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Analyzing the Post-Earnings-Announcement Drift Anomaly in the European Listed Real Estate Sector

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Abstract

This paper aims at identifying potential post-earnings-announcement drift effects in the European listed real estate sector and then comparing such results with similar studies focused on the United States listed real estate sector. The post-earnings-announcement drift effect is a well-documented market anomaly however has only recently received attention from academic research on whether it exists in the real estate sector. This paper, to the best of our knowledge, is the first to identify and analyze the post-earnings-announcement drift effect in the European listed real estate market, and focuses on both European Real Estate Investment Trusts (REITs) and European Real Estate Operating Companies (REOCs). We utilize the Standardized Unexpected Earnings and Earnings Announcement Return methodologies to calculate earnings surprises which are used to identify post-earnings-announcement drift effects. Our study finds that the Standardized Unexpected Earnings method fails to produce significant results while the Earnings Announcement Return method provides evidence towards post-earnings-announcement drift effects. Both of these findings are consistent with prior research done on the United States listed real estate sector, and we compare our findings so as to look into the informational efficiency of the European listed real estate sector.

Keywords: Real Estate Investment Trusts, Real Estate Operating Companies, Post-Earnings-Announcement Drift, European Listed Real Estate Sector

Supervisor: Pehr Wissén

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1 Introduction

1.1 Research Motivation and Focus

Financial academics have long debated over financial market efficiency and Eugene Fama's "Efficient Capital Markets: A Review of Theory and Empirical Work" in 1970 brought up three potential forms of market efficiency theory: weak form efficient, semi-strong form efficient, and strong-form efficient. While most early studies could not reject the weak-form efficient market hypothesis, there are some exceptions with one of the most notable being the 1968 study by Ball and Brown which identified the post-earnings-announcement drift (PEAD) effect. Whereas efficient market theorists would suggest that information is transferred into stock prices very soon (if not immediately) after information is released, the PEAD effect is the phenomenon that a company's stock price continues to drift upwards after positive earnings announcements and drift downwards after negative earnings announcements which suggests that information is not being incorporated quickly into stock prices. There is no one universally accepted answer for why such an anomaly exists, and we are curious to delve further into this topic while analyzing an area that has previously remained unstudied with respect to the PEAD anomaly: the European listed real estate sector. This paper focuses on identifying this anomaly in the European listed real estate sector and comparing the results to previous literature conducted on the United States listed real estate sector. Furthermore, the results of this study aim to prompt discussion on two areas of academic literature: i) whether the PEAD anomaly exists in the European listed real estate sector and ii) the current market development and maturity of the European listed real estate sector.

The PEAD effect was first studied in a listed real estate context by Price, Gatzlaff, and Sirmans (2012) who analyzed the United States REIT sector by utilizing the Earnings Announcement Return (EAR) method which looks into whether investors can effectively use company's past earnings announcements as indicators of future earnings. This research was soon followed by a second study also focusing on the United States REIT market by Gyamfi-Yeboah, Ling, and Naranjo (2012) who utilized the Standardized Unexpected Earnings (EAR) method which looks into the effectiveness of analysts to accurately project future company earnings. These two studies produced intriguing results which have motivated us to carry out a similar event study using both methods on the European listed real estate market.

Current REIT legislation within Europe is country specific and arguments have been made for the further development of a European-wide framework that would provide for a more transparent marketplace. We hope to add to this discussion by providing opinions on the informational efficiency of the European listed real estate market and potential avenues to improve such informational efficiencies which would diminish PEAD effects.

1.2 Post-Earnings-Announcement Drift

In financial literature, Ball and Brown (1968) first documented the PEAD effect which is the phenomenon that a company's stock price continues to drift upwards after positive earnings announcements and drift downwards after negative earnings announcements. According to the weak-form Efficient Market Hypothesis (which posits that all past information is fully translated in stock prices), stock prices react immediately to changes in publicly available information (Fama, 1970). If this hypothesis on market efficiency were to hold, then it would suggest that PEAD effects should not occur yet numerous studies have identified such an anomaly to exist in different markets.

Explanations as to why this drift effect is present in markets vary, and the fundamental reason for why such an anomaly exists still remains a puzzle for researchers. However, two explanations are often considered: compensation for risk which is not accounted for in financial models and information processing biases caused by information uncertainty. Regarding the compensation for risk, academics have suggested that financial models such as the CAPM model fail to adequately capture all risks, and that the fair compensation for those missed risks are the so-called abnormal returns (Ball, Kothari, and Watts, 1988). Ball, Kothari, and Watts (1988) suggested that betas in the CAPM model shift upwards (downwards) for firms with high (low) unexpected earnings however their research did not produce a significant result which led to an inconclusive answer for the PEAD anomaly. Foster, Olsen, and Shevlin (1984) used an earnings-based model and security-return model to analyze PEAD and found that PEAD was only observed in the former approach. In order to explain the lack of results from the security-return model, they suggested that the model was vulnerable to some problems in risk adjustment (Foster et al., 1984). When considering their overall findings, they posited that PEAD is supposed to act as compensation for some unidentified risks (Foster et al., 1984).

Recent research has been more focused on the other explanation which states that PEAD is caused by information processing biases due to information uncertainty. Kormendi and Lipe (1987) and Freeman and Tse (1989) noted that sometimes immediate responses to earnings announcements are not complete, and based on this theory Bernard and Thomas (1989, 1990) suggested that PEAD is a result of a delayed price response. Francis, Lafond, Olsson, and Schipper (2007) also indicated that because of information uncertainty, fully Bayesian investors under-react to earnings announcements. This would be a result in support of market inefficiencies as Bayesian investors focus on historical data and if all publicly available information was incorporated in historical data then future returns should be accurately predicted. While initial under-reaction bias is discussed in numerous papers, DeBondt and Thaler (1985, 1987) suggested a different theory where people instead overreact to unexpected and dramatic news events. This is considered to be the 'over-reaction theory' where people are found to overreact after the announcement date which provides a further suggestion of market inefficiencies. Francis et al. (2007) further indicated that an increase in information uncertainty has a positive relationship with abnormal returns which would suggest that less developed markets would experience more PEAD effects than well-developed markets.

If these biases are in fact a result of information uncertainty, then changes which make the listed real estate market more transparent could reduce this information uncertainty and thus the PEAD effect. Such changes could occur through adjustments to current legislation, further involvement from investors which improves liquidity in the marketplace, or an increase in investor and analyst knowledge which allows them to better understand REIT and REOC structures. This draws into question how quickly investors learn about markets, and whether over time investors can, all other things remaining stable, better understand markets and the companies within them. If investors better understand markets over time, market efficiency should increase as information uncertainty decreases and changes to the market structure thus do not necessarily need to occur. However, if this is not the case then other changes must occur in the marketplace for informational efficiency to improve and for the PEAD effect to diminish. If, on the other hand, these information processing biases are solely due to investor behavior, then changes in the transparency of the listed real estate market would not necessarily change investor behavior and the anomaly would not be reduced.

1.3 Real Estate Investment Trusts and Real Estate Operating Companies

While both REITs and REOCs invest in real estate related assets as their primary function, the structure and regulations put in place governing the workings of both vehicles differ greatly. With a low correlation to other asset classes, real estate assets have been well documented to produce beneficial portfolio diversification results for investors (Kallberg, Liu, and Greg, 1996). REITs were introduced in the United States on September 14th, 1960 after President Eisenhower signed into legislation a new investment vehicle aimed at combining real estate investment with stock-based investments ("History", n.d.). REITs have grown to become a popular asset class in the North American marketplace and around the world particularly due to their unique tax structure: REITs are structured such that individual investors are not taxed twice from both the corporate and individual tax level (Pirounakis, 2013). By distributing the vast majority of profits garnered from the underlying business in the form of dividends, REITs act as pass through investment vehicles for investors and provide direct exposure to real estate markets. The European listed real estate market is much smaller in comparison with the United States listed real estate market despite having comparable total real estate stock sizes. While in November of 2005 Europe comprised 38.4% of global real estate stock compared with 40.1% for the United States, Europe's listed real estate securities only composed 20.4% of global listed real estate securities compared with 43% for the United States ("Monthly Statistical", 2015).

In the United States REIT sector, the number of REIT companies has remained relatively constant over the past decade while the market capitalization of the sector has ballooned from $330 Billion in 2005 to $938 Billion in 2015 according to the National Association of Real Estate Investment Trusts (US REIT, 2016). Such market capitalization growth is shown through extremely high cumulative average growth rates: between 2000 and 2015 the United States REIT sector grew at a rate of 13.6% and from the crisis levels of 2008 to 2015 at a rate of 25% (US REIT, 2016). In comparison, the European REIT market has also come into increasing prominence since the turn of the 21st century; currently, REIT companies account for roughly one-third of all European listed real estate companies and have a combined total market capitalization of $225 billion as of November 2015 ("Monthly Statistical", 2015; Nikanen and Falkenbach, 2012).

The REIT industry is often comprised of three unique structures: Equity REITs, Mortgage REITs, and Hybrid REITs (Mattarocci, 2014). Equity REITs manage their own properties and derive their revenue primarily from the operations of those underlying assets (Mattarocci, 2014). Mortgage REITs invest in the mortgages of properties, and generally hold a portfolio of mortgages from which they derive their revenue while hybrid REITs invest in a combination of mortgages and direct real estate (Mattarocci, 2014). This results in the three REIT structures holding different forms of assets such that Equity REITs hold fixed assets while Mortgage REITs hold financial assets. REIT companies can also invest in different property sectors, and within Europe REITs have historically invested in residential, office, retail, and industrial properties which have accounted for 75% of European REIT's overall asset allocation (Mattarocci, 2014). In particular, office and retail properties have accounted for more than 55% of overall asset allocation among REITs which highlights that the European REIT market has historically been focused on commercial real estate (Mattarocci, 2014).

Government legislation provides strict guidelines for the operating and investment practices of REIT companies. In the United States, the Securities and Exchange Commission mandates that REITs must abide by strict regulations including: the payment of 90% of all taxable income annually to shareholders, the investment of at least 75% of total assets into real estate assets or cash, the derivation of at least 75% of its gross income from real estate related sources, and a shareholder structure which requires that no fewer than 5 shareholders hold 50% of all shares outstanding (Real Estate, 2012). In addition, REITs cannot own more than 10% of voting stocks in other companies that are not considered to be either a REIT, a taxable REIT subsidiary, or a qualified REIT subsidiary ("Forming", n.d.). Furthermore, REIT legislation often includes restrictions on the amount of leverage that a REIT may hold and as of 2012 within Europe the only country that did not impose leverage restrictions on REITs was Luxembourg (Niskanen and Falkenbach, 2012). While these regulations differ between countries, the main criterion requires the pass-through of at least 90% of taxable income to shareholders which allows REITs to not have to pay corporate tax on distributable income and gives investors a liquid and cost-effective method for direct real estate investment (Real Estate, 2012). This results in REITs having strong incentives to remain transparent, and thus would suggest that earnings announcement surprises should be

smaller than less transparent non-real estate companies (Danielsen, Harrison, Van Ness, and Warr, 2009).

The European listed real estate market has historically been dominated by REOCs which currently represent roughly two-thirds of the listed real estate companies within Europe (Nikanen and Falkenbach, 2012). REOCs face less regulatory restrictions - they are able to reinvest earnings into their business and have more flexibility in terms of investments outside of direct real estate assets - but do not receive the same tax benefits as REITs (Nikanen and Falkenbach, 2012). For example, they do not have leverage restrictions imposed on them and have been found to be more leveraged than REIT companies in the European context (Niskanen and Falkenbach 2012). Furthermore, there is no specified form of ownership that is required which could result in single shareholders owning significant portions of the company and shareholders also face the double taxation dilemma which is eliminated by REIT structures (Nikanen and Falkenbach, 2012). One additional important difference involves the ability for REOCs to retain cash which allows them to invest in future projects using internally generated funds whereas REITs are restricted in terms of leverage and thus must look towards equity markets for financing (Mattarocci, 2014).

