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Abstract

This paper aims to introduce new evidence of consistently negative impacts on enterprise value when corporations increase real estate holdings. Adopting a different approach from previous studies, our data analysis shows that corporate real estate portfolios and enterprise value share an inverse relationship. Surprisingly, this trend was seen during the Japanese real estate bubble in the late 1980's. Previous reports from the United States and Singapore show that only in the retail sector do increases in corporate real estate holdings have a positive influence on stock performance. However, our research indicates that the stock performance of Japanese firms in the retail sector was negative across the board for firms in other sectors.

Keywords: Corporate real estate, Stock performance, Systematic risk, Stock market

1. Introduction

Corporations raise capital and deploy these funds to invest in assets as part of their business activities. In turn, the performance of such activities is evaluated by investors using various profitability indexes, such as return on invested capital and return on assets. If investment performance exceeds the cost of capital, the firm's enterprise value increases and vice versa. This mechanism is the fundamental essence of corporate finance.

Corporate real estate (CRE) is defined as the total of land and buildings owned by a firm and makes up the largest portion of its asset holdings. Yu and Liow (2009) report that as of 2006, the ratio of CRE to total assets (CRER) has been about 36%, 33%, and 32% for North America, Europe, and Asia, respectively. From this finding leads us to conclude that it is essential for firms to devise financial strategies that utilize CRE effectively to maximize enterprise value.

On the other hand, other studies on this topic point out that the stock market evaluates real estate-heavy firms negatively. Liow (2004) finds such a negative impact of CRE holdings on Singaporean firms. Using a dataset of nine countries, Brounen and Eichholtz (2005) also find a relationship between CRE holdings and stock performance that is negative but not statistically significant. The authors hypothesize that this is due to market participants viewing investments in CRE as a necessary evil, since they require the commitment of vast capital for relatively long periods.

In addition, some studies point out that the relationship between CRE holdings and stock performance varies, depending on the firm's industry. Brounen and Eichholtz (2005) report that the impact of CRE holdings on stock performance hinges on the firm's industry sector rather than geography. Because retailers are highly dependent on their store locations in terms of sales and CRE is therefore closely integrated with the core business, Brounen et al. (2005) focus on listed retail companies. The authors find that their CRE holdings are generally associated with a positive return performance. Contrary to the literature that claims a negative relationship, Yu and Liow (2009) report positive impacts of CRE holdings on retail sectors using a different analytical methodology.

However, most previous studies focus primarily on the cross-sectional impact of CRE holdings on stock performance and do not factor in the time-series variation of real estate prices.[1] As observed in the 2008 U.S. housing bubble collapse, real estate prices fluctuate considerably with economic conditions (i.e., the boom and bust cycle). This poses an interesting question: Does the stock market deem CRE holdings a negative factor on shareholder value when real estate prices go up rapidly?

Furthermore, we notice that the numbers of observations and representative subsets used in previous studies are relatively small, raising the question of the overall validity of those

[1] Liow (2004) uses data from 1997–2001 and states that CRE holdings had a negative impact on the stock performance of non-real estate firms immediately following the Asian financial crisis. The authors add that this conclusion should not be applicable to other periods.

findings. Against such a backdrop, we perform tests using extensive data with respect to both cross-sectional and timer-series analyses.

This paper analyzes the impact of changes in CRE holdings on Japanese non-real estate firms by adopting a different methodology from that of previous studies. The advantages of targeting Japanese firms are as follows. First, we can acquire vast amounts of data in terms of both cross section and time series since the Japanese stock market is one of the largest in the world since a long time. Furthermore, since Japan's real estate market is also the second largest in the world,[2] it is suitable for testing our hypothesis. We collected 27,753 observations for our analysis.

Second, the Japanese economy is prime testing ground for our hypothesis, because Japan experienced a real estate bubble and its collapse from the late 1980's to the early 1990's. Using data from the Land Market Value Publication published by the Ministry of Land, Infrastructure, Transport and Tourism, Figure 1 shows the fluctuation of land prices in Japan (1970 prices benchmarked at 100 points). Based on the overall average from this figure, we notice that land prices rose sharply, by about 600 points, during the 1980's and fell by 300 points as of 2009. Using panel data during the 30-year period since 1978, we seek to examine any significant changes in the relationship between CRE holdings and stock performance during the real estate bubble of the 1980's until its collapse after the early 1990's.

