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A FIRST LOOK AT THE IMPACT OF THE COVID-19 PANDEMIC ON SPANISH REITS

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A first look at the impact of the COVID-19 pandemic on Spanish REITs

This study analyses the impact of the COVID-19 pandemic on Spanish listed REITs during the first wave from both the stock market and the operating performance perspectives. First, we find that the Spanish stock market for REITs reacts with less intensity and later than the rest of the Spanish and worldwide REIT indexes. Moreover, we observe a significant negative abnormal return of our REIT index when the pandemic was declared (11 March 2020). This significant negative abnormal return extends during lockdown but becomes positive and significant during the de-escalation period. However, a firm-level analysis reveals that market prices do not reflect the impact of COVID-19 and in a multivariate analysis we find that, in general terms, market liquidity and the percentage of shares held by institutional investors are the only variables related to abnormal returns. Second, we observe a strong negative impact on the operating performance of REITs during the first half of 2020, regardless of the type of property and the incidence of COVID-19 by region according to the location of the assets.

Keywords: COVID-19; REIT; operating performance; Spanish market; event study.

JEL codes: G12; G14; I10; R30.

1. Introduction

Since the outbreak of COVID-19 in China at the end of 2019 and as a result of its rapid expansion, we are experiencing a shocking situation worldwide. Capital markets reacted with a severe correction, as shown in Figure 1, with high volatility mainly due to the unforeseeable magnitude and the short- and medium-term prospects of this crisis. The vertiginous expansion of COVID-19 in Europe led to the implementation of strict containment measures to try to control the pandemic, which entailed a significant loss of activity in most sectors. In Spain, on 14 March 2020, the government declared a State of Alarm under Royal Decree 463/2020, which remained in force until 21 June 2020. Pursuant to the declaration of the State of Alarm, certain commercial and hospitality activities were considered essential and allowed to open, but the rest, rated by their very nature as non-essential, were subject to a forced administrative closure. In this scenario, in the second quarter of 2020 the Spanish GDP underwent its largest

'quarter-on-quarter' contraction, with a fall of -17.8% and the unemployment rate increased by 1.3%, to stand at 15.33%.

Please insert Figure 1 about here

The aim of this study is to analyse the impact of the first wave of the COVID-19 pandemic on Real Estate Investment Trusts (REITs) listed in the Spanish Alternative Stock Market (*Mercado Alternativo Bursátil* – MAB).[1,2] There are several reasons that have encouraged us to study the impact on these investment vehicles. The first is the relevance of real estate activity in the Spanish economy, as it accounted for around 10% of the GDP in the period 2014-2019, as well as its attractiveness for the international investment community. Specifically, in 2019, direct investment in this sector in Spain reached €12.14 billion (excluding corporate transactions), the sixth consecutive annual record. Nearly 60% of the total amount was made up of foreign direct investment. REITs invested 9% of the total, while the rest consisted of domestic investment (CBRE, 2020). In 2020, investment in the Spanish real estate industry reached around €9.5 billion (73% of which is attributed to international investors). This figure is 24% less than in 2019. To put this decrease in context, it is worth bearing in mind that the decline in continental Europe was 20% year-on-year (CBRE, 2021). The second reason is the relevant weight of the Spanish listed REITs in Europe, which ranked first in number and third in capitalisation in June 2020 (EPRA, 2020). The third is that many of the measures imposed by the Spanish government to mitigate the transmission of the pandemic have directly affected activities related to the REITs' business. The paralysis of economic activity due to the declaration of the State of Alarm and the confinement measures has caused many employees to find themselves on furlough (in Spanish, *ERTE*) or unemployed,[3] which can lead to delays or even the non-payment of rent by some tenants. The widespread implementation of working from home in Spain caused a drop in the demand and use of offices. In addition, the effects of

[1] In Spanish terminology *Sociedades Anónimas Cotizadas de Inversión en el Mercado Inmobiliario* (SOCIMI).
[2] In October 2020 this market was renamed BME MTF Equity and Spanish REITs have been listed since then in the so-called BME Growth segment of BME MTF Equity. Nevertheless, we have kept the original name as it was the one in force during the period under analysis.
[3] *ERTE* stands for *Expediente de Regulación de Empleo Temporal* and is a measure taken by companies when, for justified reasons (economic, technical, organisational, production or others beyond their control), they decide to temporarily suspend or reduce the contracts of their workers.

the pandemic have also affected shopping centres and retail establishments due to forced closures during the period of lockdown. Finally, the severe restrictions on mobility, limiting the free movement of people, have led to a sharp drop in tourism and in the demand for tourist and hotel accommodation.

Our investigation of the impact of the COVID-19 pandemic on Spanish REITs is carried out along two lines. On the one hand, we performed an analysis from the stock market perspective. Thus, we first studied the stock market of REITs as a whole. As there is currently no market index for REITs, we created an *ad-hoc* index with the 15 most liquid REITs during the period of analysis. A first analysis involved a comparison of the evolution of the index with the rest of the Spanish indexes and with the REIT indexes worldwide. Subsequently, using the event study methodology, we computed the abnormal return of the index on the key dates of COVID-19 as well as over four longer periods related to the first official case of COVID-19 in China, the declaration of the pandemic by the World Health Organisation (WHO) and the subsequent declaration of the State of Alarm in Spain and the beginning of the de-escalation process. Second, we analysed the relationship between some characteristics of REIT firms and their stock market behaviour. We focused especially on two characteristics: the incidence of COVID-19 according to the geographical location of the assets and the property type. On the other hand, we carried out a complementary analysis from the operating performance perspective. We first computed empirical proxies for each firm during 3 semesters: two pre-COVID periods including the first and second semesters of 2019 (2019H1 and 2019H2, respectively), and a COVID period including the first half of 2020 (2020H1). We then tested whether the semester change in operating performance induced by the COVID pandemic was significantly different from the semester change in operating performance in a non-COVID period. Finally, we analysed this change according to our study characteristics, the property type and the incidence of COVID-19 depending on the location of the assets.

Our results show that in the analysis of the reaction of the market, the response to the pandemic was much smaller and occurred later than the rest of the Spanish and world REIT markets. Likewise, the abnormal return of the market was significantly negative at the time the

pandemic was declared and remained negative until the beginning of the de-escalation, when it turned significantly positive until the end of the semester. In the firm-level analysis, we observed that market prices, as a consequence of the reduced liquidity of many REITs, did not reflect the impact of COVID-19. In a multivariate analysis we found that market liquidity and the percentage of shares held by institutional investors were the only variables related to abnormal returns, our two variables of interest being not significant, with a few exceptions. Finally, we found a strong negative impact on REITs' operating performance during the first half of 2020, regardless of property type and the incidence of COVID-19 by region, according to asset location.

The paper contributes to the literature as follows. This is the first piece of research, as far as we know, to analyse the impact of COVID-19 on REITs in Spain, one of the first countries to suffer the health consequences of the virus. Besides, studies on the impact of the COVID-19 pandemic on the Spanish economy have mostly focused on the index level analysis; instead, in this paper we extend the analysis to the company level. We consider it relevant to investigate the impact of such a severe public health crisis on REITs' performance and to quantify the magnitude of the actual effect. Another interesting contribution is that the results are different from those obtained in other countries and markets in the following terms: i) a lower and later impact in the market analysis, ii) market prices do not reflect the impact of COVID-19 in the firm-level analysis, and iii) the property type (with the exception of diversified REITs) and the incidence of COVID-19 by region according to the location of the assets do not reflect the effect of COVID-19. Thus, the different characteristics of the market analysed, together with the different treatment of the social and health crisis in Spain compared to other EU and non-EU countries, with more restrictive measures that were common to all regions, have led to different results from those obtained so far. From our point of view, these questions are of interest both to investors, especially those who are considering possible investment options in the Spanish real estate market in the post-COVID-19 pandemic, and regulators.

The remainder of the paper is organised as follows. Section 2 describes the REIT market in Spain and the characteristics of the market analysed. Section 3 examines the

empirical evidence of the impact of COVID-19 on REITs. Sections 4 and 5 describe the sample and the methodology used, respectively. The results obtained are shown in Section 6 and Section 7 concludes.

