure 18, are as follows:

$$TE_{CRS}= \frac{UD_{CRS\text{-}I}}{UD}, \quad TE_{VRS}= \frac{UD_{VRS\text{-}I}}{UD}, \quad SE_{CRS}= \frac{UD_{CRS\text{-}I}}{UD_{VRS\text{-}I}}. \tag{1}$$

Furthermore, the nature of return to scale is another concept that is derived from the DEA model. As shown in the right hand graph of Figure 18, the most efficient firm B creates the split point between lower and upper firms. This in turn creates two regions of DRS and IRS. The firms that are below the split line have an IRS, and if they increase their size, they can reach the B point. However, the firms C and E are too big in their size and are facing DRS. By reducing their size, the firms C and E could achieve optimal positions at point B. This concept is similar to the marginal product, which reaches the inflection point at the peak (Huguenin, 2012).

The DEA efficiency method is a mathematically demanding model, and the previously discussed figures only give a simplified understanding of the model. Comprehensive inner workings were provided by Charnes et al. (1978); Johnes (2004); Huguenin (2012); nonetheless, in order to understand the DEA model to its full extent, the formulas shall be provided. The following notation is adopted by Johnes (2004) for the technical efficiency:

$$TE_k= \frac{\sum_{r=1}^{s} u_r y_{rk}}{\sum_{i=1}^{m} v_i x_{ik}} ; \tag{2}$$

where TE_k is the technical efficiency of the firm k, using m inputs to produce s outputs; $\mathbf{y_{rk}}$ is the quantity of output r produced by the firm k; u_r is the weight of output r; x_{ik} is the quantity of input i consumed by the firm k; v_i is the weight if input i; m is the number of inputs; s is the number of outputs.

The equations differ, depending on how the technical efficiency is calculated under CRS and VRS and under the input and output direction. Under the CRS option, the formulas are converted into linear programming. For the CRS input model, the formulas take the following form:

$$\text{Maximize} \quad \sum_{r=1}^{s} u_r y_{rk}, \tag{3}$$

Subject to:

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_r y_{rj} \geq 0 \quad j=1,\ldots,n, \tag{4}$$

$$\sum_{i=1}^{m} v_i x_{ik} = 1, \tag{5}$$

$$u_r, v_i > 0 \ \forall r = 1,\ldots,s; \ i= 1,\ldots,m. \tag{6}$$

For the VRS input model, the formulas take the following form:

$$\text{Maximize} \quad \sum_{r=1}^{s} u_r y_{rk} + c_k, \tag{7}$$

Subject to:

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_r y_{rj} - c_k \geq 0 \quad j=1,\ldots,n, \tag{8}$$

$$\sum_{i=1}^{m} v_i x_{ik} = 1, \tag{9}$$

$$u_r, v_i > 0 \ \forall r = 1,\ldots,s; \ i = 1,\ldots,m. \quad (10)$$

The formulas for the output orientation differ as well, but as this dissertation will use only the input orientation and because, as mentioned by Coelli and Perelman (1996, 1999), the differences between the output and input is negligible, it is sufficient to provide only these formulas.

2.2.2. The volatility model framework

Volatility is another crucially important element when evaluating stability. In the finance world, it is understood as a measure of dispersion around the mean return of the stock. Traditionally, it is analyzed through the perspective of the variance and standard deviation with the following formulas:

$$r_t = \ln(P_t) - \ln(P_{t-1}), \quad (11)$$

$$\sigma = \sqrt{E[(X-\overline{X})^2]}, \quad (12)$$

$$corr = \frac{\sum (X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum (X-\bar{X})^2 \sqrt{(Y-\bar{Y})^2}}}; \quad (13)$$

where r_t is the return of a firm; P_t the price of the stock at time t; P_{t-1} is the price of the stock at time t-1; σ is the standard deviation, and corr is the Pearson correlation coefficient. These measures help investors to understand how risky the assets are. If both REIT and REOC stock prices do not deviate strongly from their means, it gives a general guide on how robust is the stock to the economic shocks. The standard deviation measure was used by EPRA and CEM Benchmarking Inc. and Falkenbach and Niskanen (2012), while the correlation coefficient was used extensively by Lee and Stevenson (2004); Fei, Ding, and Deng (2010); Chong et al. (2012); IPF (2012); Case (2012); BNP (2016); Beath and Flynn (2018, 2018b) to understand whether companies have strong diversification abilities.

The analyses of leverage ratios and volatility are usually conducted simultaneously. The authors Cheung and Lilian (1992); Wang and Figlewski (2000); Nelson, Kim, and Bae (2006) have discovered that higher levered beta increased companies' volatility. Thus, it is important to look at the short-term to long-term debt and debt-to-equity ratios that have the following formulas:

$$D/E = \frac{\text{Total liabilities}}{\text{Total Equity}}, \quad (14)$$

$$S/L = \frac{\text{Short-term liabilities}}{\text{Long-term liabilities}}, \quad (15)$$

$$ROE = \frac{\text{Net income}}{\text{Equity}}. \quad (16)$$

Although the standard deviation gives a general understanding on how volatile is the stock price, it does not delve into a more complex nature of how shocks affect the stock price volatility. The need for a more in-depth volatility analysis came from

the observations made by Mandelbrot (1963); Fama (1965); Baillie et al. (1996); Chou (1988); Schwert (1989). All authors reported that when large changes in asset prices occur, large movements usually follow them. Another attribute that was found is that volatility is mean reverting. As described by Engle and Patton (2001), this implies that current information has no ramifications on the long run forecast. Mathematically, it can be explained as follows:

$$\lim_{k \to \infty} \theta_{t+k|t} = 0 ; \tag{17}$$

where k is a number of periods in the future, $\theta_{t+k|t}$ is a partial derivative, which can be interpreted as forward persistence, and t is time.

For these reasons, a more advanced volatility model was developed by Engle (1982) that is called GARCH model. The researchers like Liow and Schindler (2014); Devaney (2001); Lee and Stevenson (2004); Cotter and Stevenson (2006); Zhou and Kang (2009); Liow (2013); Bhargava et al. (2010); Liu, Loudon, and Milunovich (2012); Kola and Kodongo (2017) have used the GARCH technique on REITs. The model itself has three stages:

a) The mean model,
b) Volatility process,
c) Distribution fit.

As described by Cowpertwait and Metcalfe (2009) in the mean model section, a pre-whitened residual series have to be created. This is achieved by applying the best fit model to the data, for instance, using linear regression, ARIMA, or other types of models. In this dissertation, the case of the ARIMA model has been chosen, because it is more advanced and fits the data better than a simple linear regression. The ARIMA has the following mathematical notation:

$$r_t = \sum_{i=1}^{P} a_i r_{t-i} + e_t + \sum_{i=1}^{Q} \beta_i e_{t-i}; \tag{18}$$

where r_t is the returns of a stock at time t; r_{t-i} is the lag return of the stock at time t-I; e_t is the error term; e_{t-i} is the lag of error terms at period t-I; a_i, β_i are coefficients that have derived from the ARIMA model. First, in order to be able to use ARIMA, the autocorrelation must be detected. This can be detected by using autocorrelation plots or calculating the LjungBox test, which has the following mathematical notation:

$$Q=n(n+2)\sum_{k=1}^{h} \frac{\hat{p}_k^2}{n-k}. \tag{19}$$

The LjungBox test has the following hypothesis:

H0 – The data are i.i.d.

H1 – The data are not i.i.d.; they exhibit serial correlation.

In the case of H1 hypothesis being true (where data is autocorrelated), the ARIMA model can be applied; however, in order to decide which ARIMA model fits best, a custom algorithm will be developed to iterate through certain AR lags and MA lags in order to find the best fit. The standard for choosing a model will be chosen according to the AKAIKE criteria, and if the ARIMA model is significant,

the volatility process modelling may commence. The residuals received from the ARIMA must be squared and checked for the autocorrelation. If the autocorrelation persists, the GJR-GARCH model can be used, which has the following notation:

$$r_t = \mu + \epsilon_t, \tag{20}$$

$$\epsilon_t = \sigma_t z_t \ , \ z_t \ \text{N.I.I.D}(0.1), \tag{21}$$

$$I_{t-1} = \{y_1 x_1 \ldots..,y_{t-1} x_{t-1}\} = \{e_1,\ldots..e_{t-1}\}, \tag{22}$$

$$E\left(\epsilon_t^2 \middle| I_{t-1}\right) = \sigma_t^2, \tag{23}$$

$$\epsilon_t | I_{t-1} = \sim N(0,\sigma_t^2) \ , \tag{24}$$

$$\sigma_t^2 = \omega + \alpha\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2, \tag{25}$$

$$\sigma_t^2 = \omega + (\alpha + \gamma V_{t-1})\epsilon_{t-1}^2 + \beta\sigma_{t-1}^2, \tag{26}$$

$$V_{t-1} = \begin{cases} 0 \text{ if } r_{t-1} \geq \mu \\ 1 \text{ if } r_{t-1} \leq \mu \end{cases}; \tag{27}$$

where μ is the mean model; ϵ_t are the error terms received from the ARIMA model; σ_t^2 is the squared error term variance; z_t is a normally distributed innovation; V_{t-1} is bad/good news dummy variable, and ω, α, β are equation parameters. This particular mathematical notation describes GJR-GARCH model that was created by Engle (1982) and Glosten, Jagannathan, and Runkle (1993). The good/bad news asymmetry is a more advanced iteration of the standard GARCH model.

Lastly, if the standardized residuals retrieved from the GJR-GARCH model have no autocorrelation; then, the persistency of shocks can be obtained by viewing α, β sum. If the sum is below 1, the model is stable, and shocks impact can be interpreted. In order to satisfy GJR-GARCH assumptions, the model parameters have to have the following values: $\alpha > 0$, $\beta \geq 0$, and $\gamma + \alpha > 0$.

2.2.3. The systematic interest rate and market sensitivity model framework

In the period from 2006 to 2019, the interest rate changes have occurred regularly. These changes are considered as a macroeconomic shock or systemic risk and affect the firm's financing opportunities, especially in the real estate industry, where most acquisitions are leveraged. The economists usually view systemic risk as a risk that cannot be diversified, like inflation or interest rates; thus, the systemic risk heavily influences the company's performance. For these reasons, it is important to understand how interest rate changes affected REITs and REOCs.

The framework of measuring how the firm's returns are impacted by certain variables was developed by Sharpe (1964) and Lintner (1965) and is called the capital asset pricing model (CAPM). The latter authors claimed that the company's excess returns were a linear function of a systemic market risk. However,

approximately ten years later, the single-factor CAPM model was replaced by a two-factor model that was developed by Stone (1974). In the two-factor model, the interest rates were included as a proxy, solely because it was believed that the market risk factor cannot exclusively explain the changes in the stock returns. The economist Fama (1976) has as well noted the importance of two-factor model and argued that because interest rate changes are associated with inflationary expectations, the stock returns should have in inverse relation to the interest rates. In general, the CAPM model is valuable, because it lets to understand which firms have noticeable exposure to the interest rate changes.

Similar n-factor models to measure REITs were employed by Chen and Tzang (1988); Liang et al. (1995); Mueller and Pauley (1995); Allen et al. (2000); Devaney (2001); He et al. (2003); Clayton and MacKinnon (2003); Bredin et al. (2007); Giliberto and Shulman (2017). Their methods and proxies are depicted in Table 9. It seems that the consensus exists among the researchers for the methods and proxy usage: the regression estimation with the two-factor equation (market and interest rate) on the return of the stock has been the most common. The government bonds had been unanimously used as a proxy for the interest rate, as it moves similarly to the national interest rates. Although the market variable differed, the basic idea was to take an index that represents the biggest stock companies and the overall economy.

Table 9. Methods and proxies used by the authors for the interest rate sensitivity analysis

Author	Method	Proxies/Interest	Proxies/Market
Chen and Tzang (1988)	Regression	3-months, 6-months, 1-year, and 20-year bonds for interest	CRSP monthly returns
Liang et al. (1995)	Regression	Long-term government bonds	NYSE/ASE CRSP
Mueller and Pauley (1995)	Regression	Long, medium- and short-term government-bonds	S&P 500
Allen et al. (2000)	Regression	10-year constant maturity reasury	CRSP
He et al. (2003)	FLS	Monthly treasury bill	CRSP
Clayton and MacKinnon (2003)	Regression	Index of long-term government and corporate bonds	S&P500, Russell2000
Delcoure and Dickens (2004)	Regression	Ten-year U.S. treasury bonds	SP500
Brounen et al. (2016)	Regression	Long-term government bonds	MSCI
Giliberto and Shulman (2017)	Regression	Ten-year treasury yield	-

In accordance with the previous authors, this dissertation shall employ a multi-factor model in a following form:

$$R_{it}\text{-}RF_{t,c} = B_{iy} + B_{iy}^{mkt} * 2SLS\_R_{mkt,t,c} + B_{iy}^{int} * ortho(\Delta IRATE_{t,c}) + \mu_{ty}; \quad (28)$$

where R_{it} is the return of firm i in time t; $RF_{t,c}$ is the risk free rate in time t of country c; R_{it}-RF_t is the excess returns; B_{iy} is a constant of regression; B_{iy}^{mkt} is the yearly market Beta or firm's exposure to the market systematic risk; $R_{mkt,t,c}$- $RF_{t,c}$ is the excess return of the market portfolio; $2SLS\_R_{mkt,t,c}$ is the two stage least squares market index excess returns; B_{iy}^{int} is firm's yearly sensitivity to the interest rate changes; ortho($\Delta IRATE_{t,c}$) is the weekly orthogonalized change in the long term government bond rate in the country c; μ_t is the error term. If the beta value with regards to the interest rates is negative and significant, it means that it has an inverse effect on the firm's returns and vice versa. The negative effect suggests that a firm might be exposed to additional risk that might increase the turbulence in the stock price if the central banks decided to change the lending rates.

The chosen regression estimation type was the robust regression. This was done in order to control the outlier distortion effect that might happen due to the unexpected excess return swings or shocks. In order for the regression to be a valid candidate for calculation, at least 38 observations must be collected from the firm's returns each year, and the orthogonalization procedure must be done as well. This procedure is similar to two-stage least squares method and is used to create a proxy that is independent from the movements of the stock market portfolio. The orthogonal equation takes the following form:

$$\Delta IRATE_{t,c} = y_c + y_c^{mkt} * 2SLS\_R_{mkt,t,c} + ortho(\Delta IRATE_{t,c}) ; \quad (29)$$

where y_c is a constant; y_c^{mkt} is the sensitivity of interest change to the market excess returns; ortho($\Delta IRATE_{t,c}$) is the residual from the equation.

Furthermore, many firms' returns have had outliers, which negatively affect the multifactor analysis; thus, a winsorizing technique was used, which was first developed by Charles P. Winsor in 1946 and used as a percentile cut-off principle. The procedure of this algorithm is fairly simple; first, the percentile is determined where a rank to each number must be given from lowest to highest, and then, the following formula can identify the desired percentile cut-off limit:

$$R = \frac{P}{100} * (N + 1); \quad (30)$$

where R is the rank of a percentile, P is the desired percentile, and N is the number of observations. In this dissertation, 5% upper and lower bound winsorizing techniques were used.

Additionally, in order to improve the predicting accuracy of the market, the proxies' suggestions from Serra (2016) thesis have been employed.

$$(R_{mkt,t,d}\text{-}RF_{t,d}) = \alpha_{2sls\_mkt,\,d} + B_{2sls\_mkt,d} * (R_{mkt,t,c}\text{-}RF_{t,c}) + \varepsilon_t ; \quad (31)$$

where $d \neq c$.

$$2SLS\_R_{mkt,t,d} = \alpha_{2sls\_mkt,\,d} + B_{2sls\_mkt,d} * (R_{mkt,t,c}\text{-}RF_{t,c}); \quad (32)$$

where r_{it} is the corresponding index; β is a matrix of other indexes that best predict the corresponding index; d and c are countries, and ε_t is the error term. This is a

simple two stage least squares procedure, where other indexes have been used as an instrumental variable to predict the selected index. It captures the 'pure' market factor by eliminating any additional influences.

Table 10. Methods and proxies used by the authors for the micro analysis of the real estate companies

Author	Method	DV	Micro-VB
Allen et al. (2000)	Regression	Interest rate beta	Assets, leverage, management, specialization.
Chaudhry et al. (2004)	Regression	Idiosyncratic risk	Size (assets), leverage, performance, capital, variability of earnings.
Delcoure and Dickens (2004)	Regression	Interest rate beta	Short-term financing, long-term financing, variable financing, marketability, agency cost, business risk.
Brounen et al. (2016)	Regression	--------||--------	Occupancy, variable debt, loan-to-value, short-term-debt, maturity of the debt.

After calculating these equations, a better understanding of the firm's exposure to interest rate changes will be grasped, and the risk of the company from the market will be evaluated. If the market beta is low, it could be argued that REITs or REOCs have good diversification abilities.

Furthermore, after receiving the interest betas, the regression models were created to identify whether micro/macro firm, sector, country effects contribute to the sensitivity. The following equation was formed:

$$B_{iy}^{int} = \emptyset * X + \varepsilon; \quad (33)$$

where X_i is a vector of micro variables that might influence the beta interest rate size, and $\emptyset$ the corresponding sensitivity coefficeint.

Few authors, like Allen (2000); Clayton and MacKinnon (2003); Chaudhry et al. (2004); Delcoure and Dickens (2004); Brounen et al. (2016), have analyzed this issue, although only one compared REOCs to REITs with regards to interest beta regression (the details of the variables that were used are depicted in Table 10). Leverage and assets have been widely used in all outlined studies; other variables were more specific; however, due to the limited data availability, it is not easy to retrieve more detailed information about the company. The method for analysis in all studies was a linear regression model.

2.3. Study setup and specifications of variables

It is of highest importance to collect and adopt the most rational inputs and outputs when conducting econometric analysis. Ideally, when thinking about the production output, the model should consider the amount of created products, like shoes, chairs, or cars. In the case of this dissertation, the real estate companies create rentable square meters of industrial, office, retail, or apartment spaces. The problem arises, because the amount of space is not equal to the value it provides. It is easier

to provide more square feet of industrial space, than in the city center for restaurants. Thus, this variable would distort the overall picture of performance. As shown in Table 8, in order to circumvent this problem, the output variable of total assets was used prominently by most authors. There are many reasons why assets are a good output variable for the real estate companies, one of which, as claimed by Bers and Springer (1997), is that total assets have high co-movement with market capitalization and low variance, which in turn creates more consistent results. It is a meaningful choice, because income, which comes in terms of rent or interest from the output, i.e., total assets, depends on the manager choices (e.g. where to invest the funds, i.e., either buy new property or issue new loans). For the input side, a list of expenses was gathered. Although the data has been retrieved from the balance sheets, some notable differences among European and USA companies' accounts have been detected. The REITs in the USA give plenty of detail on types of expenses that were accrued, while the European companies had a more generalized balance sheets and profit statements. In order to compare them objectively, the following inputs have been chosen: interest expenses, depreciation, general and administrative expenses (in the formula 34, the following abbreviations will be used: Int_exp, Deprec, G_A).

After inserting the chosen inputs and outputs in the second formula, the TE model takes the following form:

$$TE_k = \frac{\sum_{r=1}^{s} u_r Assets_{rk}}{\sum_{i=1}^{m} v_i G\_A_{ik} + v_i Int_{Exp} + v_i Deprec}. \quad (34)$$

The efficiency results will be separated for REITs and REOCs, and the CRS, VRS, and SE parameters will be compared between these two investment structures. In total, 1227 listed companies have been gathered for the DEA model in the time period from 2017 to 2019.

Additionally, for comparison, some baseline descriptive statistics will be observed. As noted by Angrist and Pischke (2014), when trying to dissect the causal effect in the experiment, the two groups (treatment and control) must be created in an identical manner. By constructing two groups that are similar, one could better understand how the treatment effect truly affected the variable; otherwise, the group differences might distort the effect (in the case of this dissertation, the treatment is a REIT company). Although, it is easy to create groups when designing the experiment, in this dissertation, the observed data are much less flexible in terms of selecting similar contenders. However, it was decided to take the S_L and P_E ratios, compare the differences between REITs and REOCs, and if the differences were significant, balance them by selecting upper and lower bounds and recalculate the CRS efficiencies with the balanced set. Even though the number of observations will be reduced, some meaningful insights might be discovered. Nonetheless, the population and the unbalanced efficiency data will be discussed together, as both give insightful perspectives.

For the interest rate sensitivity model, in total, 423 companies have been gathered with their corresponding weekly returns. This in total amounts to 174,036

data points for companies' weekly returns. Additionally, the following market indexes were gathered:

1) "Belgium MSCI",
2) "France MSCI",
3) "Germany MSCI",
4) "Italy MSCI",
5) "Spain MSCI",
6) "Sweden MSCI",
7) "UK MSCI",
8) "FTSE UK",
9) "S&P USA".

The indexes amounted to around 4,176 data points. Regarding the second variable, the following bond proxies with additional 4,176 data points were chosen:

a) Belgium 10-years bond,
b) France 10-years bond,
c) Germany 10-years bond,
d) Italy 10-years bond,
e) Spain 10-years bond,
f) Sweden 10-years bond,
g) UK 10-years,
h) USA 10-years.

For the risk-free rate, the central bank's annual policy rates have been used, which signaled each country's central bank monetary stance. Everything earned above these rates were considered excess returns. Consequently, in total, 182,388 data points were analyzed only for the interest and market betas. All the data was collected for the period of 2010–2019.

In addition, for the 33-regression formula, in total, 4,010 data points have been gathered from the following sources: Bloomberg company info page, yahoo finance website, current CEO board member page, or personal company's website. With the obtained data, the following models were formed:

$$B_{iy}^{int} = \emptyset_0 + \emptyset_1 * Country_{i,} + \emptyset_2 * G_i + \emptyset_3 * F_i + \emptyset_4 * Born_i + \emptyset_5 * Sal_i, \quad (35)$$

$$B_{iy}^{interest} = \emptyset_0 + \emptyset_1 * Sector_{i,}, \quad (36)$$

$$B_{iy}^{int} = \emptyset_0 + \emptyset_1 * Sector_{i,} + \emptyset_2 * Type_i + \emptyset_3 * L\_debt_i + \emptyset_4 * Current\_liab_i ; \quad (37)$$

where G_i is a gender diversity for firm i (this variable is binary, meaning that if one female existed as an executive in the company, the variable took a value of 1 and zero if no female executives were found in the company); F_i is company's foundation date, which is a proxy for companies experience in the sector; $Born_i$ is the CEO's birth date, which works as a proxy for CEO's experience; Sal_i is the CEO's salary; $Sector_{i,}$ is the sector in which the real estate firm is in; Type is whether a firm is REIT or REOC; L_debt_i is firm's long-term debt; $Current\_liab_i$ is firm's short-term liabilities. Furthermore, the variables have had different scales; the standard scaling for the input variables have been applied as well; due to the time

constraints and data size, only the year 2019 has been analyzed. The scaling formula was the following:

$$z = \frac{x - \mu}{\sigma}. \tag{38}$$

In total, over 3,000 regression lines have been constructed for the systemic risk analysis from micro and macro perspectives.

