

## Risk Shift of Real Estate Stocks during the COVID-19 Pandemic

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**Abstract**

The outbreak of the COVID-19 pandemic induces an increase of risk in global equity markets where real estate stocks are often perceived as a 'safe haven'. Employing the Fama and French's (2015) five-factor model, we calculate the betas for risk factors and investigate the influence of market crises on excess returns of real estate stocks. The time series used in this study allows for splitting the data into two crisis periods namely the global financial crisis during 2007-2008 and the COVID-19 crisis in 2020. Our empirical evidence underlines that the undifferentiated view of real estate stocks as an overall 'safe haven' is not supported: 1) We find the risk factors of Fama and French can be applied to real estate stocks only to some extent, where the investment and profitability factors show opposite signs compared to general stocks; 2) Regional differences exist and Asian real estate markets show stronger diversification benefits during the crises; 3) Differences in business scopes lead to distinct reactions to the crises, where Asian firms focusing on real estate development and diversified activities are proven stronger during the COVID-19 pandemic and thus may offer better diversification value for investors; and 4) European real estate stocks are the worst-performing in terms of annualized return, specifically for firms offering real estate development and diversified activities. During both crisis periods, operating and services firms suffer a significant negative impact in Europe and are less likely to have diversification value.

*Keywords:* Real estate stocks, risk and return, Fama & French's (2015) five-factor model

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**1.0 INTRODUCTION**

The latest events around the COVID-19 pandemic have caused a global shutdown of the world's leading economies and a coarse disruption of supply chains. During the course of the COVID-19 crisis stocks have taken an abrupt route. While stocks first seemed to ignore the corona situation, a panic happened when corona hit Europe and become the center of the further spread. Leading stock market indices suffered substantial losses of around 40% in only a few weeks time, which is not too dissimilar to the Great Recession of the 1930s. By obviating firm bankruptcies and in turn banking sector woes due to outstanding receivables, central banks have inundated the markets with a rash of money catapulting the perception of inflation risk to new unprecedented levels. Today, six months after the lockdown in Europe, global stocks have recovered to near pre-crisis levels.

In times of crises, an investment in real estate is often associated as safe haven as to its low volatility and stable income streams. However, the dissemination of the corona pandemic has challenged this cognition of real estate being capable for value protection. It turned out that the success of an investment is heavily dependent on the industry and asset class. For instance, hotel and retail have witnessed significant troubles as these sectors are heavily dependent on tourism whereas logistics have testified all-time highs due to thriving e-commerce activities and the like (see for example CBRE, 2020; JLL, 2020). In view of the aforementioned aspects, amongst equities real estate stocks in particular are often seen as 'safe haven'. In this paper, we employ the Fama and French's (2015) model, calculate the betas for risk factors and examine the influence of market crises on excess returns of real estate stocks to analyze whether or not this perception holds true. We are fully aware that a number of studies is currently dealing with the potential impacts of COVID-19 on stock markets and the global economies. Nevertheless, to the best of our knowledge no such study exists that investigates the risk perception on real estate stocks during the COVID-19 pandemic and therefore in a way links both the real estate markets and stock markets on a global scale. To present an overarching view, we use a fixed-effects panel covering monthly data of exchange-listed real estate companies from Asia, Europe, and North America from 01/2007-04/2020. Hence, this study contributes to the limited body of existing literature and provides diversification implications for mixed asset portfolios including real estate stocks for international investors.

The remainder of this paper proceeds as follows. Section 2 briefly reviews the literature on both the current implications of COVID-19 to economies and stock markets and about pricing of real estate equities. Section 3 states data issues and presents the methodology. Our findings are shown in Section 4. Finally, Section 5 concludes the paper.