1.4 Current European Legislation and Market Development

There is currently no unified European legislation surrounding REITs and only sixteen European countries have REIT legislation in place as of 2015 (Vaccari, Gibbs, and Turnbull, 2015). European REIT legislation has occurred sporadically throughout the late 20th century beginning first in the Netherlands in 1969, and it was not until 1995 that the next European country, Belgium, adopted REIT legislation (Vaccari, Gibbs, and Turnbull, 2015). Since then the remaining 14 European countries with REIT legislation have primarily adopted such legislation in the 2000's (refer to table 11 for a full breakdown of country legislation enactment) (Vaccari, Gibbs, and Turnbull, 2015). As such legislation has been slow to occur, this raises the question of how best to promote REIT legislation in the remaining European countries. The European Public Real Estate Association (EPRA) has been a strong advocate for developing further REIT legislation throughout Europe and argues that there is a lack of availability for small to mid-sized pension funds and retail investors due to the relatively low levels of European real estate assets that are currently operated via publicly traded markets (Lewis, 2013).

A policy paper written in 2013 by the European Public Real Estate Association found a startling statistic in the European listed real estate market: combining all of the European real estate owned by companies listed on European exchanges accounted for only 2% of the total real estate stock in Europe (Lewis, 2013). This was compared with 7.2% in North America and 8% in the Asia-Pacific region and provides clear evidence of an underdeveloped listed real estate market in Europe (Lewis, 2013). The EPRA aims to promote accounting, corporate governance, and reporting best practices across the listed real estate sector in Europe and are also advocates for further European-wide listed real estate legislation which should, over the long-term, have a positive impact on the informational efficiency in the market. One way in particular of spurring development of the listed real estate sector while also fostering cohesive policies would be to create an EU-wide policy framework (Lewis, 2013).

Within the European REIT sector, restrictions for companies vary by country in terms of distribution requirements, acceptable gearings ratios, and operating activities (Nikanen and Falkenbach, 2012). While this makes a comparison of REIT companies across Europe more difficult, the basic tenet behind each country's legislation is similar: REITs are designed to be more transparent than REOCs and offer a tax advantage for investors. In this sense, investors must also analyze the differences in country legislation before comparing multiple European REITs. The maturity and current legislative development of the European listed real estate market from a qualitative perspective is of great importance to the examination of our study as our results can be viewed as providing further quantitative evidence to the current stage of development within the market. By comparing our results with similar studies from the United States we are able to provide evidence as to the size of potential PEAD effects and discuss how it relates to the current informational efficiency found within the European listed real estate sector.

1.5 Relevant Literature

Our initial interest in analyzing the European listed real estate sector for PEAD effects stems from two specific research papers by Price, Gatzlaff, and Sirmans (2012) and Gyamfi-Yeboah, Ling, and Naranjo (2012) which have utilized different methods to analyze PEAD effects within the United States REIT sector: the Standardized Unexpected Earnings method and the Earnings Announcement Return method. We have tried to apply both approaches so as to draw conclusions

which we can ultimately compare with the two studies. Price, Gatzlaff, and Sirmans (2012) identified significant PEAD for United States REIT securities when compared to ordinary common stocks despite initial assumptions that REITs would experience less PEAD than common stocks due to the availability of information flowing from a parallel private real estate market. Conversely, research conducted later by Gyamfi-Yeboah, Ling, and Naranjo (2012) found contradictory results suggesting significantly muted PEAD among REITs in the United States.

1.5.1 Price, Gatzlaff, and Sirmans (2012)

Price, Gatzlaff, and Sirmans (2012) conducted the first study focused on examining the potential PEAD anomaly in the United States REIT market over the time period of 1982-2008 utilizing the Earnings Announcement Return methodology. For their data set they used Earnings Per Share (EPS) announcements rather than Funds From Operations (FFO) announcements and analyzed PEAD effects through a 121-day event window looking at 60 days prior to and after earnings announcements. They found strong evidence supporting the PEAD anomaly, however they documented a small initial response followed by larger drift effects which would suggest that the presence of the parallel private real estate market does not translate into investors being more certain of the movements of real estate companies compared with non-real estate companies. They also identified lower returns for United States REIT companies than non-REIT companies when analyzing reactions to initial earnings surprises which raises further questions regarding the role of the parallel private real estate market. If a parallel private market was able to help provide informational clarity for investors, reactions to initial earnings surprises would be expected to be quick and significant followed by a lower drift effect.

1.5.2 Gyamfi-Yeboah, Ling, and Naranjo (2012)

Gyamfi-Yeboah, Ling, and Naranjo (2012) focused on examining the uncertainty factors which impact cumulative abnormal earnings announcement returns. They examined these factors by using the Standardized Unexpected Earnings (SUE) methodology utilizing FFO announcements rather than EPS announcements due to the availability of FFO data for the United States REIT market. They also considered a 121-day event window from 60 days prior to the announcement to 60 days after the announcement. They found little evidence of a pre-announcement drift, and in contrast to Price, Gatzlaff, and Sirmans (2012) they found very limited evidence of PEAD effects

in their sample set. Even when they excluded all data save for only the extreme positive and negative earnings surprises they found evidence of PEAD for only the most sizeable positive surprises. This is consistent with the broader academic literature available on PEAD effects which supports the conclusion that real estate markets are able to more quickly incorporate changes in earnings information into stock prices when compared with non-real estate securities and thus should experience less PEAD effects. In order to try and further explain the causes of this lack of PEAD effect, Gyamfi-Yeboah, Ling, and Naranjo (2012) examined surprise statistics and found that firm-level uncertainty, market-wide uncertainty, and real estate investor sentiment play key roles in determining the effect that unanticipated earnings announcements have on abnormal returns.

1.6 Development of Theory

The primary focus of this thesis is to identify whether PEAD effects exist in the European listed real estate market and how such effects compare with those found in the United States listed real estate market. The European publicly listed real estate market in particular has yet to be studied for potential PEAD effects and this study offered a unique opportunity to provide a starting point for future academic literature into the European real estate market. In addition, our study can provide valuable comparable analysis to recently completed studies focused on the United States REIT market and provide input into the informational efficiency of the European listed real estate market.

In order to conduct this study, we utilize the two most common methodologies for identifying potential PEAD effects: the Standardized Unexpected Earnings (SUE) methodology and the Earnings Announcement Return (EAR) methodology. This allows for a further comparison to be made as the SUE method focuses on analyst expectations for EPS announcements compared with actual EPS announcements while the EAR method looks into previous company EPS announcements as an indicator for future EPS announcements. In addition, as each previous study used a different method for calculating PEAD effects this study uses both methods so as to provide results which can be compared. As such, the research questions we have aimed to answer are as follows:

Does the European listed real estate sector exhibit the post-earnings-announcement drift anomaly?

and

If post-earnings-announcement drift is found, which of analyst expectations (using the SUE methodology) or historical results (utilizing the EAR methodology) provide more conclusive evidence in support of the PEAD anomaly?

and

Does the European listed real estate sector and the United States REIT sector exhibit similar patterns with regards to post-earnings-announcement drift effects?

1.6.1 Hypothesis Development

1. We expect to find results supporting the notion that post-earnings-announcement drift effects are present in the European listed real estate market.

As previously discussed, post-earnings-announcement drift anomalies have been identified in markets around the world, and the potential explanation behind this anomaly could be the result of information uncertainty. Price, Gatzlaff, and Sirmans (2012) have found PEAD effects to exist in the United States listed real estate market which is arguably the most well developed listed real estate market in the world, and we would thus expect to find PEAD effects in a younger, less developed market such as that found in Europe. Due to numerous European countries having only recently adopted REIT legislation, information uncertainty may exist as investors are less familiar with the company structures and thus PEAD effects should be present.

As the European REIT and REOC markets are less mature than comparable markets in the United States, we expect that the market may react less quickly to earnings surprises however it could be due to a number of reasons which we do not explore further including: thin trading, differing financial liberalization in each country, and the types of investors in the market (Oprean, 2012). If

the European listed real estate sector is invested in by mainly sophisticated investors, then it could be that they are better able to interpret the more limited historical data than unsophisticated investors who have little to no prior experience investing in listed real estate markets.

2. Post-earnings-announcement drift effects are expected to be lower among real estate companies than among non-real estate companies.

As discussed in numerous previous research papers, the real estate market offers a unique opportunity to look into PEAD effects due to existence of a parallel private market (Price, Gatzlaff, and Sirmans, 2012). The Real estate market is a "rich…information environment" which should allow for investors to better understand and hence predict future company performance expectations (Price, Gatzlaff, and Sirmans, 2012). As a result, we would expect post-earnings-announcement drift to be larger for non-real estate companies than for real estate companies.

3. The Standardized Unexpected Earnings methodology is expected to produce lower PEAD effects than the Earnings Announcement Return methodology.

We posit that as the European real estate market is younger than the United States market, investors may rely more heavily on analyst expectations. Analysts have the opportunity to gain signals from management during conversations which normal investor are not privy to, and this could lead to more accurate earnings expectations by analysts (Hutton, 2005). However, this hypothesis is far from certain as real estate earnings in general are considered to be relatively stable over time and the REIT structure is meant to provide transparency for investors which would suggest that analysts may not be able to gain additional information from such conversations. This would result in the EAR method being more accurate when calculating surprises and demonstrates that there are potential reasons in favor of suggesting that, in fact, the EAR methodology should have lower PEAD effects than the SUE methodology.

4. European REIT companies are expected to experience less PEAD effects than European REOC companies.

Real Estate Investment Trusts are investment vehicles aimed at providing investors with clear and transparent ways to invest in real estate. They are also more restricted in their shareholder structure and capital outflow requirements (among others) as previously mentioned, and thus we would expect investors to be able to more accurately predict future earnings expectations compared with REOC companies that are considered to be less transparent and less restricted in operating activities.

1.7 Data

In order to produce a European-wide study analyzing the listed real estate sector, we first chose to look at listed real estate securities in 30 European countries. As many European countries have only adopted REIT legislation during the mid-2000's, this study focuses on a time period of 10 years between 2005-2015 as little data has been found to be available prior to 2005. Of these 30 countries, we were able to find REOC data on 26 of the 30 countries and REIT data on only 11 of the 16 countries with REIT legislation.

In order to gain data on European REITs and REOCs we used the Wharton Research Database Services involving the Institutional Brokers Estimate System (I/B/E/S) statistics as well as Thomson Reuters Datastream and Bloomberg. Utilizing three industry classification systems - the Industry Classification Benchmark by Dow Jones & FTSE, the Global Industry Classification Standard by S&P, and the Bloomberg Industry Classification Systems by Bloomberg - to identify European REITs, we found 159 companies which met at least two of the three classification systems as REITS, and 318 REOCs. The classification for the International Classification Benchmark was the sector code 8670 titled 'Real Estate Investment Trusts' for REITs and the subsector code 8633 titled 'Real Estate Holding & Development' for REOCs. For the Global Industry Classification Standard, we utilized the classification codes 404020 titled 'Real Estate Investment Trusts' for REIT companies and 40403020 titled 'Real Estate Operating Companies' for REOC companies. For the Bloomberg Industry Classification System, we used the level three sector indicator value of 'REIT' to indicate REIT companies.

While we originally aimed at using both Funds From Operations and Earnings Per Share announcements, we found the dataset to be much larger for EPS announcements. Furthermore, focusing on EPS announcements allowed for our study to remain consistent with Price, Gatzlaff, and Sirmans (2010). After finding the companies with EPS data we then required daily return data for the 121-day window for each earnings announcement, as well as book values and market cap values for the preceding four quarters similar to the two comparable studies. In order to compare stocks by market capitalization, book-to-market values, and earnings surprises we also converted all currencies into euros. However, we utilized each stock's individual currency to calculate return figures so as to ensure no currency fluctuations would impact our results. In order to provide a comparison with non-real estate stocks, we utilized the STOXX Europe 600 index and excluded financials and utilities to remain consistent with previous literature (Price, Gatzlaff, and Sirmans, 2010).

Within our dataset we originally included all quarters from 2005 to 2015 including the global financial crisis however as the financial crisis had a dramatic impact on the global real estate sector and after analyzing the iShares FTSE EPRA/NAREIT Europe Index Fund we decided to exclude the data from the period beginning in July 2008 to the end of May 2009 in order to produce more normalized results (Gardo and Martin, 2010; Griffiths, n.d.). This also allows us to produce more effective EAR results due to their exposure to financial cycle effects which is discussed in further detail in Section 2.2.