[2] According to Fiorilla et al. (2012), the size of the global institutional-grade commercial real estate market in Japan was US$2.7 trillion, the second largest after the United States as of 2011.

(Figure 1)

As a result, we find that the stock performance of firms that have increased their CRE holdings is, on average, significantly negative. In addition, we show that these firms do not experience a significant increase in systematic risk (i.e., beta close to zero). Surprisingly, such a trend was observed even when the real estate bubble economy was fairly buoyant. Contrary to several overseas studies that report that only in the retail sector does property ownership positively influence stock performance, our research results show the exact opposite, where the stock performance of Japanese firms in the retail sector is consistently negative, in parallel with the trend of firms in other sectors.

The remainder of this paper is organized as follows. The next section reviews the literature. Section 3 develops the methodology and discusses the sample data used in our research. Section 4 presents the empirical results, followed by Section 5, which draws our conclusions.

2. Literature Review

Seiler et al. (2001) investigate the relationship between CRE ownership and firm performance. In their analysis, they use a set of two-stage least squares (2SLS) equations to examine whether real assets provide a diversification benefit to US corporations. The authors assume that if real estate assets provide such a benefit, then firms with real estate assets

should achieve a higher rate of return for a given level of risk or a lower level of risk for a given rate of return. Their results from scrutinizing a dataset of 80 US firms from 1985 through 1994 show no significant relationship between CRE and systematic beta or between CRE and risk-adjusted returns. From these findings, the authors conclude that further research is needed to draw any generalizations.

Liow (2004) examines the impact of CRE on the stock market for 75 Singaporean non-real estate corporations with portfolios comprised of at least 20% real estate assets from 1997 to 2001. The author uses the monthly property proxy index and the stock market index to isolate hypothetical business returns from stock returns. The results of calculating the comparative median returns, total risk, time-varying systematic risk, and time-varying risk-adjusted return values for the four pairs of stock return and business return series, suggest that CRE holdings are associated with lower returns, lower risk-adjusted returns, higher risks, and higher systematic risk. This negative impact of CRE on stock market performance is consistent across the board for all non-real estate firms in different industries and with varying levels of exposure to real estate assets.

Brounen and Eichholtz (2005) use 2SLS to investigate the relationship between CRE holdings and stock market performance in nine countries for the years 1992, 1995, 1998, and 2000. Their findings indicate that aggregate CRE holdings have significantly decreased over time, although the levels of CRE exposure vary across industries. Using the same

aforementioned method to measure the impact of CRE holdings on stock market performance, the authors find an insignificant adverse relationship between CRE holdings and both risk-adjusted return and firm systematic risk, although such impact differs across industries. Furthermore, they find that the retail sector is generally associated with higher CRE exposure, largely due to the inevitable nature of real estate constituting a vitally strategic asset for businesses engaged in this sector.

Hwang et al. (2005) examine the diversification effects of CRE holdings for US-based multinational corporations (MNCs). They use a series of rolling 2SLS regression models on a sample set of data from 91 firms selected from the first quarter of 1992 through the fourth quarter of 2001 to determine the relationships shared between CRE holdings, systematic risk (beta), and risk-adjusted returns. They find that the CRE holdings of US-based MNCs have a significant negative impact on firm systematic risk during limited periods but no significant impact on risk-adjusted returns. These findings ultimately imply that the CRE holdings of US-based MNCs do not have a diversification effect on firm systematic risk.

Brounen et al. (2005) focus on firms in the retail sector since CRE holdings in this sector appear to be strategically important for these firms. By applying an ordinary least squares regression methodology to data accumulated from 454 international retailers between 1999 and 2002, the authors measure the impact of CRE holdings on their respective stock performance. The results show that CRE holdings have a significant positive relationship with

risk-adjusted returns and a significantly adverse effect on systematic risk. Although Brounen and Eichholtz (2005) reports an insignificant negative relationship between CRE holdings, risk, and returns in general, the results suggest that this relationship may be dependent on how closely CRE holdings are associated with the firm's core business.

Employing the same method as Liow (2004), Yu and Liow (2009) study the impact of CRE holdings on risk returns for international retail firms from a sample set of 556 firms from 15 countries between 2001 and 2006. Similar to Brounen et al. (2005), the authors find that higher levels of CRE holdings are associated with better stock market performance. In particular, their results indicate that positive market performance is incremental on a diminishing return to scale (i.e., performance growth becomes proportionately lower as CRE exposure increases), which suggests that there may be an optimal level of CRE holdings to induce relatively positive stock performance benefits. The authors conclude that further research is needed to verify this hypothesis.