## ■2.0 LITERATURE REVIEW

Numerous studies have explored the economic impact of pandemics. Siu and Wong (2004) evaluate the economic impact of the SARS epidemic dissemination in Hong Kong and illustrate that the consumer side has experienced the most serious negative impacts with respect to local consumption, tourism activities and air-travel services. The economy, however, did not encounter a supply and demand shock contemporaneously in those days. Lee and McKibbin (2004) also study the ramifications of SARS and demonstrate that the aftermaths for the human society is severe as due to globalization and financial interrelation an (economic) shock from one country swiftly spills over to others. Focusing on the impact of pandemics on investors' behavior, Chen et al. (2007) study the impact of SARS on the performance of Taiwanese hotel stocks and find a severe decline in hotel income and stock price levels. According to Morales and Andreosso-O'Callaghan (2012), in the event of crises, stock market movements across countries become increasingly correlated as to strong interdependencies and interconnectedness of countries. Therefore, events such as the COVID-19 pandemic can evoke shifts in investor's risk perception that gravely affects their investment decisions and, in turn, stock market prices. In this context, Kaplanski and Levy (2010) point out that investment decisions can be suspended due to bad mood and anxiety as anxious individuals tend to be more pessimistic about the future and thus take lower risks. Amongst others, Durand et al. (2011) measure fear in the light of the latest financial crisis by using a volatility index (VIX) and infer that an escalation in expected volatility is generally associated with flights to quality and safety. In other words, investors are more likely to shift their investments from stocks to bonds causing stock prices to diminish.

In terms of real estate, REIT stocks are commonly investigated in the context of investment behaviors towards indirect real estate. After the burst of the dot-com bubble in 2001, investors were seeking investment alternatives that were both safe and profitable. Due to usually high dividend payments, relative strong performance and non-cyclical business activities, REITs became a popular and sought after investment. Although this rationale is fairly comprehensible, Basse et al. (2009) find a massive structural break in the 2007 crisis using a U.S. REITs dataset. Their results indicate that U.S. REITs became more risky relative to utility stocks in times of financial crises. In this regard, Schulte et al. (2011) examine the pricing of pan-European real estate equities and the drivers for return employing the Fama-French framework. Their findings show that systematic risk factors are crucial drivers for real estate equity returns. While returns are positively linked to excess market return and a value factor, size factors evince a negative relation to real estate returns, though. Similarly, Peterson and Hsieh (1997) find that EREIT risk premiums can be derived from market excess returns, size and value. However, based on a U.S. sample, McIntosh et al. (1991) postulate that small REITs yield higher returns than larger ones without bearing higher risk. According to Karolyi and Sanders (1998), the stock and bond market risk premium are important to determine return variations of U.S. REITs. Notwithstanding, they also infer that an economic risk premium for real estate equities cannot be explained by multiple beta asset pricing models.

Lately, a number of papers have dealt with the potential impacts of the COVID-19 pandemic on global stock markets. For instance, Baker et al. (2020) employ text-based methods to track back daily stock market movements to 1900 in reference to overall stock market volatility. Their findings show that the time frame from 24 February to 24 March 2020 exhibits more market jumps than any other period in history that diseases such as the Spanish Flu, SARS, Swine Flu, Ebola etc. have caused. They argue that this is due to the severity of the pandemic and high mortality rates as well as disturbances in business traveling behavior and the vulnerability of supply chains, but the main contribution stems from the policy responses to the COVID-19 pandemic all over the world. Likewise, Liu et al. (2020) examine the short-term impacts of the COVID-19 outbreak on 21 leading stock market indices in major affected countries utilizing both an event study method and a fixed effects panel. Their results feature that the disease caused a rapid dip in stock prices while Asian markets were witnessing more negative abnormal returns than other countries. While these studies demonstrate the significant impact of COVID-19 on stocks, the shift in risk perception associated with real estate stocks has not been explored in detail. Liu et al. (2020) contend that the adverse effects are entailed by investor's pessimistic sentiment on future returns and fear of uncertainties. Given this explanation, a rise in uncertainty could make investors search for alternatives that offer diversification benefits such as real estate as opposed to highly volatile stocks or low-interest bonds. In a recent paper, Öztürk et al. (2020) can corroborate this idea on a direct real estate level, as they find that the real estate sector is less adversely affected by the outbreak than other sectors. Despite this, as previously found by Basse et al. (2009), Akinsomi (2020) finds that most REITs have shown considerable losses in value during the COVID Pandemic. However, data REITs, grocery-anchored REITs and storage REITs have been less adversely affected during COVID-19 in comparison to other REITs. While the literature has found evidence to suggest that real estate stocks do not act as a safe haven in times of uncertainty, this study looks to add to this literature by testing this hypothesis and looking into regional differences, which has not been explored in the prior literature.