2. The REIT market in Spain

The regulation of the real estate investment industry in different countries in recent decades has promoted the growth of these entities, resulting in increases in both their number and their size around the world, including Europe. In Spain, with the passing of Law 16/2012 (Reino de España, 2012),[4] the first REIT was listed at the end of 2013. The REIT market in Spain has a significant weight in the EU (including United Kingdom), since, as of 30 June 2020, it has ranked third in capitalisation and first in the number of REITs (EPRA, 2020). It should be noted, however, that most of the companies are admitted in a specific segment dedicated to REITs in the Spanish Alternative Stock Market (*MAB* – its initials in Spanish). In this respect, on 30 June 2020 only 4 of the 81 REITs listed on the Spanish stock market were listed in the regulated market, more widely known as the *Mercado Continuo* or SIBE. The MAB is a Multilateral Trading Facility (MTF) that has a far more flexible regulation than the *Mercado Continuo* in terms of admission and trading requirements, without foregoing an adequate level of transparency. Trading is mainly carried out multilaterally and electronically in the SIBE-SMART (the same electronic system as the one used in the *Mercado Continuo*) through a trading system called *fixing*, in which shares are auctioned throughout the session (from 8.30 am to 4.00 pm) with two price fixing and stock allotment times: at 12 noon and 4 pm (Bolsas y Mercados Españoles, 2017).[5]

One of the characteristics of the market under study that must be taken into account in our analysis is that it is still a developing market. For this reason, despite the existence of the

[4] Law 16/2012 modified Law 11/2009 (Reino de España, 2009) and introduced flexibility, less restrictive conditions and tax advantages for this type of companies (García-Vaquero & Roibás, 2020). Law 16/2012 promoted the incorporation of these investment vehicles in Spain, making the Spanish real estate market more dynamic and providing real estate investments with liquidity.

[5] Circular 7/2017, of 20 December, on trading rules for shares in growth companies and Real Estate Investment Trusts (REITs) on the Alternative Stock Market (MAB) (Bolsas y Mercados Españoles, 2017) was repealed by Circular 5/2020, of 30 July, on contracting rules for shares in companies admitted to the BME Growth segment of BME MTF Equity (Bolsas y Mercados Españoles, 2020).

figure of the Liquidity Provider,[6] the MAB still has reduced liquidity compared to other more mature markets. This fact prevents a rapid and complete incorporation of public information to the market (price discovery).

In this regard, in the period under study (January 2020 to June 2020) we have calculated three liquidity proxies, the Zerovol, Zeros2 and Amihud ratio (Hilal Anwar & Hogholm, 2020) for the sample of REITs, the Spanish alternative market for small-growth firms (MAB-EE) and Spanish regulated market *Mercado Continuo* companies (MC). However, the companies whose trading system is *fixing* (see variable definitions in notes to Table 1) were excluded from this latter market. Since the size of the MC sample was much larger than that for REITs and MAB-EE, we have also split the MC sample into quartiles by liquidity as shown in Table 1.

Please insert Table 1 about here

According to Table 1, Zerovol and Zeros2 are higher in the case of REITs than in the MAB-EE and in the MC, clearly reflecting lower liquidity in the REIT sample. Moreover, the Amihud ratio is higher for REITs than for the MC, but not for the MAB-EE. This result is due to the fact that the number of days on which the price change is zero in the REIT segment is much higher than in the case of MAB-EE and, therefore, the Amihud illiquidity ratio is higher in the case of MAB-EE. Therefore, we conclude that the liquidity of the MAB segment for REITs is lower than the MAB-EE and *Mercado Continuo*.

3. Empirical evidence of the impact of COVID-19 on REITs

The outbreak of the new coronavirus (COVID-19) has affected the global economy. The quarantine policy imposed in most countries has led to a weakening of purchasing power and a stagnation of the world economy, although affecting certain sectors of the economy more severely than others. This has led to a rapid growth in the number of studies analysing its impact in different areas and regions since the pandemic began. In the financial markets, some studies focus on how stock returns have responded to changes in information and investor

[6] The main task of the Liquidity Provider is to favour the liquidity of transactions and achieve a sufficient liquidity frequency (Bolsas y Mercados Españoles, 2017). Its presence is mandatory for all REITs.

expectations. Most of these studies provide evidence for whole markets through the use of market index (Alfaro et al., 2020; Baker et al., 2020; Gormsen & Koijen, 2020; Lee et al., 2020; Phan & Narayan, 2020; Thorbecke, 2020) or firm level data (Ding et al., 2021; Gerding et al., 2020; Hassan et al., 2020; Ramelli & Wagner, 2020). These latter authors used the event study methodology in their analysis of the impact of the COVID-19 outbreak, although they are not the only ones (P. He et al., 2020; Liu et al., 2020; Rebucci et al., 2021; Singh et al., 2020; Wei & Han, 2021). Although many studies on COVID-19 focus on the effect of the pandemic on financial markets, there are also a few that investigate the impact of this health crisis on firm performance (Hu & Zhang, 2021; Shen et al., 2020).

However, the impact of COVID-19 in the case of REITs has been investigated separately from the rest of the industries. Their nature, specific characteristics and the regulatory restrictions to which they are subject (obligation to distribute most of their profits to their shareholders annually, limitations for their shareholders, specific organisational structures, among others (Jones Lang LaSalle & Bolsas y Mercados Españoles, 2020)) mean that they must be considered a separate case study. In this regard, Ling et al. (2020) were the first to analyse the effect of COVID-19 on commercial real estate prices. They analysed the US market and created a firm-level measure of COVID-19 exposure based on the location of the properties and reported coronavirus cases at the county level. Their results showed that regional COVID-19 exposure based on a firm's properties led to a significant decrease in its performance on average, although the effect varied from one property type to another. Akinsomi (2020) examined, in a preliminary study, the impact of COVID-19 on the performance of the global REITs index and US sector index for REITs during the period from January 2020 to May 2020. The results showed that REITs have been negatively affected by the COVID-19 pandemic, especially by the effects of social distancing and closure restrictions, as they are having difficulties to meet dividend distribution obligations, to generate income through continued rent payments by tenants and to meet debt obligations. On the other hand, Milcheva (2020) analysed the impact of COVID-19 on real estate stock returns (including a sample of real estate companies that have REIT status) through the construction of a COVID-19 risk

factor. This factor is related to daily changes in confirmed global coronavirus infections to capture the risk exposure in the impact of COVID-19 on the risk-return ratio of real estate assets. The results showed that firms' beta associated to this risk factor increased markedly during the pandemic, although there are large variations across countries and sectors. Finally, Milcheva (2020) also found that COVID-19 risk is predominantly propagated by financial constraints. Xie and Milcheva (2020) investigated the relationship between cases of COVID-19 and the daily returns of real estate firms and REITs in Hong Kong during the early stage of the pandemic using a difference-in-differences approach. Their results revealed a negative relationship and a stronger effect for buildings located closer together and a weaker effect for residential properties. We can observe how Sumer and Ozorhon (2020) compared the returns of gold prices and the Turkish real estate investment trust index (T-REIT) covering the 2008 global financial crisis, the 2018 Turkish currency crisis and the 2020 pandemic-based economic crisis, and examined the effects of gold prices and the T-REIT index returns on each other. The results of the study showed that, except in the first case, the T-REIT index performs better than gold prices, but it is a riskier instrument, and neither of the investment instruments affect the performance of the other. Chiu et al. (2020) studied the impact of social isolation, confinement and business closure measures adopted in Mexico on a small sample of REITs. Their results suggested that they had a significant negative effect on the prices of REIT certificates and that the main drivers were property type and geographic asset allocation. The best performing property types were industrial and high-tech facilities. Finally, Balemi et al. (2021) provided a comprehensive literature review (qualitative meta-analysis) of the scientific papers related to the impact of the COVID-19 pandemic on real estate markets (including REIT papers).

With regard to the analysis of the impact of COVID-19 on the Spanish market, some studies have examined it in the financial and stock market context, either individually in Spain (Ahmar & del Val, 2020; Blanco Escolar et al., 2020; Fernández Cerezo et al., 2021; Hernández de Cos, 2020) or as part of a broader analysis (Alber, 2020; Ashraf, 2020; Aslam et al., 2020; Cao et al., 2020; Contessi & De Pace, 2021; Q. He et al., 2020; Just & Echaust,

2020; Onali, 2020; Zeren & Hizarci, 2020), but as far as we know no specific empirical study has been conducted on the impact on Spanish REITs.

4. Sample

Our final sample consists of 46 REITs listed on the Spanish Alternative Stock Market (*Mercado Alternativo Bursátil* – MAB). To reach this figure, we made a number of adjustments to our initial sample, which consisted of all the REITs listed in that market on 31 December 2019 – a total of 78.[7] To avoid overlapping events, we eliminated from the REIT sample those firms that had gone public in a window of 240 days before the start of the period analysed, which amounted to another 10 REITs. Moreover, we discarded 17 companies that had either been delisted or had not traded or had only traded block trading, as the latter is not considered an official closing price in the period analysed (first half of 2020).[8] Finally, we excluded 5 REITs that had not submitted the financial information under study or did not have any real estate because they were involved in a corporate restructuring.