Looking back on previous studies, we identify no consistent relationship between CRE holdings and risk return in general, thus implying the fact that the impact of CRE holdings on stock performance may depend on the subject company's industry sector or general business characteristics. Although previous studies are limited to analyzing cross-sectional data between the 1980's and the early 2000's, our study encompasses a broader time span (the 1970's to the late 2000's) that includes both economic boom and bust cycles of the real estate

markets (i.e., asset bubbles). The study also adopts the panel data methodology to consider the potential impact of economic status on CRE holdings. In contrast to previous studies based on rather narrow sample sets, our study employs an extensive sample set of over 20,000 samples, leading to more precise empirical results.

3. Research Design

3.1. Methodology

As with previous studies, we define CRE holdings as buildings and structures plus land and other non-depreciable property. To estimate the impact of the change of CRE holdings on changes in excess return and systematic risk, we measure the former based on the Fama and French three-factor model (Fama and French (1993)). We use a window of 48 months (t - 35 to t + 12, where $t = 0$ is the end of a given fiscal year) to estimate the parameters of the regression model:

$$r_{ii} - r_{mt} = \alpha_i + \Delta\alpha_i d_t + b_i(r_{mt} - r_{ft}) + \Delta b_i d_t(r_{mt} - r_{ft}) + s_i SMB_t + \Delta s_i d_t SMB_t + h_i HML_t + \Delta h_i d_t HML_t + \varepsilon_t \quad (1)$$

where d_t is a dummy variable equal to one during a given fiscal year from t + 1 to t + 12 and zero otherwise; $\Delta\alpha_i d_t$ measures the changes in excess return during a given fiscal year when firms increase or decrease CRE holdings; and, similarly, $\Delta b_i d_t$, $\Delta s_i d_t$, and $\Delta h_i d_t$ measure the changes in factor loading during a given fiscal year when firms increase or decrease CRE

holdings. We obtain the changes in systematic risk ($\Delta RISK$) by summing up the factor loadings.

Previous studies show that excess return and systematic risk are correlated with firm size, leverage, and the book-to-market ratio. To allow for differences in a firm's financial profile, we regress changes in excess return and systematic risk on firm size, leverage, and the book-to-market ratio:

$$\Delta\alpha_i = \beta_1 + \beta_2 \Delta CRER_t + \beta_3 CRER_t + \beta_4 LnSIZE_t + \beta_5 LEV_t + \beta_6 BM_t + \varepsilon_t \quad (2)$$

$$\Delta RISK_i = \beta_1 + \beta_2 \Delta CRER_t + \beta_3 CRER_t + \beta_4 LnSIZE_t + \beta_5 LEV_t + \beta_6 BM_t + \varepsilon_t \quad (3)$$

where $CRER_t$ is CRE holdings divided by the book value of total assets, Ln$SIZE_t$ is the natural log of the book value of total assets, LEV_t is debt divided by the book value of total assets, BM_t is the book value of equity divided by the market value of equity, and $\Delta CRER_t$ measures changes in CRE holdings from t to $t + 1$. We define $\Delta CRER_t$ as CRE holdings at fiscal year $t + 1$ minus CRE holdings at fiscal year t, which are divided by the book value of assets at fiscal year t. All reported regressions use White (1980) heteroskedastic-consistent errors corrected for correlations across a given firm's observations.

3.2. Sample

Stock data are compiled from Portfolio Master, provided by Financial Data Solutions, and financial data are compiled from NEEDS Financial Quest, provided by Nikkei Media

Marketing. Our sample set consists of all firms listed on first and second sections of the Tokyo Stock Exchange (TSE) between September 1977 and December 2009. In accordance with previous research methodology, financial firms, utility firms, and real estate companies are excluded from the sample set. To further narrow down the sample, any firm without continuous monthly returns from t - 35 to t + 12 are excluded. Also excluded are firms whose data on CRE holdings, market value, total liabilities, and market-to-book ratio of equity is either unavailable or unusable for two consecutive fiscal periods. The top and bottom 1% of all variables are omitted. The final sample consists of 27,753 firm–years.

Table 1 is a summary of CRER statistics calculated by CRE divided by total assets, sorted by industry based on the TSE classification.[3] This table shows that average CRE holdings are 18.3% against total assets. The land transportation sector has the highest CRE holdings ratio (40% of total assets) and the marine transportation ranks the lowest (6.6% of total assets).