## ■3.0 DATA AND METHODOLOGY

### 3.1 Data and Descriptive Statistics

This paper investigates the risk shifts of real estate stocks from January 2007 to April 2020 to examine whether real estate stocks can offer a diversification value to broader markets in the financial crisis during 2007-2008 and the pandemic outbreak in 2020. To specify our observations, the following criteria are applied in Thomson Reuters Datastream: 1) the firm is publicly listed in a stock exchange in Asia, Europe, and North America; 2) the firm is focusing on real estate management and development according to the Global Industry Classification Standard (GICS), not REITs; 3) the firm has an efficient trading history from 2007 to 2020; 4) the firm's stock is liquid, where we consider stocks with more than 30% of daily returns equal to zero as illiquid. The final sample comprises 326 global real estate management and development firms from 19 markets covering Asia, Europe, and North America.

The regional distribution of the sample is presented in Table 1. As for business scopes, based on GICS, we classify real estate development and diversified activities, mainly including development and sales businesses as a subgroup named *Develop&*, while real estate operates and services that focus on leasing, management, and brokerages as the subgroup *Operating&*. In the final sample, over 60% are firms with the business focus of development and diversified activities from Asia. In Europe, the number of firms concentrating on real estate operating and services overweighs the development ones. The sample from North America shows an insignificant difference between the two business scopes. The regional business distribution can reveal market maturity to some extent. In Asia, due to the high

development speed and urbanization process, the increasing demand for housing and commercial buildings stimulates real estate development. On the other side, European and North American markets tend to be more mature. The demand for new real estate projects is potentially more stable and people would focus on operating and services in existing buildings.

**Table 1** Regional distribution of the sample<sup>1</sup>

Region	Country	Develop&	Operating&	Total
All	All	243	83	326
Asia	All	207	28	235
	China (mainland)	115	11	126
	Hong Kong	52	8	60
Europe	Taiwan	40	9	49
	All	27	45	83
	Austria	0	3	3
	Belgium	1	4	5
	Denmark	2	2	4
	Finland	0	1	1
	France	4	1	5
	Germany	3	9	12
	Greece	3	0	3
	Italy	4	1	5
	Netherlands	1	0	1
	Norway	1	2	3
	Spain	3	0	3
	Sweden	0	14	14
	Switzerland	2	4	6
North America	UK	3	4	7
	All	9	10	19
	Canada	4	4	8
	USA	5	6	11

To further understand the regional differences of the sample, we calculate the annualized return and volatility as well as the average market cap using monthly trading data from January 2007 to April 2020. The results are shown in Table 2. In terms of annualized returns, Asian real estate stocks perform best but are subject to high risk and small size, especially the ones focusing on development and diversified business. On the contrary, operating and services firms in Europe and North America perform significantly better than real estate developers, who even suffer negative annualized returns and high risk, particularly in Europe.