The stock market data came from the Bolsas y Mercados Españoles Group for the REIT sample and from Thomson Reuters Datastream database for the rest of the cases. The financial information was obtained from the Refinitv database and from the financial statements published by each company on the MAB website. Data on market admissions, firm and property characteristics and other information about the REITs were hand-collected from the Informational Document on Admission to the Market (IDAM) and the relevant facts available on the MAB website. Information on the number of cases of COVID-19 was obtained from the website of the National Epidemiology Centre of the Government of Spain.[9]

[7] To carry out the study, the four REITs of the Spanish *Mercado Continuo* (which is a regulated market) have not been included in the sample so that the results are not distorted by differences in the characteristics and regulation of this market and the MAB (see section 2). It should be noted that these four REITs comprise the FTSE EPRA NAREIT Spain index.
[8] Block trading is a system designed to allow members to apply cross opposite-side orders or carry out bilateral trading, provided that they meet the volume requirements established for gaining access to block trading conditions.
[9] https://cnecovid.isciii.es/covid19/#documentaci%C3%B3n-y-datos

5. Methodology

5.1. Stock market performance

5.1.1. Market analysis

To analyse the impact of COVID-19 on the REIT segment of the Spanish Alternative Stock Market (MAB), we created a value-weighted index with the 15 most liquid stocks during the analysed period, which we have called MAB REIT 15 Index. We selected 15 firms to make up our index so as to be analogous to the small-growth index of this market, which is composed of the 15 most liquid companies. Specifically, we measured liquidity through trading frequency. The number of each company's shares taken for calculation depends on its free float and the prices are adjusted for financial operations. The base value of this index is 1,000 on 31 December 2018. We have homogenised the base of the rest of the indexes starting from a value of 1,000 on 31 December 2018 to compare the evolution of this index with the main Spanish indexes (IBEX MAB 15, Índice General de la Bolsa de Madrid –IGBM – and IBEX Small Cap) and REIT indexes around the world (FTSE EPRA NAREIT Global, FTSE EPRA NAREIT United States, FTSE EPRA NAREIT Developed Europe and FTSE EPRA NAREIT Spain).

To measure the REIT market response to COVID-19, we used the event study methodology as in Binder (1998). The COVID-19 key days (event days) are described in Table 2.

Please insert Table 2 about here

We first analysed the response of the MAB REIT 15 index for each event, estimating the abnormal returns (*AR*) and cumulative abnormal returns (*CAR*) with expressions (1) and (2), respectively, starting on 1 January 2019 until 30 June 2020.

$$R_t = \alpha + \beta R_{mt} + \sum_{j=1}^{7} \sum_{k=-1}^{+1} \lambda_{jk} D_{tjk} + u_t \,, \qquad (1)$$

$$R_t = \alpha + \beta R_{mt} + \sum_{j=1}^{6} \phi_j \, d_{tj} + \, u_t \, , \qquad (2)$$

$$h_t = \gamma_0 + \gamma_1 \cdot h_{t-1} + \gamma_2 \cdot u_{t-1}^2$$

where R_t is the return of the MAB REIT 15 index on day t and R_{mt} is the daily return of the Madrid Stock Exchange General Index (IGBM), which is indicative of the general performance of the Spanish market. D_{tjk} is a dummy variable that takes a value of 1 on the event day for *k* = t_0, t_0-1 and t_0+1, respectively, and zero otherwise, on each key day *j* under analysis. In expression (2), d_{tj} is a dummy variable that takes a value of 1/(*T*+1) on the day of each event *j* (t_0) and the following *T* days, and zero otherwise. *T* takes a value of 4 on all events except for PANDEMIC and START OF STATE OF ALARM. In this case we estimated the CAR for both events jointly as these events were very close in time. Thus, *T* takes a value of 7 in this case.

We estimated the linear regression models (1) and (2) with the Generalised AutoRegressive Conditional Heteroscedasticity model, GARCH (1,1), to take into account the persistence of volatility. GARCH models are especially suitable for analysing daily data with leptokurtosis and volatility clustering (Bollerslev, 1986; Bollerslev et al., 1992). For each expression (1) and (2), the conditional volatility of u_t is defined as h_t, γ_0 is the unconditional variance, γ_1 reflects the dependence of the current volatility on the volatility of the previous period and γ_2 reflects the dependence of the current volatility on the conditional variance of the previous period.

The parameter λ_{jk} in expression (1) is the abnormal return (*AR*) for event *j* and day *k* around the event. The parameter ϕ_j in expression (2) is the cumulative abnormal return (CAR) for event *j*.

In addition, and taking the COVID-19 key dates in Table 2 as a reference, we estimated the cumulative abnormal return over the first semester of 2020 (Period 1) and the following three sub-periods using expression (3):

- Period 2: the sub-period prior to the declaration of COVID-19 as a pandemic by WHO (31 December 2019 to 10 March 2020).

- Period 3: from the declaration of COVID-19 as a pandemic by WHO to the beginning of the de-escalation process in Spain (11 March 2020 to 3 May 2020). Note that the declaration of the State of Alarm was on 14 March 2020, which is included in this period.
- Period 4: from the beginning of the de-escalation process to the end of the semester (4 May 2020 to 30 June 2020).

$$R_t = \alpha + \beta R_{mt} + \varphi P_{tM} + u_t , \quad (3)$$

where P_{tM} is a dummy variable that takes a value of 1/T and zero otherwise, *T* being the number of days in each period *M* under study.

Expression (3) was estimated for the period from 1 January 2019 to 30 June 2020, excluding from the estimation in each sub-period the days corresponding to the remaining sub-periods. In this case, we estimated the regression model of expression (3) by Ordinary Least Squares (OLS) applying the methodology proposed by White (1980).[10]

5.1.2. Stock market reaction and firm characteristics

Based on empirical evidence, we focused on two variables for our analysis. On the one hand, and as we have observed that several authors have already done (Ling et al., 2020; Xie & Milcheva, 2020), there is a variable incorporating the evolution of COVID-19. For this purpose, we created a specific variable that measures the incidence according to the location of the properties and the coronavirus cases reported at the regional (Spanish Autonomous Communities) level (GEOCOVID). Note that the assets that these REITs invest in are almost all located in Spain. On the other hand, based on the literature that shows that in several markets the impact of COVID on REITs has been different depending on the type of property (Akinsomi, 2020; Ling et al., 2020; Milcheva, 2020; Xie & Milcheva, 2020), we included the variable PROPERTY, which reflects the diversity of properties in the Spanish market. Both study variables are defined in Panel A of Table 3. We also included four control variables used

[10] In expression (3), the estimation using the GARCH methodology is not possible because the series of returns are not continued in time.

in the literature: age, leverage, illiquidity and the percentage of shares held by institutional investors (Ling et al., 2020; Milcheva, 2020; Xie & Milcheva, 2020), defined in Panel B of Table 3.

We explored the firm characteristics related to REITs' stock market performance through several multiple regression models in accordance with expression (4) over the following periods: (i) the whole first semester of 2020 (Period 1 defined in section 5.2.1) and (ii) the period with the hardest restrictions of the lockdown in Spain (Period 3).

$$CAR_{i\tau} = \alpha + \sum_{j=1}^{m} \beta_j \; X_{ij} + \varepsilon_i \,, \tag{4}$$

where ($CAR_{i\tau}$) is the cumulative abnormal return for REIT i in the period analysed τ, calculated in accordance with expression 5, and X_{ij} represents the *m* independent variables that correspond to the selected explanatory variables named above and defined in Table 3.

In equation 5, we compute the $CAR_{i\tau}$ in expression (4) adding the abnormal return for REIT i on day *t* (AR_{it}) from the beginning (*s*) until the end (*s*+τ) of the horizon considered (Period 1 and Period 3). The abnormal return is computed by the difference between the return of REIT i on day *t* and the return of the MAB REIT 15 Index on day *t.*

$$CAR_{i\tau} = \sum_{t=s}^{s+\tau} AR_{it}. \tag{5}$$

To minimise the influence of extreme values, the natural logarithms of the variables AGE (LNAGE) and DEBT (LN (1+DEBT)) have been used in expression (4). Table 4 offers a summary of the main characteristics of these explanatory variables. Note that the sample analysed is composed of companies whose flotation has taken place recently, with a low presence of institutional investors in their shareholding and low liquidity in trading. Likewise, a value of zero in the median of the GEOCOVID variable shows that most REITs do not have more than 75% of their assets located in a single region and therefore their possible impact on COVID-19 is lower. By property type, diversified REITs, residential and retail account for most of the sample.

Please insert Table 3 about here

Please insert Table 4 about here

Model (4) was estimated including the property variable as a categorical variable which has been absorbed. In view of the results, different regressions were performed including each of the different types of property as a dummy variable (PROPERTY). Each regression was estimated by Ordinary Least Squares (OLS), applying the methodology proposed by White (1980). To analyse the absence of multicollinearity among the regressors, we used Spearman's *Rho* correlation coefficient among the different variables of each model. We also computed the Variance Inflation Factor (VIF).

5.2. Operating performance

To analyse the impact of COVID-19 on the financial position of REITs in the Spanish market during the first wave, we used different proxies of efficiency, profitability, leverage and valuation. Table 5 describes the variables selected to test the change in the operating performance of REITs, based on variables used in the literature to determine the operating performance of these investment vehicles in different fields and under different approaches (Bauer et al., 2010; Beracha et al., 2019; Carstens & Wesson, 2019; Coskun et al., 2020; Devos et al., 2007; Ding et al., 2021; Feng et al., 2011, 2020; Ghosh & Sun, 2014; Han, 2006; Koelbl, 2020; Ling et al., 2020; Noguera, 2020; Sah et al., 2015).