Lastly, REIT and non-REIT indexes needed to be selected for the GJR-GARCH model. FTSE Russel provides two indexes for measuring REIT and Non-REIT performance, which are FTSE EPRA NAREIT Developed Europe REITs and Non-REITs indexes. The index stocks have weights assigned to them, and respectable companies from the real estate industry are chosen to ensure that the index would be investable and tradable. For a company to be eligible to the index inclusion, the following requirements have been declared:

a) The firm has to be a common stock listed on the eligible country stock exchange.
b) It has to be classified as 8600 in ICB super sector real estate, as 2357 in ICB super sector heavy construction, or as 3728 subsector home construction.
c) The firm has to derive 75% of EBITA from the real estate operations.
d) Additional requirements are minimum size, comprehensive company English report, minimum liquidity.

For the FTSE EPRA Nareit Developed Europe REIT, 33 companies were included from the UK, Belgium, France, and Germany and for the FTSE EPRA Nareit Developed Europe Non-REITs index, in total, 40 firms were selected from Sweden, Germany, the UK, and Switzerland. Similar countries were as well selected for the systemic risk and DEA analysis; thus, the results are relatable. Moreover, in order to check how correlated with the market index were the REITs and non-REITs, the STOC-50 index was included as well. The latter index includes Blue-chip companies of Europe and covers over 50 stocks from 17 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, and the Netherlands. The data were downloaded from the Bloomberg Terminal; however, the indexes were only available for European companies that would have both counterparts, i.e., REITs and REOCs; thus, only two indexes were analyzed. Furthermore, as data frequency is important, the daily returns of indexes were taken, because weekly or monthly periods did not contain detailed enough data. The period starts with the beginning of 2006 and finishes with the end of 2019.

3. EMPIRICAL RESEARCH OF REIT IMPACT ON THE REAL ESTATE MARKET STABILITY BY COMPARING PERFORMANCE DIFFERENCES BETWEEN REIT AND REOC

In order to grasp whether REITs should be a preferable way for the real estate market to operate, the empirical analysis must be conducted. Thus, in this chapter, the empirical models were deployed, their results collected, and the interpretation of achieved performance scores were presented according to the 2.3 section setup. A general result summary was outlined in the last paragraph, collecting the findings from all the models, hence giving an understanding of how REITs might affect the real estate market. As the only competitive counterpart for REIT is REOC, by comparing the two investment vehicles, a theoretical understanding of how the REITs introduction into the real estate market will affect stability can be obtained. As mentioned before, the macro and micro perspectives play a major role in the real estate market stability; thus, the firm's performance was measured on a micro and macro levels.

3.1. Empirical efficiency analysis of REITs and REOCs

The "DEA" efficiency analyses in this dissertation are focused on determining how well firms do on a micro level. As this method focuses on allocative efficiency between firms, this in turn can tell whether some companies manage to get better results with the same amount of resources compared to the other competitors. If so, these companies might be superior at generating economies of scales and adapting to changing market environments; whereas, others might be experiencing diseconomies. In a sense, this analysis encompasses the competitive advantage that firms hold over the others from a micro level perspective that translates to the economy and thus provides a more rigid and faster growth in the real estate market.

Table 11. Summary of statistics for input and output variables in model plus debt variables; all numbers are in natural logarithms

	Variables	Assets	L_Deb	S_Debt	G_A	Deprec	Int_Ex
2019	Mean	22,312	21,430	19,723	18,407	18,516	18,15
	SD	22,977	22,097	20,719	19,785	19,174	19,004
	Max	25,438	24,62	23,246	22,483	21,298	21,796
	Min	14,618	11,47	11,489	11,979	7,0900	3,4781
2018	Mean	22,268	21,432	19,642	18,348	18,47	18,128
	SD	22,974	22,169	20,634	19,709	19,172	18,909
	Max	25,531	24,830	23,055	22,373	21,301	21,625
	Min	13,233	12,366	11,811	9,287	7,0810	7,7832
2017	Mean	22,188	21,377	19,553	18,285	18,452	18,069
	SD	22,768	21,924	20,56	19,612	19,119	18,783
	Max	25,158	24,237	23,19	22,254	21,263	21,399
	Min	7,8954	11,041	10,95	11,60	6,984	7,638

Note. All variables are converted to natural log: L_debt – long-term debt, S_debt – short-term debt, G_A – general and administrative expenses, Deprec – depreciation, Int_exp – interest expenses.

The aggregate summary statistics for the analyzed variables are depicted in Table 11, and the density plots are portrayed in Figure 19 for both REITs and REOCs. At a first glance, some notable similarities can be seen, as both company types, in terms of asset size, S_L, P_E and D_E ratios, were approaching a normal bell curve distribution under the natural logarithm transformation, as it is depicted in Figure 19. However, significant differences between the two-types persisted. REITs, with regards to the total assets, were on average 53.7% bigger in the whole 2017–2019 period. This was mainly because in the USA, REITs held the majority of the real estate stock. Furthermore, the biggest noticeable difference was recorded while analyzing the short-term to long-term debt ratios. REITs, on average, had a S/L ratio of 0.26, while for REOCs, this ratio was very inconsistent. Some REOC had short-term liabilities that were 60 times larger than long-term liabilities; for this reason, on average, the short-term to long-term ratio was 2.1 for years 2017–2019, while at the same time having a large standard deviation. Although Falkenbach and Niskanen (2012) did not look at the same ratios, their study found that the short-term maturities to total debt ratio was larger for REOCs, which is similar to this section's findings that REOCs had more short-term debt accrued compared to the REITs.

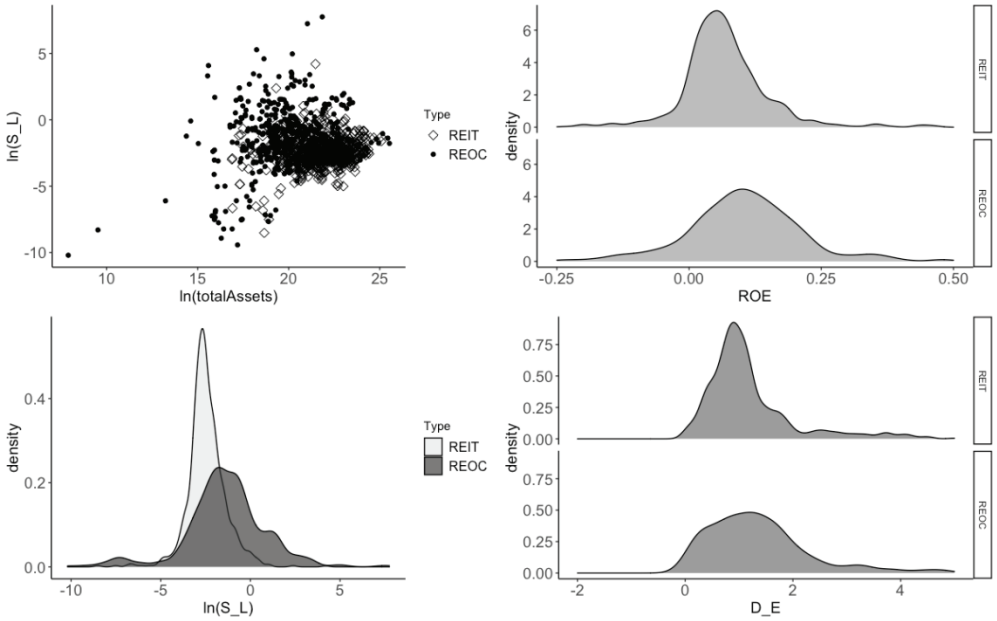


Figure 19. Density plots of debt-to-equity, short-term-to-long-term-debt, return-to-equity ratios and scatter plot of assets-to-short-term-to-long-term-debt ratios between REITs and REOCs for all years combined

It is not surprising that REOCs relied more heavily on the short-term financing and REITs on the long-term. REOCs were allowed to speculate; hence, the need of funds for short-term projects were in demand, but REITs with limited ability to invest had to focus more on the long-term projects; thus, long-term financing was a better fit. It is hard to say which debt financing options make the real estate market more robust. The findings by Jun and Jen (2003); Garcia-Teruel and Martinez-

Solano (2007) indicated that short-term loans were more common in firms with greater financial strength, had better growth options, and were more financially flexible. A study by Choe (1994) have even found that short-term debt increased firm's excess returns even after accounting for the firm's size, systemic risk, and debt-ratio, and Dang, Lee, Liu, and Zeng (2017) argued that short-term debt financing had lower future stock crash risk. Likewise, Goyal and Wang (2013) discovered that borrowers with unfavorable default risk information were more willing to take long-term financing rather than short-term. However, as noted by Della, Morellec, and Zucchi (2017), short-term debt incentivized risk taking; thus, it can make the real estate market more exposed to the economic shocks; however, if investing risk is managed carefully, the exposure to default risk for REOCs might have been smaller.

Table 12. DEA model results for REITs and REOCs

		REITs			**REOCs**		
Years	Stats.	TE_{CRS}	TE_{VRS}	SE	TE_{CRS}	TE_{VRS}	SE
2019	Mean	0.259	0.344	0.81652	0.314	0.4311	0.7672073
	SD	0.227	0.2856	0.2238963	0.2560	0.3068	0.2646242
	Max.	1	1	1	1	1	1
	Min.	0.0414	0.0438	0.18696	0.0015	0.0065	0.021949
2018	Mean	0.2269	0.308201	0.8048	0.2875844	0.3975172	0.7423
	SD	0.1815	0.2465248	0.211324	0.26164	0.3000672	0.2739529
	Max.	1	1	1	1	1	1
	Min.	0.03456	0.036260	0.2886	0.002836	0.004534	0.0064
2017	Mean	0.269	0.33094	0.8607869	0.290	0.386	0.78933
	SD	0.218	0.260	0.1882	0.267	0.30333	0.278832
	Max.	1	1	1	1	1	1
	Min.	0.021	0.0227	0.300	0.00008	0.0151361	0.00008

In accordance with the literature, the return on equity ratios was better for REOCs. On average, the ratio was about 13% bigger, for REITs, it stood at 0.065, while for REOCs, at 0.075. This does agree with the previous short-term debt research findings that companies earn bigger profits with higher short-term to long-term debt ratios. The debt to-equity was as well more favorable for REOCs. REITs had the D/E ratio of 1.37 and REOCs of 1.6.

The DEA efficiency model results are presented in Table 12 and density plots in Figure 20. These models give additional input into understanding how these two firm types compare with each other on a micro-level. In two categories, CRS and VRS, and in all years starting from 2017 to 2019, the REOCs have had a better efficiency; however, the standard deviations of efficiencies were as well larger, meaning that REOCs have had bigger variability. In 2017, 2018, and 2019, CRS efficiencies were better for REOCs by 18%, 21%, and 7% and for VRS, by 21%, 23%, and 13%, respectively. Only 8 REOC firms and 6 REITs had perfect efficiencies. This unconstrained ability for REOCs to pursue the opportunities, which otherwise were not allowed for REITs and might have affected their input-output model results.

Interestingly, the scale efficiency was better for REITs. The efficiency number of scale efficiency can be interpreted as follows: in 2018, the average REIT firm was achieving 80% optimal scale efficiency, while the residual of 20% automatically proceeded to diseconomies or economies of scale. The model discovered that in 2019, 39% of all REIT companies and 46% of all REOC companies exhibited increasing returns to scale, while concerning decreasing returns to scale, 56% of all REITs and 49% of all REOCs were experiencing diseconomies. Similar trends persisted along the years 2018 and 2017.

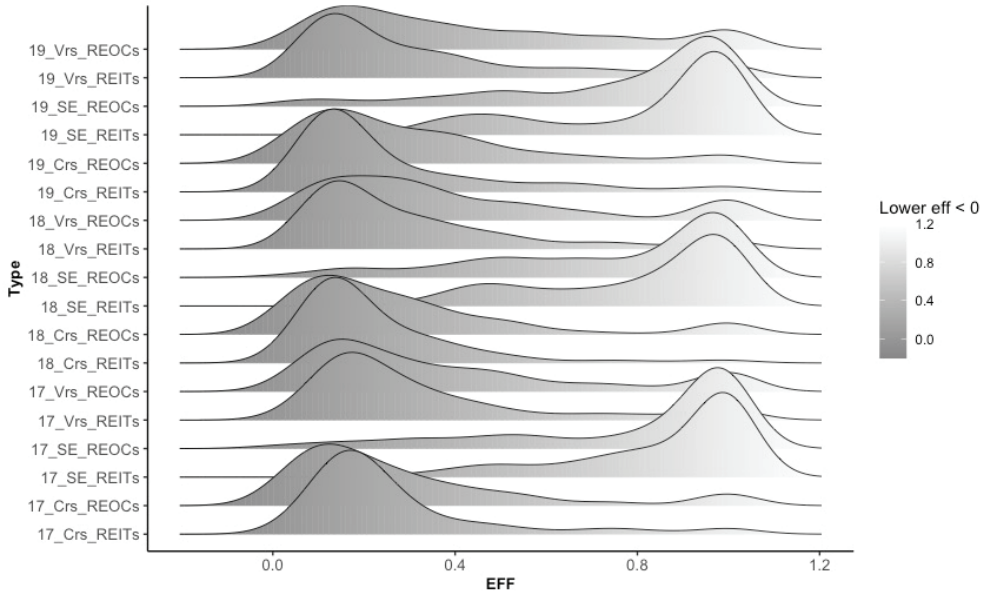


Figure 20. Density plots of DEA efficiencies for REITs and REOCs during 2017–2019

As mentioned in the study setup section, in order to compare, the baseline statistics of S_L and P_E ratios were constructed and were depicted in Table 13 along with the efficiency scores. As expected, the regression analysis in the table confirmed that there were significant differences between REITs and REOCs; thus, a balancing procedure was needed to dissect companies that were more similar. After successfully achieving a balanced dataset with regards to S_L and P_E ratios, the recalculated DEA efficiency revealed that the REOC company type was far more efficient than REIT during all three years. As the trend of efficiency remained the same, it has been decided not to recalculate other efficiency measures, because similar findings would be upheld once more.

The financial ratios and DEA model results between REITs and REOCs indicated that on a micro level, the REOCs in 2017 to 2019 managed to outcompete REITs in many areas. Following the statements made by authors Garcia-Teruel and Martinez-Solano (2007); Jun and Jen (2003); Choe (1994); Dang et al. (2017); Goyal and Wang (2013), REOCs preference for short-term financing debt signaled their financial strength, financial stability, and ability to exploit local real estate market opportunities better. This as well was shown in the ROE ratio, where REOCs

outperformed REITs. In accordance with the debt-to-equity ratios, REOCs were less overleveraged. Furthermore, DEA efficiency numbers stated that in the CRS and VRS models, REITs were less cost efficient, and only in the scale efficiency, the REOCs were lagging behind the optimal scale output. Even after baseline adjustments with regards to S_L and P_E ratios, the results remained similar.

Overall, REOCs did outperform REITs on a micro level; hence, REOCs might be a more preferable way for the real estate market to operate; however, REOCs did show higher standard deviation in many ratios; thus, some REOCs might be riskier than others, especially because higher short-term debt incentivizes to take risks.

Table 13. Treatment vs. control balancing for REITs and REOCs

		2019		2018		2017	
Unbala	S_L	-2.2980	(0.875) ***	-2.952	(1.075) ***	-0.191	(0.031)
nced	P_E	-0.1466	(0.073) **	-0.125	(0.048) ***	0.0046	(0.047)
Balanc	S_L	-0.0067	(0.007)	-0.013	(0.089)	-0.0091	(0.008)
ed	P_E	-0.0134	(0.009)	0.0015	(0.009)	-0.0146	(0.009)
Average REIT and REOC Crs efficiencies after baseline adjustment							
REIT		0.35		0.346		0.332	
REOC		0.45		0.447		0.427	
Obs.		271		224		217	

Note. REITs are considered as a treatment to a company; *p<0.1, **p<0.05

Although the achieved efficiency results cannot be objectively compared with other studies, because of different sample size, inputs/outputs, companies, years, or non-differentiation between REITs and REOCs, other authors have achieved similar results from efficiency analysis. Ambrose et al. (2016) in his DEA model have found that SE is around 77%, while the results of this dissertation indicate that SE is around 74–86%. Topuz and Isik (2006) claimed that technical efficiencies for REITs were from 11% to 55%; Anderson et al. (2002) claimed to have found efficiencies of 50% and scale efficiencies of 80%; Harris (2012) found that CRS efficiencies are around 33% and for VRS around 51%. Despite the fact that the numbers show variation, it does seem that previous studies have found that the majority of real estate companies' efficiencies are below 50%, similar to the findings in this section.

3.2. Empirical analysis of systematic risk for REITs and REOCs

This part of the analysis is oriented towards the macro level understanding of how REITs and REOCs differ and commit to some micro explanatory models that try to explain how certain macro risk can be related on a firm level. Macro level interpretation is crucial, because, as mentioned in Figure 3, it strongly influences the real estate market cycles through the changes of interest rates, monetary policy, etc. For this reason, the models in this section look at a systemic risk from a beta coefficient perspective that measures how related are the firms' excess returns movements to the market and interest rates changes. If REITs are more strongly affected by the market changes or interest rates than REOCs, this, in turn, will dictate that REITs implementation can introduce more volatility and uncertainty for countries that are in the process of accepting this regime.

Table 14 presents returns for both REITs and REOCs within the country categories in the period of 2010–2019. The average returns for REITs were slightly higher; however, the negative returns on Italy and Spain mostly influenced this difference. Without these countries, the average returns for REOCs jumped to 15.19%, almost 3% higher than REITs. The calculation of standard deviation revealed that REOCs had more than twice as much data spread than REITs, which coincide with the similar findings of the DEA model where the standard deviation for REOC was bigger as well. Even after removing the stark deviation of France, the average variability among REOCs was still higher. The summary statistics in Table 14 as well notes that REITs returns had a tendency to cluster together, even after accounting for the country factor, similar to the findings of normal distribution in the DEA section's summary tables.

Table 14. Summary statistics of REIT and REOC companies' returns

Type	Country	# Comp	Avg. Return	Std. Return	# Records	Time Period
REIT	Belgium	15	15.26%	0.22347	7,860	2010–2019
	France	19	14.77%	0.32404	9,670	2010–2019
	Germany	3	15.84%	0.19563	757	2010–2019
	Spain	6	4.61%	0.17789	1,314	2010–2019
	UK	30	11.20%	0.23244	14,243	2010–2019
	USA	180	14.02%	0.36113	76,771	2010–2019
	Avg.		12.62%	0.2524224		
REOC	Belgium	4	11.22%	0.229577	2,096	2010–2019
	France	14	15.84%	3.379547	6,812	2010–2019
	Germany	33	16.40%	0.388053	17,816	2010–2019
	Italy	6	-7.90%	0.413873	3,144	2010–2019
	Spain	5	-1.78%	0.459955	2,620	2010–2019
	Sweden	40	19.97%	0.344241	20,960	2010–2019
	UK	32	9.85%	0.348167	16,768	2010–2019
	USA	36	17.90%	0.656121	18,864	2010–2019
	Avg.		10.19%	0.777442		

In retrospect, the unlimited speculation abilities on REOCs might have contributed to higher variability among the companies, as some decided to take excessive risk with available short-term financing options. In some cases, like the USA or Germany, the risk paid off, other times, like in Spain or Italy, substantial losses had to be endured. This raises some nuances when contemplating which investment vehicle makes the real estate market more robust, leaving governments to choose between performance and variability.

Table 15 provides summary statistics for the government bond returns and average risk-free rate. The latter rate, which in this case is the central bank's policy rate, is referred by investors as the theoretical rate of return with a zero risk and is considered usually to be smaller than the bond rate. Due to the globally interconnected economies, the risk-free rates were very close to one another, with

the biggest being recorded in the USA at 0.61% and the smallest in Sweden at 0.32%. On the topic of bonds, the largest returns of bond yields were recorded in Italy and Spain, and although there were many reasons for higher yields, Italy for the past ten years have been economically struggling, and their bond ratings were downgraded to BBB in 2018 data. It is expected for countries facing higher economic turbulence to be offering larger yields to compensate for the investment risk; otherwise, the investors will choose countries that are on a path of stable economic growth.

Table 15. Summary statistics of bond and risk-free rate returns

Country	Avg. Return	Std. return	Avg. RF	Std. RF	Time Period
Belgium	1.66545504%	1.41465721	0.39%	0.0047305	2010–2019
France	1.47518345%	1.16084459	0.39%	0.0047305	2010–2019
Germany	1.01397122%	1.05979538	0.39%	0.0047305	2010–2019
Italy	3.06347662%	1.52624656	0.39%	0.0047305	2010–2019
Spain	2.81460432%	1.88961878	0.39%	0.0047305	2010–2019
Sweden	1.22601439%	1.0498103	0.32%	0.0082451	2010–2019
The UK	1.87343165%	0.93684789	0.50%	0.0012934	2010–2019
The USA	2.30064388%	0.651044	0.61%	0.0074647	2010–2019

After extensive data cleaning and preparation, more than 3,000 regression models revealed the market and interest beta coefficients, which are depicted in Table 16 and Table 17. The average market beta for REITs was recorded 23% higher than for REOCs, meaning that if the local country's market index moved by one point, the response of REITs excess returns would have been bigger than for REOCs. The majority of analyzed market beta coefficients for both investment vehicles (REIT and REOC) have been positive, meaning that an increase in market indexes boosted firms' excess returns in the same direction, although at a significantly lower rate.

Unfortunately, on average, only 53% of all analyzed REIT coefficients were reliable at identifying the correct firm's excess return response to the market changes and even less, only 36%, for REOCs. Although these coefficients are popular among financial analysts, there are certain nuances, as some might not be relatable to the company's performance. The negative coefficients for both company types were very small, meaning that rarely any company had an inverse relationship with the market indexes. This concluded that both REITs and REOCs can be used as a diversification tool for investment companies, because they were more robust to the market changes and should retain more profit when indexes are falling down. The biggest differences between REITs and REOCs within countries for market betas were found to be in Spain and the UK, otherwise, quite similar. REOC exhibited higher standard deviation than REITs by 13.9%; the biggest data spread was recorded in the US for REOCs and in Spain for REITs.

Equivalently, Table 17 presents the interest betas that were recovered from the CAPM regression models, where bond yields were orthogonalized to pure bond

effect. On a similar note, for this time period, on average, the REOCs were less sensitive to the interest changes. Most companies had a negative mean beta response, which is in accordance with theoretical literature: as interest rates grow, it becomes burdensome to acquire or develop new properties, as most new projects in the real estate sector require some form or another of bank financing. Thus, most companies experienced the negative side effect of interest rate increase for their excess returns. This negative relationship was as well confirmed by Devaney (2001). Interestingly, by comparing European REITs to European REOCs, the effect of interest rate growth has been less pronounced on REITs than REOCs by around 0.01, primarily because the USA REITs have been the most sensitive from all analyzed companies with a coefficient of -0.133.