When considering the data available to us presently, we hope in the future as more European countries adopt REIT legislation and the listed real estate sector becomes larger that data will become more easily available and larger in quantity. Presently we find that outside of the largest listed real estate markets, analyst coverage is either still very limited or not well documented by databases.

2 Methodology

In this section we discuss the two methods of calculating earnings surprises (the Standardized Unexpected Earnings method and the Earnings Announcement Return method), the calculations behind the abnormal returns and cumulative abnormal returns, and our regression frameworks.

2.1 Standardized Unexpected Earnings Method

First researched in 1982 by Rendleman, Jones, and Latane, the SUE methodology has been commonly used in academic literature when analyzing potential PEAD effects. The SUE method compares the average analyst expectations for quarterly earnings announcements with the actual earnings announcements for firm i in quarter q. This difference between the average analyst expectation and the actual announcement is then scaled by dividing it by the standard deviation of the analyst earnings expectations for that period and produces the surprise value $SURP_i$. Earnings expectations can be drawn from either historical analyst expectations or by creating a time series model to estimate expected historical earnings and in our study we choose to analyze historical analyst expectations. When collecting the earnings projections, it is important to note that as stated by Jegadeesh and Livnat (2006) the I/B/E/S system adjusts earnings for unique items and thus allows for a comparable approach to analyst expected earnings that otherwise would be more difficult to calculate.

When considering the Standardized Unexpected Earnings methodology, several caveats exist which must be taken into consideration when analyzing results. First, by definition, the standardized unexpected earnings method only measures the earnings surprises of a company at a given date and does not account for other information that may be incorporated into a stock on the given earnings announcement date. There can be other factors such as sharply changing inventory levels, statements regarding the competitive marketplace, or other forms of new information released at the same time as earnings which could impact the stock price reaction (Yan and Zhao, 2008). Most recently, Jegadeesh and Livnat (2006) found that earnings announcement drift is affected by simultaneously released information including sales figures (and thus sales surprises). The SUE method using analyst forecasts is also limited to the companies that have analysts reporting on them. Thus, while it remains a commonly used methodology for analyzing PEAD

effects, researchers must be aware of the potential shortcomings of such a method when analyzing results.

$$SURP_i = \frac{(Actual(EPS)_{i,q} - Expected(EPS)_{i,q})}{\sigma(E(EPS)_{i,q})}$$

2.2 Earnings Announcement Return Method

We also use the Earnings Announcement Return (EAR) method for PEAD calculations. We follow the seasonal random walk model for calculating earnings surprises as done so by Price, Gatzlaff, and Sirmans (2012) in their study focusing on the PEAD effects in the REIT sector in the United States Market. Earnings surprises for firm i are defined as the difference between earnings per share announced, EPS_i, and earnings per share lagged four quarters, $EPS_{i,q-4}$, divided by the stock price 45 days before the earnings announcement date, Stock $Price_{i,t-45}$, as below:

$$SURP_i = \frac{EPS_i - EPS_{i,q-4}}{\text{Stock Price}_{i,\ t-45}}$$

We use the stock price 45 days prior to the earnings announcement date to remain consistent with Price, Gatzlaff, and Sirmans (2012) who draw from the study by Liang (2003). Besides surprises in earnings, the EAR method also captures other unexpected information contained in the earning announcement such as sales and margin figures as well as information about potential future adjustments contained in conference calls and press releases around the earnings announcement dates (Brandt et al., 2008). Such unexpected information is the main driver of the EAR method and makes it possible for the EAR method to be less exposed to estimation errors when compared with the SUE method (Brandt et al., 2008). Also, according to Johnson (2004), analyst forecasts can be biased by the personal interests of analysts and this is proven by Bradshaw, Drake and Myers (2009) who show that analyst forecasts are less accurate than simple random walk models. However, even though the EAR method excludes seasonal effects due to using lagged information, financial cycle effects could still potentially affect the EAR method as it uses historical data. In comparison, the SUE method should not be as exposed to financial cycle effects due to analysts being able to adjust their expectations prior to earnings announcements. In conclusion, both

measures have their own pros and cons and we decide to use both measures so as to be able to compare the results with the studies focusing on the United States market while gaining two potentially differing viewpoints on the European listed real estate market.

2.3 Abnormal Returns

Once the surprise is calculated for the earnings announcement date where t = 0, daily stock returns are found for the preceding and succeeding 60 days. Furthermore, consistent with Price, Gatzlaff, and Sirmans (2012) we match the market capitalization of the firm in euros at the earnings announcement date so as to be able to produce abnormal returns that are size adjusted which is of particular importance due to the fact that our sample size contains firms of greatly varying market capitalization rates (refer to Appendix Tables 9 and 10). Firms are then sorted into size deciles, and the average returns for each day within each decile is recorded as $R_{m,t}$ at date t. Abnormal Returns, $AR_{i,t}$ are then calculated on day t by first sorting the stocks into surprise deciles and then taking the difference between a firm's actual daily return $R_{i,t}$ and the average return of the firms in the same decile $R_{m,t}$.

$$AR_{i,t} = R_{i,t} - R_{m,t}$$

2.4 Cumulative Abnormal Returns

After calculating the abnormal returns we then calculate cumulative abnormal returns CAR_i for each stock i within each size decile by summing the daily abnormal returns for each stock for three event windows: the full time period CAR(-60,60), the initial earnings announcement period CAR(-1,0), and the post-earnings-announcement window CAR(1,60). The three event windows are described as follows: CAR(-60,60) is the cumulative abnormal return starting from 60 days prior to the earnings announcement date to 60 days after the earnings announcement date, CAR(-1,0) is the two-day cumulative abnormal return which only includes abnormal returns on the day prior to the earnings announcement date and the abnormal returns on the earnings announcement date, and CAR(1,60) is the cumulative abnormal return starting from the day after the earnings announcement date to 60 days after the earnings announcement date.

$$CAR(-60,60)_i = \sum_{-60}^{60} AR_{i,t}$$

$$CAR(-1,0)_i = \sum_{-1}^{0} AR_{i,t}$$

$$CAR(1,60)_i = \sum_{1}^{60} AR_{i,t}$$

These cumulative abnormal returns are then averaged for each decile which are used to create visual representations of PEAD effects (refer to Figures 1-6).

2.5 Cumulative Abnormal Returns Visual Analysis

Once we calculate the cumulative abnormal returns for the three time windows for both the SUE and EAR methods, we then visually analyze the results and compare the two methods. Doing so raises further questions regarding the stock reactions to initial earnings surprises and the presence of PEAD effects after the announcement date. When looking at each chart we specifically focus on three key identifiers: we look for reactions to initial earnings announcement surprises at t=0, we look for a positive or negative drift after the earnings announcement for the high decile groups and low decile groups respectively, and we look to see whether there is a trend upwards or downwards that occurs prior to the earnings announcement release date. Evidence of a reaction to initial earnings announcement surprises would show that the stock prices quickly incorporate the new information released with the earnings announcement which would be expected if one assumes the market is efficient. If we see sustained positive or negative drifts occurring throughout the entire 121-day window then it is less clear whether that drift is occurring due to pre-earnings-announcement drift effects, PEAD effects, or the result of a small sample size. After visually analyzing the cumulative abnormal returns in each of the three event windows, we then run a regression looking at the three event windows.

2.6 Regression Frameworks

After looking at the visual results from the cumulative abnormal returns, we then run regressions using both real estate and non-real estate stocks for each window $_w$ to measure the relationships

between the independent variable, $CAR_{w,i}$, and the dependent variables, $SURP_i$, $REIT_i$, and $REOC_i$. The aim of this regression is to identify differences in PEAD effects between REIT, REOC, and non-real estate stocks. Before running the regressions, we winsorize the SUE and EAR surprises by completing a 95% winsorization to exclude outlier data and to remain consistent with the methods used by Price, Gatzlaff, and Sirmans (2012). After winsorizing the data we separate our data into two indicator variables: $REIT_i$ and $REOC_i$. For REIT firm data we set the REIT indicator variable equal to 1, and for other firm data we set the REIT indicator variable equal to 0. We do the same for REOC firm data and set the REOC indicator variable equal to 1 for REOC firm data, and 0 for other firm data. To further test for the marginal differences in cumulative abnormal returns for REITs and REOCs we include two interaction terms in our second regression: $SURP*REIT_i$ and $SURP*REOC_i$. These two interaction terms are calculated by multiplying the $SURP_i$ variable by the REIT and REOC indicator variables and are consistent with Price, Gatzlaff, and Sirmans (2012). To further control for firm features we include two additional interaction terms: $SIZE_i$ and BM_i. $SIZE_i$ is calculated from each company's market capitalization 45 days prior to the earnings announcement date in their respective currencies to remain consistent with the calculation for the surprise. BM_i is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date which is consistent with Price, Gatzlaff, and Sirmans (2012). We also adjust our standard errors for potential heteroscedasticity issues (White 1980).

$$CAR_{w,i} = \gamma_0 + \gamma_1 SURP_i + \gamma_2 REIT_i + \gamma_3 REOC_i + \varepsilon_i$$

$$CAR_{w,i} = \gamma_0 + \gamma_1 SURP_i + \gamma_2 REIT_i + \gamma_3 REOC_i + \gamma_4 SURP * REIT_i + \gamma_5 SURP* REOC_i + \varepsilon_i$$

$$CAR_{w,i} = \gamma_0 + \gamma_1 SURP_i + \gamma_2 REIT_i + \gamma_3 REOC_i + \gamma_4 SURP * REIT_i + \gamma_5 SURP* REOC_i + \gamma_6 SIZE_i + \gamma_7 BM_i + \varepsilon_i$$

If the REIT and REOC indicator variables produce non-significant results, we then wish to further test the significance of the REIT and REOC datasets individually. This regression would allow for us to identify differences in PEAD effects between REIT and REOC stocks specifically, without including non-real estate stocks. However, due to our sample size this would not produce reliable

results and we thus combine both REIT and REOC data to measure real estate sector-wide PEAD effects. Prior to running this additional regression, we recalculate size and surprise deciles.

$$CAR_{w,i} = \gamma_0 + \gamma_1 SURP_i + \gamma_2 SIZE_i + \gamma_3 BM_i + \varepsilon_i$$

3 Empirical Results and Analysis

In this section we discuss the findings from our cumulative abnormal return figures as well as the regressions. We first discuss how the cumulative abnormal return data can be interpreted visually, and then discuss the regression results individually for the two methodologies. After discussing each method, we then compare the two methods.

3.1 Cumulative Abnormal Returns Charts

We first consider the cumulative abnormal returns for REITs and while we find that both methods produce noisy results due to our small data set, we find the EAR method produces results which could point towards a PEAD effect. For both the SUE and EAR method, we do not find a significant trend prior to the earnings announcements or during the initial earnings announcement window.