(Table 1)

4. Results

This section highlights our empirical results, beginning with statistics from the univariate analysis in Section 4.1 and followed by results of the regression analysis in Section 4.2, to

[3] Five industry sectors excluded from the TSE's 33 sectors are banks, insurance, securities and commodities futures, electric power and gas, and real estate.

accurately measure the relationship between changes in excess return or systematic risk with CRE holdings.

4.1. Univariate Analysis

To investigate the relationship between CRE holdings and changes in excess return or systematic risk, we divide the sample into two groups, based on whether the firms in question increased or decreased CRE during a given fiscal year. Table 2 shows the results of the median difference between the set categorized by increased CRE and that categorized by decreased CRE. For this analysis, we exclude firms that did not change CRE holdings ($\Delta CRE = 0$). Panel A of Table 2 reports the results for the total sample. The figures from Panel A imply that CRE holdings are perceived negatively by the market: $\Delta\alpha$ is noticeably negative for firms that increased CRE, but noticeably positive for firms that decreased CRE. The Inc-Dec column shows that the difference in $\Delta\alpha$ for firms that altered their CRE exposure is significantly negative at the 1% level.

This relationship is prevalent in other subsample periods. Panel B of Table 2 shows the results for the bubble economy period. As is apparent from the ΔCRE data, firms continuously increased CRE holdings during this period. Based on these results, it seems that stock market participants do not consistently appreciate firms that increase their CRE portfolios.

From the data in Panel C of Table 2, we observe that the excess returns of CRE-increasing firms are far below the levels seen in other subsamples. The real estate myth was debunked as land prices collapsed during this period. Such results imply that the market does not perceive CRE as a profitable investment. Panel D shows the results during the rebound period, when land prices gradually returned to pre-bubble levels. This panel indicates that the difference between the two groups (increase/decrease) is significantly negative. Hence, regardless of economic conditions, firms that increase CRE holdings are consistently perceived as experiencing negative performance in comparison to firms that decrease CRE exposure.

However, when focusing on changes in systematic risk, no such relationship is found. The median difference of Δ*RISK* between the two subgroups (increase/decrease) is marginal. The term Δ*RISK* does not change substantially whether a firm increases or decreases its CRE holdings. The above results indicate that CRE exposure has barely any impact on systematic risk.

(Table 2)

4.2. Regression Analysis

To accurately estimate the impact of changes in CRE holding on changes in excess return or systematic risk, we regress Δα or Δ*RISK* on Δ*CRER*, *CRER*, Ln*SIZE*, *LEV*, and *BM*.

Table 3 shows the results of regression analysis. Each panel shows the results for $\Delta\alpha$ and $\Delta RISK$, along with regressions reports. Focusing on the results of the simple regression analysis on $\Delta\alpha$, we find the coefficient of $\Delta CRER$ to be significantly negative at the 1% level in all our sample periods. On the other hand, there is no identifiable relationship with $\Delta RISK$. These results are consistent with those of the univariate analysis in Section 4.1.

Previous studies show that excess return and systematic risk are correlated with firm size, leverage, and book-to-market ratio. To allow for differences in firm financial profiles, we conduct a multiple regression analysis. The second row of each panel in Table 3 shows the results for each multiple regression test.

Panel A shows that the *CRER* coefficient is significantly negative. This result implies that $\Delta\alpha$ is increasingly negative as CRE holdings levels increase. Panel A also shows that the coefficients of *LEV* and *BM* are significantly positive. Central to our thesis, our main finding is that the coefficient of $\Delta CRER$ is significantly negative at the 1% level. This relation holds true for all our sample periods. These results indicate that the impact of increases in CRE holdings on $\Delta\alpha$ is negative and remains consistently negative, regardless of economic conditions.

Apart from the regression results on $\Delta\alpha$, $\Delta CRER$ and *CRER* do not have any significant effects on $\Delta RISK$ during any our sample periods. All things considered, these results indicate that CRE holdings have a negative impact on $\Delta\alpha$ but no effect on $\Delta RISK$. This implies that the

stock market perceives CRE holdings as a negative factor in enterprise performance, even if the effect of CRE holdings on systematic risk is taken into account.

