Relations of Japanese Investment Styles and US Investment Styles after the Lehman Bankruptcy: Evidence from Japanese and US Stock Markets

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Abstract

In this paper, in order to clarify the stock return relations of Japanese investment styles and US investment styles after the Lehman bankruptcy, we investigate the dynamic return linkages of Japanese four kinds of stock indices and US three kinds of stock indices. Specifically, this study empirically inspects the dynamic effects of the Nikkei 225, Tokyo stock price index (TOPIX), and the Morgan Stanley Capital International (MSCI) Japanese value- and growth-style equity indices on the MSCI US value, growth, and standard equity indices. As analyzing methodology, we employ the threshold generalized autoregressive conditional heteroskedasticity (TGARCH) model, and as a result of our investigations, we obtain clear and consistent important findings as follows. (1) First, our examinations by the TGARCH model evidence that the Nikkei 225 and TOPIX have a stronger effect on the MSCI US standard stock index than on the MSCI US value- and growth-style indices. (2) Second, our explorations by the TGARCH model further reveal that the time-series evolution of the MSCI Japanese value- and growth-style indices also has a stronger effect on the MSCI US standard stock index than on the MSCI US value- and growth-style stock indices.

Keywords: growth equity index, international stock market linkage, investment style, TGARCH model, value equity index

1. Introduction

The international stock market interdependence (e.g., Voronkova, 2004; Wälti, 2011; el Alaoui et al., 2015) and the value and growth effects on stock performances (e.g., Ding et al., 2005; Fama and French, 2007; Abhyankar et al., 2009; Huang, 2011) have been paid much attention by the researchers in the fields of business, economics, management, and finance. However, we point out that these two appealing topics have been separately studied. Thus, in order to step forward into new research area, using multiple daily time-series stock return data of US and Japanese value, growth, and standard equity indices, this paper attempts to conduct new research by combining these two issues.

More specifically, our objective is to empirically inspect the effects of the Nikkei 225 (hereinafter called 'the Nikkei'), Tokyo stock price index (hereinafter called 'TOPIX'), and the Morgan Stanley Capital International (MSCI) Japanese value- and growth-style equity indices on the MSCI value, growth, and standard equity indices of the United States. This study focuses on the period after the Lehman bankruptcy; and by this, we aim to clarify the stock return relations of Japanese investment styles and US investment styles after the Lehman shock in the US. As analyzing methodology, we employ the threshold generalized autoregressive conditional heteroskedasticity (TGARCH) model in this research.

Briefly documenting our new findings, first, our investigations reveal that (1) after the Lehman bankruptcy in the US, the Nikkei and TOPIX have a stronger effect on the MSCI US standard stock index than on the MSCI US value- and growth-style indices. Second, we find that (2) after the Lehman shock in the US, the time-series evolution of the MSCI Japanese value- and growth-style indices also has a stronger effect on the US standard stock index than on the MSCI US value- and growth-style stock indices.

The remainder of the article is structured as below. First, Section 2 conducts a literature review. Next, Section 3

documents our data and Section 4 explains the econometric methodology employed in this paper. Further, Section 5 reports our empirical results and finally, Section 6 concludes the paper.

2. Literature Review

We here concisely review existing literature in this section. As regards the research of international stock market interdependence, there are many past studies; however, those papers examined the simple linkages among standard equity indices. Reviewing by focusing on very recent papers, Liu (2013) analyzed the international equity market interdependence by using the standard stock market indices as to 40 world markets. Gupta and Guidi (2012) examined the time-varying co-movements and cointegration relations among Indian and Asian developed stock markets. Graham et al. (2013) investigated not only global but also regional co-movements of the Middle East and North Africa (MENA) stock markets. On the other hand, with respect to the research of the value and growth stocks, value effects were much more studied than growth effects. More concretely, Black et al. (2007) investigated the long-run relations among the indices of the value premiums as to G7 countries. Moreover, employing equity return data in international markets, Fama and French (2012) investigated the momentum, value, and size effects in the world stock markets.