Figure 1: REIT Cumulative Abnormal Returns by Surprise Deciles - SUE Method

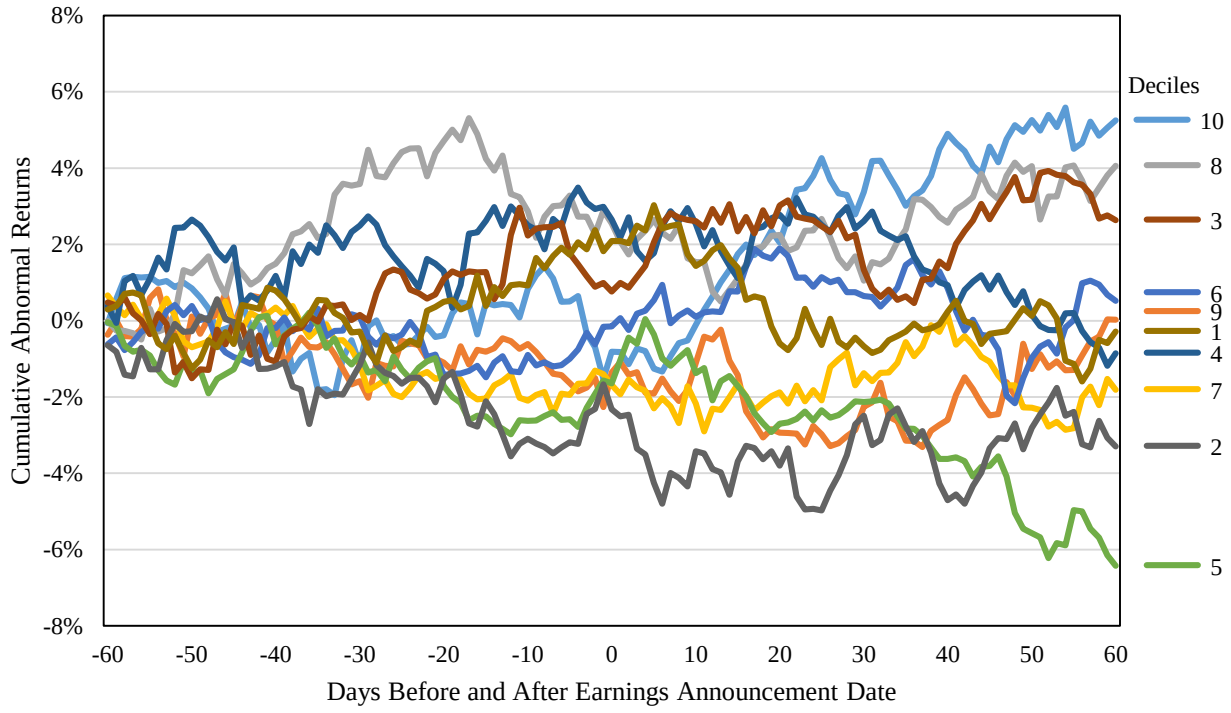
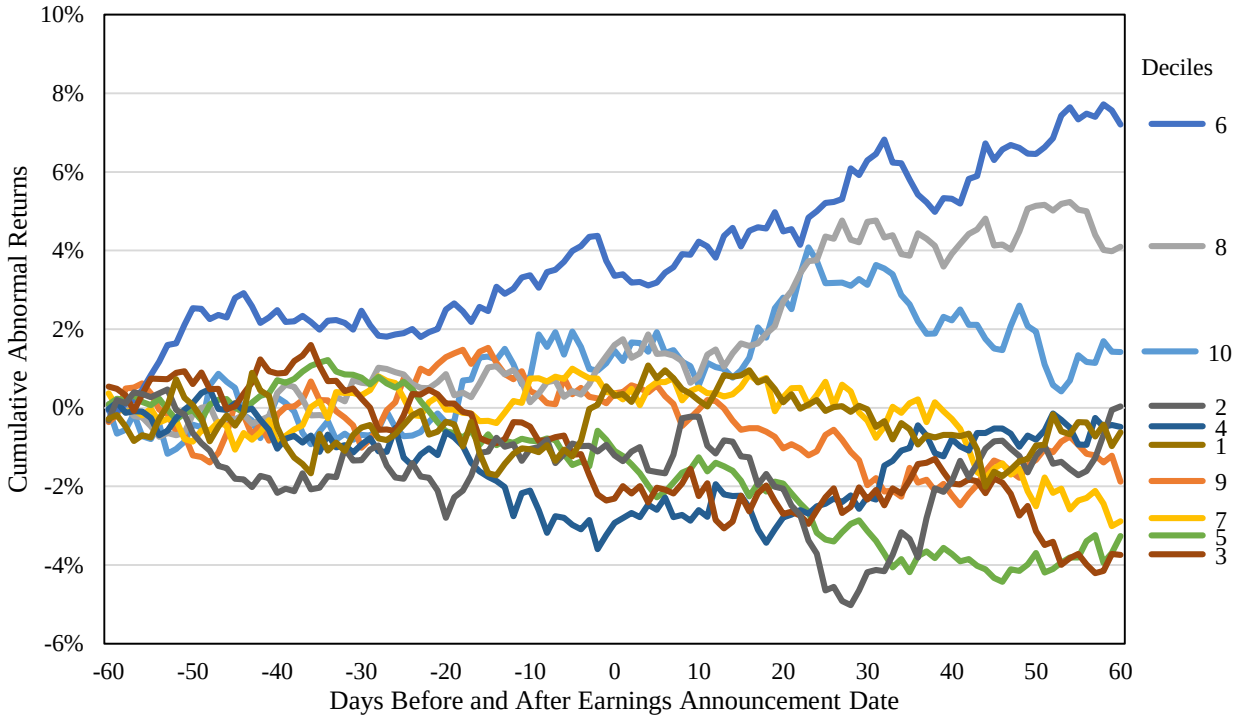


Figure 2: REIT Cumulative Abnormal Returns by Surprise Decile - EAR Method



We then consider the REOC cumulative abnormal returns and note that they provide more clearly identifiable trends. Focusing on the SUE method, we see initial earnings announcement reactions only in the 4th and 7th deciles and see little, if any, drift effects after the earnings announcement. The chart is of similar ambiguity for the EAR method as we notice few trends save for the 9th decile which demonstrates a small initial earnings announcement reaction and then a seemingly evident drift effect.

Figure 3: REOC Cumulative Abnormal Returns by Surprise Deciles - SUE Method

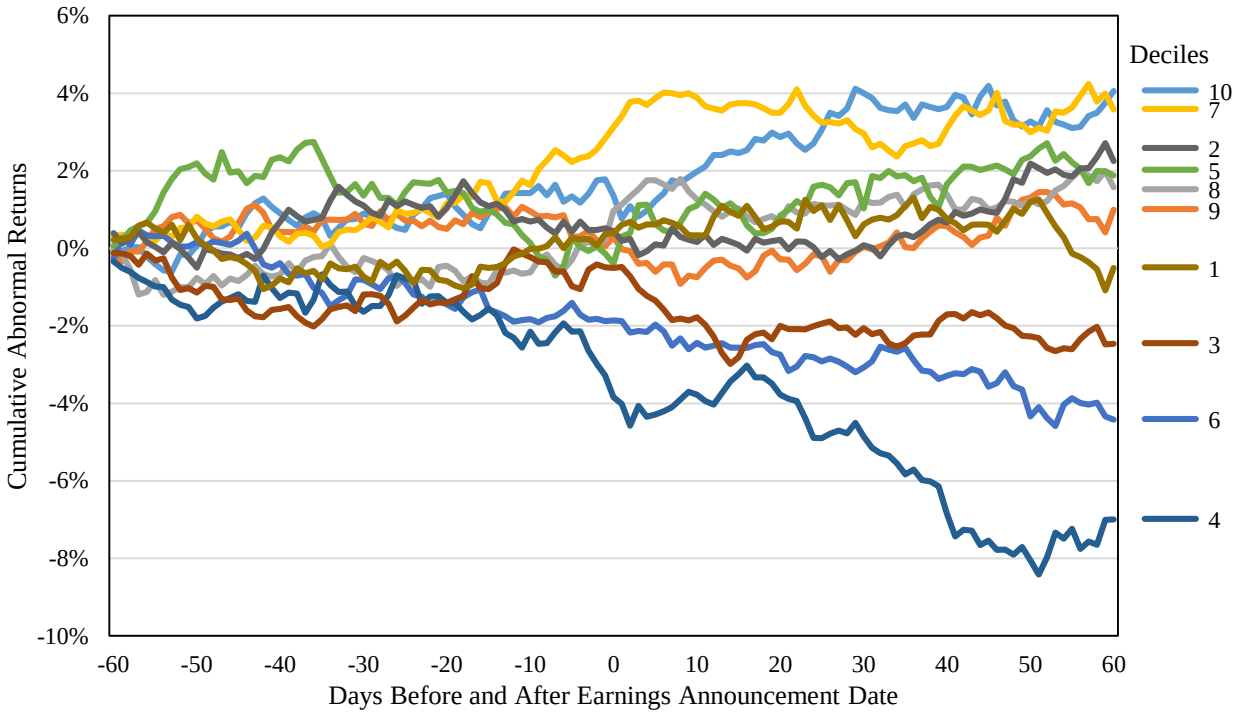
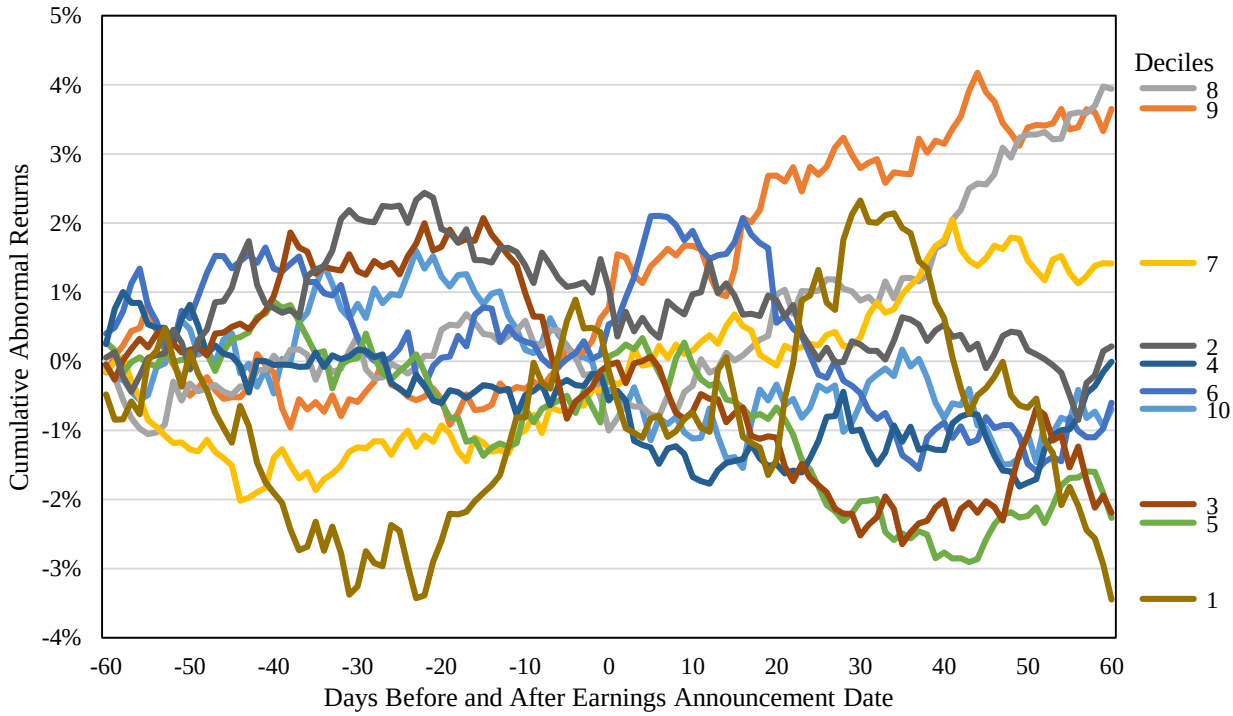


Figure 4: REOC Cumulative Abnormal Returns by Surprise Decile - EAR Method



When considering the cumulative abnormal returns for the STOXX 600 we note patterns which provide visual evidence of potential PEAD effects. In both the SUE and EAR method we see clear initial earnings announcement reactions from the majority of surprise deciles. For the highest deciles we also note drift effects after the announcement dates which are larger for the EAR method than for the SUE method. This leads us to conclude prior to running our regressions that the EAR method may produce more evidence of PEAD effects than the SUE method which is contrary to our initial hypothesis. If this were also to be true for REIT and REOC companies then it would be consistent with current academic literature which suggests that, as in the United States REIT market, the EAR method produces significant evidence of PEAD effects while the SUE method does not.