Table 16. Market Beta coefficient values for REITs and REOCs

Type	Country	Mean beta	Std. Dev	Median	Pos and sig.	Neg and sig.
REITs	Belgium	0.257	0.229	0.217	0.4142	0.00714
	France	0.299	0.344	0.189	0.44623	0.00537
	Germany	0.217	0.3115	0.17	0.46666	0
	Spain	0.46	0.394	0.435	0.68181	0
	UK	0.5	0.399	0.453	0.55133	0.0038
	US	0.6164	0.564	0.600	0.6304	0.022297
	Avg.	0.39	0.373583	0.344	0.531771	0.097689
REOCs	Belgium	0.238	0.2221	0.188	0.3	0.025
	France	0.2050	0.438	0.066	0.3032	0.0327
	Germany	0.2623	0.378	0.170	0.38655	0.01680
	Spain	0.225	0.453	0.2885	0.4	0
	UK	0.32830	0.4003	0.23	0.3032	0.004098
	USA	0.62	0.79	0.637	0.4581	0.007968
	Sweden	0.278	0.43797	0.221	0.4	0.016666
	Avg.	0.3080857	0.4456242	0.2572142	0.3644357	0.014747

The standard deviation on average was as well higher for REOCs by 23%. It is worth mentioning that only 9% of coefficients were significant and negative for REOCs, while for the REIT, up to 20%. Astonishingly, the significance was very high for the USA REIT, i.e., up to 39.5%, meaning that the USA REITs were highly dependent on the interest changes. The number of positive coefficients was minimal for both company types: for REITs, only 3%, and for REOCs, only 6% had positive and significant coefficients. It is unreasonable to expect that with the higher cost of capital, the real estate companies will deliver higher excess returns, although some exceptions could be made, concerning the mortgage REITs that operate on interest as income.

Figure 21 shows how market and interest betas change over the time. Right from the start, the deviations are evident for both REOCs and REITs. For the market betas, REITs in 2010 exhibited a very strong reaction to the market change, which from 2010 to 2019 began to dwindle with a negative trend and change direction at

around 2018. This might have occurred because of the real estate market crash in 2007–2008 that reigned heavily on REITs, because the majority of them existed in the USA, while REOCs were more prominent in Europe. The highest mean market beta for REITs was captured in 2010 at 0.92, and the lowest in 2017 at -0.03. The trends were less visible and more ambiguous for REOCs. The highest mean market beta for REOCs was captured in 2018 at 0.54, the smallest in 2017 at 0.27. Such findings question the hedging effect of REITs against the market changes, as in some years, REITs were highly sensitive to the market movements. The investors should be aware that market betas are none robust timewise, at the time of a market crash, the real estate assets were as risky as any other assets; only in economic growth times, the real estate provided good hedge opportunities. Such findings were as well confirmed by Brounen et al. (2016) study, where in 2009, the listed real estate companies exhibited a market beta of over 1.1 and in 2007, just below 1. This again substantiate that at the time of crises, the real estate stocks become unstable, while at growth periods, they do not catch up with all the blue-chip stocks in the technology sector that are leading the path forward.

Table 17. Interest Beta coefficient values for REITs and REOCs

Type	Country	Mean beta	Std. Dev	Median	Pos and sig.	Neg and sig.
REITs	Belgium	-0.014	0.0394	-0.0127	0.00714	0.1142
	France	-0.0127	0.071	-0.006	0.02150	0.1559
	Germany	-0.014	0.020	-0.018	0	0.2
	Spain	-0.029	0.173	-0.046	0.09090	0.1818
	UK	-0.033	0.0974	-0.032	0.04562	0.1673
	USA	-0.133	0.168	-0.126	0.0195	0.3952
	Avg.	-0.0392	0.0948	-0.040116	0.03077	0.20241
REOCs	Belgium	-0.014	0.058	-0.0102	0.05	0.15
	France	-0.0138	0.096	-0.00014	0.07377	0.08196
	Germany	-0.0165	0.082	-0.0102	0.05042	0.13865
	Spain	-0.0013	0.173	-0.0562	0.08	0.04
	UK	-0.005	0.1135	-1.32e-15	0.0696	0.069672
	USA	-0.0010	0.27	-0.0056	0.07569	0.04382
	Sweden	-0.0111	0.072	-0.0052	0.03333	0.11666
	Avg.	-0.00895	0.1235	-0.012505	0.06183	0.0915374

Interestingly, the interest rate betas gave different directional trends for REITs and REOCs. For REITs, the negative impact of interest rate betas had grown larger from 2010 to 2019, while reaching the highest coefficient of -0.22 in 2018 and the smallest in 2011. For REOCs, the negative impact of interest rate growth dwindled by each year reaching a positive effect in 2018. The largest effect was recorded in 2010 at -0.0189.

Lastly, due to the recovered interest rate betas coefficients, it was possible to conduct additional micro/macro perspective analysis of what factors contribute to the achieved sensitivity from a country, sector, and firm level perspectives. The

analysis was only carried out for the year 2019, as the data was only available for that period, otherwise data needed to be hand collected, which is a time-consuming procedure. Furthermore, different scales were observed for the collected variables; thus, the data was scaled using the z method, prior fitting the regression model. The results of the micro-macro regression analysis are depicted in Table 18.

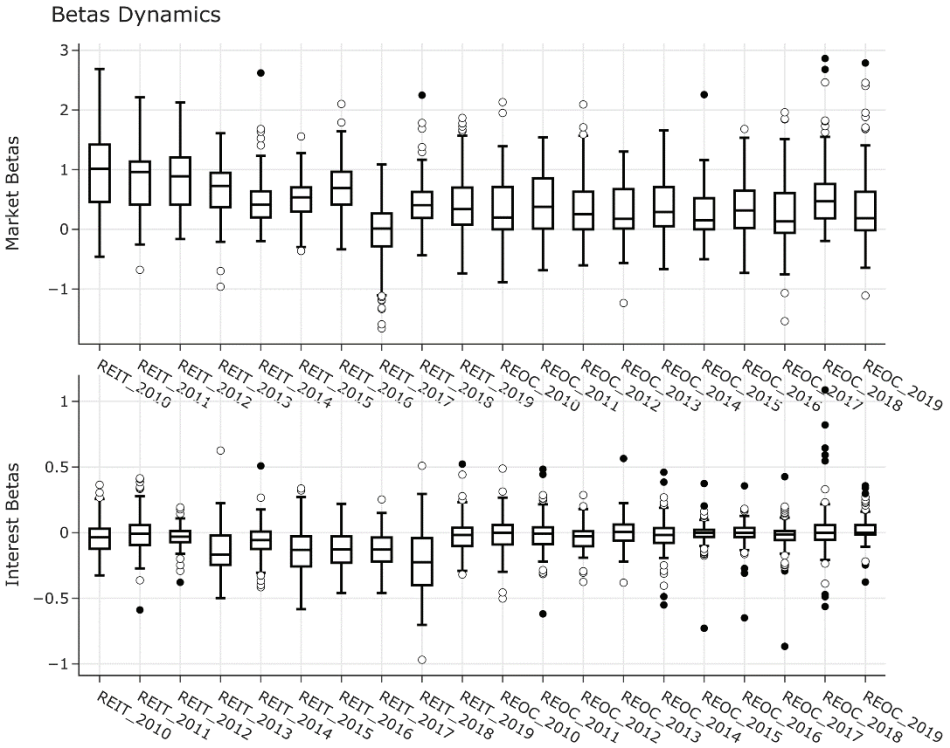


Figure 21. Time varying market and interest beta distributions for REITs and REOCs

At the first model in Table 18, countries and management variables had been adopted. The age of the CEO was a proxy for experience; the CEO salary was a proxy for the motivational aspect; the company's foundation was a proxy for the team's experience in the market; the countries gave a perspective whether sensitivity changes throughout the regions existed, and gender showed whether gender diversity in the management have impacted the firm's resilience in any way. Unfortunately, none of the coefficients were significant at the 5% level, and only one was significant at the 10% level, which was gender diversity (having both male and female at management). The latter variable made companies more robust against interest rate changes; however, as the amount of variance that was explained only amounted to 0.041, these coefficients, although significant at the p-statistic test, were unreliable in general. On a similar note, the second model that included sectors as a control in the regression model showed that the coefficients were insignificant as well. Only after including leverage and company type controls in the third model, the retail sector became significant at the 10% level and indicated that companies that operated in the retail were more robust to the interest rate changes. Moreover,

the firm's type, as expected, was highly significant, and being a REIT increased the exposure to the interest rate sensitivity. The leverage effect from the short-term and long-term was as well significant at the 5% level. Accruing more long-term debt made companies more perceptive to interest rate betas in a negative direction, and the short-term debt made firms more robust.

Table 18. Regression analysis of contributing factors to the interest beta values

Variables	**DV = interest rate Betas**					
	1		**2**		**3**	
Country:						
France	0.000419	(0.2989)				
Germany	-0.00507	(0.2912)				
Sweden	0.138299	(0.3186)				
The UK	0.265445	(0.2708)				
The USA	-0.04932	(0.2513)				
All Male	0.288947	(0.2715)				
M and F	0.49632*	(0.2728)				
Founded	0.361248	(0.7902)				
Born	-0.02748	(0.0561)				
Salary	-0.07877	(0.0560)				
Sector:						
Commercial			-0.27012	(0.5984)	-0.27017	(0.5729)
Development			-0.08741	(0.5412)	-0.17213	(0.5186)
Diversified			-0.30170	(0.4497)	-0.09056	(0.4331)
Financing			-0.20737	(1.0825)	-0.24693	(1.0363)
Healthcare			-0.78928	(0.5027)	-0.02205	(0.5037)
Hotel			0.065626	(0.4941)	0.730055	(0.4950)
Industrial			-0.56286	(0.4811)	0.083586	(0.4815)
Lodging			-0.40688	(1.0825)	-0.43581	(1.0363)
Logistics			-0.12689	(0.8268)	-0.18606	(0.7916)
Management			0.186553	(0.6250)	0.268691	(0.5989)
Mortgage			-0.52139	(1.0825)	0.040176	(1.0467)
Office			-0.45648	(0.4694)	0.227719	(0.4714)
Residential			-0.58103	(0.4708)	-0.14462	(0.4606)
Retail			0.176395	(0.4658)	0.86342*	(0.4684)
Specialty			-0.79377	(0.4995)	-0.00418	(0.5018)
Storage			-0.11720	(1.0825)	-0.15307	(1.0363)
Type_REIT					-0.601**	(0.1469)
Long_Debt					-0.295**	(0.0774)
Current liabi.					0.1723**	(0.0762)
Intercept	-0.391	(0.358)	0.3152	(0.438)	0.2589	(0.422)
N	380					
R-squared	0.041		0.077		0.161	

Note. *p<0.1, **p<0.05, the brackets depict standard deviation.

The obtained results from the regression agree with Choe (1994); Garcia-Teruel and Martinez-Solano (2007); Jun and Jen (2003); Dang et al. (2017); Goyal and Wang (2013) findings that companies with more short-term debt showed greater

financial strength. The R-squared value was highest for the third model, although still rather small, which means that the interest rate sensitivity can hardly be avoided with only management, leverage, country, or sector diversification; perhaps, some additional parameters were impacting the betas. Likewise, Brounen et al. (2016) found small r-squared value for the interest rate regression model, which was around 0.1, and as well confirmed that the higher short-term leverage ratios made firms more robust to the negative effects of the interest rate. Equally, Delcoure and Dickens (2004) obtained small r-square values with similar regression models, but they found an inverse relationship, where an increase in short-term debt negatively impacted the firm's excess returns, when interest rates were set higher. Small r squared value was found in Allen's (2000) research as well.

This section's findings indicate that REOCs, which had more short-term debt financing and were less confined by the investment regulations, have had less systemic market risk and interest rate sensitivity than REITs, although some aspects of having more standard deviation in many measures might indicate a bigger volatility for REOCs.

3.3. Empirical analysis of REITs and REOCs volatility

In this section, the GJR-GARCH models were deployed in order to understand how each company type reacted to the economic shocks. If economic shock consequences persisted for longer periods for one firm type, it can be concluded that, perhaps, certain companies were less able to cope with the emerging risk factors. Eventually, if certain type of firms is introduced into the real estate market that is more prone to the long lasting volatility consequences, this could undermine the robust growth of the real estate market.

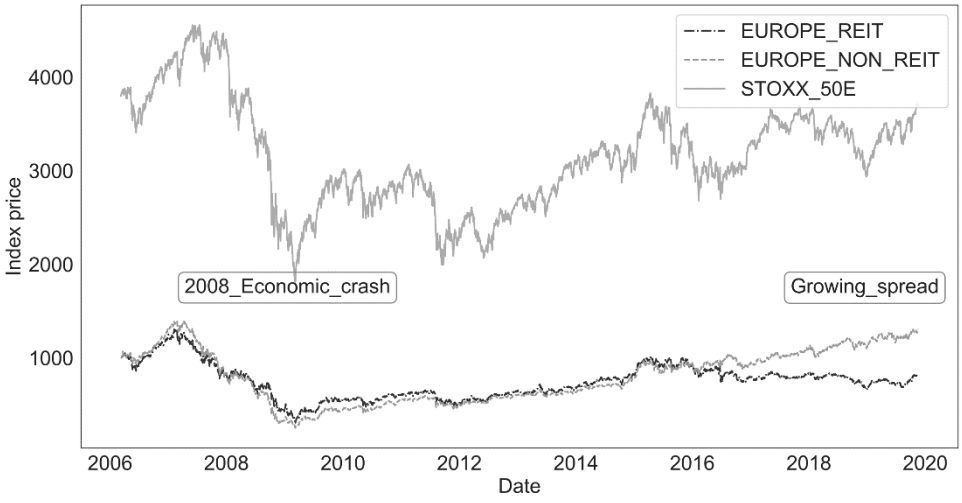


Figure 22. FTSE REIT, non-REIT, and STOXX50E indexes

In Figure 22, the selected indexes were depicted. What can be seen at a first glance by observing the figure is that there was a very close co-movement between

the REIT and non-REIT indexes. In fact, in the time period from 2006 to 2016, these two indexes were close to being identical. The peaks for REITs were reached in February of 2007 at around 1,310.3 index points, while for non-REITs, in February of 2007 at 1,395 index points, a difference of only around 85 index points. The lows of REITs occurred in March of 2009 at 306 index points, while for non-REITs, similarly, in March of 2009 at 252 index points. A quicker recovery was spotted for REITs in the period of 2009–2012 that eventually converged into being almost identical lines, starting from 2012. However, in the period after 2016, the growing spread has occurred, where the non-REITs almost managed to get back to their initial 2006 peak levels, while REITs were lagging behind.

Regarding the index parameters, the total asset size for REITs were 1.63454, and for non-REITs companies, around 2.4134 trillion; thus, the REITs in Europe were considerably smaller. The debt analysis confirmed similar findings in other sections that non-REITs were more overleveraged; the debt/assets ratio for non-REITs was at 41.43%, and for REITs, 35.9% in 2018. Throughout the analyzed time period of 2012–2018, the gap between the debt size for REITs and non-REITs were deviating between 9 and 5.5%. Additionally, the findings with short-term liabilities revealed a stronger use of short-term financing by non-REIT than REITs. The biggest size discrepancy of short-term debt usage was recorded in 2012, and more than 50% of short-term leverage was used by non-REITs, but this gap was reduced to 22% in 2018. A question might arise, whether because of regulatory requirements, the REITs can surpass the non-REITs in the amount of used short-term debt, and the data suggested that such periods existed. In 2015 and 2016, the REITs were using more short-term debt by 1.5 and 8% that disappeared in 2017.

Table 19. Descriptive statistics for REIT and non-REIT indexes during 2012–2019

	EUROPE REIT			EUROPE NON-REIT		
Stats.	Price	Returns (*100)	Volume	Price	Returns (*100)	Volume
Mean	748	0.00498	210,477,052	803	0.01489	12,225,394
Med.	754	0.02805	38,729,726	795	0.04332	20,107,699
Min.	306	-12.532	1,288,072	252	-8.6389	990,480
Max.	1,310	7.58831	478,114,208	1,395	10.6940	550,811,200
Std.	183	1.36361	237,892,442	284	1.20772	202,963,389

The return on equity was as well better for non-REITs. The last data provided for ROE by the Bloomberg terminal was in 2017, and for non-REITs, it reached 16.77, while for REITs, 6.29. Only in 2014 and 2015, the ROE of REITs managed to surpass non-REITs. In contrary, the dividend yields were considerable higher for REITs as expected, because REITs had a regulatory obligation to pay most of their profits. In 2017, the recorded dividend yield for REIT was 4.59, and for non-REITs, 2.79. Through the most of the years, the dividend yield for non-REITs deviated between 2.5% and 3.2%, while for REITs, between 5.68% and 3.3%. As noted previously by author Choe (1994), the analysis of these indexes substantiated the claim that firms with more short-term debt offered higher returns.

Furthermore, the index foundation data was 2006, and a longer time period was not possible to obtain. For this reason, the obtained data timeline for this analysis was both advantageous and had its own challenges. As many economic shocks occurred during 2006–2019, the GJR-GARCH model has had the ability to test extreme volatilities, giving a great comparison which company type was less prone to the volatilities. However, this timeline only showed REITs in a time of crisis with small periods of consistent growth from 2012. It would have been beneficial to know how REITs faired in the 2000 to 2007 period of extreme growth. Another drawback is the young age of REITs compared to non-REITs. As mentioned in the first section, in Germany, REITs were enacted only in 2008, and only 3 REITs existed in 2018, while the UK enacted REIT laws in 2007; thus, they had less time to adjust and make way in the local real estate market; the REOCs, being historically the first viable option for the stock real estate companies to exist, had the advantage of experience over REITs.

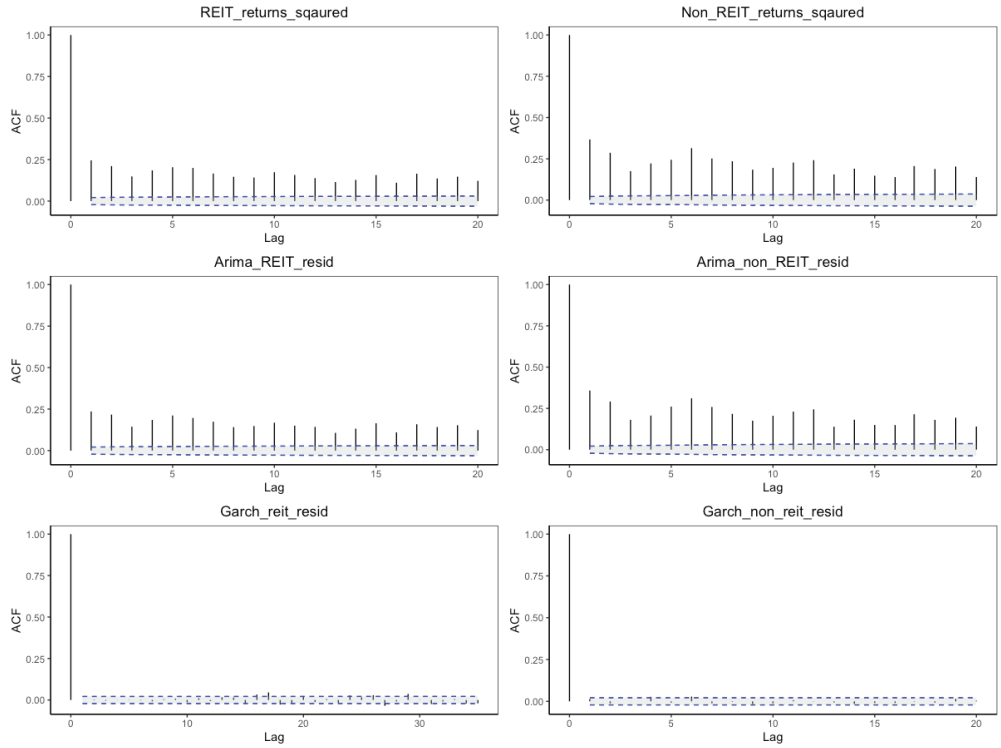


Figure 23. The autocorrelation graphs for REIT and non-REIT indexes

The descriptive statistics were depicted in Table 19. For the price column, a higher standard deviation was recorded for the REOCs index by 35.5%, but it was 11.7% higher for REIT index returns. The recorded traded volumes have been higher for REITs consistently by 41%, which means that REITs have had higher liquidity than REOCs, although the standard deviation was higher for REITs by 14.7% as well. The differences between trading volumes have started to emerge

around 2014, while up to this point, it was low for both firm types. Small spikes of trading volumes for non-REITs have happened in between 2014–2016, but eventually normalized and stayed consistent at a mean value, whereas for REITs, the average volumes had grown significantly and after 2016, consistently stayed above 53,163,453.09 trades, which was more when double the REOCs trading volume that averaged around 21,817,019.27 from 2016 to 2019.

The correlation coefficients have been calculated with regards to the European market index STOXX50E in order to investigate the claims by Lee and Stevenson (2004); Mahmood et al. (2015) that REIT type companies are great sources for portfolio diversification. The findings by the latter authors were barely applicable for the European FTSE REIT and non-REIT indexes that were analyzed in this dissertation. The correlation coefficient of REITs and STOXX50E was at 0.7, and between non-REITs and STOXX50E, around 0.66. This signaled a very strong co-movement between the indexes; thus, it hardly could be considered a good diversification strategy. The Pearson coefficient among REITs and non-REITs was at 0.84. For this reason, the investors should be careful in putting blind diversification trust in listed real estate stocks, as the numbers indicate a complex picture. Perhaps, this is because the last economic shock in 2007 was related to the real estate sector, and the consequences of the market crash and earlier debt were still felt after 2008. Although to be fair, while comparing real estate stocks with STOXX50E index, in terms of standard deviation, the STOXX50E showed a much higher volatility on a daily basis. Perhaps, from a trader's perspective, real estate listed stocks could have given the benefit of higher consistency, especially REITs that had a lesser deviation.

Eventually, the GJR-GARCH analysis has been carried out. The stationarity using Ljung-Box test was inspected to check if the data was mean reverting. As expected, the index prices needed to be differenced in order to make the data stationary; thus, the index returns were more appropriate for ARIMA-GARCH analysis. Moreover, in order to fit autoregressive models, the autocorrelation must exist; otherwise, no useful information can be extracted from the previous time periods. The autocorrelation graphs for all modelling stages were depicted in Figure 23. Fortunately, the returns for both indexes were autocorrelated; thus, the ARIMA modelling was possible to conduct. By using a custom algorithm to select which order of ARIMA model fits best according to the AIC criteria and observing the significance of p-values at the 5% level, for REITs, the best order choice was (4,0,3), and for REOCs, (3,0,2).

After obtaining the residuals for REITs and non-REITs in the ARIMA model, the autocorrelation was tested if conditional heteroscedasticity was present, and it was indeed. This allowed using the GJR-GARCH modeling technique to find out how persistent the shocks were. In order to have a better volatility comparability at this stage, it was decided to use the best GJR-GARCH orders with regards to AIC criteria, which for REITs were (1,1,1) and for Non-REITs (1,1,2), as well as to construct a model with (1,1,1) orders for non-REITs. Additionally, the GJR-GARCH model was chosen to test the news asymmetry effects. The results for the models are displayed in Table 20. All the coefficients for GJR-GRACH models have

been significant at the 5% level. A close attention was paid to alfa and beta coefficients, whose sum represents the economic shock persistency. If the sum of alfa and beta coefficients is close to one, the upcoming period will retain larger volatility effects compared to the lower sum of alfa and beta.

