The Impact of COVID-19 Pandemic on Different Property Sectors of J-REIT: Comparative Analysis before and after the Crisis

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Abstract

Three sectors (Office, Residential, and Retail & Logistics) of J-REIT (Real estate Investment Trust) move independently without mutual transmission before the pandemic of COVID-19. But three sectors of J-REIT move together after the pandemic with some mutual transmissions. Three sectors of J-REIT are priced without a common trend before the pandemic, but they are priced with a common trend after the pandemic. A common trend is an influence of COVID-19 severely damaging the demand of real estate market in Japan. J-REIT market structurally changes after the pandemic of COVID-19.

Keywords: Causality, Cointegration, COVID-19, J-REIT, Property Sectors

JEL Classifications: E44, G19

1. Introduction

This paper focuses on the J-REIT (Real Estate Investment Trust) in different property sectors under COVIT-19 crisis. It originally started in China around the end of 2019. As the pandemic crisis became serious around the end of February 2020 especially in the northern part of Italy, the financial markets tumbled not only in Europe but also in the rest of the world. The price of J-REIT market started to decline sharply around the beginning of March, 2020 to avert risks associated with COVIT-19 crisis.

It is no exaggeration to say that real estate market structurally changed after the pandemic started. The number of foreign tourists and business persons visiting Japan decreased dramatically. This caused the vacancies in hotels. Many corporations stared to reduce the work space of office because they shifted their workers from office to online work. On the other hand, the demand for

warehouse in increased a lot because of the brisk demand for on-line shopping. Some people moved their living space from urban to rural area because of increased opportunities for on-line working. This paper analyzes the J-REIT in different property sectors before and after the pandemic in terms of co-movement and transmission. Property sectors are Office, Residential and Retail & Logistics.

Chiang (2010), Anderson and Beracha (2011), Zhou (2012), and Akash and Sandip (2017) are cited as related literatures analyzing the co-movement and transmission of the REIT market outside of Japan. Ito (2018) is the only previous study in the analysis of co-movement and transmission. Ito (2018) concludes that "with the introduction of a strong monetary policy, REITs and real estate markets become bullish. Aggressive monetary policies, as a common factor, contribute to co-movement and mutual transmission." Thus this paper has a great originality as a first one to analyze J-REIT market under the COVIT-19 pandemic.

As for the impact of COVID-19 pandemic on REIT, Akinsomi (2020) is cited. Akinsomi (2020) identifies "the impact of COVID-19 on the performance of global REITs and US sector REITs during the periods from January 2020 to May 2020. Most sector REITs during the pandemic have lost considerable value based on YTD returns as at May 2020". "Flight to quality is expected during this uncertain period to REITs such as data REITs, grocery-anchored REITs and storage REITs".

2. Data

According to TSE (Tokyo Stock Exchange), "the constituents of the REIT Property Sector Index Series are selected from the TSE REIT Index on the basis of their use of the properties subject to investment by each REIT. The series is composed of three indexes: Office, Residential, and Retail & Logistics." Daily data of three Property Sector Indexes are used. TSE explains that "their constituents are selected from the TSE REIT Index, based on their use of the properties subject to investment by each REIT". The whole sample is divided into two. First period is Sample A from August 20, 2019 to February 21, 2020 and second period Second period is Sample B from February 25, 2020 to August 24, 2020. Sample A is a period before the outbreak of COVID-19. Sample B is a period after the outbreak of COVID-19. The movement of three

series are shown in Figure 1. The descriptive statistics are shown in Table 1.

Figure 1

Table 1

3.Methodology and Results

3.1 Unit Root Test

"Augmented Dickey-Fuller (ADF)" and "KPSS (Kwiatowski/Phillips/Schmidt-Shin)" tests are conducted. According to Dickey and Fuller (1979), and Dickey and Fuller (1981), the ADF test define "a null hypothesis as 'unit roots exist' and an alternative hypothesis as 'unit roots do not exist'". Fuller (1976) provides the table for the ADF. According to Kwiatkowski et al. (1992), the KPSS test defines "the null hypothesis as "unit roots do not exist" and the alternative hypothesis as "unit roots exist". Unit root tests are conducted both on original data and first differenced data. The results show that three variables are found to be non-stationary I (1) variables by two unit root tests. These results are shown in Tables 1, 2, 3, and 4.