In contrast to the value effects, there are very few papers that analyzed the growth effects. A paper by Rytchkov (2010) tested the return predictability as to the US growth- and value-style portfolios. This paper found that the returns of the US growth- and value-style portfolios were forecastable, and for growth-style portfolios, the forecastability was more significant. Further, Larsen and Munk (2012) examined the effectiveness of the growth-value style tilting strategies in the framework of the dynamic asset allocation, and they advocated that such growth-value tilting strategies were highly effective. It is understood that in the existing literature, as the above literature review shows, the issues of international equity market interdependence and the value and growth effects on stock performances have been separately studied. Hence, again in this paper, we conduct new research that takes into consideration these two interesting issues.

3. Data

We next describe the data analyzed in this research. This paper uses four sorts of Japanese stock index return data and three kinds of US stock index return data. Specifically, *plnk* means the daily percentage log return of the Nikkei in Japan and *pltpx* means the daily percentage log return of the TOPIX in Japan. Further, *pljg* is the daily percentage log return of the MSCI Japanese growth-style equity index and *pljv* denotes the daily percentage log return of the MSCI Japanese value-style equity index. In addition, *plus* represents the daily percentage log return of the MSCI US standard equity index, *plusg* is the daily percentage log return of the MSCI US growth-style stock index, and *plusv* is the daily percentage log return of the MSCI US value-style stock index. In this research, our sample period is from 1 January 2009 to 8 April 2016 and the number of the time-series observations is 1897. All data used in this study are obtained from the Thomson Reuters.

Figure 1 shows the time-series return evolution of US and Japanese stock indices after the Lehman bankruptcy and the descriptive statistics of the above return data in the period are exhibited in Table 1. Table 1 suggests the following data characteristics. (1) First, the mean and median values are slightly positive for all stock index return data. (2) Next, Japanese stock index returns show somewhat higher volatilities than the US equity index returns. (3) Further, the values of skewness are slightly negative for all index return data.

4. Methodology

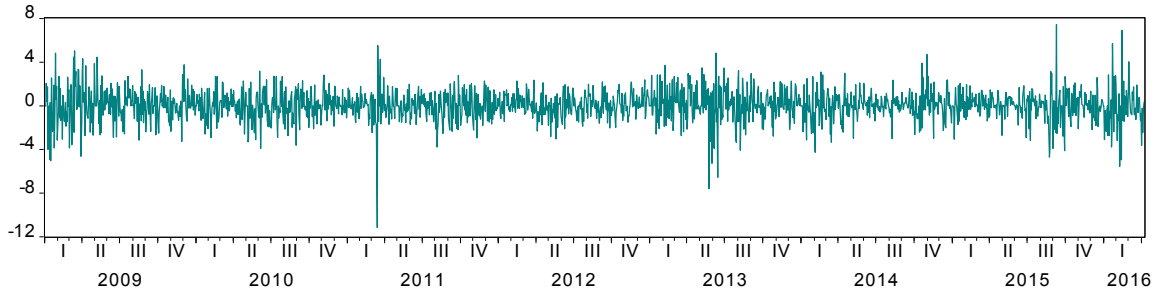
To test the dynamic effects of several Japanese stock index return evolution on the MSCI value, growth, and standard equity index returns in the US, this paper employs a univariate-GARCH model, in which the mean equation has the autoregressive (AR) terms. Namely, in this study, we use the following AR(5)-TGARCH(1,1) model to examine the time-varying effects of Japanese stock index returns on the three different US equity index return evolution:

$$\begin{aligned} y_t &= \eta_1 + \eta_2 z_t + \sum_{p=1}^{5} \lambda_p y_{t-p} + \varepsilon_t, \\ \sigma_t^2 &= \psi_1 + \psi_2 \sigma_{t-1}^2 + \psi_3 \varepsilon_{t-1}^2 + \psi_4 \varepsilon_{t-1}^2 d_{t-1}, \end{aligned} \tag{1}$$