(Table 3)

Brounen et al. (2005) and Yu and Liow (2009) examine the relationship between excess return and CRE holdings in the retail industry. In addition, Brounen et al. (2005) report that CRE holdings have an impact on systematic risk. To clarify whether the impact of CRE holdings on $\Delta\alpha$ or $\Delta RISK$ varies by industry, we re-estimate equations (2) and (3), sorted by industry (see Table 4).

Table 4 shows the coefficient of $\Delta CRER$ based on the multiple regression analysis from equations (2) and (3). It reports that the coefficients are negative throughout almost all industries. Note that only the marine transportation industry, with the lowest ratio of CRE holdings, has a significant positive coefficient. In this industry, α significantly increases with CRE holdings. From the market's perspective, this industry makes effective use of its CRE holdings. In terms of $\Delta RISK$, we do not find any significant relationship, with the exception of a few industries. Table 4 reveals that in the oil and coal products industry, systematic risk increases with any increase in CRE holdings.

Within the retail industry, contrary to Brounen et al. (2005) and Yu and Liow (2009), we find that the relationship between $\Delta\alpha$ and $\Delta CRER$ is significantly negative. In addition, we do not find any significant relationship between $\Delta RISK$ and $\Delta CRER$.

(Table 4)

5. Conclusion

This paper analyzes the impact of changes in CRE holdings on Japanese non-real estate firms by adopting a different methodology from that of previous studies. As a result, we find that the stock performance of firms that increased their CRE holdings is, on average, significantly negative. In addition, our research does not reveal any significant relationship between CRE holdings and systematic risk. Therefore, our results imply that firms that increase CRE holdings are unable to make effective use of them.

Surprisingly, however, such a trend was observed even when the real estate bubble economy was fairly swollen. During the period when real estate prices skyrocketed, real estate-heavy firms should have seen their enterprise value grow from increasing the holdings of their property portfolios even if they could not make effective use of them. Nevertheless, the fact that the stock market does not evaluate firms that increase their CRE holdings very highly is a phenomenon that requires attention.

Furthermore, we examine the impact of changes in CRE holdings on Japanese non-real estate firms by industry. Unlike Brounen et al. (2005) and Yu and Liow (2009), we find significant negative relationship between the stock performance and CRE holdings of firms in

the retail sector as well as other sectors. One of the reasons is that although they focus on recent several years, we examine using the long-period data since 1978.

In conclusion, our results show that excessive CRE holdings tend to impair firm enterprise value, regardless of the market environment. Based on these findings, corporations should proactively develop more effective CRE strategies by disposing of unnecessary assets or leasing.

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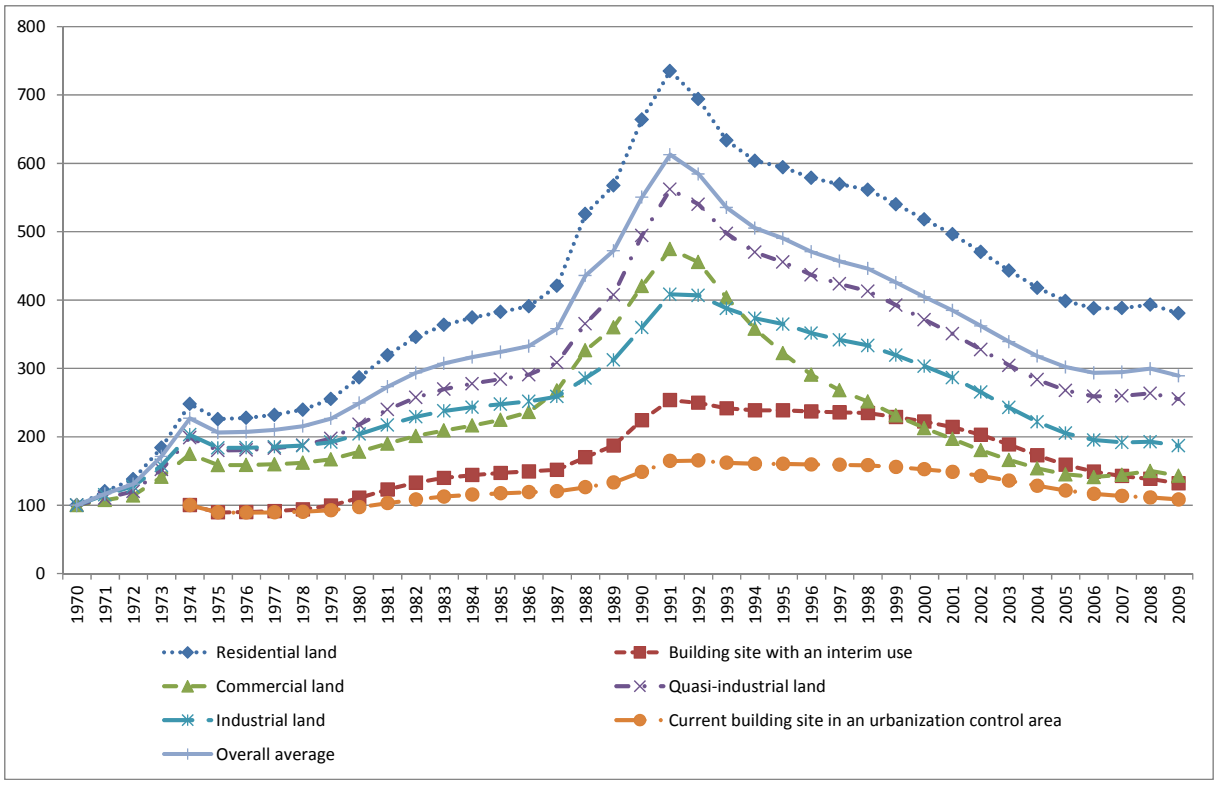
Figure 1: Land prices in Japan from 1970 to 2010