Figure 5: STOXX 600 Cumulative Abnormal Returns by Surprise Deciles - SUE Method

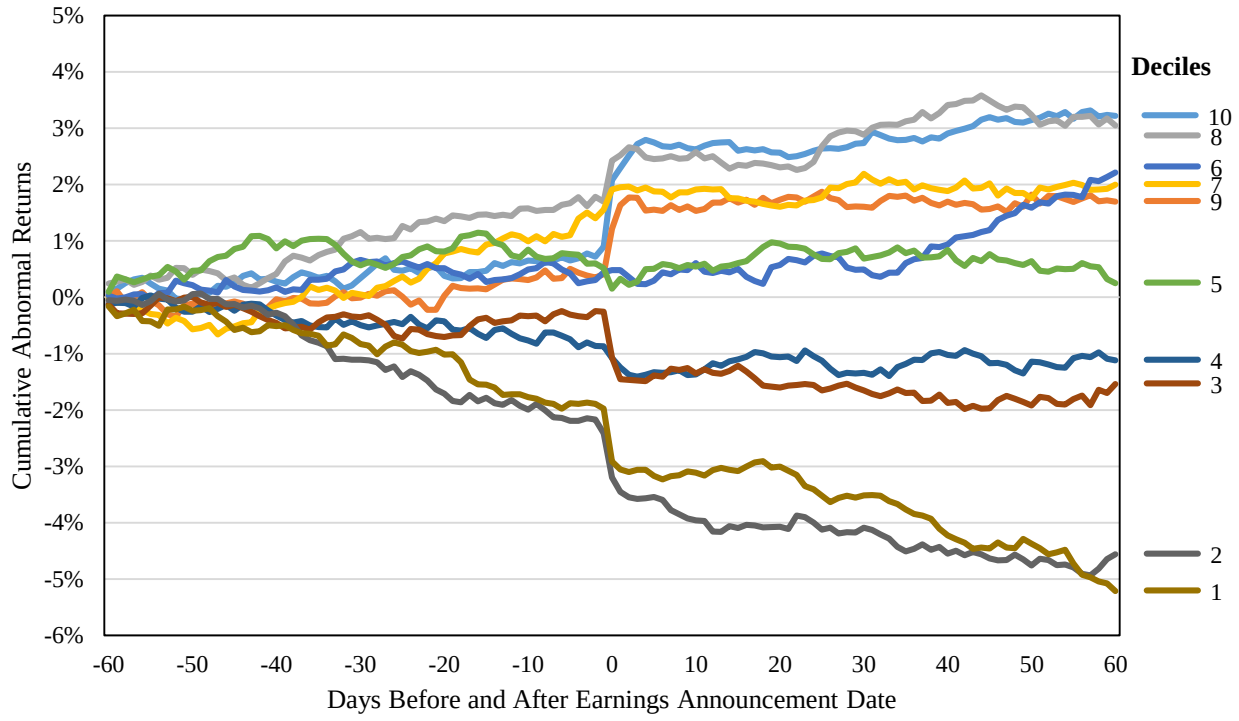
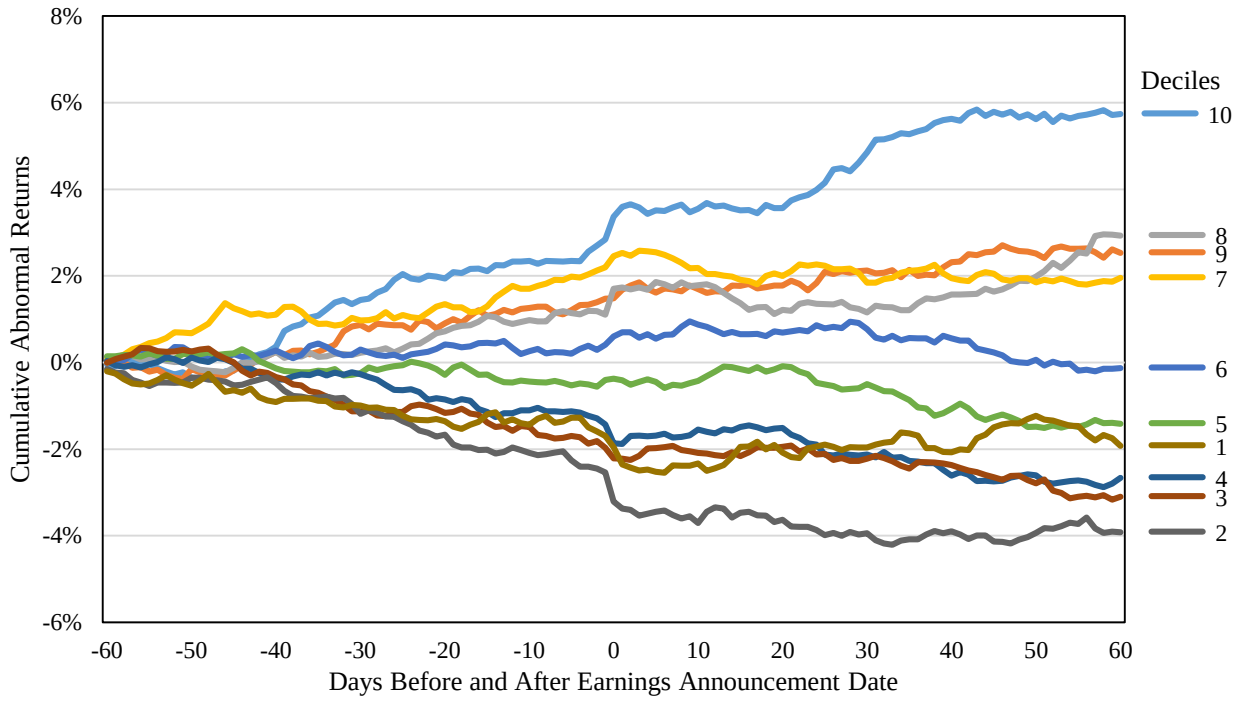


Figure 6: STOXX 600 Cumulative Abnormal Returns by Surprise Deciles - EAR Method



3.2 Regression Results

This section discusses the results of the two regression models. The first regression includes REIT, REOC, and Non-Real Estate companies and the second regression includes only REIT and REOC companies which are combined to test for the PEAD effect in only the listed real estate sector.

3.2.1 REIT, REOC, and Non-Real Estate Regressions

Standardized Unexpected Earnings Method

The first regression found in Table 1 separates real estate stocks into REITs and REOCs and includes non-real estate stocks. This is done to see if PEAD effects differ between REITs and non-real estate stocks and REOCs and non-real estate stocks. As shown in Table 1 Panel B, we note that the surprise is significant for the initial surprise window of CAR(-1,0). As neither the REIT nor REOC coefficient is found to be significant, we cannot determine if they have initial reactions to earnings announcements. Furthermore, when considering the variables REIT*SURP and REOC*SURP which refer to the "marginal difference[s] in the cumulative abnormal returns" for REITs and REOCs when compared with non-real estate stocks, the regression suggests that both

REITs and REOCs experience less initial reactions to earnings announcements than non-real estate stocks (Price, Gatzlaff, and Sirmans 2012). This is contrary to our initial hypothesis that REITs and REOCs would experience a more significant initial reaction to earnings announcements when compared to non-real estate companies due to their increased transparency.

We also see that neither size nor the book-to-market ratio coefficients are significant for the initial earnings announcement window CAR(-1,0). As a high book-to-market ratio would signify a value-oriented stock and a low book-to-market ratio would signify a growth-oriented stock we would have initially expected to see growth stocks exhibit lower initial reactions to earnings announcements by having a positive significant result. This reasoning is centered on growth stock valuations being based on higher future growth rates that are more volatile than the lower growth rates in value stocks which traditionally are well established and stable companies. With higher growth rates that are more uncertain for investors, higher information uncertainty would exist and thus investors would be less able to react quickly to changes in information in those growth stocks. However, as the book-to-market ratio is not significant within this window, our regression fails to support this argument. Furthermore, from a size perspective, we would also have expected larger companies to be more stable than small companies from an operating standpoint and thus more predictable from a future earnings standpoint.

When looking at the post-earnings-announcement window CAR(1,60) as shown in Table 1 Panel A, we see evidence of a significant positive drift effect for the entire sample. We do not, however, see significant results when considering REITs and REOCs individually which would have suggested that there are PEAD effects for those stocks. This result could potentially change, however, if a larger dataset is introduced for REITs and REOCs. The Size coefficient is also not significant, however the book-to-market ratio coefficient is significant and positive.

Contrary to our expectations for the initial announcement window CAR(-1,0), we would expect for the post-earnings-announcement window CAR(1,60) to see a significant and negative book-to-market coefficient. We would expect this result as value-oriented stocks are generally larger and older than growth stocks and should have larger analyst followings. Information should be better incorporated as a result, and thus value stocks should have less drift over the post-earnings-

announcement window. Despite this assumption, the results suggest that value-oriented stocks exhibit additional PEAD effects however this is consistent with academic research by Fama and French (1992), Lakonishok, Shleifer, and Vishny (1994), Rosenberg, Reid, and Lanstein (1985), Basu (1977), and Jaffe, Keim, Westerfield (1989) which suggested that value stocks outperform growth stocks. Fama and French (1992) postulated that the book-to-market ratio captures a measure of risk which had been previously discussed as a relative risk factor by Chan and Chen (1991) and suggested that a higher book-to-market ratio company has worse market prospects which thus requires higher expected returns and higher costs of capital. Rosenberg, Reid, and Lanstein (1985) claimed that their findings of higher returns for higher book-to-market companies is a result of pricing inefficiencies in the market while Lakonishok, Shleifer, and Vishny (1994) argued that investors have a tendency to have overly positive expectations for growth stocks than value-oriented stocks which cannot be met by the growth companies who then tend to underperform the market. After considering these explanations, we feel that they could each be applied to our regression results and due to the inclusion of both real estate and non-real estate companies it is difficult to pinpoint specific reasons for this book-to-market coefficient result as both types of companies exhibit different characteristics in this regard as can be seen in Table 5.

Earnings Announcement Return Method

When considering the initial earnings announcement window CAR(-1,0) found on from Table 2, Panel B, we find only the surprise coefficient to be significant. This result suggests that there is a clear initial reaction to unexpected earnings surprises compared with analyst expectations however none of the additional coefficients are able to provide further explanations regarding the characteristics of the initial reaction.

When considering the post-earnings-announcement return window CAR(1,60) as shown in Table 2, Panel A, we see a significant positive coefficient for the earnings announcement surprise for the data set as whole while the individual coefficients for REITs and REOCs are not significant. However, the book-to-market coefficient is also significant and positive. This is similar to what is found in the SUE regression, and further suggests that higher book-to-market ratios do impact post-earnings-announcement drift.

3.2.2 Stand-alone Real Estate Regressions

Standardized Unexpected Earnings Method

In order to further test whether real estate stocks as a whole exhibit PEAD effects, we conduct a further regression utilizing only real estate data. In order to combine the two data sets of REITs and REOCs, we recalculate deciles, abnormal returns for deciles, and cumulative abnormal returns for each real estate stock. The regression results for all three windows are shown in Table 3, and we see that there is no evidence of PEAD effects. However, for both the post-earnings-announcement window CAR(1,60) and the full 121-day window CAR(-60,60) we see that the coefficients for size and the book-to-market ratios are significant and positive. The size coefficients are small due to the size adjustment made when calculating cumulative abnormal returns while the book-to-market ratio coefficient result is consistent with the initial regression results when we included REITs, REOCs and Non-Real Estate companies.

Earnings Announcement Return Method

When looking at our regression results on Table 4 using only real estate data with the EAR method, initial earnings results CAR(-1,0) yield no statistically significant coefficients. However, when considering both the post-earnings-announcement window CAR(1,60) and the full period time window CAR(-60,60) we see that the surprise coefficients are significant and positive which would suggest that there is PEAD within the real estate data set. When looking at the three event window results together, there seems to be a lag between when the earnings announcement is released and when the new information begins to be incorporated in the stock price. We believe this time between the announcement and the reaction from investors could be the result of the information uncertainty in the market which could be caused by the younger market structure as discussed previously. We would expect that this is more likely the case in the younger markets in Europe such as Hungary and Ireland which only adopted REIT legislation in 2011 and 2013 respectively than in the older listed real estate markets such as the Netherlands and Belgium which adopted REIT legislation in 1969 and 1995 respectively however we are unable to determine differences due to our data set (refer to Table 11 for REIT legislation adoption).

Further building on the notion of a less developed market, it is interesting to look into the average size of European listed real estate companies. It is evident from Tables 7 and 8 that, according to our data, the average listed European REIT and REOC is quite small when compared with STOXX 600 non-real estate companies. Furthermore, Tables 9 and 10 show that the majority of listed REITs and REOCs in Europe according to our data have market capitalization rates under €1 Billion, with 37% of REITS and 63% of REOCs having market capitalization rates of €100 million or less. As a result of these small market capitalization rates, questions arise as to the investor base within these companies. REITs, in particular, often have legislation in place restricting the size of ownership stakes which investors can take in the company and this could have significant impacts on the ability for institutional investors to invest in these companies.