**Table 2** Summary statistics of real estate stocks<sup>2</sup>

Region	Business scope	N	Annualized return (%)		Annualized volatility (%)		Average size (USD mil)	
			Mean	p50	Mean	p50	Mean	p50
All	All	326	1.88	3.49	49.39	48.69	16.14	0.68
Asia	All	235	3.48	3.92	52.53	51.26	0.86	0.44
	Develop&	207	3.59	3.95	53.17	51.33	0.82	0.44
	Operating& Diff.	28	2.69	2.73	47.81	48.63	1.16	0.45
Europe	All	72	-2.82	1.34	41.70	38.86	62.12	13.74
	Develop&	27	-12.06	-9.37	51.84	49.24	118.04	31.37
	Operating&	45	2.72	4.24	35.61	34.37	28.57	12.24
	Diff.		***	***	***	***		***
North America	All	19	-0.13	0.67	39.65	38.72	29.22	23.11
	Develop&	9	-6.47	-8.14	39.29	38.85	34.17	32.85
	Operating&	10	5.58	4.46	39.97	38.64	24.77	13.10
	Diff.		***	***				

The descriptive statistics show the regional differences of listed firm numbers, business scopes, as well as return and risk profiles. In the next section, we illustrate the factor models to explain the stock performance and the influence of the financial crisis during 2007-2008 and the pandemic crisis of COVID-19.

### 3.2 Factor Models

We apply the widely used factor-based asset pricing model on the monthly returns of 326 real estate stocks from January 2007 to April 2020 to investigate whether general risk-premium factors can explain the stock performance of real estate firms. We estimate the coefficients  $\beta$  of factors by applying the ordinary least squares (OLS) regression on the excess return of stock  $i$  on day  $t$ , adjusted for heteroscedasticity, and applied fixed effects on firm-level.

Here, we apply Sharpe's (1964) capital asset pricing model (CAPM), Fama and French's three- (1993, 1996) and five- (2015) factor models, respectively as follows:

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt} * (R_{m,t} - r_{f,t}) + \varepsilon_{i,t} \quad (1)$$

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt} * (R_{m,t} - r_{f,t}) + \beta_{i,smb} * SMB_t + \beta_{i,hml} * HML_t + \varepsilon_{i,t} \quad (2)$$

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt} * (R_{m,t} - r_{f,t}) + \beta_{i,smb} * SMB_t + \beta_{i,hml} * HML_t + \beta_{i,rmv} * RMV_t + \beta_{i,cma} * CMA_t + \varepsilon_{i,t} \quad (3)$$

In the equations,  $r_{f,t}$  is the risk-free rate and  $R_{m,t}$  is the return of the market portfolio. The size factor  $SMB_t$  shows the excess returns of small stocks over large stocks, implying the risk of smaller size yielding higher premiums. The value factor  $HML_t$  captures the excess returns of value stocks over growth stocks, meaning that firms with lower valuation get more rewarded than expensive ones. The profitability factor  $RMV_t$  indicates the excess returns of stocks with high operating profits over low operating profits and the investment factor  $CMA_t$  is formed by the excess returns of stocks with low investment over high investment. These two factors imply that firms with more operating profits and lower investment are rewarded in stock markets. The monthly five-factor data and risk-free rates for Asia<sup>3</sup>, Europe, and North America are obtained from the French's website.

To check the influence of the pandemic crisis of COVID-19 in 2020, and comparison to the financial crisis during 2007-2008, we introduce two dummy variables. The extended five-factor model is adjusted as follows (similarly applied to the CAMP and the three-factor model):

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt} * (R_{m,t} - r_{f,t}) + \beta_{i,smb} * SMB_t + \beta_{i,hml} * HML_t + \beta_{i,rmv} * RMV_t + \beta_{i,cma} * CMA_t + \gamma_i * Financial\ crisis + \delta_i * Pandemic\ crisis + \varepsilon_{i,t} \quad (4)$$

The dummy variable *Financial crisis* equals 1 if the time series is located in the time window from January 2007 to December 2008 and 0 otherwise. Similarly, the dummy variable *Pandemic crisis* equals 1 if the time series is located in the time window from January to April 2020 to capture the influence of the first global breakout wave of the COVID-19.