Table 1

Table 2

Table 3

Table 4

3.2 Johansen Cointegration Test

The Johansen cointegration test is used to analyze the co-movement among three Property Sectors. Johansen (1988) proposes "an analysis with the *k*-order VAR model". According to Johansen (1988), "the VAR model is presented with *k* order against vector X_t with *p* variables. All the *p* elements of X_t are considered to be *I* (1) variables; u_t is an error term with zero mean; λ is a constant term". Osterwald-Lenum (1992) provides the critical values at the 5% level.

$$X_t = \Pi_1 X_{t-1} + \ldots + \Pi_k X_{t-k} + \lambda + u_t \qquad (1)$$

The results show that the existence of no cointegration relationship can be found in Sample A.

But there are two cointegration relationships in Sample B. Three Property Sectors move together in long-term equilibrium. These results are shown in Table 5.

Table 5

3.3 Granger Causality Test

Toda and Yamamoto (1995) developed a new causality test to overcome the problem of non-stationarity proposed by Granger(1969). Toda and Yamamoto (1995) explains that "the trend term *t* and $p + 1$ (original lag plus one) are included for the estimation". As shown below, these three equations investigate causalities among three Property Sectors.

$$Office_t = k_0 + \lambda_t + \sum_{i=1}^{p+1} \alpha_i Residential_{t-i} + \sum_{i=1}^{p+1} \beta_i Retail_{t-i} + \sum_{i=1}^{p+1} \chi_i office_{t-i} + u \quad (2)$$

$$Residential_t = k_0 + \lambda_t + \sum_{i=1}^{p+1} \alpha_i Office_{t-i} + \sum_{i=1}^{p+1} \beta_i Retail_{t-i} + \sum_{i=1}^{p+1} \chi_i Residentail_{t-i} + u \quad (3)$$

$$Retail_t = k_0 + \lambda_t + \sum_{i=1}^{p+1} \alpha_i Office_{t-i} + \sum_{i=1}^{p+1} \beta_i Residential_{t-i} + \sum_{i=1}^{p+1} \chi_i Retail_{t-i} + u \quad (4)$$

There is no causality found among three Property Sectors in Sample A. But there are two causalities found in Sample B. They are from Office to Residential and from Retail &.Logistics to Residential. These results are shown in Table 6.

4.Concluding Remarks

This paper focuses on the impact of COVID-19 on J-REIT Property Sectors by analyzing the comovement and transmission of J-REIT in three property sectors before and after the pandemic. They are Office, Residential , and Retail & Logistics.

The results show that the existence of no cointegration relationship can be found in Sample A. But there are two cointegration relationships in Sample B. Three Property Sectors move together in long-term equilibrium. There is no causality found among three Property Sectors in Sample A.

But there are two causalities found in Sample B. They are from Office to Residential and from Retail &.Logistics to Residential.

From the results of empirical analysis, three sectors of J-REIT move independently without mutual transmission before the pandemic. But three sectors of J-REIT move together after the pandemic with some mutual transmissions. Three sectors of J-REIT are priced without a common trend before the pandemic, but they are priced with a common trend after the pandemic. A common trend is an influence of COVID-19 severely damaging the demand of real estate market in Japan. J-REIT market structurally changes after the pandemic of COVID-19.

This paper focuses only on Japan. There is a room to expand this study for an international comparison. I would like to make it as further study.

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Figure 1 Movement of REIT in Different Property Sectors

Note: Data source is datastream.

Sample A is from August 20, 2019 to February 21, 2020.

Sample B is from February 25, 2020 to August 24, 2020.