Please insert Table 5 about here

As the economic information from balance sheets and income statements is biannual, we first computed empirical proxies for each firm during 3 semesters: two pre-COVID periods including the first and second semesters of 2019 (2019H1 and 2019H2, respectively), and a COVID period including the first half of 2020 (2020H1).

Once we had defined the periods of study, we calculated the mean (median) of each variable for every firm over the different periods and compared the variables between periods. As a consequence of the well-known asymmetry of accounting ratios, and as usual in the literature, instead of the mean, we tested whether the median difference between periods was

zero. In order to measure the statistical significance of the change in the variables, we used the Wilcoxon signed-rank test. Additionally, we tested whether the semester change in operating performance induced by the COVID pandemic was significantly different from the semester change in operating performance in a non-COVID period. That is, we tested differences between the change 2020H1-2019H2 versus the change between 2019H2-2019H1. As before, we employed the Wilcoxon signed-rank test to test significance.

As we found that the COVID pandemic impacts significantly on the change in the operating performance of Spanish REITs, finally we tested whether the property type and the location of the assets (GEOCOVID EXPOSURE) were related to the changes in operating performance. In this analysis, this variable takes the value HIGH when the GEOCOVID variable (described in Table 3) is greater than the mean and LOW when it is less than or equal to the mean. The null hypothesis to be tested is that the mean (median) of each subgroup was equal to zero. To test the mean, we used the conventional *t*-test statistic. With regard to the median, we used the Wilcoxon signed-rank test. The differences in median for GEOCOVID EXPOSURE and property type were tested with the Wilcoxon rank sum (Mann-Whitney) test and Kruskal-Wallis test, respectively.

6. Results

6.1. Stock market performance

6.1.1. Market analysis

Figures 2 and 3 illustrate the evolution of Spanish indexes and the main REIT indexes around the world during the period from 31 December 2018 to 30 June 2020, respectively, compared to the MAB REIT 15 index.

Please insert Figure 2 about here

Please insert Figure 3 about here

In both figures, the evolution of the MAB REIT 15 index throughout 2019 and up to 6 March 2020 (three trading days before the WHO declared COVID-19 a pandemic on 11 March) was very steady, with no major movements during the period. From 6 March until the end of

that month, it fell by about 16%, from 924.5 points to 777.1 on 27 March. After that date, the index remained practically flat until 26 May (down only 2% since the end of March). Since then, the indicator has improved, the six-month period ending at 838 points, 9.35% lower than at the beginning when the pandemic was declared but almost 10% above the minimum value set on 25 May (762.2 points).

If we compare the evolution of the MAB REIT 15 index with the main indexes of the Spanish market (Figure 2) and REIT worldwide (Figure 3), we can see that the latter reacted earlier to the situation produced by COVID-19 (in mid-February approximately) and more intensely. Likewise, after reaching its lowest level in the period analysed, the rebound has been faster than in the case of the MAB REIT 15 index.

Table 6 shows the reaction of the Spanish REIT market proxied by the MAB REIT 15 index at COVID-19 events defined in Table 2. We did not find any significant *AR* around the COVID key dates. When we computed the CARs (panel B of Table 6), only the joint key dates PANDEMIC–START OF STATE OF ALARM event is statistically significant with a decline of -6.2%.

Please insert Table 6 about here

Table 7 exhibits the CAR for the four periods defined in Section 5.1.1. We found a strong negative and significant CAR for Period 3. This suggests that during the period from the declaration of COVID-19 as a pandemic by WHO to the beginning of the de-escalation process in Spain, the MAB REIT Index accumulated an abnormal performance of -15.63%. Note that this period comprises the hardest restrictions of the lockdown in Spain, which brought the economy to an almost complete standstill. However, when the last of the sub-periods is analysed (Period 4), the results show a positive and statistically significant CAR of 9.44%, thus reflecting an improvement in the expectations since the de-escalation.

Please insert Table 7 about here

6.1.2. Stock market reaction and firm characteristics

Next, we carried out a multivariate analysis to study the relationship between our variables of interest (GEOCOVID and PROPERTY) and the CAR of REIT firms estimated through

expression (5) for the whole of the first semester of 2020 and the period with the hardest restrictions of the lockdown in Spain (Period 3). We controlled for several firm characteristics that are also related to abnormal returns. In untabulated results, we ran expression (4) including the property variable as a categorical variable that was absorbed. As the property variable was significant for the whole of the first semester of 2020 (Period 1), we re-ran expression (4) including each of the different types of property as dummy variables. Table 8 shows the results for the models with a significant *F*-statistic. No model has a Variance Inflation Factor (VIF) value that exceeds the value of 5, so there are no multicollinearity problems between the explanatory variables.

Please insert Table 8 about here

We found that the most novel explanatory variable in our study, the GEOCOVID variable, was not significant in any case, contrary to the results obtained by similar variables in Ling et al. (2020) for the US market and Xie and Milcheva (2020), in the case of Hong Kong. The application of infection containment measures has been one of the main determinants of economic activity since the outbreak of the pandemic in Spain. From the introduction of the first restrictions in March until June, the management of containment and the first stages of de-escalation followed a centralised model under the framework of the State of Alarm. At this time there were hardly any territorial differences in the restrictions as the regional incidence of COVID-19 was not taken into account when determining the measures (Fernández Cerezo, 2021). This could explain the lack of a relationship between the CAR and the GEOCOVID variable in Table 8.

In the case of another of the variables of interest in our study, PROPERTY, the results showed that those REITs that have a diversified portfolio of assets (DIVERSIFIED) had a better stock market performance than the rest of the REITs in both periods (panels A and B of Table 8). Nevertheless, those REITs focused on the RESIDENTIAL segment showed a worse performance, which was only significant in the broader period of analysis (Panel A of Table 8). These results differ from those obtained by Akinsomi (2020), Ling et al. (2020), Milcheva (2020) and Xie and Milcheva (2020), who showed that there is substantial variation across property

types, but no better performance in diversified REITs and not much worse than in the case of residential REITs.

Regarding the ILLIQUIDITY variable, the significance of this variable for both periods leads us to conclude that the market liquidity of the REITs during the period analysed influences their stock market performance. Considering that this variable measures illiquidity as the number of days with zero volume traded divided by the total number of trading days in the period (see Table 1), the positive coefficient suggests that those REITs with higher illiquidity have better stock market performance. The possible explanation for this relationship may be the fact that REITs with lower illiquidity have captured the price impact of COVID-19, while the rest have not.[11]

As far as the proportion of shares held by institutional investors (INSTITUTIONAL) is concerned, the variable is significant in the different models in both panels of Table 8. Our result differs from those obtained in the study by Ling et al. (2020) and Xie and Milcheva (2020) where this variable, although with a positive and a negative coefficient, respectively, is not significant in either case. The positive sign indicates that the greater the proportion of shares held by institutional investors is, the better the performance is. We assume that the best-managed REITs attract more institutional investors and, based on the monitoring hypothesis (Tee, 2019), REITs owned by more institutional investors tend to be more carefully scrutinised by their shareholders (Hartzell et al., 2014).

Finally, with regard to the AGE and DEBT variables, unlike Ling et al. (2020) and Milcheva (2020), we observed that neither of them are consistently significant in any model or period (with the exception of the DEBT variable, which is slightly significant in some sporadic cases). The weak evidence of the relationship between these variables and the cumulative abnormal return of REITs suggests that they cannot be considered relevant characteristics.

[11] Indeed, in untabulated results, the CAR adjusted using the MAB REIT 15 index for the full sample shows a significant cumulative abnormal return of 8.8% and 14.47% in the periods 1 January 2020 to 30 June 2020 and 11 March 2020 to 3 May 2020, respectively.

6.2. Operating performance

The results obtained in the analysis of REITs' operating performance during the period 1 January 2019 to 30 June 2020, spanning three semesters, are shown in Table 9.

Please insert Table 9 about here

Note that for the two semesters free of COVID-19, we did not find that the operating performance changes significantly between the first half and the second half of 2019 (column A of Table 9). Only the DEBT ratio experiences a significant reduction between the two semesters. However, the COVID pandemic implied a strong statistically significant decline in the profitability and the efficiency of REITs (column B of Table 9). In addition, we found a significant increase in the debt ratio, breaking the downward trend of the previous period, whose negative change was statistically significant, in contrast to the previous cases. However, on analysing the value of the company through TOBIN's Q, the results differed from those obtained previously, as the changes in this ratio were not significant for any period, which led us to reinforce the results obtained in the previous section in the market analysis. Finally, we found that the differences between the change 2020H1-2019H2 versus the change 2019H2-2019H1 (column C of Table 9) were negative and significant in the case of profitability and efficiency ratios and significantly positive in the case of the leverage ratio. As in the previous case, the difference was not significant when we analysed TOBIN's Q.