Table 20. ARIMA and GJR-GARCH model results for REIT and non-REIT indexes

ARIMA models			
Index	European REITs	European Non-REITs	European Non-REITs
Obs	3555	3555	-
Model	ARMA(4, 3)	ARMA(3, 2)	-
Method	MLE	MLE	-
AIC	12269.964	11408.298	-
Parameter	Coefficients	Coefficients	Coefficients
AR(1)	1.4789*** (0.239)	-0.6484*** (0.017)	-
AR(2)	-1.3529*** (0.335)	-0.9445*** (0.012)	-
AR(3)	0.5969* (0.211)	0.0757*** (0.016)	-
AR(4)	-0.0608* (0.021)		-
MA(1)	-1.4213*** (0.238)	0.7234*** (0.002)	-
MA(2)	1.2654*** (0.319)	0.9965*** (0.003)	-
MA(3)	-0.5357* (0.191)		-
GJR-GARCH models			
Distribution	Std. Student's t	Std. Student's t	Std. Student's t
Method	MLE	MLE	MLE
Model	GJR-GARCH (1,1,1)	GJR-GARCH (1,1,1)	GJR-GARCH (1,1,2)
AIC	10696.6	9769.04	9768.25
Parameter	Coefficients	Coefficients	Coefficients
Omega	0.0236*** (0.00603)	0.0257*** (0.0063)	0.0316*** (0.0071)
Alpha	0.0452*** (0.01)	0.0257*** (0.0092)	0.0314*** (0.01)
Gamma	0.1133*** (0.002)	0.1438*** (0.023)	0.1858*** (0.029)
Beta(1)	0.8864*** (0.016)	0.8847*** (0.018)	0.5152*** (0.124)
Beta(2)	-	-	0.3387*** (0.119)
Distribution	Std. Student's t	Std. Student's t	Std. Student's t

Note. *** Denotes significance levels at 0.01, ** at 0.5, * at 0.1.

What can be seen from the results is that for REIT (1,1,1,) order, alfa and beta sum was 0.9316, and for Non-REITs (1,1,1), equal to 0.9104, while for non-REIT (1,1,2) order, equal to 0.8853. Essentially, this indicated that REITs have had a larger volatility persistency from 2 to 5%, or in other words, a poorer recovery from an economic shock to REIT index returns was recorded. The gamma coefficients were significant as well for all models. This coefficient, as claimed by Ali and Mhmoud (2013), captures the asymmetry, and if the gamma coefficient is larger than zero, it shows leverage effect as well. The latter effect is defined as a process where correlation of past returns exists with future volatility. The relationship is negative, meaning that the deviation of the firm's returns grows with a decrease in prices. In this model case, the coefficients were all larger than zero, concluding that the leverage and asymmetric effects existed. The non-REITs showed higher asymmetry by 21% for (1,1,1) models for both REITs and non-REITs and by 39% for the REIT (1,1,1) and non-REIT (1,1,2) model. This indicated that REOCs were more sensitive to bad/good news information shocks.

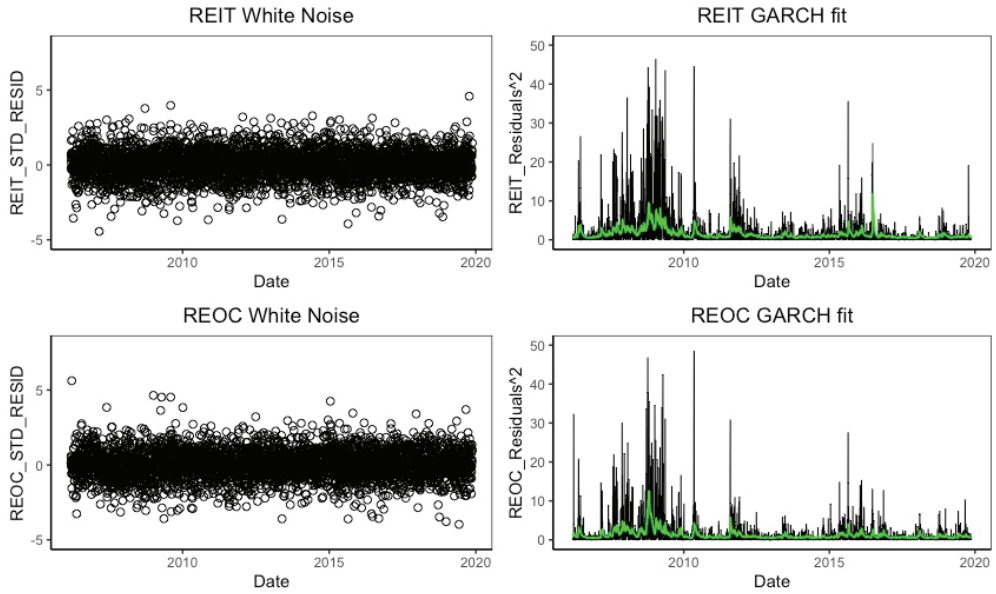


Figure 24. The GJR-GARCH (1,1,1) model fit for REIT and Non-REIT companies alongside with white noise residuals after removing possible trends

The GJR-GARCH model have as well generated the residuals, which as expected, were reminiscent of white noise as shown in Figure 24 on the left. Moreover, the additional autocorrelation tests had been carried out on the GJR-GARCH residuals to determine if any more trends have been left out. As shown in the Figure 23, no autocorrelation has been left, meaning that GJR-GARCH model was successfully fitted. Intuitively, the GJR-GARCH model as well captured the most important economic shocks that occurred in the last ten years. For instance, as

shown by the green line in Figure 24, the GJR-GARCH model correctly identified the 2007−2008 real estate crisis as well as some other smaller shocks.

Although it is difficult to compare the findings with the previously mentioned authors, because of different methodology, time periods, and only REIT GJR-GARCH modeling results being available, the authors did find similar results. Bhargava et al. (2010); Case et al. (2012); Kola and Kodongo (2017) in their studies found REITs persistency to be over 0.9, which is similar to this dissertation's findings. At this moment, there are no studies that analyzed non-REITs with GJR-GARCH models.

3.4. Outlining research results' applicability, interpretation, and limitations

After conducting many empirical econometric models, a clearer picture of what impact REITs might impose on the real estate market began to emerge. The comparison was done precisely with REITs competitive counterpart REOCs, because the latter company type was the only investment option for the investors to organize themselves as a publicly-traded real estate company on the local stock exchange. Thus, as depicted in Figure 15, the understanding how different these two investment companies perform could give a partial insight into what is expected for countries that impose REIT legislations.

Table 21 collected and depicted the summary findings that were discovered in the third chapter, using various econometric models, at the same time comparing these findings between the firm's types, i.e., REIT and REOCs. Furthermore, individual scores are presented beside each analyzed company type in accordance with the displayed metric. The scores come in a form of three values: 0, 0.5, and 1. Zero value was assigned when the other firm's type was superior in certain econometric model performance, the value of 0.5 was assigned if the firm's type only had a partial advantage over the other company's type, and 1 if the firm's type outcompeted the other company's type significantly. The scores were chosen in accordance with the literature findings of other authors, which analyzed what makes a company more robust and less exposed to certain types of risks as well as to the findings in the previous three subsections of the empirical analysis. Finally, the scores were summed, and the indicator score was presented at the bottom. The higher the score was, the more robust performance was delivered to the real estate market, and consequently, contributed to the resilience from the economic shocks.

The variables in Table 21 have been divided into micro-level and macro levels. For the micro level, the efficiency analysis results were evaluated first. The REOCs were clearly ahead of REITs in their cost efficiencies. An efficiency difference from 7 to 23% might not seem large from a one-year perspective; however, in all three years, the REOCs had better efficiencies, and by compounding the differences annually, a big performance gap might arise. Perhaps, it was one of the reasons why the spread between the indexes has widened, giving REOCs a faster growth period. Despite this fact, a 0.5 score was given, because many efficiencies for REOCs have had a higher standard deviation, meaning that individual companies might differ vastly in their performance because of the spread. The scaling without a

doubt was better for REITs from 5 to 8%; thus, a score of 1 was given, while the IRS/DRS positions were more fortunate for REOCs.

Table 21. REIT and REOC impact indicator on the real estate market stability

Type	REIT	REOC	Notes
Micro-level			
DEA analysis			
CRS/VRS	0	0.5	REITs showed lower efficiency; however, the Std. was higher for REOCs. The scale efficiencies were better for REITs with lower Std. More REOCs experienced IRS and less DRS.
SE	1	0	
IRS/DRS	0	1	
Leverage			
Total debt	1	0	Despite the fact that the authors found that short-term debt signaled the firm's strength; it as well incentives firms to take more risk. Concerning total debt, the REITs index and the average firms were less overleveraged.
S/L debt	0	0.5	
Returns			
ROE	0	1	ROE was larger for REOCs.
Stock returns	1	0	The stock average return was higher for REITs, some REOCS exhibited negative growth.
Index returns	0	0.5	REOCs had higher growth as well as higher Std.
Dividend yield	1	0	REITs had consistently higher dividend yields.
Liquidity			
Volume	0.5	0	Starting from 2015 onward, REITs volume doubled the amount of REOCs.
Macro-level			
Market risk	0	0.5	Mean market risk was higher for REITs, although it varied among countries.
Market co-mov.	0	1	The correlation with the market was higher for REITs indexes.
Interest risk	0	0.5	The average REOC was more robust to the interest rate changes, although it varied among countries.
REIT	0	1	The regression model showed that the REIT dummy variable increased exposure to the interest risk.
Volatility			
Persistency	0	1	REIT index had larger shock persistency.
Asymmetry	1	0	REITs index was more robust against bad news shock.
Indicator SUM	**5.5**	**7.5**	

In the leverage case, in the analysis of average firms, where the debt to equity ratio was larger for REITs by 0.23 points or indexes, where the debt gap deviation from 5.5 to 9% were chosen, REOCs consistently had higher debt accrued than REITs; thus, a score of 1 was put for REITs. However, the type of debt was important, and short-term maturities dominated in REOCs. As mentioned by authors Garcia-Teruel and Martinez-Solano (2007); Jun and Jen (2003); Choe (1994); Dang et al. (2017); Goyal and Wang (2013), the firms with larger short-term maturities were financially stronger, although according to Della et al. (2017), the latter debt incentivizes companies to risk more, for these reasons, a score of 0.5 was given.

Furthermore, ROE ratios were higher for the average REOC firm as well as for REOC indexes. The existing speculative limitations gave a performance drawback for REITs; hence, a score of 1 for REOCs was written. Regarding the stock returns, REITs were given an edge. This is because two countries, i.e., Italy and Spain, had negative returns for REOCs of -7.9% and -1.78%; whereas, all REITs had stayed positive in all analyzed countries. Having consistently no negative returns positively promotes a healthy growth of the real estate market; thus, 1 was given for REITs. In the index case, REOCs gave better returns but at a cost of higher standard deviation; hence, a score of 0.5 was given for REOCs. Concerning the dividend situation, not only the obligatory profit distribution made the dividends from REITs more attractive, but the yields were higher for REITs regularly by more than 1 or 2%; thus, a score of 1 was given for REITs. Lastly, on the micro level, the recorded trading volume starting from 2010 had a similar amount of stocks traded for REITs and REOCs, which from 2015 onward has grown in double digits for REITs. Therefore, an edge and a score of 0.5 were given to REITs.

On the macro level, the market beta coefficients for REOCs on average were smaller and more clustered, making REOCs less sensitive to the market changes, but as in most cases, a standard deviation was recorded higher; hence, a score of 0.5 was attributed. Similarly, the correlation coefficients of indexes with STOCC50E measured the co-movements between the market and the company. In this metric, REOCs were less correlated than REITs with the value of 0.04; thus, REOCs received a score of 0.5. In terms of interest rate, the risk was more pronounced for REITs, especially for the USA REITs, although the European countries did not consistently show that REOCs were less sensitive for all the countries. Following this logic, a score of 0.5 was considered. Furthermore, using regression analysis and controlling many other variables, a closer look at whether the beta interest rate coefficient differences could be attributed to the REIT investment companies revealed that indeed, in 2019, the REIT type variable increased the company's sensitivity to the interest rate changes. Thus, REOCs received a score of 1.

Lastly, the GJR-GARCH models revealed that the persistency of shocks that remained on the REIT returns lasted for longer periods from 2 to 5%. REOC managed to deal with the economic shocks more efficiently; thus, a score of 1 was given for REOCs. In addition, the leverage effect and asymmetry were found, which revealed that REOCs are more exposed to the bad news cycles.

The impact factor on the real estate market sum for REITs achieved a score of 5.5, and for REOCs, a score of 7.5. This indicates that REOCs played an important role in the real estate market growth. Although the nuances of high variability existed, REOC companies were more efficient at the local market, showed greater financial strength and less systematic market and interest rate risk. This does not mean that REITs do not have a place in the market, but the existing regulatory limitations do place some performance constraints, thus making REOCs a swift market competitor. The scientific question of whether REITs should be a preferable way for the real estate market to operate rather than solely relying on non-REITs should be answered in the following frame: REOCs have had an edge in the performance in the time period of 2010–2019, but REITs had their edge in lower debt, dividend yield, and being more clustered. The company types should be a complement to each other rather than solely relying on only one investment vehicle.

Despite the obtained results, the limitations encountered in this study should be noted. First, the analyzed time period of 2010–2018 came right after the real estate market crash in 2008, which dramatically affected the real estate companies, real estate market regulations, and the monetary policy. In such turbulent times, REITs might have been impaired negatively in terms of their performance, for instance, Delcoure and Dickens (2004) by analyzing the pre-2007 period found REITs to be more robust to the interest rate changes than after the real estate crash in 2007. One must understand that many mortgage delinquencies have been prolonged and carried to the post-2008 crisis era; perhaps, after longer debt clearance and reset, the REITs might show different results of market and interest risk. The second problem with the time period is the fact that many analyzed REITs in Europe were still very young. The REITs in Germany, which only emerged in 2008–2009, had barely any competitive advantage over companies that had been established thirty years ago. Even though the micro regression models showed that for 2019 company foundation, years had no impact, but for other periods, they might have been significant.

Moreover, a wider variety of analyses can be conducted to analyze the performance differences between REITs and REOCs. Inflation is another subfield that is extremely relevant to many portfolio managers, because real estate is considered as a hedge against rising prices. By enlarging the list of analysis variables, the impact factor score might rise or dwindle, thus giving different conclusions like which company type is a preferable way for the real estate market to operate.

The research results applicability can be interpreted on a governmental and individual level. The governments that are planning to impose REIT legislation in the future have to understand that economic stability is crucial for the REITs well-being. Because of regulatory limitations and long-term debt usage, REITs became highly dependent on the interest rates, and if country's monetary policy is filled with constant fluctuations, REITs might be impaired negatively in such environments. Furthermore, the governments should constantly reference the previous historical crisis before adopting new investment systems or laws. The S&Ls area is a great example where similar investment limiting behavior was placed on companies that

resulted in the market crashes. Although REITs are only reminiscent of S&L, the experts should understand that regulations not necessarily make the real estate market safer. Furthermore, the countries that experience housing shortages should not rely solely on REITs, as they were less risk-taking and less efficient. REOCs, having more flexibility, might be able to exploit market opportunities better, thus creating new housing stock faster. However, the introduction of REITs might as well lead to higher market competition that might help to develop new real estate supply.

Despite, the latter fragility in many countries, the wealth concentrations happen in a form of the real estate. Without changing the tax system and using the regulatory base of REITs, the pension funds, investors, and ordinary citizens could enjoy the returns from highly expensive assets in a form of dividends with an accessible price of a stock. Otherwise, this wealth concentration is not accessible to many market participants, thus creating problems for social cohesion in the future. Moreover, although this time period showed that REITs are more sensitive to the market shocks, the lower leverage in the future times could translate into a more robust growth, thus making the real estate market more stable.

CONCLUSIONS

After completing a thorough real estate literature and methodology review and conducting analysis with empirical modeling in the previous three sections, the following conclusions can be made:

1. The terms "the real estate market" or "the real estate market stability" in the majority of scientific articles were usually taken as axioms, without explicitly defining them; however, this dissertation tried to fill the gap by stating the expressions in the following ways:
    - The real estate market is an area where buyers and sellers negotiate the exchange of rights of the real estate on an institutional level.
    - The real estate market stability is the situation where there are no extreme fluctuations or volatility in a particular real estate market performance measure.
2. The extensive analysis of the real estate cycles and what factors influence the real estate market have revealed the following detrimental facts about the real estate market stability:
    - Market stability and instability occur in irregular cycles of growth and collapse; however, a consensus among researchers does not exist, as the scholars cannot surely agree on the exact real estate cycle length, although the findings suggest that long cycles might last around 18–30 years, while short cycles might last around 4–5 years.
    - The cycle magnitude has an enormous effect on the real estate prices, in some cases a 160% difference between the cycle bottom and peak points for the office market and 50% for the industrial market were recorded. These price discrepancies put the real estate market out of balance and affect the stability negatively.
    - It has been identified that a vast number of factors that influence the real estate cycles exist, and they can be classified into micro and macro levels. Nonetheless, the factor effect pipeline was found to be extremely complex. For instance, the macroeconomic variables before inducing any change on the real estate prices must first pass the local filter of the local market, where microeconomic factors are used. Depending on the circumstances, in some cases, the microeconomic variables might neglect the macroeconomic variable effect completely, leaving only local market forces to influence the price changes and vice versa.
    - When analyzing macro-variables' interest rates, inflation, unemployment, speculation, the macroprudential policy and macro supply and demand have been noted as imperative elements that influence the cycle corrections.
    - On the micro-variable side, the metropolitan area laws, information scarcity, fraudulent activity, metropolitan and sectoral supply and

demand have been widely discussed in the scientific literature as imperative elements of the cycle movement. A strong case was made that business cycles and the real estate cycles do not match, and even the real estate cycles among the regions were found to exhibit different peak and collapse timings.

3. The historical analysis of the real estate stability crisis revealed the following important attributes:
   - Although not all market crashes start in the real estate sector, in the end, it always or partially attaches to one, this partially happens because the real estate is considered as a universal value storage unit.
   - Most real estate crises involved the following things: availability of some sort of easy credit, loose monetary policy, fraudulent activity, and unmeasured confidence in something.
   - When governments limit the speculative behavior of a company, the risk of systemic crisis is not necessarily reduced and in some cases, even increases. For instance, it has been found that the highly regulated S&L institutions and their fraudulent activity caused systemic instability back in the 1980–90s.
   - In order to sidestep the previous historical disruptions in the future, any forthcoming innovation should pay close attention to these four areas: leverage safety, limited speculation, activity transparency, and availability to the public.
4. The historical overview of the REIT and an overview of the modern real estate market had disclosed the following findings:
   - REIT origins could be traced back to 19th century England, where unincorporated associations emerged. An uphill battle for the existence of unincorporated associations was constant; many times, they were deemed illegal.
   - Although officially REITs were signed in the 1960s by the President of the United States of America Dwight Eisenhower, in Europe, many countries still do not have the REIT regime. Even the Western countries like the UK or Germany enacted the REIT regime only in 2007. The reasons for slow development are unknown.
   - The most important attributes that make a company a REIT are the following: a) compulsory obligations to pay-out the majority of dividends annually, b) limited speculative abilities, c) limited leverage requirements, d) tax-exemption.
   - Nonetheless, the countries around the world showed a varying degree of laws that governed REITs activity.
5. The analysis of the previously used methodologies revealed the following discoveries:
   - DEA, stochastic frontier, CAPM, GARCH techniques, financial ratio, and other regression models have been commonly used methods for the REIT performance analysis in the research papers.

- Interestingly, most papers have focused solely on the REIT performance analysis, without comparing REITs with REOCs, thus creating a literature gap.

6. For the analyzed periods, the empirical models in the third chapter reveal the following findings:
   - REOCs have surpassed REITs in efficiency models in all three years in CRS, VRS categories, although the standard deviation was higher for the REOCs in most cases.
   - REITs had an edge in the SE metric against REOCs; however, more REOCs were found to have an increasing return to scale.
   - In the leverage case, whether the analysis of firms or indexes were done, REOCs consistently had higher debt ratios accrued compared to the REITs. The type of debt as well differed among the company types: short-term debt dominated REOCs, while long-term debt was prevalent in REITs. Many scholars have argued that short-term-debt is related to a firm's financial strength, although they as well admitted that short-term financing incentivizes speculation.
   - Return on equity was higher for REOC in both index and the average company case; however, in the stock return section, REITs surpassed REOCs in many countries, only in the index case, REOCs delivered higher stock return than REITs.
   - Without a doubt, the dividend yields were consistently higher in REIT indexes in all analyzed time period.
   - Index liquidity metrics at the start of 2010 were similar, but soon after 2015, they substantially began to diverge, leaving a partial advantage for REITs with regards to the trading volume.
   - Systemic market and interest rate risk were found to be higher for REITs. Interestingly, the listed real estate companies' beta coefficients were not constant but dynamic over time; the factors like long-term debt and company type were significant contributors to the interest sensitivity, other factors like country, management, gender were insignificant. Additionally, REIT and REOC indexes showed a high correlation with the market.
   - The shock persistency was observed to be higher for REIT companies; however, the REIT index had a smaller leverage effect.
7. The final impact indicator sum revealed that on average, with regards to the analyzed models, the REOC was a more stable choice for the real estate market to operate. However, certain limitations in the study period existed:
   - First, the achieved impact score was only marginally different; hence, these investment vehicles should be more looked as compliments to each other, because there are many other metrics that can widen or narrow the performance differences, for instance, inflation is another important variable for the real estate market stability. Thus, this study can only state marginal performance differences.

- Second, the analyzed time period of 2010–2018 came right after the real estate market crash in 2008, which dramatically affected the real estate companies, real estate market regulations, and the monetary policy. In such turbulent times, the REIT companies might have been impaired negatively in terms of their performance, for instance, other authors by analyzing the pre-2007 period found REITs to be more robust to the interest rate changes than after the real estate crash in 2007. The period limitation could impact other variable calculations as well.

8. The research results' applicability can be interpreted on a governmental and individual levels:
   - Governments that are planning to impose REIT legislation in their markets should understand that monetary policy and economic stability are important for REITs well-being. As REITs are heavily regulated, they become sensitive to the interest rate or market movements; thus, countries in turbulent economies should reconsider before implementing REITs.
   - The notion that more regulations on speculative activity will increase the real estate market stability is false, and it was demonstrated by the examples of S&L. Thus, the limitation of REIT speculative operations may not necessarily translate into the market cohesion. Additionally, even though listed companies may need to be more transparent with the shareholders than with the private real estate owners, the previous crises affirm that fraudulent activities can take place even at the listed company levels.
   - As some real estate income is scarcely accessible, due to the high cost, the introduction of REITs could help the real estate to be listed on the stock exchange, thus creating an opportunity for individuals, pension funds, and other investors to derive income from these assets, which otherwise would not be accessible.
   - Investors should have a dynamic diversification strategy, as the systemic risks of the real estate stocks are non-stationary.
   - If the higher efficiencies achieved by the REOC in the analyzed period translate into other time-periods as well, the countries that experience housing shortages should rely more on the REOCs for new project development.
9. Lastly, the future research trends have a wide range of untouched subject areas with regards to REITs and REOCs:
   - First, the inflation point has not been reviewed yet. Real estate is in many cases considered a hedge against rising prices, thus the comparison of REOCs against REITs would give valuable insight.
   - Second, it seems that speculation is more likely to occur in REOCs; thus, it would be interesting to know if fraudulent activity factor increases as well.