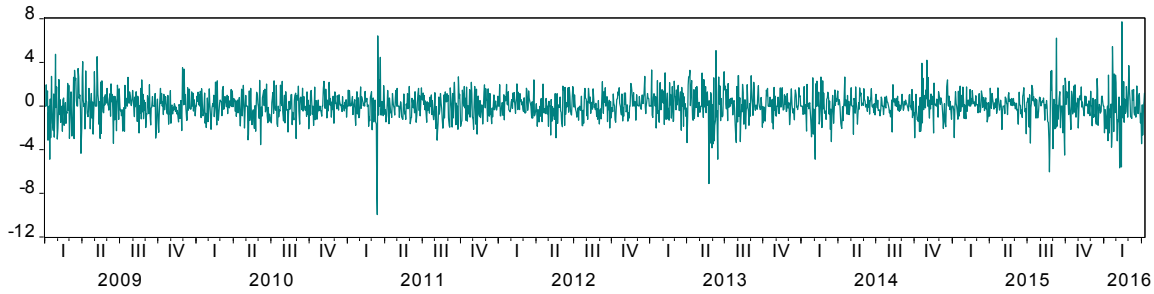
where z_t is one of the stock index returns in Japan and y_t is one of the stock index returns in the US. Further, $d_{t-1} = 1$

if $\varepsilon_{t-1} < 0$ and zero otherwise. Using this AR-TGARCH specification (1), we investigate the international dynamic effects of the Japanese stock returns of the Nikkei, TOPIX, and MSCI value- and growth-style equity indices on the MSCI US standard-, value-, and growth-style stock index returns. We note that between Tokyo and New York, there is 13- or 14-hour time difference and therefore, the Japanese stock market precedes the US equity market. Thus, we use the same-day return data of the US and Japanese stock price indices; and this enables us to evaluate the time-varying effects of the different kinds of Japanese stock indices on the different kinds of succeeding US stock index price changes.