## 4.0 FINDINGS

### 4.1 Rewarded Risk Factors for Real Estate Stocks

Table 3 shows that the stock performance of real estate stocks can be explained by factors only to some extent. When comparing model (1), (3), and (5), the extended factors can improve the adjusted  $R^2$  that measures the proportion of the variation in excess returns explained by the factors after adjusting the random effect due to the increasing number of variables. However, the unexplained returns for individual stocks are significant through all factor models. In model (1) the market risk can explain the stock performance of real estate to approximately 16.5%, while in model (3) the added size (SMB) and valuation (HML) factors only improve the predictability by around 2.2%. In model (5), the operating profitability (RMV) and investment (CMA) factors only have a trivial contribution to explaining the excess returns of real estate stocks. As for rewarded factors, implied by the signs of significant betas, the positive exposures to market, small size, and low valuation risks are rewarded as they increase excess returns. On the contrary, firms with high operating performance and low investment detracted from stock performance, meaning that these risk factors do not yield extra returns for real estate firms. Within the real estate sector, we notice that the average firm size shown in Table 2 is in general small, where real estate development and diversified firms are from nature highly investment-intensive, which can explain that the low investment should not be rewarded factor. Large expenses associated with investment activities can further exclude high operating profits from explaining excess returns.

When considering the influence of the financial and pandemic crises on excess returns in model (2), (4), and (6) in Table 3, we observe that the financial crisis during 2007-2008 shows a negative impact on real estate stocks while the pandemic crisis unexpectedly has significant positive coefficients in the three- and five-factor models. The significant positive coefficients of the dummy variable imply that, during the period of the outbreak of COVID-19, the returns of the observed firm have significantly increased. In model (4), the excess returns are increased at around 0.017. However, compared to model (3), we do not observe a strong improvement of adjusted  $R^2$ , meaning that the dummy variable of the pandemic crisis has little contribution to explain the overall excess stock returns. These findings stay robust for the five-factor models (5) and (6).

To understand the positive phenomenon, one has first to recap the causes. The COVID-19 pandemic directly influences all economic activities, for example, due to the regional shutdown, the retail business got into a standstill that would also affect its global suppliers. Under this situation, sectors that depend on liquidity are at high costs. Real estate firms are generally regarded as less liquid because of the long development process and the stable services relationship. These features can potentially make real estate stocks offer diversification value in down markets caused by the COVID-19 crisis. However, whether this holds long for all regional markets needs to be investigated from a longer perspective, especially when the economic damage weighs on household incomes in the lagged periods.

**Table 3** Factors explaining excess returns of real estate stock<sup>4</sup>

	(1) CAPM	(2) &Crisis	(3) 3-Factor	(4) &Crisis	(5) 5-Factor	(6) &Crisis
$\beta_{i,mkt}$	0.816*** (88.888)	0.813*** (87.287)	0.795*** (87.292)	0.799*** (86.842)	0.735*** (72.592)	0.740*** (71.918)
$\beta_{i,smb}$			0.499*** (21.890)	0.499*** (21.820)	0.374*** (14.964)	0.376*** (14.995)
$\beta_{i,hml}$			0.546*** (24.302)	0.565*** (24.850)	0.508*** (17.238)	0.512*** (17.300)
$\beta_{i,rmv}$					-0.319*** (-8.683)	-0.320*** (-8.744)
$\beta_{i,cma}$					-0.301*** (-7.956)	-0.276*** (-7.173)
Financial crisis (2007-2008)		-0.005*** (-2.891)		-0.004** (-2.250)		-0.004** (-2.088)
Pandemic crisis (2020)		0.002 (0.561)		0.017*** (6.006)		0.011*** (3.748)
Intercept	-0.014** (-1.969)	-0.013* (-1.862)	-0.013* (-1.891)	-0.013* (-1.865)	-0.011* (-1.660)	-0.011 (-1.621)
Fixed firm	Yes	Yes	Yes	Yes	Yes	Yes
Observed firm	326	326	326	326	326	326
Observed month	160	160	160	160	160	160
R <sup>2</sup>	0.170	0.170	0.192	0.193	0.196	0.196
Adjusted R <sup>2</sup>	0.165	0.165	0.187	0.188	0.191	0.191