Table 1 Descriptive statistics

Variable	Average	SD	Min	Max	Median
Sample A					
Office	3301.08	80.08	3171.54	3470.86	3297.97
Residential	2247.45	61.14	2141.12	2386.69	2241.29
Retail & Logistics	2509.34	67.72	2391.33	2636.15	2497.96
Sample B					
Office	2869.55	204.93	1903.12	3347.93	2899.23
Residential	1627.73	198.69	1171.51	2351.40	1563.16
Retail & Logistics	1989.33	191.99	1303.05	2490.91	2038.47

Notes : Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 2 ADF test - original series

Variable	Without Trend	With Trend
Sample A		
Office	0.635	-2.639
Residential	1.086	-2.296
Retail & Logistics	0.390	-2.719
Sample B		
Office	-0.495	-5.335*
Residential	-1.329	-5.834*
Retail & Logistics	-0.283	-6.077*

Notes : * indicates significance at the 5 % level.
5% critical values are -2.86(Without Trend) and -3.41(With Trend）.
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 3 KPSS test - original series

	Lag=0		Lag=6	
Variable	η_μ	η_τ	η_μ	η_τ
Sample A				
Office	1.146*	1.225*	0.196	0.209*
Residential	3.642*	1.189*	0.618*	0.228*
Retail & Logistics	1.942*	1.979*	0.312	0.362*
Sample B				
Office	3.248*	0.552*	0.610*	0.118
Residential	2.771*	1.006*	0.514*	0.1886*
Retail & Logistics	3.132*	0.971*	0.543*	0.181*

Notes: * indicates significance at the 5 % level.
5% critical values are 0.463(level stationary), 0.146 (trend stationary).
$\eta_\mu$indicates level stationarity. η_τ indicates trend stationarity.
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 4 ADF test - first differenced series

Variable	Without Trend	With Trend
Sample A		
⊿Office	-10.214*	-9.674*
⊿Residential	-9.281*	-8.790*
⊿Retail & Logistics	-6.267*	-6.003*
Sample B		
⊿Office	-5.112*	-5.469*
⊿Residential	-4.865*	-5.292*
⊿Retail & Logistics	-4.600*	-4.268*

Notes : * indicates significance at the 5 % level.
5% critical values are -2.86(Without Trend) and -3.41(With Trend）.
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 5 KPSS test - first differenced series

	Lag=3		Lag=12	
Variable	η_μ	η_τ	η_μ	η_τ
Sample A				
⊿Office	0.114	0.107	0.091	0.086
⊿Residential	0.139	0.125	0.101	0.092
⊿Retail & Logistics	0.205	0.110	0.147	0.081
Sample B				
⊿Office	0.186	0.088	0.195	0.097
⊿Residential	0.405	0.098	0.319	0.103
⊿Retail & Logistics	0.059	0.137	0.068	0.138

Notes: * indicates significance at 5 % level.
5% critical values are 0.463(level stationary), 0.146 (trend stationary).
1% critical values are 0.739 (level stationary), 0.216 (trend stationary).
$\eta_\mu$indicates level stationarity. η_τ indicates trend stationarity.
Results showing signicance at 5 % are not significant at 1 % level.
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 6 Johansen cointegration test

Null	Alternative	Test Statistics	5% Critical Value	Test Statistics	5% Critical Value
		Maximal Eigenvalue Test		Trace Test	
Sample A					
r = 0	r = 1	15.220	22.00	21.554	34.91
r ≦1	r = 2	6.288	15.67	6.033	19.96
r ≦2	r = 3	0.913	9.24	0.767	9.24
Sample B					
r = 0	r = 1	23.606*	22.00	44.669*	34.91
r ≦1	r = 2	17.439*	15.67	22.235*	19.96
r ≦2	r = 3	5.678	9.24	5.081	9.24

Notes: * indicates significance at 5 % level.
Critical values are from Osterwald-Lenum (1992).
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.

Table 7 Granger causality test

Variables	Test Statistics
Sample A	
Office →Residential	0.312
Office →Retail&Logistics	0.520
Residential → Office	0.473
Residential→ Retail & Logistics	0.235
Retail & Logistics →Office	0.469
Retail & Logistics → Residential	0.724
Sample B	
Office →Residential	0.029*
Office →Retail&Logistics	0.519
Residential → Office	0.494
Residential→ Retail & Logistics	0.192
Retail & Logistics →Office	0.865
Retail & Logistics → Residential	0.059**

Notes: * indicates significance at the 5 % level.
** indicates significance at the 10 % level.
As for the number of lags, one is added to AIC selection.
Sample A is from August 20, 2019 to February 21, 2020.
Sample B is from February 25, 2020 to August 24, 2020.