- Third, the M2 and other money supply-based variables have been found in some instances affecting the real estate market; thus, it would be interesting to know how REITs and REOCs respond to the money supply shocks.

ĮVADAS

Tyrimo aktualumas. Iš visų ekonomikos sektorių nekilnojamojo turto (toliau – NT) sektorius pasižymi išskirtinumu. Visų pirma, šiam sektoriui tenka ypatingas vaidmuo visuomenės būsto aprūpinimo požiūriu, antra, tai yra finansiškai intensyvus sektorius, nes jis reikalauja daug išlaikymo ir išteklių statyboms įvykdyti. Galiausiai NT sektorius pasižymi konservatyvumu ir biurokratiškumu, kadangi egzistuoja daug teisinių reglamentų, ribojančių NT vystymą. Gali būti, kad konservatyvumo bruožų šiame sektoriuje atsiranda todėl, kad didžiajai daliai namų ūkių būsto pirkimas yra kartą per gyvenimą įvykstantis procesas ir testuoti inovacijas, kai egzistuoja rizika individams prarasti gyvenamąją vietą, yra itin atsakingas procesas. Vis dėlto, turint omenyje egzistuojančias rizikas, naujų technologijų adaptacija yra vienintelis būdas išspręsti esamas ekonomines problemas NT sektoriuje.

Impulsas keistis ypač išaugo po 2007–2008 metų NT rinkos krizės, kuri paveikė visus ekonominius subjektus. Viena vertus, NT pasiūlos greitis, tai yra, kaip greitai NT objektas pastatomas ir pristatomas į rinką, vis dar yra prioritetas, nes tiesiogiai kovoja su augančiomis būsto kainomis. Kita vertus, kaip pasiūlos greitis yra pasiekiamas tvarios ekonomikos kontekste, tampa vis labiau aktualu. Praėjusį dešimtmetį naudoti finansiniai išvestiniai instrumentai (pavyzdžiui, turtu garantuotos obligacijos) prisidėjo prie NT rinkos burbulo formavimosi ir griūties bei paliko tūkstančius žmonių be gyvenamosios vietos. Kompleksyvios finansinės schemos apskritai menkai prisidėjo prie pridėtinės vertės kūrimo ir labiausiai pasitarnavo mažai daliai investuotojų, dėl to galima daryti išvadą, jog išvestiniai instrumentai nėra tvarus būdas sėkmingai vystyti ekonomiką. Dėl minėtų priežasčių, galima išskirti dvi kryptis, kuriomis turėtų vadovautis ateities NT inovacijos: inovatyvus instrumentarijus turėtų būti prieinamas visoms visuomenės grupėms ir įrankiai turėtų kurti NT pasiūlą tvaraus augimo principais tam, kad būtų išvengta ateities burbulų formavimosi. Šie du principai galėtų padėti dėsningai spręsti NT rinkos problemas ir išvengti 2007–2008 krizių atomazgų.

Vis dėlto prieš pradedant generuoti naujus, kompleksinius investavimo būdus, svarbu žinoti, ar visos galimos inovacijos NT rinkoje jau pritaikytos. Deja, vieno investicinės kompanijos tipo Europos šalyse buvo pasigesta. Jis vadinamas „Nekilnojamojo turto investiciniu trestu“ (angl. *Real estate investment trust*, REIT) ir buvo istoriškai įteisintas prezidento Dvaito Eizenhauerio 1960 metais JAV. Trumpai tariant, REIT yra investicinė kompanija, turinti savo teisinį statusą ir reglamentus bei atliekanti daugiausia savo investicinių operacijų NT sektoriuje. Remiantis EPRA tyrimais, 2018 metais tik 13 Europos Sąjungos šalių turėjo veikiančius REIT įstatymus savo šalių akcijų biržose. Labiausiai galimybės kompanijai turėti REIT statusą pasigesta Europos Rytų bloko šalyse, kol Vakarų Europoje REIT adaptacija buvo beveik įgyvendinta. Nuostabą keliantis faktas yra tas, kad net tokios inovatyvios šalys kaip Vokietija, REIT statuso galimybę įdiegė tik 2008 metais, tai yra praėjus 48 metams nuo atsiradimo pradžios. Dauguma Europos šalių savo NT vystymosi veiklą rėmė tipu „Kompanija, kurios veikla pagrįsta nekilnojamojo turto operacijomis“ (angl. *Real estate operating company*,

REOC), kuris yra tiesioginis konkurentas REIT. Tarp šių dviejų investicinių kompanijų tipų egzistuoja subtilūs skirtumai, pavyzdžiui, REIT pagal įstatymus yra priversti atlikti 75–90 % kasmetines dividendų išmokas, būti kotiruojamos akcijų biržose bei yra apriboti jų ilgalaikių ir trumpalaikių įsipareigojimų dydžiai. Disertacijoje yra pateikta nuodugni apžvalga ir skirtumų analizė, tačiau verta paminėti, jog pastarieji veiklos principai yra tiesiogiai susiję su iškeltais tikslais: prieinamumas individams, kuris yra adresuojamas viešų akcijų pavidalu, ir tvarumas, kuris atsiranda, kai kompanijoms apribojamos galimybės spekuliuoti. Be to, reikia paminėti, jog dėl savo įstatyminės bazės REIT tapo vienu iš populiariausių būdų JAV investuoti ir plėtoti NT. Pensijų fondai ir akcijų brokeriai vis dažniau laiko REIT patrauklia diversifikavimo priemone, kadangi REIT akcijos yra netiesioginis investavimas į NT per akcijų biržą.

Bet kokiu atveju, išlieka klausimas, kodėl tiek mažai Europos šalių turi REIT savo akcijų biržose? Ar egzistuojanti įstatyminė bazė trukdo atsirasti REIT? Akivaizdu, kad esamus įstatymus galima modifikuoti, kaip tai padarė Vokietija 2008 metais, kai priėmė REIT reikalingus reglamentus. Galbūt jau egzistuojančios REOC puikiai patenkina investuotojų ir rinkos lūkesčius arba gal REIT nėra tokia efektyvi priemonė, lyginant su REOC. Visi pastarieji klausimai yra aktualūs ekspertams, norintiems padėti NT rinkai tvariai vystytis. Bet kuri šalis, prieš leisdama REIT vykdyti veiklą, turėtų žinoti aiškius šių investicinių kompanijų privalumus, lyginant su kitomis bendrovėmis. Reikia nepamiršti, jog REIT kaip investavimo priemonės įvedimas yra sudėtinga procedūra, kuri gali reikalauti ir centrinio banko bei parlamento patvirtinimo. Negana to, jeigu REIT poveikis NT rinkos stabilumui yra neigiamas, tai gali sukelti papildomų problemų, siekiant užtikrinti tvarią ateitį.

Mokslinė problema. Istorinė NT rinkos stabilumo analizė, kuri buvo atliekama tokių autorių kaip Vanderblue (1927), Pizzo, Fricker ir Muolo (1989), Lowry (1991), Bordo (2003), Kindleberger ir Aliber (2005), Anderson (2009) ir Rapp (2009), parodė, jog NT krizės yra pasikartojantis reiškinys, kuris pasireiškia ciklo pavidalu. Deja, stinga vieningos mokslinės nuomonės, kuri pagrįstų NT burbulų formavimos priežastis bei veiksnius, turinčius įtakos NT ciklams. Nemaža dalis autorių teigia, jog makroveiksniai yra vieni svarbiausių, nulemiančių NT rinkos stabilumą, kiti atkreipia dėmesį, jog mikroveiksniai yra tokie pat reikšmingi.

Tuo pačiu metu, moksliniai tyrimai, apibūdinantys, kokius pranašumus vienas investicinės kompanijos tipas turi prieš kitą ir kaip tie pranašumai gali paveikti NT rinkos stabilumą, yra riboti. Istorinės REIT atsiradimo aplinkybės, kurios buvo tirtos tokių autorių kaip Cook (1923) ar Jones, Moret ir Storey (1988), leidžia tik abstrakčiai suprasti šios investavimo priemonės įtaką stabilumui bei jos pranašumus prieš kitas kompanijas. Literatūros stoka ypač juntama, kai ieškoma REIT veiklos rezultatų palyginimo su REOC. Tokie autoriai kaip Bers ir Springer (1997), Ambrose ir Linneman (2001), Anderson, Springer, Webb ir Fok (2002), Anderson, Springer ir Lewis (2003), Lee ir Stevenson (2004), Delcoure ir Dickens (2004), Ambrose, Highfield ir Linneman (2005), Schacht ir Wimschulte (2008), Sham, Sing ir Tsai (2009), Isik ir Topuz (2006), Tahir, Harun ir Zahrudin (2012), Falkenbach ir Niskanen (2012), Kawaguchi, Schilling ir Sa-Aady (2012), Brounen, Mahieu ir Veld (2013), Newell, Adair ir Nguyen (2013), Hoesli ir Oikarinen (2014),

Cotter ir Richard (2015), Mahmood, Kuhle, Al-Deehani ir Bhuyan (2015), Ahmed ir Mohamed (2017), Newell ir Marzuki (2018) susitelkė analizuoti tik REIT. Kai kurie autoriai atskleidė, jog REIT demonstravo dinamiškas gamybos masto ekonomijas, kurios priklausė nuo specifinių kontrolinių veiksnių, tokių kaip skolos dydis ar vadybos stilius, kiti autoriai pabrėžė, jog mokesčių lengvatas turintys REIT buvo mažiau įsiskolinusios negu kitos kompanijos, turėjo geresnius likvidumo rodiklius, sugebėjo pritraukti pelningas kapitalo finansavimo galimybes, buvo efektyvios kaštų atžvilgiu, mokėjo didesnius dividendus, buvo puikus diversifikavimo įrankis ir suteikė konkurencingą grąžą lyginant su valstybinėmis obligacijomis.

Kiti tyrėjai, tokie kaip Case, Yang ir Yildirim (2012), Bhargava, Dania ir Anderson (2010), Kawaguchi et al. (2012), Liow (2013), Liow ir Schindler (2014) skyrė nemažą dėmesį, analizuodami REIT akcijų svyravimus. Tyrimai rodo, jog nors tarp akcijų indeksų ir REIT egzistavo koreliacija, ji nebuvo didelė. Kiti nustatė *spillover* efektą REIT iš užsienio bei vietinių rinkų, neigiamą ryšį tarp nuosavybės vertės ir svyravimų.

Sisteminės rizikos klausimu, kuris apima rinkos bei palūkanų normų jautrumo analizę, mokslininkai vadovavosi Sharpe (1964), Lintner (1965) ir Stone (1974) metodologija. Aktualūs tyrimai buvo atlikti Chen ir Tzang (1988), Liang, McIntosh ir Webb (1995), Mueller ir Pauley (1995), Allen, Madura ir Springer (2000), Devaney (2001), He, Webb ir Myer (2003), Clayton ir MacKinnon (2003), Delcoure ir Dickens (2004), Bredin O'Reilly ir Stevenson (2007), Giliberto ir Shulman (2017). Keli autoriai patvirtino, jog egzistuoja neigiamas ryšys tarp palūkanų normų ir REIT akcijų grąžos, be to, nustatyta, jog REIT rinkos beta koeficientai buvo atsparūs rinkos pokyčiams.

Papildomai buvo atrasta ir neigiama konotacija apie REIT iš tokių autorių kaip Liow ir Schindler (2014), Kola ir Kodongo (2017), Zhou (2011), Li (2012), Zhou (2016) tyrimuose. Argumentuota, jog tam tikrais periodais REIT demonstravo didesnius akcijų, indeksų grąžos svyravimus negu kitos kompanijos iš kitų sektorių, todėl buvo mažiau nuspėjamos. Keli minėti autoriai taip pat pripažino atradę aukštą svyravimo užsitęsimo lygį REIT nagrinėjant jų grąža. Kiti niuansai buvo iškelti į viešumą tokių autorių kaip McIntosh, Liang ir Thompkins (1995), Ambrose, Ehrlich, Hughes ir Wachter (2000), Gentry, Kemsley ir Mayer (2003), Eichholtz ir Kok (2007), Miller ir Springer (2007), Brounen, Ling ir Vaessen (2016), kurie argumentavo, jog priešingai negu kitų tyrėjų tyrimo rezultatai, REIT nedemonstravo gamybos masto ekonomijų bei turto efekto (angl. *wealth effect)* požymių, taip pat kyla įtarimas, jog gali atsirasti konkurencijos iškraipymas. Galiausiai nemažai autorių pabrėžė, jog REIT buvo jautrios palūkanų normų pokyčiams.

Iš trumpos apžvalgos matyti, jog egzistuoja tam tikra mokslinės literatūros dalis, kuri analizavo akcijų, indeksų grąžos svyravimus, sisteminę riziką ar efektyvumą. Deja, daugumos autorių analizėje REIT nebuvo lyginamos su kitomis kompanijomis, pavyzdžiui, REOC, todėl nėra aiškaus suvokimo, kaip REIT veikia bendrame kontekste, konkuruodamos su kitomis investicinėmis bendrovėmis. Dėl šios priežasties sunku suprasti, ar REIT veikimo principai kompanijoms turi daugiau pranašumų ar trūkumų. Tik maža dalis mokslininkų, tokių kaip Naranjo ir Ling (2015), Sin, Chun-Kei ir Yat-Hung (2008), Morri ir Cristanziani (2009), Bhargava et

al. (2010), Falkenbach ir Niskanen (2012), Brounen et al. (2013), Koulakiotis ir Kiohos (2016), Ascherl ir Schaefers (2018) bandė atsakyti į šį klausimą. Autoriai ištyrė, jog REIT nustelbė privačius NT investicinius portfelius, ir nustatė, jog privačios NT kompanijos sekė REIT strategijas iš informacijos srautų perspektyvos. Lyginant REIT ir REOC buvo pagrįsta, jog REIT turėjo mažesnį įsiskolinimą, tačiau abu kompanijų tipai rodė aukštą svyravimo užsitęsimo lygį ir *spillover* efektas buvo fiksuojamas iš REOC į REIT.

Apibendrinant galima teigti, jog dauguma tyrimų koncentravosi į JAV REIT, tik maža dalis autorių atliko lygino REIT ir REOC arba agreguotai atliko bendrą analizę, kuri neleidžia išskirti REIT ir REOC pranašumų bei skirtumų. Pavyzdžiui, tyrėjas Ambrose et al. (2016) analizavo Europos NT bendroves, bet neatskyrė, kaip efektyvumas ir palūkanų normų jautrumas skyrėsi tarp REIT ir REOC. Dėl to egzistuoja mokslinių tyrimų stoka, kuri neleidžia suprasti, kaip REIT atsiradimas likusiose Europos sąjungos šalyse gali paveikti NT rinką. Dėl šios priežasties iškeliama tokia mokslinė problema: kaip įvertinti REIT įtaką NT rinkos stabilumui, lyginant su REOC.

Tyrimo objektas – REIT ir REOC veiklos skirtumai.

Tyrimo tikslas – įvertinti, kokį poveikį REIT turi NT rinkos stabilumui, lyginant REIT ir REOC veiklų rezultatų skirtumus.

Tyrimo uždaviniai:

1. Įvertinti NT rinkos struktūrą, jos dalyvius ir veiksnius, kurie daro įtaką NT rinkos ciklams.
2. Išnagrinėti istorines aplinkybes, dėl kurių kilo NT krizės.
3. Išanalizuoti REIT ir REOC charakteristikas, sampratas ir jų teisinius ypatumus istoriniu ir tarptautiniu lygmenimis.
4. Ištirti metodus, kuriais būtų galima įvertinti REIT poveikį NT rinkos stabilumui, išmatuojant veiklos rezultatų skirtumus tarp REIT ir REOC.
5. Sukonstruoti ekonometrinius modelius, kuriais būtų galima išmatuoti ir palyginti įmonių veiklos rezultatų skirtumus tarp REIT ir REOC.
6. Įvertinti sukurtų sisteminės rizikos, svyravimo ir efektyvumo modelių rezultatus.

Tyrimo metodai:

1. Buvo atliekama sisteminė mokslinės literatūros, susijusios su NT rinka, įmonių efektyvumu, kainų svyravimu, palūkanų normų jautrumu, analizė bei atliekama palyginamoji analizė REOC ir REIT atžvilgiu.
2. Efektyvumui matuoti taikytas DEA metodas.
3. Regresinė analizė naudota išgauti beta koeficientų reikšmes, balansuoti duomenis įmonių atžvilgiu.
4. GJR-GARCH modelis buvo naudojamas matuoti rinkos šokų užsitęsimą.
5. Statistiniai modeliai buvo kuriami, naudojant *Python* ir *R-code* programinę įrangą. Duomenys apdoroti, naudojant „Microsoft Excel“.

Disertacijos struktūra

Pirmojoje disertacijos dalyje nagrinėjamos pagrindinės sąvokos, reikalingos suprasti NT rinką, stabilumą, REIT ir REOC bei ciklus. Taip pat nuodugniai

analizuojami istoriniai NT nestabilumo niuansai, NT rinkos ciklai, jų atsiradimo priežastys, kokį bendrą efektą jie turi ekonomikai ir, remiantis moksline literatūra, yra pateikiamas konceptualus žemėlapis, kuriame parodoma, kaip faktoriai veikia NT ciklus. Toliau yra pristatoma REIT istorijos apžvalga nuo investicinės priemonės susiformavimo pradžios iki jos modernizavimosi, įstatyminiai reikalavimai pasaulio šalyse bei REIT struktūra. Skyriaus pabaigoje diskutuojama, kokią teorinę naudą NT rinka gali patirti, įdiegus REIT kotiravimosi galimybes.

Antrojoje disertacijos dalyje pristatoma konceptuali modeliavimo krypties samprata ir REIT įtakos NT stabilumui objektyvaus matavimo schema. Šiuose disertacijos poskyriuose daug dėmesio skiriama įvertinti ankstesnių autorių metodus, kurie taikomi, tiriant REIT efektyvumą, jautrumą palūkanų pokyčiams bei kainų svyravimus mikro- ir makrolygmenimis. Taip pat pristatomos duomenų surinkimo ir naudojimo procedūros bei, remiantis autorių rekomendacijomis, sukuriami modeliai REIT ir REOC veiklos skirtumams išmatuoti.

Trečiojoje disertacijos dalyje yra pateikiami antrojoje dalyje sukurtų modelių rezultatai efektyvumo, palūkanų jautrumo ir kainų svyravimo modeliavimo aspektais. Modeliai yra skaičiuojami iš REIT ir REOC perspektyvų, vėliau pasiekti rezultatai lyginami tarpusavyje, taip pat palyginant su autoriais, kurie kūrė modelius panašia kryptimi. Skyriaus pabaigoje pasiekti rezultatai yra agreguojami į bendrą lentelę ir sukuriamas poveikio indikatorius, kuris, remiantis empiriniais rezultatais, interpretuoja REIT ir REOC poveikį NT rinkai, šalia pateikiami egzistuojantys tyrimo apribojimai.

Tyrimo naujumas ir praktinė reikšmė

1. NT rinkos veikimo ir vystymosi analizė, sutinkama moksliniuose darbuose, parodė vieningos nuomonės trūkumą vertinant veiksnius, kurie turi arba neturi reikšmingo poveikio NT rinkos stabilumui. Dėl to buvo sukurtas konceptualus žemėlapis, kuris sistemingai įprasmino egzistuojančios mokslinės mokslinių tyrimų įžvalgas apie veiksnių poveikį NT rinkai ir prisidėjo prie NT tyrimų vystymosi. Ekspertai ir kiti NT rinkos dalyviai, remdamiesi disertacijoje atlikta analize, gali tiksliau suprasti, kodėl tam tikrais atvejais veiksniai neturi jokios įtakos NT rinkos stabilumui.

2. Apžvelgus istorines NT rinkos krizes, ši disertacija pateikia priežastis, kodėl įvyko tam tikri rinkos sutrikimai. Tam, kad būtų išvengta ateities NT rinkos griūties, vyriausybės institucijos turėtų stebėti kredito prieinamumą, monetarinę politiką, šešėlinę veiklą ir per aukštą pasitikėjimą tam tikrais investiciniais objektais. Be to, istorinėje analizėje buvo aptiktos „S&L“ kompanijos, kurios turėjo panašius veiklos apribojimus kaip REIT bei veiklos liberalizavimo periodus. „S&L“ istorija suteikia svarbių įrodymų, jog apribota kompanijų veikla nebūtinai sukurs tvarios rinkos augimą, bet atvirkščiai – gali sukelti nestabilumų. Šis atradimas parodo, jog reikėtų remtis įrodymais grįstais tyrimais.

3. Ši disertacija pateikia sistemišką istorinę apžvalgą apie REIT atsiradimo priežastis ir aplinkybes. Nemaža dalis literatūros, analizuojančios REIT, koncentruojasi tik į tam tikrus laikotarpius ir neapima visos priešistorės, todėl sunku susidaryti išbaigtą paveikslą apie REIT atsiradimo niuansus. Disertacijoje pateikta

analizė politinėms institucijoms gali padėti suprasti, kokie specifiniai reikalavimai egzistuoja REIT bei kokia galima šių kompanijų nauda.

4. Šios disertacijos tyrimas pateikia multidimensinę struktūrą, kaip konkuruojančios investicinės kompanijos gali būti palyginamos skirtingais lygmenimis šiais aspektais: efektyvumo, palūkanų normos jautrumo ir svyravimų. Panaši struktūra gali būti naudojama ir tolesniems REIT ir REOC palyginimams.

5. REIT ir REOC veiklos skirtumai buvo nuodugniai išmatuoti skirtingais aspektais ir interpretuojami naudojant sistemišką poveikio indikatorių. Remiantis šio indekso rezultatais, investuotojai gali racionaliau suformuoti savo investicijų portfelį ir išvengti nuostolių. Tuo pačiu metu, vyriausybinės institucijos, remdamosi indeksu, turėtų įvertinti, ar REIT gali būti tikslingai pritaikoma akcijų biržose, nepaaukojant NT rinkos stabilumo.

6. Dėl atsiradusios papildomos konkurencijos iš REIT miestai gali tikėtis naujos NT pasiūlos sukūrimo, kita vertus, empiriniai tyrimai rodo, jog atsiradus REIT, NT rinka gali tapti jautresnė ekonomikos šokams. Be to, analizuojamu laikotarpiu empirinis efektyvumo tyrimas parodė, jog REOC yra našesnės, todėl jeigu didesnis efektyvumas egzistuoja ir kitais periodais, sprendžiant būsto trūkumo klausimus, labiau verta naudoti REOC.

7. Žmonės, pensiniai fondai ir kitos institucijos, naudodamiesi REIT, galėtų sukurti naują pridėtinę vertę savo biudžetams ar klientams. Prieinamumo iššūkiai prie NT pajamų šaltinių būtų sumažinti, kadangi daugiau turto būtų įtraukti į akcijų biržas.