This figure shows the fluctuation of land prices in Japan (1970 prices benchmarked at 100 points).



Source: Land Market Value Publication, published by the Ministry of Land, Infrastructure, Transport and Tourism.

Table1: CRER by industry

This table summarizes CRER statistics by industry sector in ascending order of mean CRER. The industry sectors are categorized by the same classification as the TSE (33 sectors). Five sectors—banks, insurance, securities and commodities futures, electric power and gas, and real estate—are excluded from the sample.

	Min	Mean	Median	Max	S.D.	Sample
Marine Transportation	0.006	0.066	0.031	0.500	0.083	353
Fishery, Agriculture and Forestry	0.008	0.109	0.079	0.604	0.118	158
Construction	0.007	0.109	0.091	0.532	0.077	2450
Wholesale Trade	0.006	0.116	0.085	0.589	0.101	2123
Electric Appliances	0.006	0.124	0.107	0.532	0.074	3161
Precision Instruments	0.008	0.128	0.112	0.438	0.062	598
Air Transportation	0.042	0.130	0.107	0.423	0.090	90
Machinery	0.006	0.140	0.127	0.555	0.077	2647
Nonferrous Metals	0.013	0.149	0.130	0.448	0.080	668
Information & Communication	0.006	0.156	0.126	0.550	0.128	361
Pharmaceutical	0.032	0.157	0.141	0.456	0.068	655
Iron and Steel	0.010	0.167	0.163	0.528	0.075	853
Transportation Equipment	0.026	0.171	0.154	0.604	0.078	1427
Mining	0.018	0.173	0.169	0.461	0.088	212
Chemicals	0.006	0.174	0.163	0.527	0.068	2520
Pulp and Paper	0.059	0.175	0.159	0.424	0.067	445
Glass and Ceramics Products	0.022	0.179	0.163	0.607	0.089	795
Metal Products	0.033	0.193	0.174	0.609	0.096	800
Textiles and Apparels	0.006	0.194	0.171	0.615	0.114	1004
Oil and Coal Products	0.010	0.194	0.170	0.423	0.097	227
Other Products	0.013	0.195	0.190	0.521	0.090	789
Rubber Products	0.044	0.196	0.174	0.597	0.104	313
Foods	0.038	0.230	0.212	0.601	0.102	1693
Services	0.007	0.242	0.223	0.613	0.156	1065
Retail Trade	0.016	0.286	0.275	0.615	0.129	1567
Warehousing and Harbor Transportation Service	0.014	0.392	0.412	0.613	0.152	351
Land Transportation	0.059	0.401	0.411	0.613	0.126	428
Mean/Total	0.019	0.183	0.167	0.541	0.096	27753

Table 2: Univariate analysis results

This table shows the mean of $\Delta\alpha$ and $\Delta RISK$, where $\Delta\alpha$ ($\Delta RISK$) measures changes in excess returns (or systematic risk) relative to the past three years. We divide firms into two groups, based on whether firms increased or decreased their CRE holdings. Here Increase/Decrease indicates a group of firms that increased/decreased CRE holdings during the fiscal year and Inc-Dec denotes the median difference of $\Delta\alpha$ and $\Delta RISK$ between Increase and Decrease. We exclude firms that did not change CRE holdings from our sample. Panel A shows the results for the total sample. Panel B shows the results for the subsample from August 1980 to March 1991, the bubble economy period. Panel C shows the results for the subsample from April 1991 to March 2005, the period after the bubble economy period. Panel D shows the results for the subsample from April 2005 to December 2008, the rebound period. The superscripts ***, **, and * indicate that the results of the *t*-test for the mean difference and signed-rank test for the median difference are significantly different from zero at the 1%, 5%, and 10% levels, respectively.