Therefore, results show that the COVID-19 outbreak had a significant negative impact on the performance of Spanish listed REITs, with a worsening of profitability, efficiency and leverage ratios during the first half of 2020, but not in valuation.

In Table 10 we tested whether the changes in operating performance between the first half of 2020 (2020H1) and the second half of 2019 (2019H2) (Column B of Table 9) were related to the property type and the asset allocation by the regional impact of COVID.

Please insert Table 10 about here

Thus, in the case of the GEOCOVID EXPOSURE variable, we observed that those REITs that had their assets located in an area with high COVID-19 incidence have had a worse operating performance than REITs whose assets were located in a region with low levels of

COVID-19 incidence. However, since the difference in median values between subgroups is not statistically significant in any of the ratios analysed, as in the stock market performance analysis, the results obtained were not conclusive regarding the difference in the operating performance of REITs according to the GEOCOVID EXPOSURE variable.

Finally, the results found with respect to the operating performance obtained by splitting the sample according to property type showed that there was no significant difference between them.

7. Conclusions

This study analyses the impact of the COVID-19 pandemic on REITs listed on the Spanish Alternative Market (MAB) during the first wave (first semester of 2020) through two lines of analysis.

On the one hand, we carry out an analysis of stock market performance. First, from a global market perspective, we study the behaviour of an ad-hoc constructed market index for REITs. On comparing the Spanish REIT market with other markets and industries we find that this market reacts with less intensity and later than the rest of the Spanish indexes and world REIT markets. Using the event study methodology, we analyse the market reaction to several key dates related to the COVID-19 pandemic. We do not find any significant reaction of the market to the key dates under study, except when the first wave in Spain began with the declaration of COVID-19 as a pandemic by WHO and the declaration of the State of Alarm throughout Spain by the Spanish Government. For this combined event we find a negative and significant accumulated reaction of the market of -6.2%.

The abnormal performance for periods between key dates shows a significant drop during the period with the hardest restrictions of the lockdown in Spain, which brought the economy to an almost complete standstill. In contrast, we find a significant rise since the de-escalation suggesting an improvement in the expectations of investors.

Given the previous result, we focus especially on the relationship between the property type and the incidence of COVID-19 according to the geographical location of the assets (GEOCOVID) and the individual REIT firms' stock market performance. Our results show that

REITs whose investment strategy is diversified perform better in the longest period analysed (first half of 2020). However, the incidence of the pandemic according to asset allocation seems to be irrelevant. We think that this result may be explained by the fact that the measures and restrictions were homogeneous in all the Spanish regions during the first wave. It is worth highlighting (i) that there is a significant positive relationship between the stock market performance and firm illiquidity, thereby suggesting that REITs with higher liquidity capture the price impact of COVID-19 better; and (ii) that REITs with a higher percentage of shares held by institutional investors show better performance. This latter is consistent with the notion that firms with more institutional investors tend to be monitored more closely by their shareholders.

On the other hand, from the operating performance perspective, we find that the COVID-19 outbreak has a significant negative impact on the performance of Spanish listed REITs, with a significant worsening in profitability, efficiency and leverage during the first half of 2020. Regarding the relationship between this operating performance and the property type and the asset allocation characteristics, we do not find any significant differences.

Overall, and as expected, the COVID-19 pandemic has impacted negatively on the REIT industry. Our results from both the stock market and the operating performance perspectives are consistent with this notion. However, we find that the low market liquidity for most of the Spanish REITs leads to a delay in their price discovery process. In relation to our variables of interest, namely, the incidence of COVID-19 according to the geographical location of the assets (GEOCOVID) and the property type (PROPERTY), we observe that they are not decisive in our analysis of the impact of COVID-19 on Spanish REITs except for the property variable. In this case we find that REITs that have a diversified portfolio of assets have had a better stock market performance than the rest of the REITs.

If we compare these results with those studied in other countries and markets in the empirical evidence, we see that they are different in several aspects, as we can observe in section 6 of the results. In this comparison, several issues must be taken into account. On the one hand, the Spanish REIT market has specific characteristics as it is a more recently created market with less liquidity than other more consolidated REIT markets. On the other hand, the

management of the pandemic has been very different from one country to another, both inside and outside the EU. While some countries were slower to react and reacted with laxer measures, such as the United States, others, such as Spain, reacted more quickly and with far more severe containment measures, such as the confinement of the entire population in their homes from practically the moment the pandemic was declared. Similarly, while some countries opted to take different measures for specific regions depending on the prevalence of the virus, Spain opted for a centralised management of containment during the first wave. Finally, it should be kept in mind that while this crisis has had negative effects on most industries, it has been harsher in some than in others. For all these reasons, we consider our study to be relevant as it adds a little more evidence to the as-yet unknown impact of COVID-19 on financial markets. The reason underlying this claim is that it is a study on a country, Spain, which was one of the first to suffer the health consequences of the virus and on a sector, real estate, with a strong weight in the country's economy.

This is the first research, as far as we know, to analyse the impact of COVID-19 on Spanish REITs and to allow a better understanding of the behaviour of a developed country facing the impact of the pandemic. Nevertheless, we are aware that our study has several limitations. First, the small sample size analysed. Second, the sample period, as it covers only the first wave of the spread of COVID-19. In this sense, the analysis is less influenced by the political intervention of the Spanish regional governments, as during this period it was centralised and the measures imposed by the government were the same for the whole country. Therefore, future research may include the extension of the sample period to subsequent waves of propagation so that the operating performance during the second semester of 2020 is consistent with the positive stock market expectation when de-escalation began in May 2020. Additionally, it would make it possible to analyse the impact of the different measures imposed by regional governments on the stock market and firm performance of REITs in Spain.

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Tables

Table 1. Liquidity of the REIT sample, MAB-EE and *Mercado Continuo* during the period January 2020 to June 2020.

	REIT	MAB-EE	MERCADO CONTINUO				
	Full sample	Full sample	Full sample	*Highest liquidity*	*Second quartile*	*Third quartile*	*Lowest liquidity*
ZEROVOL	0.8988	0.3259	0.0037	*0.0000*	*0.0000*	*0.0000*	*0.0151*
ZEROS2	0.4265	0.2818	0.0558	*0.0024*	*0.0146*	*0.0381*	*0.1721*
AMIHUD	1.7958	4.5836	0.2228	*0.0009*	*0.0092*	*0.0670*	*0.8347*
SAMPLE SIZE (N)	45	29	119	*30*	*30*	*30*	*29*

Notes:
ZEROVOL: mean of the number of days with zero volume/total number of trading days in the period for each firm (Kang & Zhang, 2014).
ZEROS2: mean of the number of non-zero volume days with zero returns in the period/number of non-zero volume trading days in the period for each firm (Chung & Zhang, 2014).
AMIHUD: mean of the ratio of the absolute value of daily stock return in the period and the daily trading volume in euros in the period for each firm, multiplied by one million (Amihud, 2002).
REIT, MAB-EE, *MERCADO CONTINUO:* The markets analysed are: i) the Spanish alternative stock market for REIT (see section 2), ii) the Spanish alternative market for small-growth firms (MAB-EE) and iii) the Spanish regulated market *Mercado Continuo* (excluding companies whose trading system is fixing). Companies suspended, admitted or excluded during the period of analysis were not included in the samples. All the samples have been truncated at 1%.

Table 2. COVID-19 key dates during the period 31 December 2019 to 30 June 2020.

EVENT DATE	EVENT DESCRIPTION	LABEL
31-12-2019	The World Health Organisation (WHO) China Country Office is informed of cases of pneumonia of unknown aetiology (unknown cause) detected in Wuhan City, Hubei Province of China.	CHINA CASE (1)
30-1-2020	COVID-19 declared a Public Health Emergency of International Concern (PHEIC) by WHO.	EMERGENCY (2)
13-2-2020	First death from COVID-19 in Spain.	FIRST DEATH SPAIN (3)
11-3-2020	COVID-19 declared a pandemic by WHO.	PANDEMIC (4)
14-3-2020	Declaration of a State of Alarm throughout Spain by the Spanish Government to address the health emergency caused by COVID-19.	START OF STATE OF ALARM (5)
4-5-2020	Beginning of the de-escalation process in Spain.	DE-ESCALATION (6)
21-6-2020	End of the State of Alarm in Spain declared by the Spanish government on 14 March 2020.	END OF STATE OF ALARM (7)

Table 3. Definition of the explanatory variables.