Šią disertaciją sudaro 3 pagrindinės dalys, 21 lentelė ir 24 paveikslai, terminologijos žodynas, išvados, literatūros sąrašas ir priedai. Disertacija susideda iš 114 puslapių su 38 formulėmis, pateikiamas 263 pozicijų literatūros šaltinių sąrašas.

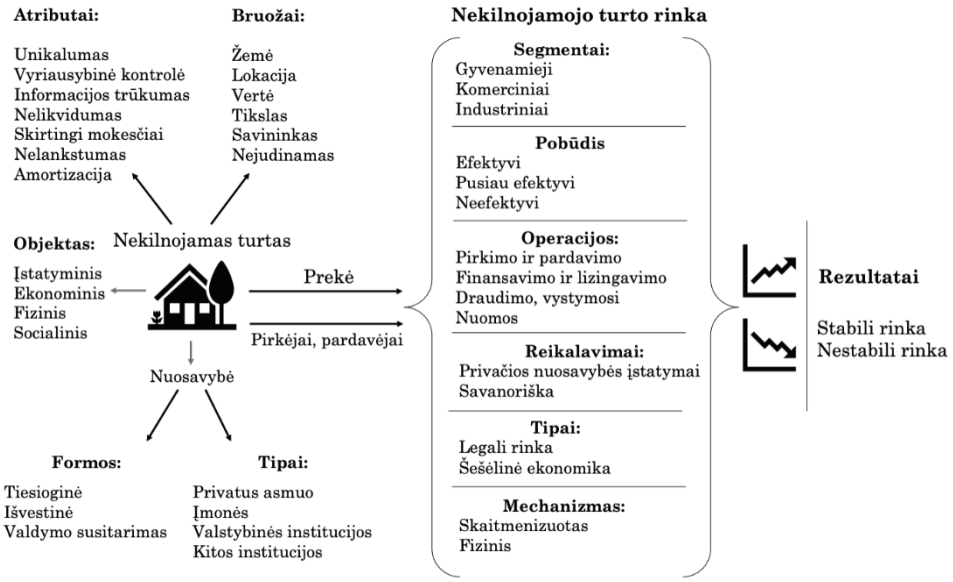
SANTRAUKOS TURINYS

1. NEKILNOJAMOJO TURTO RINKOS IR „REIT“ TEORINIS PAGRINDIMAS

1.1. Nekilnojamojo turto rinkos ir jo stabilumo samprata

Viena iš populiariausių ekonominių knygų A. Smito „Tautų turtas“ nuodugniai tyrinėjo, kaip laisvoji rinka ir nematoma ranka kryptingai veikia rinkos ekonomiką. Deja, terminas *rinka* nebuvo aiškiai apibrėžtas, o autoriaus labiau priimamas kaip aksioma. Vis dėlto, laikui bėgant atsirado nemažai bandymų iš ekonomistų Maršalo (1961), Benham (1967), Kurnot (Thompson, 1991), Chapmen, Kay (2003), Tahir (2010), Cristiano ir Teubal (2010), Aspers (2015) išsklaidyti abejones, gaubiančias terminą *rinka*. Remiantis autorių įžvalgomis, šioje disertacijoje terminas *rinka* traktuojamas kaip vieta, kurioje pirkėjai ir pardavėjai derasi dėl aiškiai apibrėžtos prekės mainų.

Apibūdinti NT buvo pasitelktas Anglijos bendrosios teisės apibrėžimas, kuris pateiktas disertacijoje. Galiausiai, sujungus NT ir *rinkos* apibrėžimus, buvo galima giliau analizuoti NT rinkos charakteristikas, atributus, veikimo principus, išskirtinumą, kurių santrauka pateikta 1 pav.



1 pav. Nekilnojamojo turto charakteristikos (sukurta autoriaus)

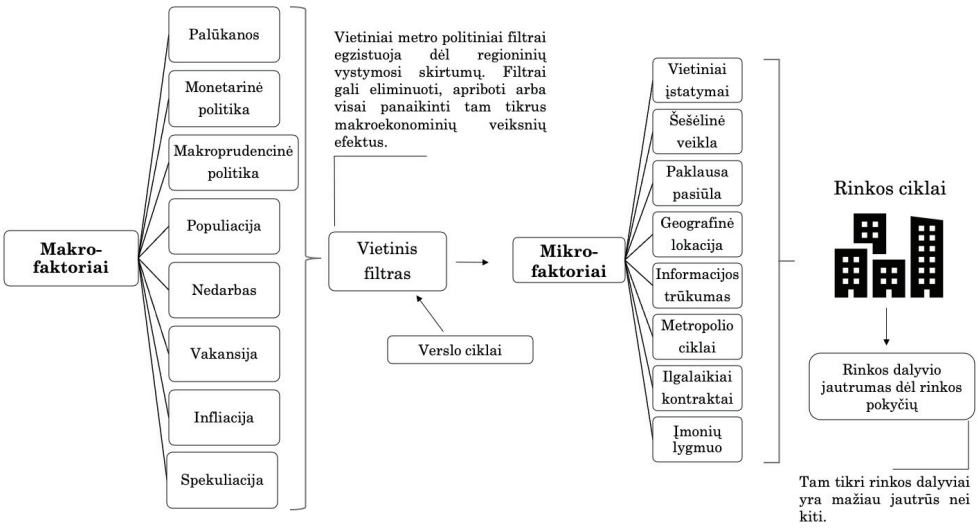
Kita svarbi samprata, kuria pagrįsta disertacijos mokslinė problema, yra NT rinkos stabilumas. Deja, aiškaus konsensuso šiuo klausimu mokslinėje literatūroje nėra, todėl galutinė formuluotė buvo apibrėžta taip: stabili NT rinka – tai tokia situacija, kai veiklos matavimo objekte ar matavimo priemonėje nėra ekstremalių pokyčių ar svyravimų. Matavimo priemonė gali būti NT nuomos ar pardavimo kaina, vakansija ir kt. rodikliai, susiję su NT rinka. Vis dėlto „pilkąja zona“ išlieka tai, kas yra dideli svyravimai. Pasak Europos centrinio banko monetarinės politikos

1998 metų reglamentų, infliacijos augimas ne daugiau nei 2 procentais laikomas stabiliu augimu, tačiau tai nereiškia, jog kitame kontekste 3 procentų augimas jau viršija stabilumo gaires. Dėl šios priežasties metodologinėje dalyje yra paaiškinama, kaip stabilumas vertinamas iš REIT ir REOC perspektyvų.

1.2. Nekilnojamojo turto rinkos ciklų ir veiksnių, darančių įtaką svyravimams, analizė

Daugiau nei 200 metų ekonomistai studijavo pasireiškiančius stabilumo ir nestabilumo procesus, kurių rezultatai parodė, jog egzistuoja reguliarūs svyravimai, kitaip tariant, periodiškumas tarp nestabilumo ir stabilumo periodų, kuriuos mokslininkai įvardijo kaip rinkos ciklus. Autoriai išskyrė keturis ciklų etapus:

- pakilimas, kurio metu NT kainos auga sparčiai;
- pikas, kurio metu NT kainų augimas pasiekia lūžio tašką ir pakeičia kryptį;
- nuosmukis, kai NT veikla pradeda mažėti;
- atsigavimas, kai kainos, pasiekusios žemiausią lūžio tašką, pradeda augti.



2 pav. Kintamieji, kurie daro įtaką nekilnojamojo turto rinkos ciklams (sukurta autoriaus)

Disertacijoje buvo nuodugniai apžvelgiamos ciklų charakteristikos ir kokius rodiklius naudodami autoriai juos nustatė. Ciklų analizės svarba buvo pabrėžta autorių Born ir Phyrr (1994), Pyhrr, Webb ir Born (1990), Pyhrr, Roulac ir Born (1999), kurie parodė, jog dėl nenuoseklaus augimo ciklų pikuose formuojasi burbulai, dėl kurių galiausiai nukenčia įvairūs rinkos dalyviai, tokie kaip šeimos arba stambūs investuotojai. Buvo fiksuojama, jog tam tikruose sektoriuose nuo žemiausio iki aukščiausio ciklo taškų NT vertė gali skirtis apie 160 proc. Didelis dėmesys skirtas analizuoti veiksnius, kurie daro įtaka NT ciklams, jie buvo grupuojami į mikro- ir makrolygmenis. Atlikus analizę, buvo sukurtas konceptualus

šių veiksnių veikimo žemėlapis, kuris pavaizduotas 2 paveiksle. Verta paminėti, jog vienareikšmiškai pasakyti, kurie kintamieji kaip paveikia NT rinką, yra sudėtinga. Tam tikrais atvejais infliacija gali sparčiai akceleruoti kainų augimą, kitais atvejais – neturėti reikšmingo poveikio, todėl disertacijoje pabrėžiama, jog pavieniui nagrinėti mikro- ir makroveiksnių poveikį yra netikslu. Disertacijoje taip pat akcentuojama, jog egzistuoja takoskyros filtras, per kurį makroveiksnių įtaka gali būti sumažinta arba visai panaikinama. Jis 2 pav. pavaizduotas kaip vietinis filtras. Jis grindžiamas tuo, jog didžioji dalis NT ciklų yra nepriklausomi nuo verslo ciklų ir turi savo individualų pasireiškimo atoveiksmį, kuris priklauso nuo vietinio miesto įstatymų, investicinio patrauklumo ir kitų veiksnių.

1.3. Istorinė nekilnojamojo turto rinkos stabilumo analizė

NT krizės yra pasikartojantis reiškinys žmonių istorijoje. Pasak mokslininko Bordo (2003), vien JAV istorijoje NT burbulų buvo aptikta apie 20 ir turbūt būtų galima surasti daugiau panašių atvejų, tačiau ankstesniu laikotarpiu duomenų rinkimo metodai nebuvo pakankamai išvystyti, kad būtų galima objektyviai išmatuoti visus NT rinkoje įvykusius svyravimus, todėl pagal turimus duomenis, viena iš pirmųjų krizių yra laikoma 1818 metais vykusi Alabamos krizė. Mokslininkas Andersonas (2009) teigia, jog nuo 1800 metų NT burbulai reguliariai įvykdavo kas 18,6 metų. Kiekviena krizė turėjo savo specifinę lokaciją ir priežastį, tačiau bendrai galima išskirti keturias priežastis:

- lengvas priėjimas prie pinigų ar kredito. Ši situacija dažnai yra susijusi su bankų reikalavimais, monetarine politika ir t. t. To pavyzdys yra 2007 metų krizė, kai buvo galima gauti būsto paskolas, nenaudojant pradinio užstato.
- monetarinės politikos nenuoseklumas. Ši situacija pasireiškia, kai palūkanos išlieka žemos ilgą laiką ir sukuria galimybę spekuliacijai vystytis.
- nepamatuoti lūkesčiai. Čia smarkiai veikia žmogaus elgsenos psichologija ir tai geriausiai iliustruoja Majamio NT krizė, kai žmonės, siekdami subjektyvios ir iliuzinės ateities, sukelia paklausą, kuri nėra paremta racionaliais lūkesčiais.
- finansinės machinacijos ir pinigų plovimo operacijos. Beveik visose krizėse buvo aptiktos tiek valstybinės, tiek privačios kompanijos ar institucijos, kurios nesilaikė reglamentų, teisinių procedūrų ar vengė mokesčių.

Remiantis moksliniais tyrimais, pagrįstas dar vienas dėsningumas, kuris rodo, jog nors krizė neprasideda NT sektoriuje, gana dažnai įsiskverbia į pastarąjį sektorių. To priežastis yra ta, jog NT investuotojų yra laikomas pinigų vertės išsaugojimo šaltiniu. Pavyzdžiui, JAV 2000 metais įvykęs interneto bumas, kuris galiausiai persikėlė ir į NT, nes praturtėję investuotojai ieškojo, kaip diversifikuoti iš informacinio sektoriaus uždirbtus pelnus.

Verta paminėti, jog šiame skyriuje buvo analizuota panaši į REIT atmaina pavadinimu „S&L“, kuri atsirado 1980-aisiai metais JAV. Pastarasis kompanijos darinys turėjo ir smarkų investicinės veiklos reguliavimo bei liberalizavimo periodus. Iš pradžių buvo ribojama šių kompanijų spekuliacinė veikla, kuri vėliau buvo išplėsta ir net suteikė pranašumų prieš bankines sistemas. Abiem atvejais dėl

šešėlinės veiklos ir kitų disertacijoje nagrinėjamų priežasčių „S&L“ veikla sukėlė NT rinkos nestabilumo atvejų, kurie gali panašiai įvykti ir REIT atveju.

1.4. REIT samprata ir veikimo principai

1.4.1. Istorinė REIT raida

Išnagrinėjus istorinę praeitį apie REIT atsiradimą buvo galima geriau suprasti, kokiais veikimo principais ir kokiais tikslais ji buvo sukurta. Bendrai vertinant, REIT istorija buvo ypač kontraversiška ir tam tikrais atvejais nelegali. REIT pirmtakės atsirado Jungtinėje Karalystėje 18 amžiuje ir buvo vadinamos neinkorporuotomis asociacijomis. Deja, iki pat 1960 metų neinkorporuotos asociacijos nuolatos kovodavo teismuose už savo išlikimą. Svarbiausia teisinė kova vyko JAV Masačiusetso valstijoje, kurioje išsigrynino NT tresto idėja. Galiausiai 1960 metais prezidentas Eizenhaueris oficialiai įteisino ir pervadino įvairius investicinių trestų darinius į REIT, todėl pirmąja šalimi, įteisinusia REIT, yra laikomos JAV. Europoje REIT pirmą kartą pasirodė Olandijoje 1969 metais.

1.4.2. REIT samprata ir jų įstatyminiai atributai bei kiti nekilnojamojo turto rinkos dalyviai

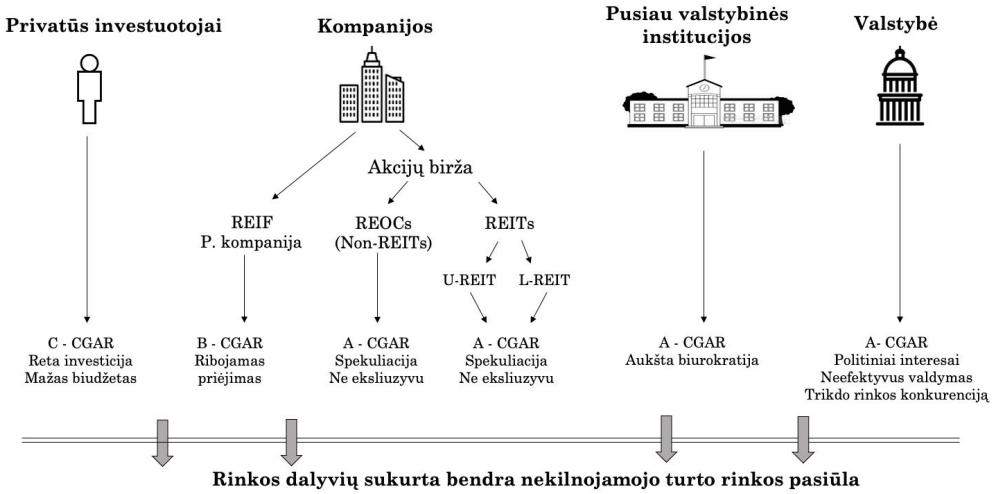
Išsivysčiusiose pasaulio šalyse šiuo metu NT dalyvius galima suskirstyti į keturias kategorijas:

- privačius asmenis;
- kompanijas;
- mišrias valstybines / privačias institucijas;
- valstybines institucijas.

Kaip matyti iš 3 paveikslo, REIT investicinis tipas pasireiškia akcinių bendrovių pavidalu ir tiesiogiai konkuruoja su non-REIT tipu arba dar kitaip vadinamomis REOC. REIT būtų galima apibrėžti taip: tai yra investicinė kompanija, turinti savo teisinį statusą ir reglamentus bei atliekanti daugiausia savo investicinių operacijų NT sektoriuje. Jos konkurentą REOC galima vadinti REIT statuso neturinčia, bet daugiausia savo investicinių operacijų NT sektoriuje atliekančia bendrove. Investicinės kompanijos, norinčios įgyti REIT ar REOC statusą, privalo laikytis specialių reglamentų, procedūrų ir veikimo principų, kurias nustato kiekvienas šalis individualiai.

2018 metais tik 13 iš 27 Europos šalių savo akcijų biržose buvo įsivedusios REIT kotiravimosi galimybes. Kiekvienoje šalyje egzistuojantys reglamentai nežymiai skyrėsi, tačiau bendrai galima išskirti keturis klasikinius ir svarbiausius bruožus, kurie siejami su REIT:

- privalomas kasmetinis dividendų išmokėjimas, kuris svyravo nuo 75 iki 95 proc. privalomo paskirstomo pelno;
- akcijos turi būti įtrauktos į tos šalies akcijų biržą, nors JAV egzistuoja ir privačios REIT bendrovės;
- didžioji dalis investicinės veiklos REIT turi būti NT sektoriuje;
- spekuliacinė veikla yra ribojama;
- ilgalaikiai įsipareigojimai yra ribojami.



3 pav. Nekilnojamojo turto rinkos dalyvių kategorijos (sukurta autoriaus)

REIT yra populiarūs JAV. EPRA duomenimis, 192 kompanijos turėjo REIT, Europoje – 223 kompanijos. Verta paminėti, jog tarp šių šalių / kontinentų smarkiai skyrėsi į akcijų biržas įtraukto NT kiekis. JAV iš viso 1 299 milijardo NT vertės buvo galima įsigyti akciniu pavidalu, o Europoje – tik 502 milijardus. Beveik visą didžiąją dalį NT JAV valdė REIT, apie 96 procentus, tuo tarpu Europoje – tik 42 procentai buvo REIT pavidalu. Gali būti, kad mokestinės lengvatos iš REIT skatina NT pateikti akciniu pavidalu, kas tuo pačiu sumažina tam tikrų NT objektų neprieinamumą.

1.4.3. REIT adaptacijos nekilnojamojo turto rinkos stabilumui teorinė nauda

Norint įgyvendinti tvarų rinkos augimą yra svarbu, jog inovacijos tiesiogiai spręstų istorinėje apžvalgoje išskirtas krizių priežastis. Kaip minėta prieš tai, spekuliacija, nepamatuoti lūkesčiai, šešėlinė veikla bei monetarinės politikos nenuoseklumas išbalansuoja rinkas ir būtent šiuo atveju REIT turi įdomų gynybinį mechanizmą šioms problemoms spręsti. Visų pirma, kadangi REIT yra draudžiama įsiskolinti daugiau negu reglamentai leidžia ir jų spekuliacinė veikla taip pat ribojama, rizika, kylanti iš nepamatuotų lūkesčių, ir spekuliacijos perspektyvos būtų sumažintos. Tęsiant toliau, kadangi REIT yra apribotos įsiskolinti iki tam tikro limito, tikėtina, jog palūkanų pokyčiams šios kompanijos bus mažiau jautrios negu REOC, kur įsiskolinimo ir nuosavybės santykis yra mažiau ribojamas. Galiausiai, kadangi REIT kotiruojasi akcijų biržose, jų veiklos skaidrumas yra didesnis negu privačių kompanijų, kurioms nereikia pateikti išsamių ataskaitų apie savo įmonės veiklą. Teoriškai vertinant, kadangi REIT turi apribojimų, kurie tiesiogiai kovoja su krizių formavimosi priežastimis, šios kompanijos galimai pagelbėtų šalių ekonomikoms, siekiant tvaresnio augimo.

2. „REIT“ POVEIKIO VERTINIMO NEKILNOJAMOJO TURTO RINKOS STABILUMUI METODOLOGIJA

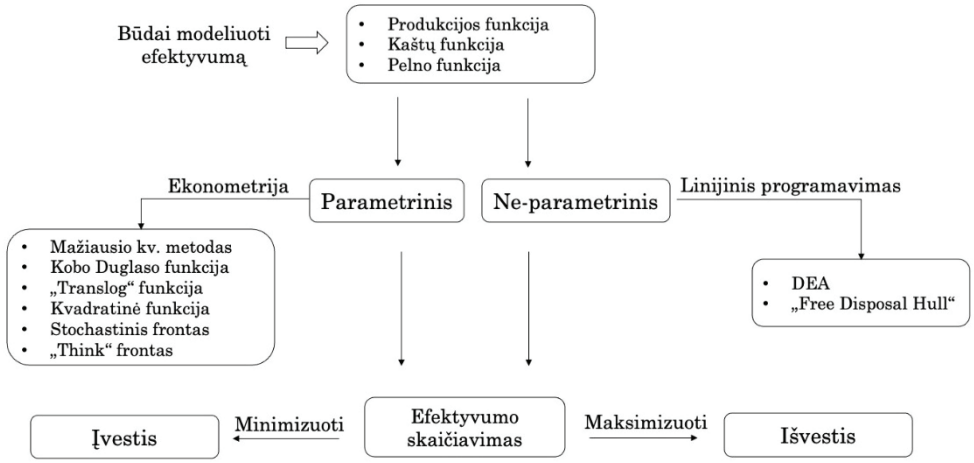
2.1. Modeliavimo krypties konceptuali samprata

Apsibrėžus NT rinkos sąvokas ir išskyrus istorinių krizių priežastis buvo nuspręsta, jog norint suprasti, kokią įtaką REIT gali turėti NT rinkos stabilumui, reikia išanalizuoti REIT ir REOC efektyvumą, sisteminį atsparumą palūkanų pokyčiams ir atsparumą rinkos šokams. REIT atveju pagrindinis pakaitalas yra REOC, todėl palyginus šių kompanijų svyravimus ir atsparumus, galima rasti atsakymą, kaip, šalyje atsiradus REIT, gali pasikeisti NT rinkos stabilumas.

2.2. Veiklos rezultatų analizės metodologinė prieiga

2.2.1. Efektyvumo modelio struktūra

Nemaža dalis autorių analizuoja įmones efektyvumo aspektu. Keli iš jų, minėti disertacijoje, yra Bers ir Springer (1997), Anderson, Fok, Zumpano ir Elder (1998), Anderson ir Springer (2002), Anderson, Springer ir Webb (2002), Anderson Brockman, Giannikos (2004), Miller, Clauretie ir Springer (2005), Ambrose et al. (2005), Miller ir Springer (2007), Isik ir Topuz (2006), Tahir et al. (2012), Ambrose et al. (2016), Beracha (2018), Springer, Highfield ir Lily Shen (2019).



4 pav. Efektyvumo vertinimo metodika metodika (sudaryta autoriaus)

Efektyvumo analizėje DEA metodas ir stochastinio fronto metodas yra vieni iš populiariausių būdų įvertinti, kaip sėkmingai įmonė naudoja savo išteklius. Abiem metodais yra kuriamos produkcijos maksimizavimo arba kaštų minimizavimo funkcijos. Abu metodai turi privalumų ir trūkumų, tačiau atlikus kitų tyrėjų metodikos apžvalgą matyti, jog DEA metodas buvo šiek tiek populiaresnis, todėl tolesnei efektyvumo analizei nuspręsta rinktis DEA metodą. DEA metodu buvo naudojama pastovi ir kintama skalė, iš kurių taip pat buvo išskaičiuojama gamybos masto ekonomija. Efektyvumo vertinimo metodai pavaizduoti 4 pav. Efektyvumai

buvo skaičiuojami tiek REIT, tiek REOC siekiant palyginti, kurios kompanijos mikroekonominiu lygmeniu geba geriau naudoti savo išteklius.