Changes to these shareholder regulations could have positive effects for information uncertainty in the European listed real estate market. This is exemplified by a change in the United States REIT legislation in 1993 which focused on the 'five or fewer' stipulation whereby no fewer than five shareholders can hold 50% of a REIT's stock (Bhasin, Cole, and Kiely, 1996). This rule was amended with guidance for the Internal Revenue Service (IRS) to "look through" specific qualified trusts owning REITs (Bhasin et al., 1996; Feldman and Man, 2008). Instead of considering the trust's ownership portion of the REIT as a whole, the IRS would consider the trust as holding the stocks directly for and proportionally to the interests of the beneficiaries (Bhasin et al., 1996; Feldman and Man, 2008). This change thus allowed institutional trusts to hold larger stakes in United States REIT companies without being in violation of the 'five or fewer' stipulation and as a result of this shift, institutional ownership in REITs jumped from less than 20% in 1992 to more than 40% by 1996 (Feldman and Man, 2008; Chan, Leung, and Wang, 2004). As institutional investors are considered to be amongst the most sophisticated investors, if they are not included in the investor mix then the investor base may consist of less knowledgeable investors. If this is the case, it would follow that information uncertainty would be greater and thus more PEAD effect would be present. As such, this is an area that could be looked into by European legislators when considering potential legislation changes aimed at improving transparency in the European listed real estate market.

When looking at both the size and book-to-market coefficients from our regression we see that they are significant and positive for the post-earnings-announcement window CAR(1,60) and the full period time window CAR(-60,60). As previously discussed a positive significant size coefficient is not what we would have initially expected however the coefficients for size are small due to the size adjustment completed when calculating cumulative abnormal returns. Seeing a positive significant book-to-market coefficient is consistent with the previous regressions and follows the same logic as previously discussed. The constant coefficient is also significant, but negative for both windows which signifies that all the abnormal return effects have been captured by the explanatory variables in this regression and could be explained by transaction costs and other such expenses.

3.3 Comparing SUE and EAR Regressions

The major difference between the SUE and EAR regressions using the REIT, REOC, and non-real estate company data involves the size of the surprise coefficients. Both surprise coefficients are significant as mentioned above, however the EAR regression surprise coefficient is much larger. This result suggests that the EAR surprises have a significant impact on PEAD effects, and a larger portion of the abnormal returns from stocks can be attributed to EAR earnings surprises. As a result, if one is considering potential trading strategies our results suggest that the EAR methodology should provide more abnormal returns when utilizing earnings announcement surprises. This result can be interpreted as meaning that investors place more importance on how the company performs compared with earnings from the same time point one year ago as opposed to how analysts expect companies to perform. Investors may choose to not focus on analyst expectations due to multiple reasons including: analyst herd mentality, analyst biases, and a lack of analyst understanding of the market (Johnson, 2004).

We also see in both studies that the book-to-market ratios are significant however the coefficients are small. In addition, the results in both studies have significant and negative constant coefficients however this only occurs in the regressions where we include seven other variables and thus we cannot adequately explain the reasoning behind their significance.

When analyzing the regression from the entire 121-day window, we see that the book-to-market ratios are significant and positive for both the SUE and EAR methodologies. These results are consistent throughout our regressions and can be explained by the academic research previously mentioned.

When completing a regression using solely real estate data by combining both REIT and REOC companies into one Real Estate variable we see significant differences between the SUE and EAR methodologies. It is important to note that prior to comparing the two methodologies the SUE methodology has a smaller dataset which may have impacted the regression results when compared with the EAR methodology. Additionally, as discussed above the SUE methodology may be impacted by analyst biases. For the SUE methodology we see that the surprise coefficient is not significant and thus there is no evidence of post-earnings-announcement drift. When considering the EAR methodology, we do see a significant positive coefficient for the surprise variable which would suggest the presence of a PEAD effect. The other variables including SIZE, BM ratio, and the constant coefficient are significant for both the full window CAR(-60,60) and the post-earnings-announcement window CAR(1,60) for both the EAR and SUE methods. This provides further evidence that the real estate market as a whole does experience PEAD when using the EAR methodology, however when splitting the two sectors into individual variables as done in the first regression we find no evidence of post-earnings-announcement drift. This leads us to conclude that a larger data in the future may yield more conclusive evidence of differences in post-earnings-announcement drift among the REIT and REOC sectors.

4 Discussion

In this section we compare our findings with the results found in previous academic literature and discuss the potential differences between the European and United States listed Real Estate markets. Furthermore, we identify the conclusions that our study can add to current academic literature and provide suggestions for avenues of further research.

4.1 Comparisons with the United States Listed Real Estate Market

The paper by Gyamfi-Yeboah, Ling, and Naranjo (2012) utilized the SUE method to study PEAD effects in the United States REIT sector and found no significant results pointing towards such a PEAD effect. This conclusion can also be drawn when analyzing our post-earnings-announcement window regression CAR(1,60) where we find no significant evidence of PEAD effects for either European REITs or European REOCs. Of particular interest is the fact that Gyamfi-Yeboah, Ling, and Naranjo (2012) also did not find significant surprise coefficients when looking at the CAR(1,60) event window despite having a sizeable data set from 1995-2009. Our initial conclusion when receiving a non-significant surprise coefficient when looking at the CAR(1,60) event window was that it was most likely a result of a lack of data, however the fact that Gyamfi-Yeboah, Ling, and Naranjo (2012) also found their result to be insignificant when considering the SUE method raises further questions as to why it is not significant. As a result, when looking at the post-earnings-announcement window CAR(1,60) our results suggest that there is either no relationship between earnings surprises (when utilizing analyst expectations) and PEAD effects or that we fail to reject our null hypothesis that there is a relationship between earnings surprises and post-earnings-announcement drift when considering this regression equation. Since there is seemingly no relationship between earnings surprises and PEAD effects we look at the initial announcement window CAR(-1,0) to see if there is evidence of significant abnormal returns which could point towards information being quickly incorporated into stock prices and thus providing evidence of an efficient market reaction to earnings surprises. In the case of Gyamfi-Yeboah, Ling, and Naranjo (2012), they found significant surprise coefficients in the initial earnings announcement window CAR(-1,0) and the window immediately after announcement CAR(0,1) which they posit to mean that the market incorporates new information quickly which supports the view that the market is efficient and that there is little information uncertainty. These results lead the authors to suggest that the United States listed REIT sector is informationally efficient. From

our results, we see no significance when looking at surprise coefficient in the initial earnings-announcement window CAR(-1,0) which leads us to suggest that investors do not react to how analyst expectations perform versus actual earnings results in the European listed real estate sector.

When studying the book-to-market ratio coefficients we also find interesting similarities between our results and those of Gyamfi-Yeboah, Ling, and Naranjo (2012). We find that book-to-market ratios are significant and produce positive coefficients when we consider only European REITs and REOCs which further raises the question regarding the abnormal returns garnered by real estate companies that have high book-to-market ratios. As discussed previously there are numerous hypotheses as to why this would exist, and we posit that this could be a result of an information asymmetry in the market or a result of investor interest in such value-oriented real estate companies which increases the stock turnover leading to a self-fulfilling prophecy.

The most important conclusion that can be drawn from comparing our study with Price, Gatzlaff, and Sirmans (2012) is that utilizing the EAR methodology produces results that point towards PEAD effects in the listed real estate sector. Price, Gatzlaff, and Sirmans (2012) found significant results pointing towards PEAD effects in the United States REIT sector using the EAR methodology, and we find significant results for the European Real Estate sector as a whole. In addition, when focusing on all three event windows (CAR(-60,60), CAR(-1,0), and CAR(1,60)) we find that the surprise coefficients in our regressions are much larger than those in the SUE regressions and are similar in size to those found by Price, Gatzlaff, and Sirmans (2012). In terms of differences, book-to-market ratios were found to be significant and negative in all three event windows for Price, Gatzlaff, and Sirmans (2012) while we find book-to-market ratios to be significant and positive only in the CAR(1,60) and CAR(-60,60) event windows. As previously discussed in Section 3.2.1 we had originally expected to see negative coefficients for the book-to-market variable in our regression for the CAR(1,60) event window which follows the results of Price, Gatzlaff, and Sirmans (2012). As we do not see this result in our regressions, we argue that this could be the case due to several reasons: (i) it could be that European value stocks experience more risks that are not captured by financial models, (ii) that there is more information uncertainty among value stocks, or (iii) that, due to the 'over-reaction theory' discussed in Section 1.2,

investors tend to overreact to earnings announcements which causes abnormal returns over the event window and that this overreaction is larger in value stocks.

We also account for size effects in a similar manner to that of Price, Gatzlaff, and Sirmans (2012) by calculating size-adjusted returns and we find that the size coefficients in our studies are similar as they are found to be significant, positive, and very small. This result was to be expected when accounting for size in our return calculations.

When considering the current stage of development in the European listed real estate sector, we find interesting comparisons regarding the size of surprise coefficients in the three studies. For example, the initial announcement period CAR(-1,0) in our study produces a smaller surprise coefficient to that of Price, Gatzlaff, and Sirmans (2012). This would suggest that European real estate stocks react more slowly to initial earnings announcement surprises and supports our initial hypothesis that the European real estate market is less developed and less able to quickly incorporate changes in information.

When looking at the post-earnings-announcement window of CAR(1,60) we see a similar difference in the surprise coefficients between our study and that of Price, Gatzlaff, and Sirmans (2012), as our study produces a larger significant surprise coefficient. This would further support the hypothesis that the European market is less developed and thus experiences more PEAD. When we run a regression using solely real estate data, we see an even larger significant surprise coefficient than when we run a regression which includes non-real estate companies and would suggest that the real estate market in Europe is less informationally efficient than European non-real estate companies as well as the United States REIT sector. While we would expect that result when comparing with the United States REIT sector, we find that result to contradict our initial hypothesis relating to European non-real estate companies that European Real Estate companies should be more informationally efficient. This could be explained by considering the age of the European listed real estate markets as investors in countries that have only recently adopted REIT legislation may not fully understand the REIT structure yet. For countries that do not have REIT legislation, investors may not understand the more opaque REOC structures. This is an issue that

is currently being raised by the European Public Real Estate Association which is promoting clearly listed real estate legislation and guidelines across Europe.

However, if our initial hypothesis is in fact correct and European listed real estate companies are more informationally efficient than European non-real estate companies, then our regressions results would point to the uncertainty theory being invalid. If the uncertainty theory is invalid, then this opens the avenue for further studies to be completed analyzing the reasons behind post-earnings-announcement drift in the European listed real estate market. A final explanation could be that our sample size is too small and thus does not truly capture the characteristics of the European listed real estate market. If this is the case, we would suggest that future studies are conducted when a large data set is available to further analyze PEAD effects in the sector.

4.2 What can be done about PEAD effects?

Having now identified PEAD effects in the European listed real estate market from our study, it is interesting to consider how PEAD effects and information uncertainty change over time. Bruin (2009) analyzed bid-ask spreads between United States and European REIT companies between 2000 and 2008 and found EU REIT companies experienced a drop in bid-ask spreads as well as volatility during that time window. This would suggest that over that period of time the EU REIT market became more liquid and a study by Bhasin, Cole, and Kiely (1996) suggested that less informationally uncertain would be the cause of such a decrease in bid-ask spreads. We posit that this drop in informational uncertainty was most likely the result of increased investor understanding of the marketplace as we are unable to identify significant changes in legislation to the already existing REIT frameworks which would account for such a decrease in investor information uncertainty. The question remains, however, as to what should be done with this information. Should market regulators attempt to further reduce this market anomaly, and if so, how? We suggest that there are three avenues to explore in this regard: changes in investor understanding of the real estate company structures, new legislation making the company structures more transparent, and potential arbitragers who arbitrage such an anomaly away.