PANEL A: STUDY VARIABLES	
GEOCOVID	Incidence of Covid-19 by regions (Spanish Autonomous Communities) according to the location of the assets. To determine the region where the assets are located, the valuation of the assets at the end of 2019 is taken as a reference. If more than 75% of the assets are in a region, that region is selected, otherwise the location is "varied". To measure the incidence of COVID-19 by regions, the confirmed cases of COVID-19 accumulated on 30 June 2020 in each region are taken into account. The variable is the difference from the mean of the number of cumulative confirmed cases of COVID-19 in each region divided by the total number of cumulative confirmed cases in Spain. For REITs whose location is "varied", the variable takes a value of 0.
PROPERTY	Dummy variable for different property focus (property type specialisation) according to the National Association of Real Estate Investment Trust (NAREIT) categories. It takes a value from 1 to 6 for Diversified, Retail, Office, Residential, Industrial and Lodging/resorts, respectively. Following Brounen and De Koning (2012), REITs having more than 75% of their total assets in one property type are regarded as specialised in that asset type, and diversified otherwise.
DIVERSIFIED (RETAIL OFFICE RESIDENTIAL INDUSTRIAL LODGING)	Dummy variables equal to one if the property focus of the REIT is DIVERSIFIED, (RETAIL, OFFICE, RESIDENTIAL, INDUSTRIAL, LODGING) and zero otherwise. Following Brounen and De Koning (2012), REITs having more than 75% of their total assets in one property type are regarded as specialised in that asset type, and diversified otherwise.
PANEL B: CONTROL VARIABLES	
ILLIQUIDITY	Zerovol illiquidity measure proposed by Kang and Zhang (2014) in the period January 2020-June 2020 calculated as the mean of the number of days with zero trading volume divided by the total number of trading days in the period.
AGE	Time (in years) elapsed from the date of the IPO to 31 December 2019.
DEBT	Total debt to total assets ratio at the end of 2019.
INSTITUTIONAL	Percentage of shares held by institutional investors at the end of 2019.

Table 4. Descriptive statistics of the explanatory variables.

PANEL A: CHARACTERISTICS	Mean	Std. dev.	Min.	Median	Max.
GEOCOVID	0.085	0.103	0.000	0.000	0.214
ILLIQUIDITY (%)	90.000	11.500	55.600	93.700	99.200
AGE (years)	2.541	1.278	0.942	2.293	6.089
DEBT (%)	39.200	21.500	1.200	38.800	86.400
INSTITUTIONAL (%)	8.000	21.800	0.000	0.000	99.500
PANEL B: PROPERTY		N			%
1.DIVERSIFIED		15			32.61
2.RETAIL		9			19.57
3.OFFICE		4			8.70
4.RESIDENTIAL		14			30.43
5.INDUSTRIAL		2			4.35
6.LODGING		2			4.35

Notes:
The variables are described in Table 3.
The sample size (N) in Panel A is 46.

Table 5. Definition of operating performance variables.

VARIABLE	DEFINITION
Profitability	
ROE	Return on equity: net income to the mean book value of total equity.
ROA	Return on assets: net operating income to the mean book value of total assets.
NI/ASSETS	Net Income to total assets: net income to the mean book value of total assets.
EPS	Earnings per share: net income to the number of shares.
Efficiency	
PROFIT MARGIN	Net income to total revenues.
Leverage	
DEBT RATIO	Total debt to total assets.
Valuation	
TOBIN Q	Tobin's Q: market value of equity plus the book value of debt to the book value of assets.

Notes:
We use the mean value (that is the mean value at the beginning and end of the year) of assets and equity in the denominator for ROA, NI/ASSETS and ROE variables, respectively, since we are comparing a flow variable (income) with a fund variable (total assets and total equity).

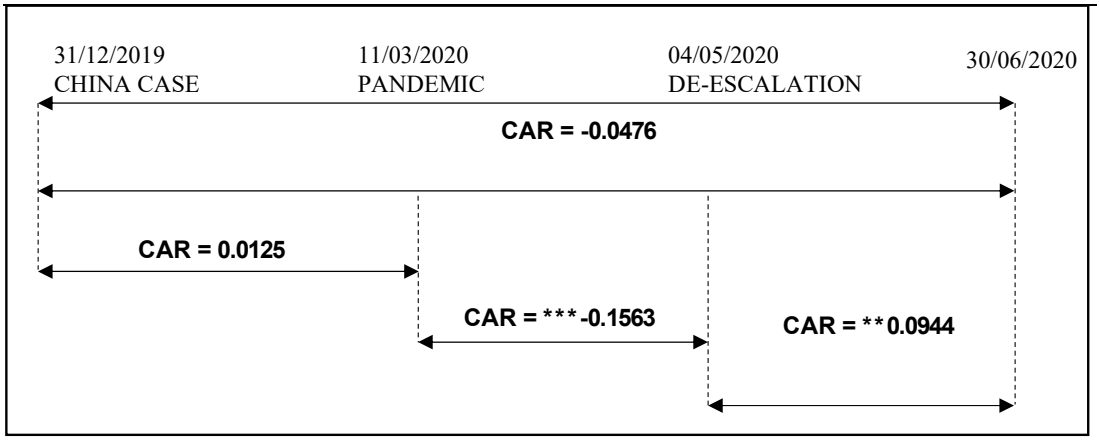
Table 6. Performance of the MAB REIT 15 index at COVID-19 events.

	CHINA CASE	EMERGENCY	FIRST DEATH SPAIN	PANDEMIC	START OF STATE OF ALARM	DE-ESCALATION	END OF STATE OF ALARM
PANEL A: Abnormal return (AR)							
AR -1	-0.0054	-0.0030	0.0000	0.0016	-0.0105	-0.0091	0.0037
AR 0	-0.0110	0.0007	0.0002	0.0001	-0.0103	-0.0001	0.0087
AR +1	-0.0014	0.0030	-0.0001	-0.0066	-0.0209	-0.0031	0.0020
PANEL B: Cumulative abnormal return (CAR)							
CAR (0, *T*)	-0.0017	0.0078	-0.0013	***-0.0620		-0.0140	0.0232

Notes:
The number of days is 381.
Multiple linear regression models estimated by Generalised AutoRegressive Conditional Heteroscedasticity (GARCH (1,1) from 1 January 2019 until 30 June 2020. Dependent variable is the return of the MAB REIT 15 Index (defined in section 5).
AR 0 (AR -1, AR+1): dummy variable taking a value of 1 on the day (the day before/the day after) of the event and zero on all other days under analysis (see expression 1).
CAR (0, *T*): dummy variable taking the value (1/(*T* +1)) on the day of each event and the following *T* days, and zero otherwise. *T* takes a value of 4 in all events except for the PANDEMIC and START OF STATE OF ALARM. In this case we estimate the CAR for both events jointly, as these events are very close in time. Thus, *T* takes a value of 7 (see expression 2).
The events are described in Table 2.
*** significant at the 1% level.

Table 7. Cumulative abnormal returns (CAR) of the MAB REIT 15 index for different periods determined by COVID-19 events.

Period	CAR1	CAR2	CAR3	CAR4
Period 1 (311219 – 300620)	-0.0476			
Period 2 (311219 – 100320)		0.0125		
Period 3 (110320 – 030520)			***-0.1563	
Period 4 (040520 – 300620)				**0.0944



Notes:
Regression models estimated by Ordinary Least Squares (OLS). Heteroscedasticity has been corrected using White's methodology. Dependent variable is the return of the MAB REIT 15 Index (defined in section 5).
Period analysed: dummy variable taking the value 1/T, where *T* is the number of days of each period under study, and zero from 1 January 2019 until 30 December 2019 (see expression 3).
***, ** significant at the 1% and 5% levels, respectively

Table 8. Multivariate analysis of cumulative abnormal return (CAR) by explanatory factors (including different property type).