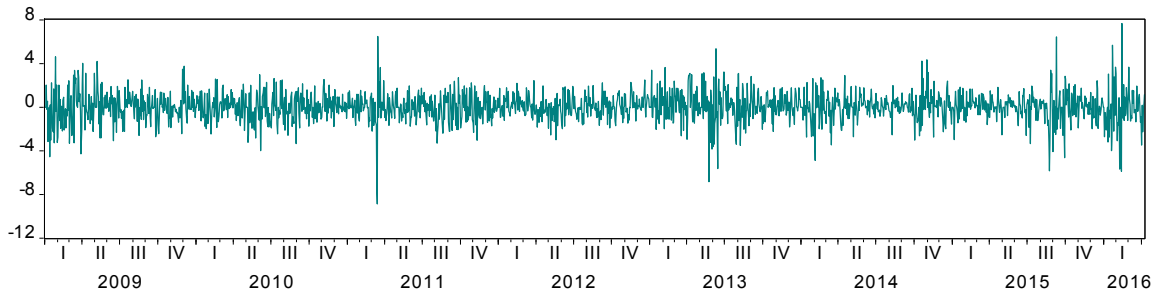
Panel A. *plnk*



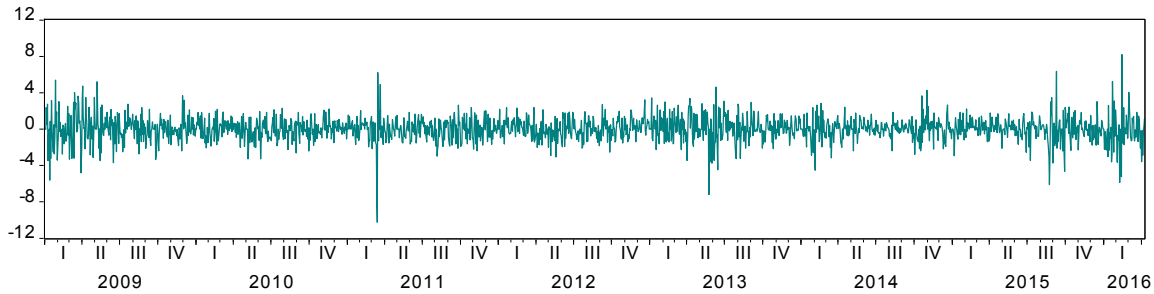
Panel B. *pltpx*



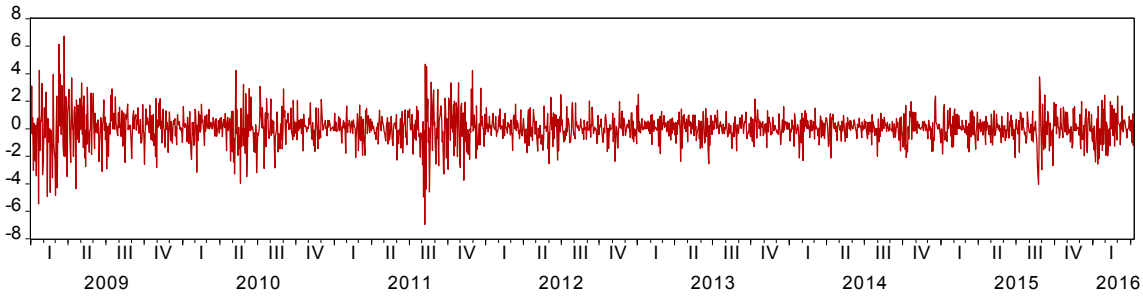
Panel C. *pljg*



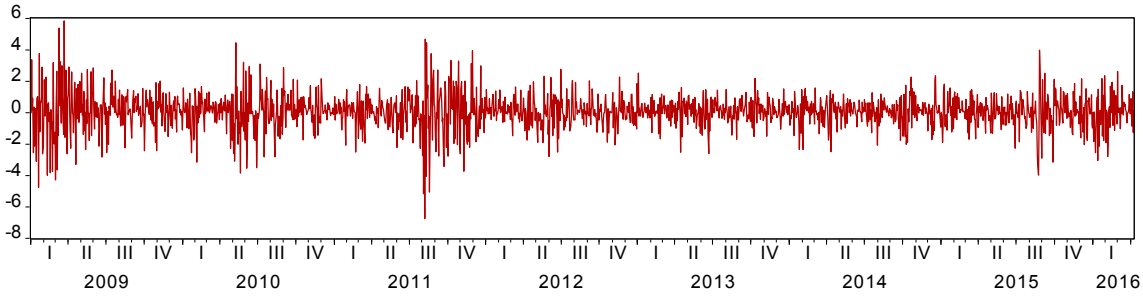
Panel D. *pljv*



Panel E. *plus*



Panel F. *plusg*



Panel G. *plusv*

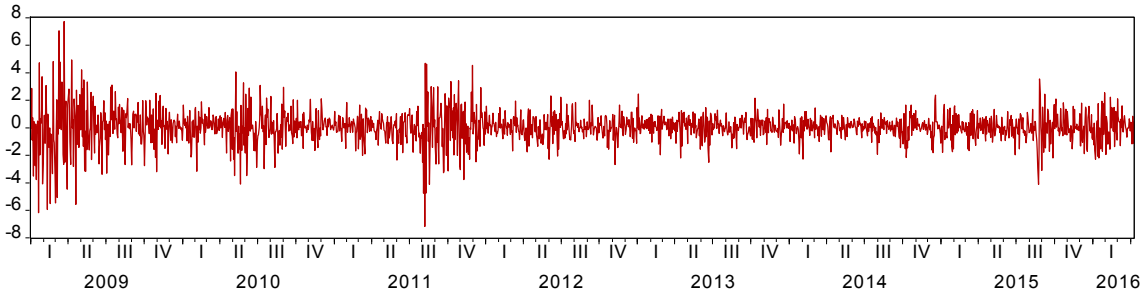


Figure 1. Time-series Evolution of US and Japanese Stock Index Returns after the Lehman Bankruptcy