Table 4 further presents regional differences in explaining factors of stock performance among Asian, European, and North American real estate markets. As the majority of the sample comes from Asia, all five factors remain significant with market, size, and valuation yield extra returns while investment and profitability detracted. However, the valuation and investment factors lost their explaining power for European stocks. Our results are partially in line with Schulte et al. (2011) as they find results on HML are mixed for real estate stocks in a pan-European context. In North America, the profitability factor cannot explain the stock performance of real estate. We also notice that how the crisis affects excess returns is quite different among regions. As for the influence of the financial and pandemic crises on excess returns in Table 4, we find that the financial crisis during 2007-2008 shows a negative impact on real estate stocks particularly in Europe, while the pandemic crisis has significant positive coefficients only in Asia. In model (2), the significant positive coefficients of the dummy variable imply that, during the period of the outbreak of COVID-19, the excess returns of the Asian real estate firms have significantly increased at around 0.014. However, compared to model (1), we do not observe a strong improvement of R<sup>2</sup>, meaning that the dummy variable of the pandemic crisis has little contribution to explain the overall excess stock returns. According to the results, we find that only in Asia, real estate stocks seem to offer some diversification value during the COVID-19 pandemic. In the next section, we examine regional real estate markets by business scopes and address which segmentation can be the source of diversification.

**Table 4** Regional differences of explaining factors<sup>5</sup>

	Asia		Europe		North America	
	(1) 5-Factor	(2) &Crisis	(3) 5-Factor	(4) &Crisis	(5) 5-Factor	(6) &Crisis
$\beta_{i,mkt}$	0.724*** (58.057)	0.733*** (57.409)	0.891*** (39.901)	0.882*** (39.013)	0.867*** (17.958)	0.866*** (17.822)
$\beta_{i,smb}$	0.326*** (11.013)	0.333*** (11.196)	0.685*** (13.730)	0.658*** (13.139)	0.293*** (2.994)	0.288*** (2.930)
$\beta_{i,hml}$	0.581*** (16.397)	0.587*** (16.476)	-0.041 (-0.554)	-0.040 (-0.531)	0.514*** (4.764)	0.493*** (4.529)
$\beta_{i,rmv}$	-0.347*** (-8.260)	-0.346*** (-8.268)	-0.487*** (-5.312)	-0.475*** (-5.136)	-0.151 (-1.125)	-0.161 (-1.162)

$\beta_{i,cma}$	-0.313*** (-7.235)	-0.293*** (-6.641)	-0.118 (-1.255)	-0.057 (-0.592)	-0.394** (-2.455)	-0.392** (-2.448)
Financial crisis (2007-2008)		-0.000 (-0.209)		-0.012*** (-4.373)		-0.001 (-0.125)
Pandemic crisis (2020)		0.014*** (4.145)		-0.002 (-0.330)		-0.012 (-0.933)
Intercept	-0.001 (-0.253)	-0.002 (-0.321)	-0.013* (-1.893)	-0.011 (-1.622)	0.000 (0.051)	0.001 (0.107)
Fixed firm	Yes	Yes	Yes	Yes	Yes	Yes
Observed firm	235	235	72	72	19	19
Observed month	160	160	160	160	160	160
R <sup>2</sup>	0.179	0.179	0.287	0.288	0.212	0.212
Adjusted R <sup>2</sup>	0.173	0.174	0.282	0.283	0.205	0.205