2.2.2. Svyravimo modelio struktūra

Nemaža dalis autorių skyrė dėmesį analizuodami REIT akcijų / indeksų grąžos svyravimus. Šioje tematikoje svarbūs autoriai Black (1976), Devaney (2001), Cotter ir Stevenson (2006), Case, Yang ir Yildirim (2012), Morri ir Cristanziani (2009), Bhargava et al. (2010), Zhou (2011), Falkenbach ir Niskanen (2012), Kawaguchi et al. (2012), Lee, Stevenson ir Lee (2012), Asteriou ir Begiazi (2013), Liow ir Schindler (2014), Agarwal ir Hu (2014), Lee ir Stevenson (2004), Zhou (2016), Kola ir Kodongo (2017). Pastebėti keli populiarūs būdai analizuoti svyravimus. Pirmasis yra standartinės deviacijos nuokrypis. Pastarasis metodas reikšmingas, kadangi parodo duomenų variaciją, ir jis disertacijoje buvo taikomas kiekviename analizės etape, siekiant nustatyti, kuris investicinės bendrovės tipas duoda nepastovesnį rezultatą. Antra, taikyti šoko užsitęsimo modeliai, tokie kaip GARCH. Pastarasis metodas pasako, kaip ilgai įmonėje jaučiamos šoko pasekmės.

2.2.3. Palūkanų normos ir rinkos jautrumo modelio struktūra

Trečiajame metodologijos etape buvo ieškoma būdų, kuriais sėkmingai galima matuoti sisteminę riziką kompanijoms iš rinkos ir palūkanų pokyčių perspektyvos. Į pagalbą buvo pasitelkti tokie autoriai kaip Redman ir Manakyan (1995), Shelor ir Anderson (1998), Brady ir Conlin (2004), Bianco, Ghosh ir Sirmans (2007), Morri ir Cristanziani (2009), Falkenbach ir Niskanen (2012), Brounen ir Koning (2014), Zainudin, Ibrahim, Hussain ir Had (2017), Schrand, Ascherl ir Schaefers (2018). Įvertinus autorių rekomendacijas, nuspręsta taikyti *two-stage least sqaures* metodą, kuris leistų išmatuoti grynąjį rinkos efektą įmonės kainoms, bei naudoti regresijos liekanas nuo palūkanų pokyčių tam, kad būtų nustatytas palūkanų jautrumo beta koeficientas. Kadangi tyrimo metu buvo išmatuoti beta koeficientai, papildomai buvo galima sukonstruoti dar vieną metodą, kuris leistų objektyviai išmatuoti, dėl kokių priežasčių skiriasi beta koeficientų reikšmės.

2.3. Stebinių ir modelių parametrų specifikacija

Norint objektyviai ir tiksliai išmatuoti REIT ir REOC veiklos rezultatų skirtumus svarbu ne tik pasirinkti teisingą metodologiją, bet ir turėti patikimus duomenis. Abiejų kompanijų atvejais buvo pasirenkamos įmonės, kurios yra įtrauktos į akcijų biržas, todėl dėl audito reikalavimų duomenų patikimumas yra aukštas. Efektyvumo analizėje buvo surinktos 1227 kompanijos nuo 2017 iki 2019 metų. Remiantis analizuotų autorių patirtimi, nuspręsta išeities duomenims naudoti įmonės turtą, o įvesties duomenims – administracines, palūkanų bei amortizacijos išlaidas.

Sisteminėje rizikos analizėje buvo surinkta daugiausia duomenų. Pirma, buvo renkami tiek REIT bei REOC akcijų kainų pokyčiai nuo 2010 iki 2019, o tai iš viso agregavosi į 174 036 stebinius. Palūkanų normų jautrumui matuoti buvo naudojami valstybių narių 10 metų obligacijų kainų pokyčiai iš šių šalių:

1) Belgija, 10 metų obligacija;
2) Prancūzija, 10 metų obligacija;
3) Vokietija, 10 metų obligacija;
4) Italija, 10 metų obligacija;
5) Ispanija, 10 metų obligacija;
6) Švedija, 10 metų obligacija;
7) JK, 10 metų obligacija.

Rinkos beta koeficientams buvo naudojami šių šalių indeksai:

10) Belgija MSCI;
11) Prancūzija MSCI;
12) Vokietija MSCI;
13) Italija MSCI;
14) Ispanija MSCI;
15) Švedija MSCI;
16) JK MSCI;
17) JAV S&P.

Iš viso atlikti šį tyrimą buvo naudota daugiau nei 182 388 stebinių. Papildomai tam, kad būtų patikrintos priežastys, kodėl egzistuoja tam tikri skirtumai tarp vidutinių beta koeficientų, nuspręsta surinkti 4010 duomenų apie kompanijų vadybą, patirtį, įkūrimo datą, vadovo atlygį, sektorių ir kitus kintamuosius bei išmatuoti, kokią įtaką šie veiksniai gali turėti.

Pabaigai, tam, kad būtų atlikti svyravimo matavimai, buvo paimti du indeksai *FTSE EPRA Nareit Developed Europe REITs* ir *FTSE EPRA Nareit Developed Europe non-REITs* nuo 2006 iki 2019 metų. Pirmąjį indeksą sudarė 33 REIT kompanijos, antrajame – 40 REOC kompanijų, kurios buvo atrenkamas pagal tokius kriterijus:

1) įmonė turi būti įtraukta į akcijų biržą;
2) įmonė turėjo būti klasifikuojama pagal 3728 statybos sektorių;
3) 75 procentai EBITA rodiklio buvo generuojama iš NT operacijų;
4) papildomi reikalavimai buvo minimalus dydis, ataskaita anglų kalba, minimalus likvidumas.

3. „REIT“ POVEIKIO NEKILNOJAMOJO TURTO RINKOS STABILUMUI EMPIRINIS TYRIMAS LYGINANT „REIT“ IR „REOC“ VEIKLOS SKIRTUMUS

3.1. Empirinė REIT ir REOC efektyvumo analizė

Efektyvumo analizėje pirmiausiai buvo apžvelgti skolos ir kapitalo grąžos rodikliai, kad būtų įvertinti surinktų įmonių skirtumai. Per visus trejus metus (2017–2019) REIT bendro turto atžvilgiu buvo apie 53,7 procentus didesni, trumpalaikės ir ilgalaikės skolos rodiklis REIT vidutiniškai siekė 0,27, tuo tarpu REOC jis buvo labai nepastovus ir vidutiniškai siekė apie 2,1. Kapitalo grąžos rodiklis REOC buvo 13 procentų didesnis, tuo tarpu skolos ir nuosavybės santykis REIT siekė 1,37, o REOC – 1,6. Remiantis autorių Garcia-Teruel ir Martinez-Solano (2007), Jun ir Jen (2003), Choe (1994), Dang, Lee, Liu ir Zeng (2017), Goyal ir Wang (2013) tyrimais, REOC gebėjimas finansuoti savo veiklą labiau trumpalaikiais įsipareigojimais rodo įmonių finansinį užtikrintumą ir stiprumą. Kita vertus, trumpalaikiai terminai gali turėti įtakos didesniam spekuliavimui, nes tai priverčia bendroves ieškoti, kaip per trumpą laiką uždirbti atitinkamą pelną. Tokiu atveju gali būti investuojama yra rizikingus projektus, kuriems nepasiteisinus, NT rinka gali tapti pažeidžiamesnė.

1 lentelė. DEA modelio rezultatai REOC ir REIT.

		REITs			**REOCs**		
Metai	Stat.	TE_{CRS}	TE_{VRS}	SE	TE_{CRS}	TE_{VRS}	SE
2019	Vid.	0,259	0,344	0,81652	0,314	0,4311	0,7672073
	SD	0,227	0,2856	0,2238963	0,2560	0,3068	0,2646242
	Maks.	1	1	1	1	1	1
	Min.	0,0414	0,0438	0,18696	0,0015	0,0065	0,021949
2018	Vid	0,2269	0,308201	0,8048	0,2875844	0,3975172	0,7423
	SD	0,1815	0,2465248	0,211324	0,26164	0,3000672	0,2739529
	Maks.	1	1	1	1	1	1
	Min.	0,03456	0,036260	0,2886	0,002836	0,004534	0,0064
2017	Vid	0,269	0,33094	0,8607869	0,290	0,386	0,78933
	SD	0,218	0,260	0,1882	0,267	0,30333	0,278832
	Maks.	1	1	1	1	1	1
	Min.	0,021	0,0227	0,300	0,00008	0,0151361	0,00008

Atlikus efektyvumo analizę, kurios rezultatai pateikti 1 lentelėje, REOC pasiekė geresnius išteklių alokacijos rezultatus negu REIT CRS ir VRS kategorijose visų metų laikotarpiu nuo 2017–2019. Vis dėlto, verta paminėti, jog skirtumai nebuvo dideli ir svyravo 7–21 procentų ribose CRS ir VRS kategorijose. Tik gamybos masto ekonomijose REIT turėjo geresnius rezultatus. Papildomai, kad būtų įgyvendinta dar objektyvesnė analizė, REIT ir REOC buvo balansuojamos pagal jų trumpalaikio ir ilgalaikio skolos ir nuosavo kapitalo rodiklius. Deja, net atlikus kompanijų supanašėjimo procedūrą, rezultatai reikšmingai nepasikeitė ir REOC išliko efektyvesnės. Palyginus su kitais autoriais, kurie atliko panašią DEA efektyvumo analizę, galima teigti, jog rezultatai iš esmės buvo panašūs. Deja, kitų

autorių tyrimai apsiribojo tik REIT empiriniais tyrimais neįvertinant ir nelyginant su REOC, todėl nėra aišku, ar REIT kituose perioduose buvo pranašesnės.

3.2. Empirinė REIT ir REOC sisteminės rizikos analizė

Atliekant sisteminės rizikos analizę pirmiausiai buvo apžvelgiama kompanijų akcijų kainos grąža ir jų variacija pagal skirtingas šalis (duomenys pavaizduoti 2 lentelėje). REIT analizuojamu laikotarpiu vidutiniškai davė geresnę grąžą, tačiau šis skirtumas iš esmės buvo nulemtas dviejų šalių – Italijos ir Ispanijos, kurios turėjo neigiamą pelningumą REOC atžvilgiu. Analizuojant variaciją pastebėta, kad dispersija buvo didesnė REOC, o tai dar kartą signalizuoja, jog REOC nuspėjamumas yra mažesnis. Panaši situacija buvo nustatyta analizuojant efektyvumą, kada variacija REOC buvo didesnė.

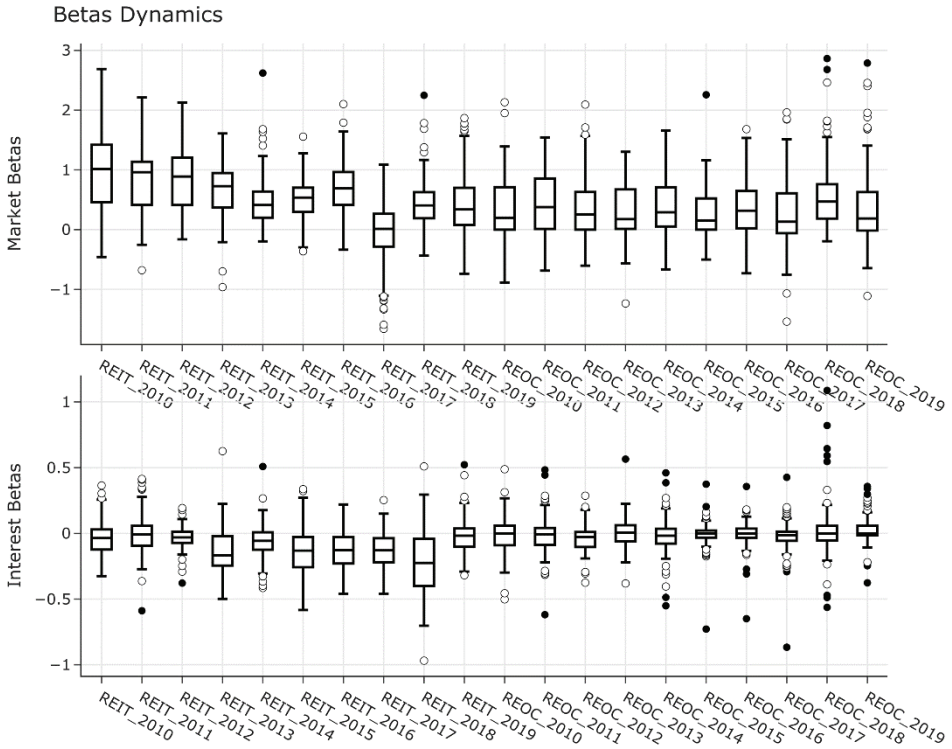
Suskaičiavus rinkos jautrumo koeficientus, kurie pateikti 3 grafike, galima daryti išvadą, jog REIT buvo nežymiai, bet reikšmingai jautresnės bendros rinkos pokyčiams. Beta koeficientas REIT vidutiniškai siekė apie 0,39, tuo tarpu REOC– apie 0,3. Didžiausias jautrumas abiejų kompanijų atveju buvo JAV, mažiausias REIT – Vokietijoje, o REOC – Prancūzijoje. Gali būti, kad dėl 2007 metų krizės kompanijos vis dar jautė besitęsiančias problemas, kita vertus, tai taip pat gali būti REIT veiklos apribojimų pasekmė, kuri galėjo atsirasti dėl egzistuojančių spekuliacijos ar įsiskolinimų apribojimų. Be to, verta paminėti, jog ir šiuo atveju variacija buvo didesnė REOC.

2 lentelė. REIT ir REOC akcijų kainų grąžos aprašomoji statistika

Tipas	Šalis	# SK.	Vid. grąža	Std.	# Įrašai	Periodas
REIT	Belgija	15	15,26 %	0,22347	7860	2010–2019
	Prancūzija	19	14,77 %	0,32404	9670	2010–2019
	Vokietija	3	15,84 %	0,19563	757	2010–2019
	Ispanija	6	4,61 %	0,17789	1314	2010–2019
	JK	30	11,20 %	0,23244	14243	2010–2019
	JAV	180	14,02 %	0,36113	76771	2010–2019
	Avg.		12,62%	0,2524224		
REOC	Belgija	4	11,22 %	0,229577	2096	2010–2019
	Prancūzija	14	15,84 %	3,379547	6812	2010–2019
	Vokietija	33	16,40 %	0,388053	17816	2010–2019
	Italija	6	-7,90 %	0,413873	3144	2010–2019
	Ispanija	5	-1,78 %	0,459955	2620	2010–2019
	Švedija	40	19,97 %	0,344241	20960	2010–2019
	JK	32	9,85 %	0,348167	16768	2010–2019
	JAV	36	17,90 %	0,656121	18864	2010–2019
	Vid.		10,19 %	0,777442		

Nagrinėjant palūkanų jautrumo situaciją galima konstatuoti, jog 2010 – 2019 metų laikotarpiu REIT taip pat buvo jautresnės palūkanų normos pokyčiams lyginant su REOC. Kaip ir rinkos beta koeficiento atžvilgiu, didžiausias jautrumas REIT atžvilgiu buvo fiksuojamas JAV, tuo tarpu REOC atžvilgiu – Švedijoje. Verta paminėti, jog palūkanų beta koeficiento reikšmė buvo neigiama, reiškianti, jog augant palūkanoms, mažėja NT bendrovių akcijų grąža. Tokios situacijos priežastis

paprasta – didžioji dalis NT bendrovių vykdo savo veiklą naudodamos paskolas, dėl to, jeigu centrinis bankas padidina bazines palūkanų normas, natūralu, jog bendrovei vystyti veiklą darosi sunkiau, nes išauga kaštai.



5 pav. Palūkanų ir rinkos jautrumo koeficientai REIT ir REOC (sudaryta autoriaus)

5 paveiksle pavaizduota, kaip analizuojamu periodu keitėsi beta koeficientų reikšmės tiek REOC, tiek REIT. Svarbus nustatytas rezultatas šiuo atveju yra tas, jog recesijos metu NT bendrovių akcijų kainos buvo tiek pat rizikingos kiek ir kitų sektorių kompanijų akcijų, kadangi rinkos beta koeficientas buvo arti vieneto. Investuotojams reikėtų suprasti, kad diversifikavimo galimybės yra dinamiškos, todėl krizės metu derėtų atsargiai vertinti NT akcijų galimybes apsisaugoti nuo rizikos ar ekonominių šokų. Kita vertus, tvaraus ekonomikos augimo laikotarpiu diversifikavimo galimybės analizuojamu laikotarpiu buvo patrauklesnės, kadangi beta koeficientai buvo arčiau nulio. Aukščiausias vidutinis beta koeficientas 0,92 REIT užfiksuotas 2010 metais, žemiausias 2017 metais – apie -0,03. REOC aukščiausias vidutinis beta koeficientas užfiksuotas 2018 metais 0,54, o žemiausias – 2017 metais apie 0,27. Kiti autoriai atrado taip pat panašias rinkos beta koeficientų reikšmes.

Kiek kitokia situacija buvo palūkanų beta koeficientų situacijoje, kurios, kaip matyti iš 5 paveikslo, mažiau keitėsi analizuojamu laikotarpiu. Galimai taip yra todėl, jog paskolų dydis kompanijose nesikeičia taip dažnai, kaip bendras įmonės

pelningumas. Didžioji dalis bendrovių turi ilgalaikius paskolų kontraktus, todėl įmonės jautrumas yra mažesnis.

3 lentelė. Palūkanų normos jautrumo regresinė analizė

Kintamieji	**DV = Palūkanų normų Beta koeficientas**					
	1		**2**		**3**	
Šalis:						
Prancūzija	0,000419	(0,29897)				
Vokietija	-0,005075	(0,29129)				
Švedija	0,138299	(0,31865)				
JK	0,265445	(0,27088)				
JAV	-0,049328	(0,25135)				
Vyr.	0,288947	(0,27155)				
Vyr. ir mot.	0,496323*	(0,27286)				
Įkūrimo pradž.	0,361248	(0,79028)				
Direkt. gim.	-0,027481	(0,05610)				
Atlyginimas	-0,078770	(0,05602)				
Sektoriai:						
Komercinis			-0,270128	(0,59841)	-0,27017	(0,57297)
Vystymo			-0,087410	(0,54129)	-0,17213	(0,51868)
Diversifikuotas			-0,301707	(0,4497)	-0,09056	(0,43313)
Finansinis			-0,207377	(1,08258)	-0,24693	(1,03637)
Gydymo			-0,789280	(0,50277)	-0,02205	(0,50370)
Viešbutis			0,0656268	(0,49412)	0,730055	(0,4950)
Industrinis			-0,562867	(0,48114)	0,083586	(0,48155)
„Lodging“			-0,406881	(1,08258)	-0,43581	(1,03635)
Logistika			-0,126899	(0,82683)	-0,18606	(0,79161)
Vadyba			0,1865539	(0,62502)	0,268691	(0,59892)
Paskolų			-0,521391	(1,08258)	0,040176	(1,04678)
Ofiso			-0,456480	(0,46943)	0,227719	(0,47148)
Gyvenamieji			-0,581030	(0,47087)	-0,14462	(0,46060)
Prekybiniai			0,1763955	(0,46586)	0,863421*	(0,46845)
Specializuoti			-0,793773	(0,49958)	-0,00418	(0,50186)
Sandėliavimo			-0,117206	(1,08258)	-0,15307	(1,03636)
Tipas_REIT					-0,6011**	(0,14694)
Ilgalaik. įsipareig.					-0,2955**	(0,07745)
Trump. įsipareig.					0,17239**	(0,07627)
„Intercept“	-0,391	(0,358)	0,3152	(0,438)	0,2589	(0,422)
N			380			
R-kv.	0,041		0,077		0,161	

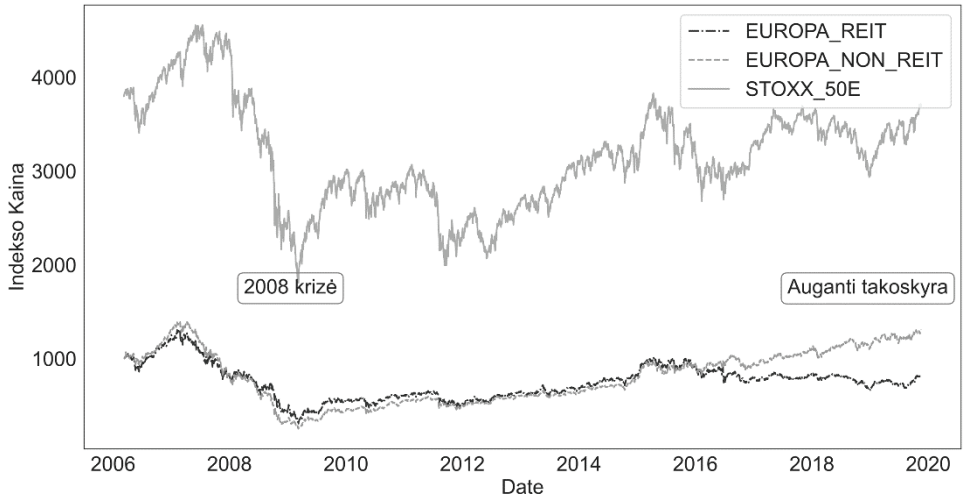
Pastaba: *p<0,1; **p<0,05

Suskaičiavus palūkanų jautrumo beta koeficientus, buvo kuriami nauji regresijos modeliai, kurie įvertino pagal sektorius, patirtį ir kitus parametrus, o tai daro didžiausią įtaką palūkanų normų kaitai. Analizė pateikta 3 lentelėje. Kaip matyti, visi trys modeliai paaiškina labai mažą variacijos dalį, vadinasi, iš tikrųjų yra daug kitų veiksnių, nulemiančių vieną ar kitą rezultatą. Pirmajame modelyje, deja, tik vienas veiksnys buvo reikšmingas ties 10 proc. p-statistikos reikšme, tai yra įmonės tarybos diversifikacija. Apsiribojant tik sektoriaus skirtumais matyti, jog nė vienas sektorius nedarė reikšmingos įtakos, tačiau kai papildomai buvo kontroliuojama regresija pagal skolos ir kompanijų tipų režimus, prekybos sektorius turėjo teigiamą reikšmę. Vis dėlto, reikšmingiausi koeficientai pagal p-statistikos

gaires buvo kompanijos tipas, trumpalaikiai ir ilgalaikiai įsipareigojimai. Jeigu kompanija buvo klasifikuojama kaip REIT, tada palūkanų jautrumas didėjo neigiama linkme, kaip ir ilgalaikių skolų įsipareigojimai. Trumpalaikiai skolos įsipareigojimai turėjo atvirkščią efektą.