5. Empirical Results

We here document the results of our empirical analyses. First, Tables 2 and 3 display the estimation results of our AR(5)-TGARCH(1,1) model (1) by using the Nikkei 225 and TOPIX as explanatory variables, respectively. Namely, Table 2 displays the dynamic effects of the Nikkei on the US three kinds of equity indices and Table 3 presents those of the TOPIX on the US three kinds of equity indices. Describing the key results, both in Tables 2 and 3, all coefficients of the daily log returns of the Nikkei and TOPIX are statistically significant with positive signs. Therefore, these results derived from our AR-TGARCH models indicate that the dynamic evolution of the Nikkei and TOPIX positively affects the following changes of standard-, growth-, and value-style equity indices in the US. In addition, in Table 2, we find the smallest values of both the Akaike's information criterion (hereinafter called 'AIC') and the Schwartz criterion (hereinafter called 'SC') in Panel A; and in Table 3, we also find the smallest values of both AIC and SC in Panel A. Hence, these results suggest that the Nikkei and TOPIX have the most substantial effect on the following changes of the US standard equity index. According to the above interesting results, we understand that the preceding Japanese representative stock price index returns of the Nikkei and TOPIX most significantly and robustly affect the succeeding US standard equity index price changes.

Furthermore, Tables 4 and 5 also display the estimation results of our AR(5)-TGARCH(1,1) model (1): Table 4 shows the dynamic effects of the Japanese growth index and Table 5 exhibits those of the Japanese value index,

respectively. Both in Tables 4 and 5, all coefficients of the daily log returns of the Japanese growth and value indices are statistically significant with positive signs. Hence, these results from our AR-TGARCH models indicate that again, the preceding evolution of the Japanese growth and value stocks strongly affect the succeeding time-series of not only growth and value stock indices but also the standard stock index in the US. Moreover, in Table 4, the smallest values of both AIC and SC are found in Panel A. Thus, Table 4 shows that the Japanese growth index has the strongest influence on the standard stock index in the US. Further, in Table 5, we also find the smallest values of both AIC and SC in Panel A. Thus, these results again indicate that the Japanese value index movements have the strongest effect on the succeeding evolution of the US standard stock index. Hence, as the above results consistently demonstrate, it is very robust that the dynamic evolution of all the Japanese standard, value, and growth stock indices most strongly affects the standard stock index in the US. Therefore, our investigations reveal that after the Lehman bankruptcy in the US, the movements of all Japanese investment style indices are significantly important for the US standard equity index, namely, the US overall stock market.

Table 1. Descriptive Statistics for the Log Percentage Returns in Terms of the Nikkei, TOPIX, and MSCI Equity Indices for the US and Japan: For the Daily Sample Period from 1 January 2009 to 8 April 2016

Panel A. Statistics for four kinds of Japanese stock indices			
Nikkei and TOPIX			
	plnk	*pltpx*	
Mean	0.0306	0.0213	
Median	0.0000	0.0000	
Maximum	7.4262	7.7153	
Minimum	−11.1534	−9.9519	
Standard deviation	1.4233	1.3129	
Skewness	−0.4049	−0.3916	
Kurtosis	7.1707	7.9103	
Observations	1897	1897	
MSCI indices			
	pljg	*pljv*	
Mean	0.0235	0.0162	
Median	0.0000	0.0000	
Maximum	7.6655	8.2081	
Minimum	−8.8734	−10.2408	
Standard deviation	1.3543	1.3471	
Skewness	−0.2655	−0.3171	
Kurtosis	6.7078	7.8924	
Observations	1897	1897	
Panel B. Statistics for three kinds of US stock indices			
MSCI indices			
	plus	*plusg*	*plusv*
Mean	0.0434	0.0533	0.0332
Median	0.0412	0.0618	0.0352
Maximum	6.7347	5.8435	7.7390
Minimum	−6.9601	−6.7437	−7.1882
Standard deviation	1.1131	1.0988	1.1672
Skewness	−0.2778	−0.2967	−0.2409
Kurtosis	7.5133	6.5564	8.7233
Observations	1897	1897	1897

Notes: This table shows the descriptive statistics as to the daily percentage log returns of seven kinds of stock indices. The indices for Japan include the Nikkei 225 stock index, TOPIX, and MSCI Japanese growth and value stock indices; while the indices for the US include MSCI US standard, growth, and value stock indices. The sample period analyzed in this paper spans 1 January 2009 to 8 April 2016.