#### 4.2 Diversification Value during the Crises

Table 5 shows the results for each region divided by business scopes *Develop&* and *Operating&*. In Asia, real estate firms focusing on development and diversified activities are proven differently than those offering operating and services. For the subgroup *Operating&*, the investment factor loses its explaining power in stock performance. As services suppliers, firms are not necessarily engaged in investment-intensive projects, which are also proven in Europe and North America. In addition, the subgroup *Develop&* in Asia seems to be the source of diversification during the COVID-19 pandemic, as the coefficient shows a highly significant positive sign in model (1), meaning that during the first four months of 2020, excess returns of Asian real estate developers tend to have increased at around 0.015. However, for Asian real estate services, this effect disappears. We could not identify similar results in Europe and North America, as the subgroup *Develop&* shows insignificant results on the variable of pandemic crisis. Moreover, according to model (3) European real estate operating and services firms seem to suffer significant losses during the financial crisis and the COVID-19 pandemic. We observe significant negative coefficients during both crises, meaning that during the period the financial crisis over 2007-2008, the excess returns suffer an average decrease of 0.013, while during the outbreak of COVID-19, the excess returns drop at around 0.016. We do not observe a strong improvement of adjusted R<sup>2</sup> despite the significant coefficients, meaning that the dummy variables has little contribution to explain the overall excess stock returns.

**Table 5** Different reaction to the crises: regions and business scopes<sup>6</sup>

	Asia		Europe		North America	
	(1) Develop&	(2) Operating&	(3) Develop&	(4) Operating&	(5) Develop&	(6) Operating&
$\beta_{i,mkt}$	0.737*** (53.874)	0.700*** (19.880)	0.906*** (21.231)	0.870*** (33.712)	0.871*** (13.121)	0.863*** (12.283)
$\beta_{i,smb}$	0.341*** (10.621)	0.279*** (3.573)	0.770*** (8.215)	0.594*** (10.383)	0.347** (2.442)	0.233* (1.709)
$\beta_{i,hmt}$	0.633*** (16.474)	0.250*** (2.669)	0.124 (0.884)	-0.136 (-1.603)	0.691*** (4.369)	0.314** (2.097)
$\beta_{i,rmv}$	-0.325*** (-7.196)	-0.496*** (-4.630)	-0.589*** (-3.417)	-0.413*** (-3.886)	-0.240 (-1.207)	-0.093 (-0.481)
$\beta_{i,cma}$	-0.312*** (-6.555)	-0.153 (-1.337)	-0.131 (-0.730)	-0.020 (-0.182)	-0.454** (-1.966)	-0.335 (-1.514)
Financial crisis (2007-2008)	0.001 (0.376)	-0.010* (-1.773)	-0.008* (-1.739)	-0.013*** (-4.365)	-0.003 (-0.367)	0.001 (0.169)
Pandemic crisis (2020)	0.015*** (4.345)	0.001 (0.062)	0.020 (1.561)	-0.016** (-2.103)	-0.008 (-0.395)	-0.017 (-0.904)
Intercept	-0.002 (-0.396)	0.008 (0.851)	-0.011* (-1.673)	0.007 (1.575)	0.009* (1.763)	-0.000 (-0.078)

Fixed firm	Yes	Yes	Yes	Yes	Yes	Yes
Observed firm	207	28	27	45	9	10
Observed month	160	160	160	160	160	160
R <sup>2</sup>	0.179	0.188	0.249	0.327	0.249	0.184
Adjusted R <sup>2</sup>	0.173	0.181	0.243	0.322	0.241	0.176

We observe that Asian real estate firms focusing on development and diversified activities have the potential to offer diversification value for investors during the COVID-19. Besides the mentioned causality of the crisis, where economic activities are suddenly at a standstill but real estate developers are not at high costs due to their rather illiquid business. There are several possible reasons due to market specialties in Asia, in particular, the mainland of China, Hong Kong, and Taiwan that are included in our sample. First, as shown in Table 2, the average size of these firms is 0.82 USD million measured by market cap. For such small firms, their investment is generally put in projects with regional and specific real estate type focus that they may suffer less burden of administration and employee costs as well as lower region and regulation risks than bigger real estate developers. During the crisis, smaller real estate developers may have more flexibility with limited projects and employee numbers, as general contractors will take part of the risk of construction projects and workers. On the other hand, as property owners, they have more financial flexibility by using mortgages to get liquidity during the pandemic crisis. Second, the demand for properties in Asia remains high due to both living and investing needs, and the COVID-19 disease was faster under control compared to the rest of the world. According to Fitch Ratings<sup>7</sup>, 92.7% of homebuilders' sales offices in China had resumed operation by end-March 2020. The sales recovery appears to have been sustained throughout March and April, wherein some cities the sales number exceeded the prior year's level in mid-April. With extremely low interest rates, many investors seek to take advantage of credits and invest in real estate markets instead of the highly volatile stock markets. Although there are restrictions for global investors to directly invest in Asian real estate markets, listed stocks may offer them an alternative investment opportunity.