$\Delta\alpha$ (%)	ΔCRE		Inc-Dec	$\Delta RISK$ (%)	ΔCRE		Inc-Dec
	Increase	Decrease			Increase	Decrease	
Panel A: Total Sample							
Mean	-0.239***	0.080***	-0.319***	Mean	0.031	0.044**	-0.013
t- value	-7.63	2.94	-7.68	*t*- value	1.37	2.20	-0.42
Median	-0.321***	-0.059	-0.262***	Median	0.005	-0.012	0.016
z- value	-10.08	0.09	-7.53	*z*- value	0.34	0.58	-0.03
N	11,212	16,485	-	N	11,212	16,485	-
Panel B: From Aug 1980 to Mar 1991							
Mean	-0.159***	0.208***	-0.366***	Mean	-0.049	0.027	-0.076
t- value	-3.12	3.80	-4.91	*t*- value	-1.28	0.64	-1.34
Median	-0.247***	0.070***	-0.317***	Median	-0.082**	-0.058	-0.024
z- value	-4.47	2.82	-5.07	*z*- value	-2.17	-0.53	-0.998
N	4,640	4,219	-	N	4,640	4,219	-
Panel C: From Apr 1991 to Mar 2005							
Mean	-0.328***	-0.012	-0.311***	Mean	0.086***	0.062**	0.024
t- value	-7.84	-0.36	-5.85	*t*- value	2.92	2.52	0.63
Median	-0.394***	-0.135***	-0.260***	Median	0.028**	0.014*	0.018
z- value	-9.73	-2.64	-5.67	*z*- value	1.99	1.69	0.57
N	5,277	9,723	-	N	5,277	9,723	-
Panel D: From Apr 2005 to Dec 2008							
Mean	-0.162	0.221***	-0.382***	Mean	0.095	0.005	0.090
t- value	-1.53	2.88	-2.92	*t*- value	1.20	0.09	0.92
Median	-0.257**	0.014	-0.272***	Median	0.096	-0.067	0.163
z- value	-2.08	1.55	-2.63	*z*- value	1.26	-0.83	1.508
N	1,295	2,543	-	N	1,295	2,543	-

Table 3: Regression results

This table shows the results from the regression analysis on $\Delta\alpha$ and ΔRISK in each panel. For each regression, the first row shows the results from the simple regression analysis and the second row shows result from the multiple regression analysis. Panel A shows the results for the total sample. Panel B shows the results for the subsample from August 1980 to March 1991 (the bubble economy period). Panel C shows the results for the subsample from April 1991 to March 2005 (the post-bubble economy period). Panel D shows the results for the subsample from April 2005 to December 2008 (the rebound period). The *t*-values, calculated using White's (1980) heteroskedastic-consistent error method corrected for correlations across observations of a given firm, are in parentheses. The superscripts ***, **, and * indicate significant difference from zero at the 1%, 5%, and 10% levels, respectively.