One of the first ways that information uncertainty can change in the European listed real estate market relates to investor knowledge and understanding. Despite the fact that REITs were

originally formed to provide a transparent way of investing in real estate, it is possible that when legislation is first introduced to domestic investors in a market they may not fully understand the structure if they have not purchased listed REITs located in other countries before. We would argue that, over time, investors should become more familiar with the structure of REITs as well as the specificities behind the legislation which would reduce their information uncertainty and produce a more efficient market. This statement should also hold true for REOCs which, despite being unregulated, should still see their stocks become more informationally efficient over time as investors gain greater familiarity with the stocks. Both of these arguments are supported by the previously discussed decrease in EU REIT bid-ask spreads as documented by Bruin (2009). While we suggest that information uncertainty should decrease over time automatically, this can be further hastened by educational programs such as the marketing of the key points of current legislation by governments and investor awareness programs put forward by organizations such as the EPRA. The notion is to provide investors with clear and concise material or education so that they may better understand the intricacies behind REITs and REOCs, thus decreasing the information uncertainty in the market.

A second method of reducing information uncertainty within the European listed real estate market relates to the legislation in place. In this case, legislation could either be implemented in REOCs or fine-tuned in REITs. For REOCs, as there is currently no legislation in place dictating issues relating to the shareholder base and operating requirements among others, investors may feel more uncertain regarding the future performance of such companies. If legislation was put in place making REOCs more transparent, this could enable investors to exhibit more certainty during earnings announcement periods. Alternatively, if REOC companies decided to switch into a REIT structure, they would gain more transparency after complying with the current legislations in place which would improve information uncertainty among investors. Regarding current REIT companies, we have previously mentioned that organizations such as the EPRA are lobbying for those European countries without REIT legislation to adopt such legislation and for those that already have legislation in place to adjust them so as to create an EU-wide comparable legislation framework. If this were the case, REIT companies across Europe would become more comparable and it would reduce the number of complexities that are potentially causing REIT companies in different countries to act differently thus making it more difficult for investors to understand them.

A final area of interest relates to the longevity and persistence of this PEAD effect in the European listed real estate market which could lead to arbitrageurs entering the market. Currently it would seem that based on our results, arbitrage opportunities exist however we cannot comment on whether or not current arbitrage is occurring within the market. Based on the EAR method results, a potential arbitrage strategy without considering trading costs could exist whereby upon the earnings announcement release arbitragers bid the stock up to the stock price that is expected at the end of the event window which in our case is 60 days after the announcement. If this were to occur, the stock price would be driven up to the price that contains all the earnings announcement information at the earnings announcement date, and no drift would occur during the post-earnings-announcement period CAR(1,60). In this way, the PEAD effect would fade and a more efficient market would be formed. For such a trading strategy to be produced however, we would suggest that a greater sample set is required so as to produce more robust results.

Of the three potential factors considered which we feel could adjust the PEAD effect in the European listed real estate market, we argue that the most likely change in the future will result from increased investor understanding of the company structures as this should occur naturally over time. However, to adjust the PEAD effect quickly we feel that changes in legislation would be the most suitable solution due to their comprehensive nature and we also would argue that it is the avenue which is most easily controlled. Despite this, we do note that while legislation should have a quick impact on the market, the lengthy processes behind such changes in legislation mean that these changes in legislation would not occur quickly.

4.3 Suggestions for Future Research

This study has produced results that point towards PEAD effects being present in the European listed real estate markets when considering the EAR methodology and no PEAD effects being present in the European listed real estate markets when considering the SUE methodology. Both of these findings are consistent with Price, Gatzlaff, and Sirmans (2012) and Gyamfi-Yeboah, Ling, and Naranjo (2012) who focused on the United States REIT sectors, however numerous avenues exist for further research into the differences between European REITs and REOCs. In particular, our dataset was limited such that we were not able to find significant results when

comparing REITs and REOCs and were thus left with analyzing the results when both company structures were combined. As discussed previously, REITs and REOCs have different legal structures and are commonly thought to exhibit differences in transparency which should reflect different PEAD effects. While our study touches on the differences in these structures, our results are not significant when comparing them and we are thus unable to provide opinions or hypotheses regarding how these structural differences are affecting information efficiency in the European marketplace.

While this paper focuses primarily on years where REIT legislation was only recently adopted, Bruin (2009) found that the EU REIT sector has become less volatile over time. We believe that this would be a unique area for research for the European REIT and REOC sectors in the coming years when potential changes in market structure and legislation could yield adjustments in the incorporation of information into such company stock prices.

The European listed real estate marketplace is extremely broad, and while our study has focused on analyzing the sector as a whole it is difficult to generalize the market when one is considering 30 different countries. We are able to generalize due to REIT legislation being at least relatively comparable in most countries, however further research can be conducted in specific markets with strong focuses on uniquely different legislations for REITs. Currently, as the European listed REIT sector is still in its infancy in most markets this type of study would most likely suffer from a lack of available data.

Many studies focusing on identifying the PEAD effect have incorporated potential trading strategies in their analysis. Our study focused more on analyzing potential differences in the PEAD effect between the European and United States listed real estate markets and analyzing trading strategies was deemed to be outside of our focus area. However, we do feel that potential trading strategies could be found utilizing the PEAD effect in Europe, and believe that this could be an interesting area for further research in the future. We posit that utilizing the EAR method would produce more significant abnormal returns for trading strategies when compared with the SUE method. This type of a study would also benefit from larger datasets which will come about in time as the European listed real estate market develops.

As our study produces non-significant results when looking at the initial earnings announcement window CAR(-1,0) we are unable to draw inferences on whether there are abnormal returns which exist directly after an earnings announcement. With a larger sample size, we feel that the issue of non-significant results might be resolved and if this was the case two results could follow: either there would be abnormal returns in that event window or not. If there were abnormal returns, this would suggest that information was being incorporated into the stock price at that point. If abnormal returns were found to not exist, then one could look at different event windows to decipher when information becomes incorporated into stock prices. If such a pattern could be found on a specific day after an earnings announcement, then one could construct a trading strategy to capitalize on such movements.

5 Conclusion

With the recent rise of European REIT legislation, the European listed real estate market has undergone a dramatic shift in how it is structured. The aim of this paper is to identify the PEAD effect in the European listed real estate sector, and this is the first the study that we are aware of to do so. While the PEAD effect has been found to exist in markets around the world, only recently has research been conducted into the anomaly within a real estate context. Our motivation stems from two research papers which aim at identifying the PEAD effect in the United States REIT sector, and our aim was to produce a comparable study that could serve as a basis for future studies into the European listed real estate market while also providing a unique platform to compare the two marketplaces.

Having utilized the two most commonly used methodologies to calculate earnings surprise results, the Earnings Announcement Return method and the Standardized Unexpected Earnings method, we find that the EAR method produces results showing significant PEAD effects in the European listed real estate sector while the SUE method does not produce evidence to suggest PEAD effects in the European listed real estate sector. Both conclusions are consistent with Price, Gatzlaff, and Sirmans (2012) who found statistically significant PEAD effects in the United States REIT market when using the EAR method and Gyamfi-Yeboah, Ling, and Naranjo (2012) who found no evidence of consistent PEAD effects in the United States REIT market when using the SUE method. When taking both study's conclusions into consideration our findings suggest that information uncertainties exist in the European listed real estate sector, and that there is no relationship between how analyst expectations perform against actual earnings results and investor behaviour directly after such earnings announcements are released in the European listed real estate sector.

We posit that PEAD effects within the REIT sector may decrease over time as more investors become familiar with the structures and as organizations such as the European Public Real Association promote uniform REIT legislation and communication among European countries and investors. This paper contributes to the current academic literature focused on publicly listed real estate markets and broadly identifies a unique market anomaly that previously had not been

identified in the European marketplace. As such, this study provides a strong foundation for further studies within the European listed real estate market to be completed in the future.

With historical roots tracing back to the 1960 enactment of legislation introducing REITs in the United States market, governments have continually sought to provide investors with a method of investing in real estate that is both transparent and easily accessible and this has come in the form of listed real estate companies ("History", n.d.). PEAD effects are contrary to what this framework originally sought to achieve and thus we argue that the PEAD anomaly should be addressed within the listed real estate sector in the future. Until this is done through such avenues as greater investor education, further legislation promoting transparency, or arbitragers entering the market we feel that the PEAD anomaly will continue to exist in the market and reflect information uncertainty among investors.

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7 Appendix

Table 1: Regression Results for the SUE Method when considering REITs, REOCs, and Non-Real Estate Stocks

Panel A: PEAD	**CAR(1,60)**	**t-statistic**	**CAR(1,60)**	**t-statistic**	**CAR(1,60)**	**t-statistic**
SURP	0.000003**	2.53	0.000003**	2.48	0.000004**	2.59
REIT	-0.000288	-0.03	-0.000376	-0.05	-0.013569	-1.46
REOC	-0.001240	-0.20	-0.001071	-0.13	-0.012676	-1.87
REIT*SURP			0.000008	0.78	0.000007	0.80
REOC*SURP			-0.000002	-0.74	-0.000002	-0.74
SIZE					-0.000000	-0.07
BM					0.019751***	3.15
Constant	0.000239	0.11	0.000195	0.09	-0.008377**	-2.37
Observations	5090		5090		5090	
R-squared	0.0011		0.0013		0.0049	
Panel B: Announcement	**CAR(-1,0)**		**CAR(-1,0)**		**CAR(-1,0)**	
SURP	0.000003***	6.41	0.000004***	7.43	0.000004***	7.42
REIT	0.000257	0.13	0.000394	0.20	-0.000284	-0.12
REOC	0.000030	0.02	0.000386	0.23	-0.000211	-0.11
REIT*SURP			-0.000003**	-2.06	-0.000003**	-2.06
REOC*SURP			-0.000004***	-5.09	-0.000004***	-5.09
SIZE					0.000000	-0.24
BM					0.000921	0.43
Constant	-0.000299	-0.42	-0.000399	-0.56	-0.000732	-0.59
Observations	5090		5090		5090	
R-squared	0.0077		0.0115		0.0116	
Panel C: Full Window	**CAR(-60,60)**		**CAR(-60,60)**		**CAR(-60,60)**	
SURP	0.000009***	5.78	0.000012***	6.26	0.000012***	6.32
REIT	0.000233	0.02	0.000385	0.03	-0.012796	-0.91
REOC	0.000377	0.04	0.001144	0.13	-0.010451	-0.95
REIT*SURP			-0.000001	0.09	-0.000001	0.08
REOC*SURP			-0.000008**	-2.28	-0.000008**	-2.31
SIZE					-0.000001	-0.45
BM					0.019128	1.81
Constant	-0.000387	-0.13	-0.000600	-0.20	-0.008473	-1.51
Observations	5090		5090		5090	
R-squared	0.0054		0.0063		0.0080	

***p<0.01 , **p<0.05

This table shows regression results of Cumulative Abnormal Returns for European REITs, REOCs and Non-Real Estate stocks with the SUE method. We look at the PEAD window CAR(1,60), initial earnings announcement window CAR(-1,0), and the full event window CAR(-60,60) during 2005 to 2015 (excluding data from 2008.07.01 to 2009.05.31 to account for financial crisis effects). Surprises are calculated as {[Actual$(EPS)_{i,q}$ - Expected$(EPS)_{i,q}$]/

$\sigma(E(EPS)_{i,q})\}$, and are winsorized by completing a 95% winsorization to exclude outlier data. For REIT firm data we set the REIT indicator variable equal to 1, and for other firm data we set the REIT indicator variable equal to 0. We do the same for the REOC indicator. SURP*REIT and SURP*REOC are calculated by multiplying the SURP variable by the REIT and REOC indicator variables. SIZE is calculated from each company's market capitalization 45 days prior to the earnings announcement date. BM is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date. Standard errors are also adjusted for potential heteroscedasticity issues when running regressions in Stata (White, 1980).