	GENERAL	DIVERSIFIED	RETAIL	OFFICE	RESIDENTIAL	INDUSTRIAL	LODGING
PANEL A: 1 JANUARY 2020 – 30 JUNE 2020 (PERIOD 1)							
Intercept	-0.0417	-0.0833	-0.0410	-0.0416	-0.0569	-0.0473	-0.0427
GEOCOVID	-0.0459	-0.0401	-0.0281	-0.0481	-0.0168	-0.0418	-0.0459
ILLIQUIDITY	***0.1804	***0.2255	***0.1763	***0.1799	***0.2267	***0.1911	***0.1811
LNAGE	-0.0025	-0.0117	-0.0044	-0.0032	-0.0275	-0.0025	-0.0023
LNDEBT	*-0.1063	**-0.1330	*-0.1074	-0.1038	-0.0818	*-0.1162	*-0.1062
INSTITUTIONAL	**0.0907	**0.1190	**0.0912	**0.0901	***0.1276	**0.0914	**0.0908
DIVERSIFIED		**0.0437					
RETAIL			0.0167				
OFFICE				0.0037			
RESIDENTIAL					***-0.0644		
INDUSTRIAL						-0.0323	
LODGING							0.0018
Sample size (N)	46	46	46	46	46	46	46
R^2	19.05%	28.24%	20.08%	19.07%	34.92%	20.09%	19.06%
Adjusted R2	8.93%	17.20%	7.78%	6.62%	24.91%	7.80%	6.60%
F-test statistic	**2.53	***3.66	*2.16	*2.08	**3.45	**2.40	**2.47
VIF	1.01-1.15	1.03-1.26	1.04-1.15	1.09-1.44	1.04-1.45	1.01-1.17	1.03-1.18
PANEL B: 11 MARCH 2020 – 3 MAY 2020 (PERIOD 3)							
Intercept	-0.0577	-0.0879	-0.0578	-0.0579	-0.0628	-0.0620	-0.0409
GEOCOVID	0.0182	0.0224	0.0171	0.0229	0.0279	0.0213	0.0186
ILLIQUIDITY	***0.2468	***0.2794	***0.2470	***0.2478	***0.2623	***0.2551	***0.2341
LNAGE	-0.0074	-0.0141	-0.0073	-0.0060	-0.0158	-0.0074	-0.0114
LNDEBT	-0.0621	-0.0814	-0.0620	-0.0675	-0.0539	-0.0697	-0.0642
INSTITUTIONAL	**0.0587	**0.0792	**0.0587	**0.0599	**0.0710	**0.0592	**0.0562
DIVERSIFIED		**0.0316					
RETAIL			-0.0010				
OFFICE				-0.0079			
RESIDENTIAL					-0.0215		
INDUSTRIAL						-0.0249	
LODGING							-0.0325
Sample size (N)	46	46	46	46	46	46	46
R^2	27.95%	34.42%	27.96%	28.08%	30.34%	28.79%	29.27%
Adjusted R2	18.95%	24.33%	16.87%	17.01%	19.62%	17.83%	18.38%
F-test statistic	**2.43	***2.91	**2.39	*2.19	**2.49	*2.15	**3.22
VIF	1.01-1.15	1.03-1.26	1.04-1.15	1.09-1.44	1.04-1.45	1.01-1.17	1.03-1.18

Notes:
Multiple linear regression models estimated by cross-sectional Ordinary Least Squares (OLS). Heteroscedasticity has been corrected using White's methodology. Dependent variable is the cumulative abnormal return adjusted by the MAB REIT 15 Index (CAR) during period 1: 1 January 2020 to 30 June 2020 (PANEL A) and during period 3: 11 March 2020 to 3 May 2020 (PANEL B). See expression 4.
The variables are described in Table 3.
VIF: Variance Inflation Factor. Maximum-minimum values are reported.
***, **, * significant at the 1%, 5% and 10% levels, respectively.

Table 9. Analysis of REITs' operating performance during the period 1 January 2019 to 30 June 2020.

VARIABLE	2019H1 Mean (median) (1)	2019H2 Mean (median) (2)	2020H1 Mean (median) (3)	(A) (2) - (1)	Z-statistic (2) - (1)	(B) (3) - (2)	Z-statistic (3) - (2)	(C) (B) - (A)	Z-statistic (B) - (A)
Profitability									
ROE	0.050 (0.018)	0.052 (0.021)	0.006 (0.009)	0.002 (0.000)	0.814	-0.046 (-0.015)	*** -3.338	-0.048 (-0.017)	**-2.507
ROA	0.017 (0.013)	0.019 (0.014)	0.011 (0.009)	0.002 (0.000)	1.032	-0.008 (-0.005)	**-2.551	-0.010 (-0.005)	**-2.092
NI/ASSETS	0.019 (0.009)	0.018 (0.010)	0.006 (0.005)	-0.001 (0.000)	1.032	-0.012 (-0.007)	**-3.119	-0.011 (-0.006)	**-2.431
EPS	0.378 (0.065)	0.424 (0.094)	0.082 (0.014)	0.046 (0.003)	1.005	-0.342 (-0.034)	***-3.032	-0.388 (-0.068)	***-2.868
Efficiency									
PROFIT MARGIN	0.567 (0.359)	0.487 (0.305)	0.121 (0.187)	-0.080 (0.000)	0.754	-0.366 (-0.106)	***-2.682	-0.286 (-0.174)	**-2.180
Leverage									
DEBT RATIO	0.409 (0.428)	0.392 (0.388)	0.399 (0.389)	-0.017 (-0.011)	**-2.409	0.007 (0.006)	**2.300	0.024 (0.017)	***2.737
Valuation									
TOBIN Q	1.171 (1.120)	1.184 (1.089)	1.171 (1.070)	0.013 (-0.004)	-0.639	-0.013 (-0.005)	-0.147	-0.026 (0.014)	0.978

Notes:
The sample size (N) is 46.
2020H1: the first half of 2020 (1 January 2020–30 January 2020).
2019H2: the second half of 2019 (1 July 2019–31 December 2019).
2019H1: the first half of 2019 (1 January 2019–30 June 2019).
The variables are described in Table 5.
Z-statistic: to compute the differences between the values of the medians, the Wilcoxon signed-rank test is computed.
***, ** significant at the 1% and 5%, respectively.

Table 10. Analysis of REITs' operating performance in the change between the first half of 2020 (2020H1) and the second half of 2019 (2019H2) by GEOCOVID EXPOSURE and property type.

	PANEL A: GEOCOVID EXPOSURE				PANEL B: PROPERTY						
VARIABLE	HIGH (N=21)	LOW (N=25)	Median Diff		DIVERSIFIED (N=15)	RETAIL (N=9)	OFFICE (N=4)	RESIDENTIAL (N=14)	INDUSTRIAL (N=2)	LODGING/ RESORT (N=2)	Median Diff
	Mean (median)	Mean (median)	Diff Median	Z-statistic for difference in medians	Mean (median)	Mean (median)	Mean (median)	Mean (median)	Mean (median)	Mean (median)	Chi-squared for difference in medians
Profitability											
ROE	-0.080 ***(-0.023)	-0.018 **(-0.009)	0.032	0.937	-0.078 (-0.006)	*-0.033 *(-0.017)	*-0.045 (-0.047)	*-0.030 *(-0.021)	-0.022 (-0.022)	-0.003 (-0.003)	2.108
ROA	**-0.010 **(-0.007)	-0.007 *(-0.005)	0.001	0.099	-0.007 (-0.004)	*-0.016 (-0.011)	0.001 (0.002)	-0.008 (-0.004)	*-0.005 (-0.005)	*-0.008 (-0.008)	3.009
NI/ASSETS	***-0.017 ***(-0.009)	-0.007 (-0.003)	0.005	1.114	-0.006 (-0.002)	*-0.016 *(-0.009)	-0.032 (-0.029)	*-0.011 (-0.006)	**-0.005 (-0.004)	-0.004 (-0.004)	2.841
EPS	***-0.408 **(-0.023)	-0.153 (-0.026)	-0.003	0.981	-0.459 (-0.022)	-0.025 (-0.089)	-0.110 (0.005)	*-0.291 (-0.007)	**-0.245 (-0.245)	***-0.135 (-0.135)	2.508
Efficiency											
PROFIT MARGIN	***-0.722 ***(-0.394)	-0.068 (-0.047)	0.348	1.643	0.079 (-0.047)	-0.071 (-0.053)	*-1.183 (-1.269)	*-0.878 (-0.309)	-0.091 (-0.091)	-0.105 (-0.105)	2.461
Leverage											
DEBT RATIO	***0.020 ***(0.016)	-0.004 (0.002)	-0.014	-1.643	-0.002 (0.010)	0.014 (0.008)	-0.006 (0.000)	***0.017 ***(0.012)	-0.002 (-0.002)	0.011 (0.011)	4.531
Valuation											
TOBIN Q	-0.032 (0.010)	0.003 (-0.007)	-0.017	0.276	0.004 (0.012)	-0.096 (-0.033)	0.004 (0.003)	0.017 (0.004)	-0.012 (-0.012)	-0.009 (-0.009)	2.077

Notes:
N: sample size.
The variables are described in Table 3 and Table 5. The variable analysed is the change between the first half of 2020 (2020H1) and the second half of 2019 (2019H2) (Column B of Table 9).
Median diff: differences in the medians according to GEOCOVID EXPOSURE and PROPERTY are tested with the Wilcoxon rank-sum (Mann-Whitney) test and Kruskal-Wallis test, respectively.
***, **, * significant at the 1%, 5% and 10% levels, respectively.