Dependent variable	Independent variable							
	Const	Δ*CRE*	*CRE*	Ln*Size*	*LEV*	*BM*	$\overline{R^2}$	N
Panel A: Total Sample								
$\Delta\alpha$	-0.021	-6.707***					0.002	27753
	(-1.21)	(-7.30)						
	-0.500***	-5.655***	-0.568***	0.010	0.309***	0.376***	0.005	27753
	(-3.09)	(-6.13)	(-3.47)	(0.77)	(3.30)	(9.61)		
Δ*RISK*	0.039***	-0.113					0.000	27753
	3.24	-0.17						
	-0.201*	0.120	0.016	0.009	0.137**	0.074***	0.000	27753
	(-1.77)	(0.18)	(0.14)	(0.97)	(2.15)	(2.87)		
Panel B: From Aug 1980 to Mar 1991								
$\Delta\alpha$	0.085***	-9.353***					0.003	8891
	(2.57)	(-5.07)						
	-1.763***	-6.891***	0.404	0.076***	0.248	1.775***	0.019	8891
	(-5.95)	(-3.68)	(1.18)	(3.37)	(1.42)	(11.96)		
Δ*RISK*	0.002	-2.167					0.000	8891
	(0.08)	(-1.61)						
	-0.243	-1.636	-0.232	0.017	-0.20	0.506***	0.003	8891
	(-1.11)	(-1.18)	(-0.90)	(0.97)	(-1.46)	(4.73)		
Panel C: From Apr 1991 to Mar 2005								
$\Delta\alpha$	-0.107***	-4.851***					0.001	15017
	(-4.73)	(-4.31)						
	-0.135	-4.325***	-0.527**	-0.003	-0.145	0.282***	0.004	15017
	(-0.61)	(-3.84)	(-2.51)	(-0.19)	(-1.14)	(6.32)		
Δ*RISK*	0.068***	0.851					0.000	15017
	(4.21)	(1.07)						
	0.296*	0.998	0.169	-0.040***	0.331***	-0.003	0.001	15017
	(1.91)	(1.25)	(1.11)	(-3.13)	(3.88)	(-0.11)		
Panel D: From Apr 2005 to Dec 2008								
$\Delta\alpha$	0.094	-10.676***					0.004	3845
	(1.53)	(-3.75)						
	-1.585***	-7.316***	-0.592	0.012	2.064***	0.706***	0.017	3845
	(-2.69)	(-2.57)	(-1.22)	(0.26)	(6.26)	(4.78)		
Δ*RISK*	0.036	0.296					0.000	3845
	(0.83)	(0.13)						
	-1.608***	0.679	-0.416	0.129***	0.331	0.148	0.003	3845
	(-3.87)	(0.30)	(-1.20)	(3.82)	(1.42)	(1.38)		

Table 4: Multiple regression analysis results by industry

This table shows the coefficients of Δ*CRER* estimated from multiple regression analysis by industry, based on equations (2) and (3). The *t*-values, calculated using White's (1980) heteroskedastic-consistent error method corrected for correlations across observations of a given firm, are in parentheses. The superscripts ***, **, and * indicate significantly difference from zero at the 1%, 5%, and 10% levels, respectively.

Dependent variable :	Δα (%)		Δ*RISK* (%)		N
Industry	Coef	*t* -value	Coef	*t* -value	
Marine Transportation	31.424**	2.54	2.040	0.30	353
Fishery, Agriculture and Forestry	-13.803	-1.40	11.357	1.41	158
Construction	-12.757***	-3.21	-3.455	-1.11	2450
Wholesale Trade	-0.431	-0.13	3.129	1.07	2123
Electric Appliances	-4.101	-1.02	-1.530	-0.60	3161
Precision Instruments	-19.478**	-2.52	-2.771	-0.66	598
Air Transportation	9.693	0.54	-0.596	-0.02	90
Machinery	-8.960***	-2.64	-2.034	-0.96	2647
Nonferrous Metals	-11.569	-1.85	-0.343	-0.08	668
Information & Communication	-3.215	-0.36	15.181*	1.92	361
Pharmaceutical	-2.125	-0.36	-7.651*	-1.91	655
Iron and Steel	-18.69***	-2.62	3.556	0.75	853
Transportation Equipment	-0.025	0.00	3.886	1.17	1427
Mining	-9.566	-1.43	3.382	0.49	212
Chemicals	-8.590***	-2.98	3.966	1.45	2520
Pulp and Paper	-5.127	-0.91	-2.232	-0.54	445
Glass and Ceramics Products	-14.069**	-2.39	-1.214	-0.28	795
Metal Products	-2.071	-0.37	-2.595	-0.69	800
Textiles and Apparels	-10.153*	-1.83	-0.233	-0.08	1004
Oil and Coal Products	-12.232	-1.43	16.350***	3.00	227
Other Products	2.193	0.33	-1.260	-0.38	789
Rubber Products	-5.595	-0.79	-6.004	-0.68	313
Foods	-6.740**	-2.39	-4.399*	-1.83	1693
Services	0.439	0.12	2.318	0.93	1065
Retail Trade	-4.008*	-1.68	0.978	0.55	1567
Warehousing and Harbor Transportation Service	-3.777	-0.87	-3.510	-1.00	351
Land Transportation	-4.684	-1.25	-1.514	-0.39	428

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