Table 2: Regression Results for the EAR Method when considering REITs, REOCs, and Non-Real Estate Stocks

Panel A: PEAD	**CAR(1,60)**	**t-statistic**	**CAR(1,60)**	**t-statistic**	**CAR(1,60)**	**t-statistic**
SURP	0.201285***	3.54	0.202802***	3.47	0.229344***	3.86
REIT	0.002640	0.36	0.002544	0.35	-0.010619	-1.23
REOC	0.001337	0.20	0.001341	0.20	-0.009936	-1.26
REIT*SURP			-0.076827	-0.27	-0.142341	-0.47
REOC*SURP			0.003122	0.02	0.035631	0.17
SIZE					0.000000	-0.14
BM					0.019928***	2.87
Constant	-0.001827	-0.84	-0.001839	-0.85	-0.010702***	-2.70
Observations	5225		5225		5225	
R-squared	0.0029		0.0029		0.0067	
Panel B: Announcement	**CAR(-1,0)**		**CAR(-1,0)**		**CAR(-1,0)**	
SURP	0.068131***	4.17	0.077694***	4.19	0.079701***	4.22
REIT	0.000516	0.28	0.000504	0.28	-0.000618	-0.27
REOC	0.000438	0.25	0.000587	0.33	-0.000377	-0.20
REIT*SURP			-0.071026	-0.95	-0.076210	-1.01
REOC*SURP			-0.053103	-1.33	-0.050351	-1.27
SIZE					0.000000	-0.24
BM					0.001609	0.82
Constant	-0.000534	-0.75	-0.000610	-0.85	-0.001264	-1.06
Observations	5225		5225		5225	
R-squared	0.0034		0.0037		0.004	
Panel C: Full Window	**CAR(-60,60)**		**CAR(-60,60)**		**CAR(-60,60)**	
SURP	0.489087***	5.89	0.533116***	6.10	0.57439***	6.54
REIT	0.004338	0.42	0.004335	0.42	-0.01632	-1.40
REOC	0.002644	0.28	0.003341	0.35	-0.01436	-1.31
REIT*SURP			-0.289758	-0.81	-0.39197	-1.15
REOC*SURP			-0.251052	-0.88	-0.20006	-0.70
SIZE					0.00000	-0.26
BM					0.03114***	3.37
Constant	-0.004358	-1.40	-0.004708	-1.51	-0.01846***	-3.68
Observations	5225		5225		5225	
R-squared	0.0082		0.0085		0.013	

***p<0.01 , **p<0.05

This table shows regression results of Cumulative Abnormal Returns for European REITs, REOCs and Non-Real Estate stocks with the EAR method. We look at the PEAD window CAR(1,60), initial earnings announcement window CAR(-1,0), and the full event window CAR(-60,60) during 2005 to 2015 (excluding data from 2008.07.01 to 2009.05.31 to account for financial crisis effects). Surprises are calculated as $\{(EPS_{i,} - EPS_{i,q-4})/ \text{Stock Price}_{i,t-45}\}$, and are winsorized by completing a 95% winsorization to exclude outlier data. For REIT firm data we set the REIT indicator variable equal to 1, and for other firm data we set the REIT indicator variable equal to 0. We do the same

for the REOC indicator. SURP*REIT and SURP*REOC are calculated by multiplying the SURP variable by the REIT and REOC indicator variables. SIZE is calculated from each company's market capitalization 45 days prior to the earnings announcement date. BM is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date. Standard errors are also adjusted for potential heteroscedasticity issues when running regressions in Stata (White, 1980).

Table 3: Regression Results for the SUE Method when considering the listed Real Estate Sector (Combining both European REITs and REOCs)

	CAR(1,60)	t-statistic	CAR(-1,0)	t-statistic	CAR(-60,60)	t-statistic
SURP	0.000001	1.08	-0.000000	-0.65	0.000002	1.11
SIZE	0.000003***	3.05	-0.000000	-0.76	0.000005***	3.66
BM	0.055602***	3.86	-0.000455	-0.12	0.070938***	3.73
Constant	-0,072384***	-4.07	0.001288	0.28	-0.097163***	-3.98
Observations	773		773		773	
R-squared	0.0508		0.0013		0.0417	

***p<0.01 , **p<0.05

This table shows regression results of Cumulative Abnormal Returns for European Real Estate Companies using the SUE method. We look at the PEAD window CAR(1,60), initial earnings announcement window CAR(-1,0) and full window CAR(-60,60) during 2005 to 2015 (excluding data from 2008.07.01 to 2009.05.31 to account for financial crisis effects). Surprises are calculated as $\{[\text{Actual}(EPS)_{i,q} - \text{Expected}(EPS)_{i,q}]/ \sigma(E(EPS)_{i,q})\}$, and are winsorized by completing a 95% winsorization to exclude outlier data. For REIT firm data we set the REIT indicator variable equal to 1, and for other firm data we set the REIT indicator variable equal to 0. We do the same for the REOC indicator. SURP*REIT and SURP*REOC are calculated by multiplying the SURP variable by the REIT and REOC indicator variables. SIZE is calculated from each company's market capitalization 45 days prior to the earnings announcement date. BM is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date. Standard errors are also adjusted for potential heteroscedasticity issues when running regressions in Stata (White, 1980).

Table 4: Regression Results for the EAR Method when considering the listed Real Estate Sector (Combining both European REITs and REOCs)

	CAR(1,60)	t-statistic	CAR(-1,0)	t-statistic	CAR(-60,60)	t-statistic
SURP	0.427505**	2.17	0.030397	0.81	0.629093**	2.38
SIZE	0.000003***	2.92	0.000000	0.20	0.000007***	5.34
BM	0.043282**	2.46	-0.000921	-0.41	0.081305***	4.80
Constant	-0.052833**	-2.46	0.000448	0.16	-0.109280***	-4.90
Observations	1030		1030		1030	
R-squared	0.0336		0.0015		0.0596	

***p<0.01 , **p<0.05

This table shows regression results of Cumulative Abnormal Returns for European Real Estate Companies with the EAR method. We look at the PEAD window CAR(1,60), initial earnings announcement window CAR(-1,0) and full window CAR(-60,60) during 2005 to 2015 (excluding data from 2008.07.01 to 2009.05.31 to account for financial crisis effects). Surprises are calculated as $\{(EPS_i - EPS_{i,q-4})/ \text{Stock Price}_{i,t-45}\}$, and are winsorized by completing a 95% winsorization to exclude outlier data. For REIT firm data we set the REIT indicator variable equal to 1, and for other firm data we set the REIT indicator variable equal to 0. We do the same for the REOC indicator. SURP*REIT and SURP*REOC are calculated by multiplying the SURP variable by the REIT and REOC indicator variables. SIZE is calculated from each company's market capitalization 45 days prior to the earnings announcement date. BM is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date. Standard errors are also adjusted for potential heteroscedasticity issues when running regressions in Stata (White, 1980).

Table 5: Book-to-Market Ratios - Sample Characteristics for the SUE Method

BM: SUE	Mean	Min	P25	P50	P75	Max	SD	N
REITs	1.10	0.44	0.87	1.03	1.20	2.33	0.36	148
REOCs	1.02	-5.99	0.70	0.90	1.27	4.82	0.64	625
Non-Real Estate	0.44	-0.49	0.20	0.37	0.58	5.90	0.38	4317

Table 6: Book-to-Market Ratios - Sample Characteristics for the EAR Method

BM: EAR	Mean	Min	P25	P50	P75	Max	SD	N
REITs	1.10	0.25	0.81	0.99	1.24	3.27	0.46	277
REOCs	1.01	-1.45	0.64	0.84	1.25	10.61	0.72	754
Non-Real Estate	0.44	-0.49	0.20	0.37	0.58	5.90	0.37	4194

Table 5 and Table 6 provide information for the Sample Characteristics for both the SUE and EAR methods. BM is calculated as the book-to-market ratio using the book value lagged by two quarters prior to the announcement data and the market capitalization value 45 days prior to the earnings announcement date. P25, P50, and P75 represent the 25^{th}, 50^{th}, and 75^{th} percentiles. SD is the standard deviation and N represents the number of observations. For REOCs under the SUE method, we took out Inmobiliaria Colonial SA on the earnings announcement date of 2012.05.12 due its book-to-market value being an extreme outlier at 320.26.

Table 7: Market Capitalization Sizes in Euros for the SUE Method

Size: SUE	Mean	Min	P25	P50	P75	Max	SD	N
REITs	1647.99	239.32	755.83	1301.84	1604.19	6038.97	1339.98	148
REOCs	1080.74	52.75	493.18	926.34	1456.52	7572.02	852.97	625
Non-Real Estate	16643.63	45.83	2750.22	6393.71	16365.13	246563.32	28153.83	4317

Table 8: Market Capitalization Sizes in Euros for the EAR Method

Size: EAR	Mean	Min	P25	P50	P75	Max	SD	N
REITs	1379.40	89.65	503.47	1024.58	1462.56	11708.28	1633.72	277
REOCs	983.22	5.31	338.12	794.83	1342.71	7572.02	883.07	754
Non-Real Estate	16401.80	13.60	2705.79	6440.99	16117.21	246563.32	27788.06	4194

Table 7 and Table 8 provide information for the size in Euros for both the SUE and EAR methods. Size is calculated from each company's market capitalization 45 days prior to the earnings announcement date. P25, P50, and P75 represent the 25^{th}, 50^{th}, and 75^{th} percentiles. SD is the standard deviation and N represents the number of observations.

Table 9: Real Estate Investment Trusts Market Capitalization Sizes Breakdown in Euros

Country	**0-50M**	**50-100M**	**100-500M**	**500-1000M**	**1000M+**
Austria	0	0	0	0	0
Belgium	2	1	9	3	3
Bulgaria	19	1	0	0	0
Croatia	0	0	0	0	0
Cyprus	0	0	0	0	0
Czech Republic	0	0	0	0	0
Denmark	0	0	0	0	0
Estonia	0	0	0	0	0
Finland	0	1	0	0	0
France	5	7	10	2	11
Germany	0	2	0	1	1
Greece	1	0	0	2	0
Hungary	0	0	0	0	0
Ireland	0	0	1	2	0
Italy	0	0	1	1	1
Latvia	0	0	0	0	0
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Malta	0	0	0	0	0
Netherlands	0	0	0	2	2
Poland	0	0	0	0	0
Portugal	0	0	0	0	0
Romania	0	0	0	0	0
Slovakia	0	0	0	0	0
Slovenia	0	0	0	0	0
Spain	2	1	3	1	1
Sweden	0	0	0	0	0
United Kingdom	2	1	9	8	13
*Turkey	12	3	10	1	1
**Ukraine	0	0	0	0	0
Total	**43**	**17**	**43**	**23**	**33**

*Included in European Public Real Estate Association Statistics

**Listed in UK

Sources: Bloomberg, Thomson Reuters Datastream, Wharton Research Data Services, and Vaccari, Gibbs, and Turnbull, 2015.

Table 10: Real Estate Operating Companies Market Capitalization Rates Breakdown in Euros

Country	**0-50M**	**50-100M**	**100-500M**	**500-1000M**	**1000M+**
Austria	3	1	2	1	4
Belgium	2	1	2	1	0
Bulgaria	3	1	0	0	0
Croatia	1	0	0	0	0
Cyprus	7	2	1	0	1
Czech Republic	0	0	0	0	0
Denmark	10	1	1	0	1
Estonia	2	0	1	0	0
Finland	1	0	1	1	1
France	11	2	4	0	1
Germany	32	7	10	5	9
Greece	7	0	1	0	0
Hungary	3	1	0	0	0
Ireland	0	0	0	0	0
Italy	5	0	1	0	0
Latvia	1	0	0	0	0
Lithuania	2	0	0	0	0
Luxembourg	2	0	0	0	3
Malta	1	2	0	0	0
Netherlands	4	2	1	0	1
Poland	27	1	7	2	0
Portugal	2	0	0	0	0
Romania	9	1	0	0	1
Slovakia	0	0	0	0	0
Slovenia	0	0	0	0	0
Spain	4	4	6	2	2
Sweden	11	5	12	2	12
United Kingdom	14	1	10	4	5
*Turkey	1	1	0	0	0
**Ukraine	0	1	0	0	0
Total	165	34	60	18	41

*Included in European Public Real Estate Association Statistics
**Listed in UK

Sources: Bloomberg, Thomson Reuters Datastream, Wharton Research Data Services, and Vaccari, Gibbs, and Turnbull, 2015.

Table 11: European Countries with Current REIT Legislation

COUNTRY	YEAR ENACTED
BELGIUM	1995
BULGARIA	2004
FINLAND	2009
FRANCE	2003
GERMANY	2007
GREECE	1999
HUNGARY	2011
IRELAND	2013
ISRAEL	2006
ITALY	2007
LITHUANIA	2008
LUXEMBOURG	2007
NETHERLANDS	1969
SPAIN	2009
TURKEY	1995
UNITED KINGDOM	2007

Source: Vaccari, Gibbs, and Turnbull (2015)