Table 2. Dynamic Effects of the Nikkei 225 on Different US Stock Indices: Estimation Results of the AR-TGARCH Models with the GED Errors

Panel A. Effects of the Nikkei 225 on the US standard index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0437***		0.0043
plnk	0.0831***		0.0000
AR(1)	−0.0910***		0.0003
AR(2)	−0.0047		0.8308
AR(3)	−0.0117		0.5825
AR(4)	0.0094		0.6605
AR(5)	−0.0070		0.7310
AIC	2.599877	SC	2.635049
Panel B. Effects of the Nikkei 225 on the US growth index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0567***		0.0004
plnk	0.0819***		0.0000
AR(1)	−0.0750***		0.0023
AR(2)	−0.0140		0.5209
AR(3)	−0.0196		0.3574
AR(4)	0.0090		0.6740
AR(5)	0.0054		0.7873
AIC	2.644313	SC	2.679485
Panel C. Effects of the Nikkei 225 on the US value index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0340**		0.0261
plnk	0.0883***		0.0000
AR(1)	−0.1064***		0.0001
AR(2)	−0.0067		0.7699
AR(3)	−0.0034		0.8785
AR(4)	−0.0015		0.9483
AR(5)	−0.0178		0.4072
AIC	2.634255	SC	2.669426

Notes: The Akaike's information criterion is denoted by AIC and the Schwartz criterion is denoted by SC. ***, **, and * denote the statistical significance at the 1, 5, and 10% levels, respectively.

Table 3. Dynamic Effects of the TOPIX on Different US Stock Indices: Estimation Results of the AR-TGARCH Models with the GED Errors

Panel A. Effects of the TOPIX on the US standard index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0451***		0.0030
pltpx	0.0852***		0.0000
AR(1)	−0.0861***		0.0005
AR(2)	−0.0118		0.5902
AR(3)	−0.0130		0.5383
AR(4)	0.0085		0.6897
AR(5)	−0.0044		0.8299
AIC	2.601072	SC	2.636243
Panel B. Effects of the TOPIX on the US growth index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0602***		0.0001
pltpx	0.0804***		0.0000
AR(1)	−0.0683***		0.0048
AR(2)	−0.0190		0.3816
AR(3)	−0.0190		0.3687
AR(4)	0.0064		0.7614
AR(5)	0.0104		0.6037
AIC	2.645426	SC	2.680598
Panel C. Effects of the TOPIX on the US value index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0358**		0.0196
pltpx	0.0910***		0.0000
AR(1)	−0.1006***		0.0001
AR(2)	−0.0107		0.6373
AR(3)	−0.0028		0.8985
AR(4)	−0.0011		0.9600
AR(5)	−0.0158		0.4611
AIC	2.635274	SC	2.670445

Notes: The Akaike's information criterion is denoted by AIC and the Schwartz criterion is denoted by SC. ***, **, and * denote the statistical significance at the 1, 5, and 10% levels, respectively.

Table 4. Dynamic Effects of the Japanese Growth Stock Index on Different US Stock Indices: Estimation Results of the AR-TGARCH Models with the GED Errors

Panel A. Effects of the Japanese growth index on the US standard index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0451***		0.0031
pljg	0.0859***		0.0000
AR(1)	−0.0879***		0.0004
AR(2)	−0.0089		0.6846
AR(3)	−0.0132		0.5320
AR(4)	0.0099		0.6423
AR(5)	−0.0052		0.7983
AIC	2.599831	SC	2.635003
Panel B. Effects of the Japanese growth index on the US growth index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0582***		0.0002
pljg	0.0850***		0.0000
AR(1)	−0.0714***		0.0032
AR(2)	−0.0174		0.4227
AR(3)	−0.0199		0.3487
AR(4)	0.0075		0.7238
AR(5)	0.0080		0.6917
AIC	2.643213	SC	2.678384
Panel C. Effects of the Japanese growth index on the US value index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0348**		0.0230
pljg	0.0900***		0.0000
AR(1)	−0.1013***		0.0001
AR(2)	−0.0098		0.6655
AR(3)	−0.0042		0.8480
AR(4)	−0.0016		0.9439
AR(5)	−0.0166		0.4387
AIC	2.634584	SC	2.669756