## 5.0 CONCLUSION

The purpose of this paper is to investigate the change in risk perception associated with real estate stocks during the COVID-19 pandemic and financial crisis in 2007-2008. Due to a prodigious increase in uncertainty of economies and capital markets, investors search for alternatives that offer a solid risk/return profiles and diversification benefits in times of low interest rates. Even though, there are several restrictions to directly invest into real estate in some countries, listed stocks may offer investors an alternative investment opportunity. Our empirical evidence shows that real estate stocks do not act as a safe asset during crises. There are several reasons for this. Firstly, the risk factors as defined by Fama and French are not ideally suited to real estate stocks, as opposite signs are shown for the investment and profitability factors compared to general stocks. Secondly, there are regional differences between Asian, European and US real estate markets with Asian markets exhibiting stronger diversification advantages during the crisis periods studied. More so, differences in business scopes lead to specific reactions to the crises in the time-frame studied. Asian firms focusing on real estate development and diversified activities are found to perform better during the COVID-19 pandemic. In contrast, European real estate stocks are found to perform the worst from the three studied continents in terms of annualized return, especially for firms offering real estate development and diversified activities. Furthermore, it was found that operating and services firms in Europe suffer a significant negative effect and have lower diversification value. However, there are some limitations to our study. As the COVID-19 pandemic and its economic consequences are still in their infancy, we are not able to capture the full effects to real estate stocks. Indeed, a longer time frame in the crisis period would be necessary to evaluate these dynamics. Further, due to the restricted time frame we are not able to account for the effect that the pandemic has spread in a different manner and a different pace within the countries. Finally, we have only investigated listed companies from Asia, Europe and North America. To gain a more profound global picture, one has to consider more countries in the sample. Irrespective of these restrictions, this study contributes to the limited body of existing literature in the field of pandemic impacts to real estate equities. Our findings also have decisive practical implications for the design of more diversified asset portfolios incorporating real estate securities for international investors.

## Notes

- (1) Table 1. This table presents the regional distribution of 326 real estate firms by country and business scope. Based on GICS, real estate development and diversified activities are classified as *Develop&*, while real estate operating and services are classified as *Operating&*. Hereafter the same classification.
- (2) Table 2. This table presents the summary mean and median (p50) statistics of return, risk, and size of 326 real estate firms from January 2007 to April 2020. The t-test (mean) and Wilcoxon rank-sum test (p50) are applied to examine the difference of the two business scopes within each region. Statistical significance at the 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, and \*, respectively.
- (3) We apply the factor data for Asia except Japan that matches our sample distribution in Asia.
- (4) Table 3. This table presents the coefficients of general risk-premium factors as well as the influence of the financial and pandemic crises on the monthly excess return of 326 real estate stocks from January 2007 to April 2020. Robust t-statistics using the White test are given in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, and \*, respectively.
- (5) Table 4. This table presents the coefficients of general risk-premium factors as well as the influence of the financial and pandemic crises on the monthly excess return of 326 real estate stocks from January 2007 to April 2020. Robust t-statistics

using the White test are given in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, and \*, respectively.

- (6) Table 5. This table presents the coefficients of general risk-premium factors as well as the influence of the financial and pandemic crises on the monthly excess return of real estate stocks from January 2007 to April 2020. Robust t-statistics using the White test are given in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, and \*, respectively.
- (7) See <https://www.fitchratings.com/research/corporate-finance/china-property-watch-april-2020-30-04-2020>.

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