Figures

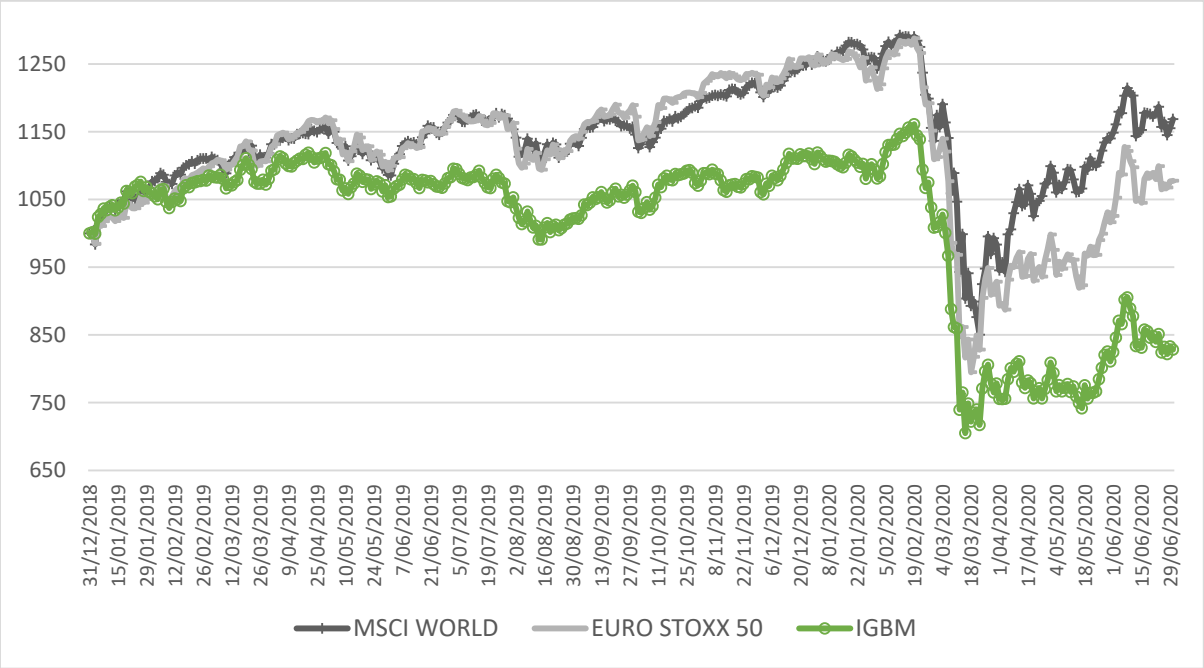


Figure 1. Evolution of the MSCI World index, Euro Stoxx 50 index and Spanish general index (IGBM) during the period 31 December 2018 to 30 June 2020.

Source:
Own elaboration based on Thomson Reuters Datastream database.

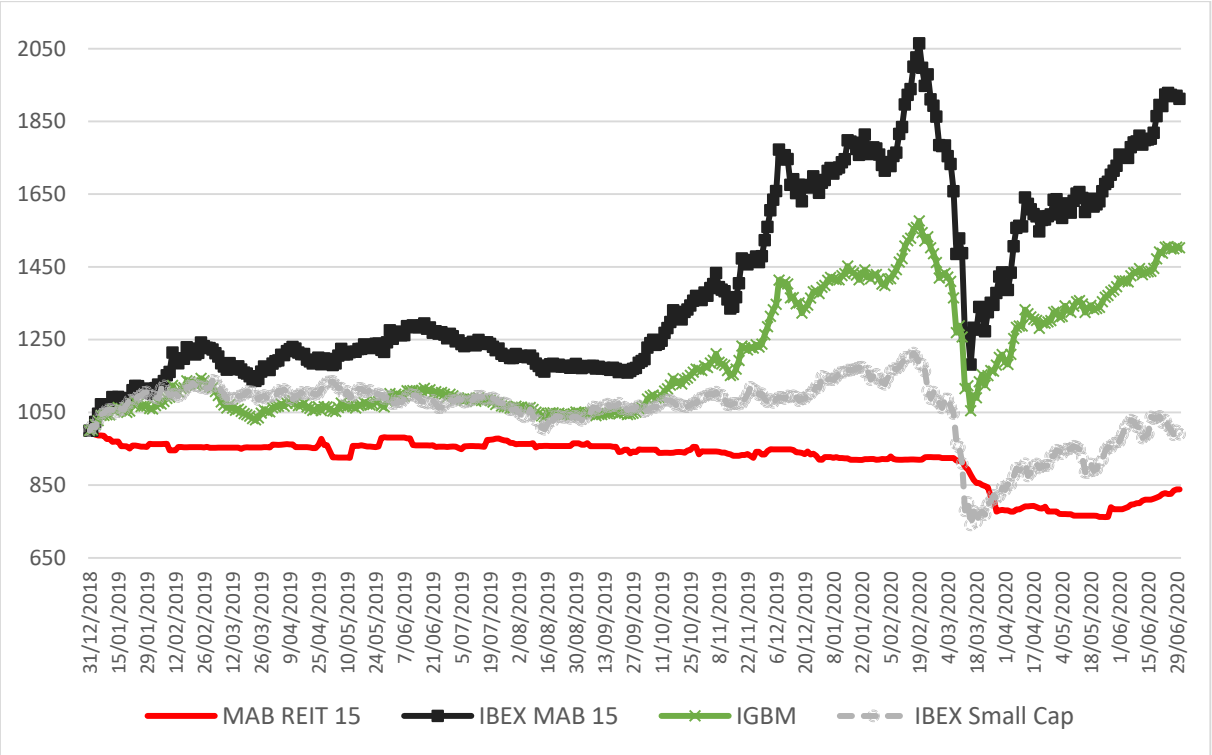


Figure 2. Evolution of several Spanish stock market indexes during the period 31 December 2018 to 30 June 2020.

Source:
Own elaboration based on Thomson Reuters Datastream database.

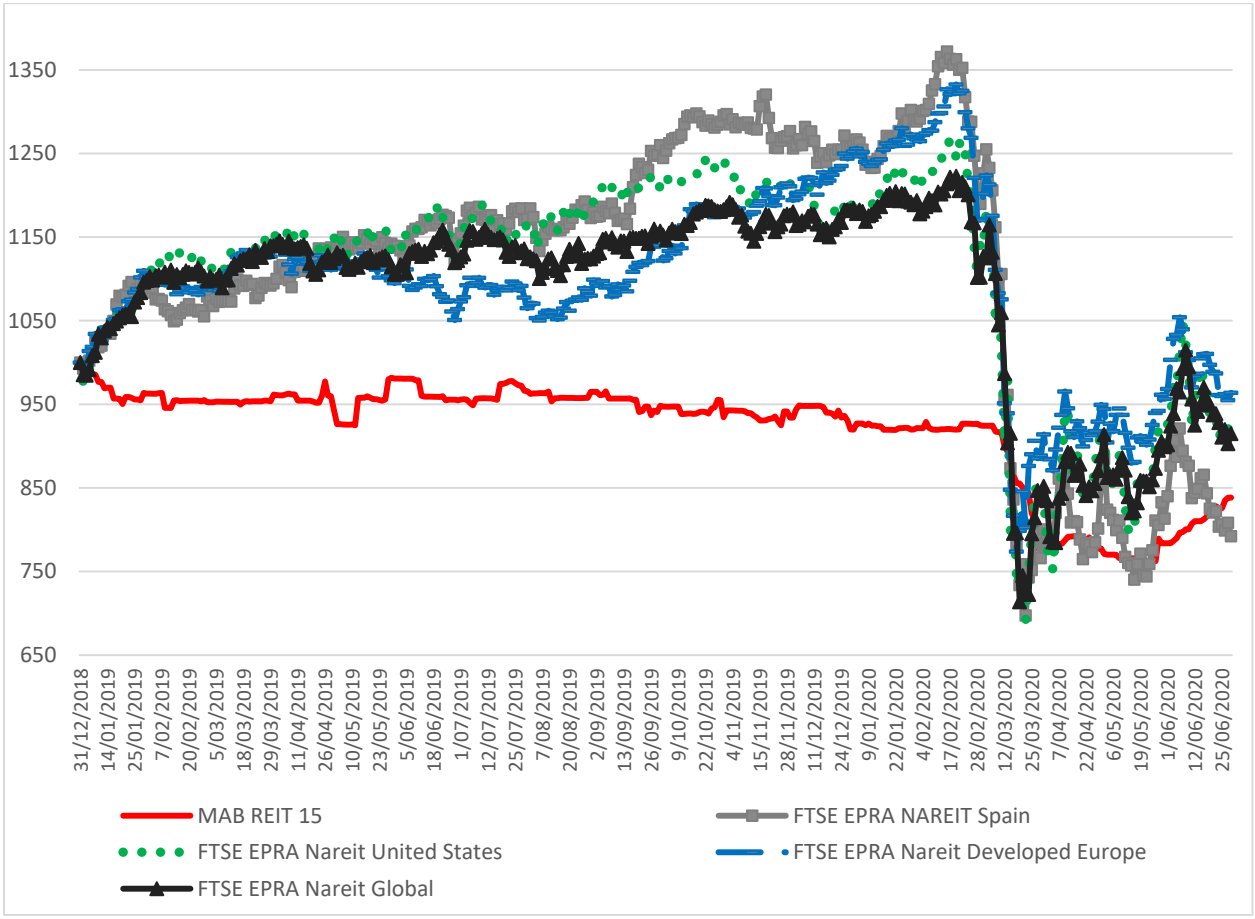


Figure 3. Evolution of the main REIT indexes around the world during the period 31 December 2018 to 30 June 2020.

Source:
Own elaboration based on Thomson Reuters Datastream database.