Notes: The Akaike's information criterion is denoted by AIC and the Schwartz criterion is denoted by SC. ***, **, and * denote the statistical significance at the 1, 5, and 10% levels, respectively.

Table 5. Dynamic Effects of the Japanese Value Stock Index on Different US Stock Indices: Estimation Results of the AR-TGARCH Models with the GED Errors

Panel A. Effects of the Japanese value index on the US standard index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0472***		0.0018
pljv	0.0828***		0.0000
AR(1)	−0.0863***		0.0005
AR(2)	−0.0128		0.5586
AR(3)	−0.0109		0.6046
AR(4)	0.0070		0.7415
AR(5)	−0.0044		0.8281
AIC	2.600802	SC	2.635973
Panel B. Effects of the Japanese value index on the US growth index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0593***		0.0002
pljv	0.0758***		0.0000
AR(1)	−0.0654***		0.0068
AR(2)	−0.0190		0.3815
AR(3)	−0.0161		0.4446
AR(4)	0.0061		0.7724
AR(5)	0.0104		0.6044
AIC	2.646214	SC	2.681386
Panel C. Effects of the Japanese value index on the US value index			
Estimation results in terms of mean equation and model statistics			
Variables	Coefficients		*p*-value
Intercept	0.0367**		0.0160
pljv	0.0918***		0.0000
AR(1)	−0.1039***		0.0001
AR(2)	−0.0129		0.5704
AR(3)	0.0002		0.9928
AR(4)	−0.0013		0.9528
AR(5)	−0.0156		0.4678
AIC	2.634323	SC	2.669495

Notes: The Akaike's information criterion is denoted by AIC and the Schwartz criterion is denoted by SC. ***, **, and * denote the statistical significance at the 1, 5, and 10% levels, respectively.

6. Conclusions

In this paper, for clarifying the stock return relations of Japanese investment styles and US investment styles after the Lehman bankruptcy in the US, we empirically explored the dynamic return linkages of Japanese four kinds of stock indices and US three kinds of stock indices. Specifically, this study empirically inspected the dynamic effects of the Nikkei 225, TOPIX, and the MSCI Japanese value- and growth-style stock indices on the MSCI standard-, value-, and growth-style stock indices in the US. As a result of our analyses with AR-TGARCH models, we obtained clear and consistent interesting findings as follows.

(1) First, our examinations by AR-TGARCH models evidenced that after the Lehman bankruptcy in the US, the Nikkei and TOPIX had a stronger effect on the MSCI US standard stock index than on the MSCI value- and growth-style indices in the US. (2) Second, our explorations by the AR-TGARCH models further revealed that after the Lehman bankruptcy in the US, the time-series evolution of the MSCI Japanese value and growth indices also more strongly influenced the MSCI US standard stock index than the MSCI US value- and growth-style stock indices. To sum up, after the Lehman bankruptcy in the US, our investigations revealed that all Japanese investment style indices were important for the US overall stock market.

We consider that it is interesting and surprising that not the same sorts of stock indices but the different kinds of stock indices of the US and Japan exhibited stronger dynamic relations; and as our study demonstrated, these were robustly evidenced in the period after the collapse of Lehman Brothers in the US. Furthermore, it is also noted that our new analyzing approach to different types of equity indices in two international markets shall bring some additional new viewpoints to future research of international stock market interdependence. Further research by using other combinations of different international stock indices with different analyzing viewpoints from previous studies is also our future works; and this line of research may derive further new findings and useful practical implications in this field.

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