3.3. Empirinė REIT ir REOC indeksų svyravimo analizė

Svyravimo analizėje pirmiausia buvo apžvelgiami *FTSE EPRA Nareit Developed Europe REITs* ir *FTSE EPRA Nareit Developed Europe non-REIT* indeksų skirtumai. Analizuoti finansiniai rodikliai konstatavo, jog, skirtingai nei REIT, REOC veiklai plėtoti daugiau naudojo trumpalaikes skolas, tik 2015–2016 metais REIT 1,5 ir 8 procentais lenkė REOC naudojimąsi trumpalaikėmis paskolomis. Kalbant apie dividendus, pasakytina, kad REIT mokėjo didesnius dividendus per visą analizuojamą laikotarpį nuo 2006 iki 2019 metų. Be to, REIT indeksas turėjo geresnius likvidumo rodiklius.



6 pav. FTSE REIT, non-REIT ir STOXX50E indeksų kainos

Iš 6 paveikslo matyti, jog tiek REOC, tiek REIT kainų indeksų kryptys buvo panašios. Krizės laikotarpiu abu indeksai smarkiai nukentėjo ir nuosekliai bandė sugrįžti į pradinį lygį, tačiau ties 2016 metais pradėjo augti takoskyra. REOC indeksas pradėjo artėti prie 2007 metų kainų lygio, tuo tarpu REIT perėjo į horizontalų judėjimą. Tai parodo, jog REOC sugebėjo greičiau atsistatyti pokriziniu laikotarpiu negu REIT. Tolesnėje analizėje buvo sukonstruoti GJR-GARCH (1,1,1) ir GJR-GARCH (1,1,2) modeliai. Galutiniai modelių rezultatai buvo reikšmingi ir konstatavo, jog REIT indeksas turėjo aukštesnį šoko užsitęsimą negu REOC indeksas, nors skirtumai svyravo nuo 2 iki 5 procentų. Gama koeficientai taip pat buvo reikšmingi, ir jų asimetrija REIT indeksui buvo nuo 21 iki 39 procentų didesnė. Tokių autorių kaip Bhargava et al. (2010), Case et al. (2012), Kola ir

Kodongo (2017) tyrimuose REIT šoko užsitęsimas buvo taip pat aukštas, koeficientas apytiksliai siekė apie 0,9.

3.4. Rezultatų pritaikomumas, interpretacija ir apribojimai

Atlikus skirtingas mikro- ar makroanalizes įvairiais pjūviais REIT ir REOC poveikis NT rinkai buvo agreguojamas į poveikio taškus pagal skirtingas kategorijas ir skaičiuojamas poveikio indikatorius. Kuo didesnė indikatoriaus suma, tuo tvaresnė rinka teoriškai turėtų išlikti.

4 lentelė. REIT ir REOC poveikio NT rinkos stabilumui indikatorius

Tipas	REIT	REOC	Aprašymas
Mikrolygis			
DEA analizė			
CRS/VRS	0	0,5	REIT buvo mažiau efektyvios, tačiau standartinė deviacija buvo didesnė REOC. Skalės efektyvumas buvo geresnis REIT. Daugiau REOC patyrė gamybos masto ekonomiją.
SE	1	0	
IRS/DRS	0	1	
Įsipareig.			
Bendra skola	1	0	Nors tyrėjai randa, jog didesnis trumpalaikių įsipareigojimų naudojimas signalizuoja įmonės finansinį stiprumą, tai taip pat skatina spekuliaciją. Bendra skola REIT buvo mažesnė.
S/L skola	0	0,5	
Grąža			
"ROE"	0	1	ROE buvo didesnė REOC.
Akcijų grąža	1	0	Tam tikrose šalyse REOC akcijų kainos grąža buvo neigiama.
Indeksų grąža	0	0,5	REOC turėjo didesnę grąžą, bet ir didesnę variaciją.
Dividendai	1	0	REIT turėjo aukštesnį dividendų pajamingumą
Likvidumas			
Volume	0.5	0	Nuo 2015 metų REIT demonstravo didesnį likvidumą.
Makrolygis			
Sisteminė rizika			
Rinkos rizika	0	0.5	Vidutinis rinkos beta koeficientas buvo didesnis REIT bendrovėms, kita vertus, REOC demonstravo didesnę variaciją.
Rinkos koreliacija	0	1	REIT turėjo stipresnę koreliaciją su rinka.
Palūkanų jautrumas	0	0,5	REOC buvo atsparesnės palūkanų pokyčiams.
REIT	0	1	Regresinis modelis parodė, jog REIT reikšmingai didino jautrumą palūkanoms.
Svyravimai			
Užsitęsimas	0	1	REIT indeksai turėjo didesnį šoko užsitęsimo lygį.
Asimetrija	1	0	REIT indeksai buvo atsparesnis blogoms žinioms.
Indikatoriaus suma	**5,5**	**7,5**	

Kaip matyti iš 4 lentelės, galutinė indikatoriaus reikšmė REOC buvo aukštesnė, nors REIT toli ir neatsiliko. Šie rezultatai kelia susirūpinimą, ar vis dėlto daug apribojimų turinčios kompanijos yra iš tikrųjų saugesnės ir tvaresnės. Gauti empiriniai rezultatai rodo atvirkščią situaciją, kurioje smarkiai reglamentuotos kompanijos lėčiau sugrįžta į pradinį indeksų kainų lygį bei yra jautresnės rinkos pokyčiams. Dėl apriboto spekuliavimo ir skolinimosi galimybių REIT naudojo daugiau ilgalaikių skolos priemonių, todėl galimai turėdamos ilgesnį skolos grąžinimo laikotarpį su fiksuotomis ar kintančiomis palūkanomis, tapo labiau priklausomos nuo palūkanų normų pokyčio. Mažesnį REIT efektyvumą taip pat galima interpretuoti kaip veiklos apribojimų pasekmę. Vis dėlto reikia pripažinti, jog poveikio indikatoriaus skirtumai nėra dideli. Taip pat beveik visose analizuojamose kategorijose REOC turėjo didesnį standartinį nuokrypį ir kai kuriose šalyse REOC kompanijų grąža buvo neigiama.

Verta aptarti ir disertacijos apribojimus. Visų pirma, tyrimas buvo atliktas tik tam tikrais pjūviais, vadinasi, tokie procesai kaip infliacijos atsparumas, turto perskirstymo efektai ir kiti nebuvo įtraukti. Išplėtus tyrimo horizontą, galima tikėtis, jog indikatoriaus suma pasikeis į vieną ar kitą pusę. Antra, iš tikrųjų tyrimo laikotarpis apima sudėtingą situaciją po 2007 metų NT burbulo sprogimo, kuris smarkiai paveikė visas su NT investicijomis susijusias organizacijas, todėl gali būti, kad laikui bėgant ilgalaikės pasekmės turės mažiau įtakos sisteminei rizikai.

IŠVADOS

Atlikus išsamią NT mokslinės literatūros ir metodologijos analizę bei empirinį tyrimą galima daryti tokias išvadas:

1. *NT rinkos* ir *NT rinkos stabilumo* terminologija moksliniuose straipsniuose dažniausiai yra priimama kaip aksioma ir nėra apibrėžiama, todėl šioje disertacijoje, remiantis kitais autoriais, buvo panaudoti ir sudaryti tokie apibrėžimai:
   - NT rinka yra erdvė, kurioje pirkėjai ir pardavėjai derasi dėl teisių į NT instituciniu lygmeniu.
   - Stabili NT rinka – tai tokia situacija, kai nėra ekstremalių veiklos matavimo objekto ar matavimo priemonės pokyčių ar svyravimų.
2. Išsami analizė apie NT ciklus ir veiksnius, darančius įtaką NT rinkos stabilumui, atskleidė tokius faktus:
   - Rinkos stabilumas ir nestabilumas yra periodiškai pasikartojantis reiškinys, tačiau aiškaus konsensuso dėl ciklų ilgio nėra. Vis dėlto nemaža dalis autorių aptinka ilgųjų ciklų trukmę nuo 18 iki 30 metų, tuo tarpu trumpieji ciklai trunka apie 4–5 metus.
   - Ciklų amplitudė daro reikšmingą įtaką NT kainoms, kai kuriais atvejais net 160 procentų kainų skirtumas nuo žemiausio iki aukščiausio taško yra fiksuojamas ofisų rinkoje ir apie 50 procentų skirtumas industriniame sektoriuje. Šis kainų skirtumas išbalansuoja NT rinką ir neigiamai veikia stabilumą.
   - Buvo nustatyta, jog egzistuoja daug veiksnių, darančių įtaką NT rinkos stabilumui, ir jie iš esmės gali būti klasifikuojami į mikro- ir makrolygmenis. Vis dėlto veiksnių tarpusavio ryšys yra komplikuotas. Pirmiausia, bet koks makroekonominio kintamojo poveikis, prieš darydamas įtaką NT rinkai, turi peržengti mikroekonominį filtrą, kuris gali visai panaikinti makroekonominių dydžių poveikį, jį išdidinti arba sumažinti.
   - Analizuojami makroekonominiai veiksniai – palūkanų normas, infliaciją, nedarbą, spekuliaciją, makroprudencinę politiką ir makroekonominę pasiūlą ir paklausą – buvo vieni iš svarbiausių minimų literatūroje veiksnių, veikiančių NT rinką.
   - Mikrolygmeniu, vietinė miesto įstatyminė bazė, informacijos trūkumas, šešėlinė veikla bei vietinė pasiūla ir paklausa mokslinėje literatūroje buvo dažnai minimi kaip svarbūs dydžiai, darantys įtaką NT rinkos pusiausvyros procesams. Buvo pabrėžiama, jog verslo ir NT ciklai dažnai nesutampa, tuo pačiu metu randant įrodymų, jog net skirtingi NT regionai turi individualius ciklus.
3. Istorinė NT krizių analizė atskleidė tokius faktus:
   - Nors ne visos NT krizės kilo NT sektoriuje, dažniausiai problemos, susiformavusios kituose ekonomikos sektoriuose, persikelia į būsto ir ofisų rinką. Taip yra todėl, jog NT yra laikomas išliekamosios vertės išsaugojimo priemone.

- Didžioji dalis NT krizių pasižymėjo tokiais keturiais procesais: lengvas priėjimas prie kredito, nenuosekli monetarinė politika, šešėlinė veikla ir neracionalus pasitikėjimas investicijomis.
- Vyriausybės reglamentai, ribojantys ar suvaržantys kompanijų veiklą iš spekuliacijos ar skolinimosi perspektyvų, nebūtinai sumažina sisteminę rinkos riziką. Panaši situacija įvyko 1980–1990 metais, kai dėl suvaržymų ir šešėlinės veiklos S&L bendrovės suformavo NT krizę.
- Norint išvengti NT krizių ateityje yra svarbu kurti inovacijas, kurios spręstų keturias problemas: skaidrumą, skolinimosi saugumą, spekuliaciją ir priėjimą visuomenei.

4. Istorinė NT trestų ir rinkos dalyvių apžvalga leidžia padaryti tokias išvadas:
   - REIT pradžia yra laikoma 19 amžiaus Anglija, kai atsirado neinkorporuotos asociacijos. Pastarosios organizacijos istoriškai nuolatos kovojo dėl išlikimo ir tam tikrais periodais net buvo laikomos nelegaliomis.
   - Nors oficialiai REIT atsirado 1960 metais, Europoje vis dar nemažai šalių neturi REIT įstatyminės bazės. Net tokios labai išsivysčiusios šalys kaip Anglija ar Vokietija įdiegė REIT įstatymus tik 2007 metais.
   - Pagrindiniai atributai, kurie apibrėžia REIT, yra šie: privalomas dividendų išmokėjimas, spekuliacijos apribojimai, minimalūs įsiskolinimo reikalavimai, mokestinės išimtys.
   - Vis dėlto skirtingose šalyse REIT įstatyminė bazė skyrėsi.
5. Rengiant metodologinę dalį nustatyta:
   - DEA, stochastinio fronto analizė, CAPM ir GARCH, finansinių rodiklių analizė ir kiti regresiniai modeliai buvo populiariausia metodika atlikti REIT rezultatų įvertinimą.
   - Didžioji dalis mokslinių tyrimų buvo skirti analizuoti tik REIT ir neatliko palyginimo su REOC.
6. Atlikti empirinio tyrimo rezultatai leido padaryti tokias išvadas:
   - REOC rodikliai buvo aukštesni nei REIT efektyvumo modeliuose, CRS ir VRS kategorijose nuo 2017 iki 2019 metų, kita vertus, dauguma atveju standartinė deviacija REOC buvo didesnė.
   - REIT rodikliai buvo aukštesni negu REOC gamybos skalės SE kategorijoje, kita vertus, REOC pasižymėjo didesne gamybos masto ekonomija.
   - siskolinimo kategorijoje analizuojant indeksus ar individualias firmas REOC turėjo aukštesnius įsiskolinimo rodiklius negu REIT. Taip pat pastebėta, jog REOC naudojo daugiau trumpalaikio įsiskolinimo, tai, pasak kitų autorių, signalizuoja kompanijos finansinį stiprumą, kita vertus, tai taip pat skatina spekuliaciją.
   - Nuosavo kapitalo grąžos rodikliai indeksų ir vidutinės kompanijos atžvilgiu buvo geresni REOC, kita vertus, akcijų kainų grąžos

analizėje REIT aplenkė REOC didžiojoje dalyje šalių. Indeksų grąža buvo geresnė REOC situacijoje.

- Dividendų grąža buvo didesnė REIT per visą analizuojamą laikotarpį.
- REIT ir REOC akcijų indeksų likvidumas 2010 metų pradžioje buvo apylygis, tačiau ties 2015 metais atsirado takoskyra ir REIT indeksai turėjo aukštesnį likvidumą.
- Sisteminė rizika buvo aukštesnė REIT tiek rinkos, tiek palūkanų normos jautrumo atvejais. Sisteminė rizika nebuvo statiška, kiekvienais metais ji keitėsi. Tokie veiksniai kaip ilgalaikis, trumpalaikis įsiskolinimas ir priklausymas vienam ar kitam kompanijos tipui darė reikšmingą įtaką sisteminei rizikai. REIT ir REOC indeksai stipriai koreliavo tarpusavyje.
- Ekonominio šoko užsitęsimas buvo didesnis REIT kompanijoms, tačiau gama koeficientas buvo didesnis REOC bendrovėms.

7. Poveikio indikatorius parodė, jog vidutiniškai kompanijos, besilaikančios REOC įstatymų, suteikė tvaresnį augimą NT rinkai, tačiau tam tikri apribojimai egzistuoja:

- Pirma, poveikio stabilumo indekso skirtumas nėra didelis. Tam tikrose kategorijose REIT nustelbė REOC, todėl šios investicinės kompanijos turėtų būti laikomos labiau papildymais negu pakaitais. Taip pat indeksas apėmė tik dalį galimų analizių. Kiti aspektai, tokie kaip infliacijos atsparumas, turto persiskirstymo galimybės ir kt. procesai, nebuvo įvertinti, todėl sunku atsakyti, kaip išplėtus analizės horizontą, pasikeistų indeksas.
- Antra, analizės periodas iš dalies yra įdomus, bet ir tuo pačiu metu nedėkingas, kadangi NT krizė įvyko 2007–2008 metais ir jos pasekmės vis dar jaučiamos po dešimties metų. Gali būti, kad nauji reglamentai ir apribojimai vis dar neigiamai veikia REIT. Įvairūs autoriai teigia, jog prieš 2007 metų laikotarpį REIT demonstravo geresnius veiklos rezultatus. Periodo apribojimai gali taip pat paveikti ir kitų rodiklių rezultatus.

8. Rezultatų praktinis pritaikomumas gali būti panaudotas tiek vyriausybės, tiek individualių žmonių lygiuose:

- Vyriausybės, kurios ketina įdiegti REIT kotiravimosi galimybes į savo akcijų biržas, turėtų suprasti, jog monetarinis ir ekonominis stabilumas yra ypač svarbus REIT sėkmei. Kadangi REIT yra jautrūs palūkanų pokyčiams, šalys, patiriančios stiprių svyravimų, turėtų atsargiai įvertinti REIT galimybes.
- Teiginys, jog didesnis reguliavimas spekuliacijos ir įsiskolinimo atžvilgiu padaro NT rinką tvaresnę, nėra tikslus. Tiek REIT, tiek S&L atveju didesni suvaržymai sukūrė aukštesnę sisteminę riziką, todėl REIT apribojimai nebūtinai suteiks naudą NT rinkos stabilumui. Negana to, nors į akcijų biržą įtrauktos kompanijos turi griežtesnius skaidrumo įstatymus negu privačios kompanijos,

istorinė krizių analizė parodė, jog net akcinėse bendrovės šešėlinė veikla gali egzistuoti.

- Kadangi tam tikra dalis NT pajamų nėra prieinama plačiajai visuomenei, REIT atsiradimas galėtų padėti spręsti pajamų nelygybės problemas. Pensiniai fondai, individai ir kiti investuotojai turėtų naują pajamų šaltinio prieigą.
- Investuotojai turėtų kurti dinamišką diversifikavimo strategiją, kadangi NT bendrovių sisteminė rizika nuolatos keičiasi.
- Jeigu pasiekti REOC efektyvumo rezultatai analizuojamu laikotarpiu yra geresni ir kituose laiko perioduose, šalys, kurios patiria būsto stygių, turėtų labiau remtis REOC naujų projektų vystymui.

9. Ateities tyrėjai turi aibę temų, kurias verta analizuoti, norint suprasti REIT ir REOC poveikį:

- Infliacija yra kitas svarbus veiksnys, kuris dar nėra išnagrinėtas. Nekilnojamasis turtas dažnai yra laikomas gera priemone apsisaugoti nuo infliacijos, todėl REIT ir REOC atsparumo palyginimas yra svarbi tema.
- Atlikta analizė parodė, jog spekuliacija yra didesnė REOC, todėl įdomu, ar dėl to šešėlinės veiklos dydis būtų didesnis REOC.
- M2 pinigų kiekis autorių minimas kaip svarbus dydis, darantis įtaką nekilnojamojo turto rinkai, todėl svarbu sužinoti REIT ir REOC reakcijos skirtumus į pinigų pasiūlos pokyčius.

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Curriculum Vitae

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2009–2013 Kaunas University of Technology, Bachelor of Economics, specialization - finance.

Work experience

From 2013-07 to 2015-02 – UAB „Radijas Kelyje" director of commerce.

From 2012 to current – Independent real estate agent.

From 2020-06 to 2020-12 – KTU junior researcher at RCL project.

From 2020-10 to current – Junior researcher at „In4act".

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LIST OF SCIENTIFIC AND OTHER PUBLICATIONS
Humanities, Social Sciences (HS) and Art
ARTICLES IN PEER-REVIEWED SCIENTIFIC PUBLICATIONS

In publications indexed in the Web of Science or Scopus with Impact Factor (JCR SSCI) or SNIP

"International Publishers"

1. [S1; GB] Grybauskas, Andrius; Pilinkiene, Vaida. Is the rest of the EU missing out on REITs? // European journal of management and business economics. Bingley : Emerald. ISSN 2444-8451. eISSN 2444-8494. 2020, vol. 29, iss. 1, p. 110-122. DOI: 10.1108/EJMBE-06-2019-0092. [Emerging Sources Citation Index (Web of Science); Scopus; DOAJ] [CiteScore: 4,50; SNIP: 1,318; SJR: 0,691; Q1 (2020, Scopus Sources)] [FOR: S 004] [Input: 0,500]

2. [S1; GB] Grybauskas, Andrius; Pilinkienė, Vaida. A comparative analysis of R.E.I.T.s, R.E.O.C.s and P.R.E.O.C.s using a stochastic frontier approach // Economic research – Ekonomska istrazivanja. London : Taylor & Francis. ISSN 1331-677X. eISSN 1848-9664. 2019, vol. 32, iss. 1, p. 1542-1560. DOI: 10.1080/1331677X.2019.1632728. [Social Sciences Citation Index (Web of Science); Scopus; DOAJ] [IF: 2,229; AIF: 2,219; IF/AIF: 1,004; Q2 (2019, InCites JCR SSCI)] [CiteScore: 2,30; SNIP: 1,174; SJR: 0,490; Q2 (2019, Scopus Sources)] [FOR: S 004] [Input: 0,500]

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1. [S1; LT; OA] Grybauskas, Andrius; Pilinkiene, Vaida. Real estate market stability: evaluation of the metropolitan areas by using factor analysis and z-scores // Inžinerinė ekonomika = Engineering economics. Kaunas : KTU. ISSN 1392-2785. eISSN 2029-5839. 2018, vol. 29, iss. 2, p. 158-167. DOI: 10.5755/j01.ee.29.2.19380. [Social Sciences Citation Index (Web of Science); Scopus; IBSS: International Bibliography of the Social Sciences] [IF: 0,730; AIF: 2,029; IF/AIF: 0,359; Q4 (2018, InCites JCR SSCI)] [CiteScore: 1,11; SNIP: 0,878; SJR: 0,288; Q2 (2018, Scopus Sources)] [M.kr.: S 004] [Indėlis: 0,500]

MOKSLO MONOGRAFIJOS, STUDIJOS IR JŲ DALYS

Kitose tarptautinėse ir nacionalinėse leidyklose

1. [K1b; LT] Pilinkienė, Vaida; Stundžienė, Alina; Stankevičius, Evaldas; Grybauskas, Andrius. Nekilnojamojo turto rinkos pokyčiai ekonomikos šoko kontekste: Lietuvos atvejis : mokslo studija. Kaunas : Technologija, 2020. 172 p. ISBN 9786090217153. eISBN 9786090217146. DOI: 10.5755/e01.9786090217146. [M.kr.: S 004] [Indėlis: 0,250] [Indėlis autoriniais lankais: 3,072]

PARTICIPATION IN OTHER CONFERENCES

1. 31st EBES Conference – Warsaw April 15-17, 2020, Warsaw, Poland. Hosted by Faculty of Economic Sciences University of Warsaw.

2. INEKA 2019 Innovation, Entrepreneurship and Knowledge Academy conference. 2019/June/11-13. Research topic: “Is the rest of EU missing out on REITs capabilities?“.

DELIVERED FOR PUBLICATIONS

1. Grybauskas, A. & Pilinkienė, V. (2020). „THE VOLATILITY CASE OF EUROPEAN REITs AND NON-REITs“. 31st EBES Conference Proceedings which will be published by Springer under its series Eurasian Studies in Business and Economics.

APPENDIXES

Appendix 1. Cash proceeds from sales, refinance, and home equity loans for housing, data source: Rapp (2009)

Year	Cash proceeds from sale of existing Homes (billion)	PCE from sale of existing homes (billion)	Free cash from refinancing (billion)	Level of home equity loans (billion)	Total cash proceeds per year (billion)
1991	223.1	17.6	17.8	222.0	240.9
1992	175.4	13.8	25.3	217.1	200.7
1993	155.5	12.1	26.4	210.4	181.9
1994	173.8	13.5	17.4	221.8	191.2
1995	141.1	10.9	12.8	237.5	156.8
1996	206.0	15.9	21.8	262.6	231.1
1997	190.8	14.7	25.9	297.0	225.2
1998	249.9	19.2	46.9	309.9	262.8
1999	347.3	26.6	45.6	334.3	371.7
2000	389.0	29.3	32.6	407.4	462.1
2001	411.6	30.4	105.9	445.1	449.3
2002	488.2	35.3	140.2	501.1	544.2
2003	647.2	46.5	173.4	593.4	739.5
2004	701.5	48.7	146.2	778.4	886.5
2005	914.5	63.2	197.9	913.7	1049.8

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